The Sizewell C Project

6.3 Volume 2 Main Development Site

Chapter 14 Terrestrial Ecology and Ornithology

Appendix 14A3 - Plants and Habitats

Revision: 1.0

Applicable Regulation: Regulation 5(2)(a)

PINS Reference Number: EN010012

May 2020

Planning Act 2008
Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

SIZEWELL C DEVELOPMENT – MAIN DEVELOPMENT SITE: VOLUME 2, CHAPTER 14:

APPENDIX 14A3 – PLANTS AND HABITATS

Documents included within this Appendix are as follows:

APPENDIX 14A3 PLANTS AND HABITATS

ANNEX 14A3.1 FIGURES (provided separately)

ANNEX 14A3.2 DESK STUDY

ANNEX 14A3.3 SECONDARY DATA

- Annex 14A3.3 Sizewell grassland surveys
- Annex 14A3.3 Phase 1 Habitat Survey Land West Lovers Lane
- Annex 14A3.3 Phase 1 Consolidated
- Annex 14A3.3 NVC Consolidated Report 2007-8
- Annex 14A3.3 NVC coast part 1
- Annex 14A3.3 NVC coast part 2
- Annex 14A3.3 Aldhurst Farm Phase 1

ANNEX 14A3.4 PRIMARY DATA

- Annex 14A3.4 Bryophyte Sampling Locations

- Annex 14A3.4 SZC Hedgerow Assessments – Hyder 2015
- Annex 14A3.4 SZC Arable weeds survey – Hyder 2015
- Annex 14A3.4 Bryophyte Baseline Assessment
- Annex 14A3.4 Sizewell lichen survey
- Annex 14A3.4 SZB RF Footpath alignment NVC Technical Note 2019
- Annex 14A3.4 SZC NVC 2014

NOTE:

Please note that the red line boundary used in figures within this document may have since been amended, and therefore does not reflect the boundaries in respect of which development consent has been sought in this application. However, the amendment to the red line boundary does not have any impact on the findings set out in this document and all other information remains correct.

VOLUME 2, CHAPTER 14: APPENDIX 14A3 – PLANTS AND HABITATS

Contents

Tables

Plates

Figures

Annexes

Annex 14A3.1 Figures

Annex 14A3.2 Desk-study

Annex 14A3.3 Secondary Data

Annex 14A3.4 Primary Data

Executive Summary

This appendix describes the plants and habitats baseline conditions that fall within the Zone of Influence (ZOI) of the Sizewell C power station at the main development site (hereafter referred to as the "proposed development").

Desk-study records identified the presence of the plant Deptford Pink (*Dianthus armeria*), protected under Schedule 8 of the Wildlife and Countryside Act (Ref 1.1).

Survey work identified that the largest component of the proposed development site (hereafter referred to as the "site") is arable farmland habitat which is of little intrinsic botanical diversity, although the margins of the fields support two uncommon arable weeds, Corn Spurrey (*Spergula arvensis*) and Shepherd's Cress (*Teesdalia nudicaulis*).

Away from the arable fields, a diverse range of habitats are present, including broad-leaved woodland, conifer plantation, acid grassland, dune grassland, vegetated shingle and wetland (including fen meadow, wet woodland, ditches and reedbed). These include habitats of national importance, the wetland habitats within Sizewell Marshes Site of Special Scientific Interest (SSSI), and the dune and shingle vegetation forming part of the Suffolk Shingle Beaches County Wildlife Site (CWS). Habitats of county importance include mixed and broad-leaved woodland and acid grassland. To the north of the site, the Minsmere to Walberswick Heaths and Marshes Special Area of Conservation (SAC) supports wetland, heathland and coastal vegetation of international importance.

Many of the habitat types present are priority habitats in the Suffolk Biodiversity Action Plan (BAP) (Ref 1.2), Suffolk's Priority Species and Habitats list (Ref. 1.3), and are habitats of principal importance for the conservation of biodiversity under the Natural Environment and Rural Communities (NERC) Act (Ref 1.4). Detailed botanical survey work in accordance with the National Vegetation Classification (NVC) has been undertaken in those areas considered to support habitats of particular botanical diversity.

A detailed eco-hydrological review of the fen meadow vegetation present within Sizewell Marshes SSSI has considered all available data to identify patterns and trends within the vegetation and how these trends are related to the underlying eco-hydrological conditions. This has shown that there is a strong relationship between the best zones of fen meadow and wet ground conditions, low fertility and neutral to

basic pH. Survey work has enabled four grades of fen meadow to be identified, with the two highest-quality grades (Grades 1 and 2, supporting the greatest number of rich-fen species) comprising approximately 60% of the total fen meadow area.

To ensure a robust Ecological Impact Assessment (EcIA) process, all plant assemblages and habitat types within the ZOI of the proposed development have been assessed to determine whether they would qualify as Important Ecological Features (IEFs), as defined in Chartered Institute of Ecology and Environmental Management (CIEEM) guidelines on EcIA (Ref. 1.5). In addition, plants and habitats have been assessed in accordance with the standard Environmental Impact Assessment (EIA) methodology used elsewhere within the **Environmental Statement** (**ES**) (Doc Ref. Book 6).

Based on these criteria, the following plant and habitat ecological receptors within the ZOI of the proposed development have been identified as IEFs:

- The habitats present within the Minsmere to Walberswick Heaths and Marshes SAC, would be of international importance under the CIEEM guidelines (Ref. 1.5) and of high importance following the EIA-specific assessment methodology.

- The habitat and plant designated features of the habitats within both the Minsmere to Walberswick Heaths and Marshes Heaths SSSI and Sizewell Marshes SSSI would be considered of national importance under CIEEM guidelines and of high importance following the EIA-specific assessment methodology.

- Vegetated shingle and dune within the Suffolk Shingle Beaches CWS would be considered of national importance under CIEEM guidelines and of high importance following the EIA-specific assessment methodology.

- The acid grassland, broad-leaved and mixed woodland resource within the site would be of county importance under CIEEM guidelines and of medium importance following the EIA-specific assessment methodology.

- The plant Deptford Pink would be considered of county importance under CIEEM guidelines and of medium importance following the EIA-specific assessment methodology.

- As outlined in **Appendix 14A.2** of this volume – Designated Sites, additional European and national designated sites have been taken forward for consideration in the **ES** due to potential impact pathways such as recreational disturbance or air quality changes but a detailed assessment of the plants and habitats they support is not discussed here.

1. Plants and Habitats

1.1 Introduction

a) Purpose of this appendix

1.1.1 This is an appendix to the Sizewell C power station at the main development site (referred to throughout this volume as the "proposed development") Volume 2, Chapter 14 of the ES (Doc Ref. 6.3). This appendix presents a description of the plants and habitats baseline for the proposed development site (hereafter referred to as the "site") (and adjacent areas). It describes the methodologies employed in carrying out the desk-studies and detailed surveys, provides the results of this work, evaluates each receptor and determines the plant and habitat features that could potentially be affected.

1.1.2 In addition to this appendix, a Plants and Habitats Synthesis Report, provided in **Appendix 14B1** of this volume also provides the evidence base underpinning the assessment. This evidence is referenced in sections of this baseline and the **ES** to support the conclusions reached.

b) Establishing Zone of Influence, study area and survey area

i. Zone of Influence

1.1.3 In establishing an appropriate ZOI for plants and habitats, reference was made to **Appendix 14A2** of this volume – Designated Sites and consideration was given to the cited plant and habitat interest features of designated sites within the following ZOI:

- Special Protection Areas (SPAs), SACs and Ramsar sites within 20 kilometre (km) radius of the site;
- SSSIs within a 20km radius of the site; and
- CWSs within a 2km radius of the site.

1.1.4 Direct effects on plants and habitats from the proposed development would, by their nature, be relatively localised, so the ZOI for these would be restricted to the site boundary. However, plants and habitats could also be affected indirectly through impacts such as recreational pressure and changes in air quality. The ZOI for these effects is far greater, so the ZOI has been extended to 20km for statutory designated sites.

ii. Study area and survey area

1.1.5 The study area for designated sites mirrors the ZOI defined above, whilst desk-study data relating to plants and habitats (outside of designated sites) was requested from within the site and a 2km radius.

1.1.6 The survey area for plants and habitats has encompassed all of the habitats within the site boundary, extended where appropriate. The survey area is shown on the Phase 1 habitat map, **Figure 14A3.1** as provided in **Annex 14A3.1**.

c) Structure of this appendix

1.1.7 This appendix has been set out as follows:

- **Section 2** sets out the approach and methodology for obtaining the desk-study and secondary data. The detail of the desk-study information acquired is presented in **Annex 14A3.2**, whilst the secondary data reports are presented in **Annex 14A3.3**.

- **Section 3** first sets out the approach and methodology for the collection of primary data. The detailed data underpinning these results are presented in **Annex 14A3.4**.

- Finally, **section 4** brings together all of this information into a detailed consideration of the baseline conditions for plants and habitats within the site and identifies those IEFs (whether habitats or individual plants species) to be taken forward to be considered and assessed with the EcIA.

1.1.8 Figures summarising the ecological baseline regarding Plants and Habitats are presented in **Annex 14A3.1 - Figures.**

1.2 Desk-study/secondary data

a) Approach and methodology

i. Desk-study

1.2.1 Information on plants and habitats was requested from Suffolk Biodiversity Information Service (SBIS) in 2014 and updated in 2018. This included records of legally protected or notable plant species and the distribution of semi-natural habitats within a 10km radius of the site boundary.

1.2.2 The Suffolk BAP, Suffolk's Priority Species and Habitats list, and the habitats and species of principal importance included on the Section 41 list of the Natural Environment and Rural Communities (NERC) Act, were reviewed with reference to the habitats and plant species present, or likely to be present, within or adjacent to the site and the wider study area.

1.2.3 The locations of all designated sites (statutory and non-statutory) within the ZOI defined in **section 1.2** of this appendix were identified. Citations for these sites were reviewed to ascertain which habitats and/or plants are included as interest features of these sites.

1.2.4 With regard to statutory designated sites, the only direct habitat loss would be within Sizewell Marshes SSSI, and this area may also be subject to hydrological change. Detailed botanical surveys have, therefore, been carried out within Sizewell Marshes SSSI. In addition, detailed surveys were also carried out over a small area of the Minsmere to Walberswick Heaths and Marshes SPA, SAC, Ramsar site and SSSI, this being the coastal dune vegetation located just to the north of the site as dust and other air quality effects may potentially affect this location.

1.2.5 For the remainder of statutory designated sites, desk-study information is considered sufficient to inform the baseline for these sites.

1.2.6 Detailed botanical surveys have also been conducted of the Suffolk Shingle Beaches CWS and the rides of Goose Hill Conifer Plantation as these areas will also be subject to habitat loss.

1.2.7 In addition to reviewing the above sources of information, a detailed eco-hydrological review has been undertaken of the fen meadow and ditch communities present within Sizewell Marshes SSSI. This has considered all available data to identify patterns and trends within the vegetation and how these are related to the underlying eco-hydrological conditions. This review includes a detailed description of the underlying hydrological functioning of Sizewell Marshes SSSI and highlights particularly sensitive areas for the fen meadow communities. This is a large and detailed body of work, comprising several separate reports. A summary of this information is presented within **Appendix 14B1** of this volume - Plants and Habitats Synthesis Report**.**

ii. Secondary data

Wood Group

1.2.8 Wood Group (formerly Entec and Amec Foster Wheeler) undertook Phase 1 habitat surveys within the site boundary and wider study area during the period 2007 to 2012. This comprised mapping dominant habitat types following the Phase 1 habitat survey methodology (Ref 1.6).

1.2.9 In addition to the Phase 1 habitat surveys, more detailed botanical surveys on targeted areas of semi-natural habitat were also undertaken by Wood Group during 2007 and 2008, following the NVC methodology (Ref 1.7). Areas of habitat subject to an NVC survey included the grassland of the main platform, dune and shingle habitats on the coast, reedbed, fen meadow and ditch habitats within Sizewell Marshes SSSI, and woodland and woodland ride habitat within Goose Hill and Kenton Hills.

1.2.10 The following reports pertaining to the site and the wider study area have been reviewed when compiling this appendix:

- Wood Group (2010) Extended Phase 1 Habitat Survey, Aldhurst Farm, Leiston (Ref 1.8);

- Wood Group (2011) Extended Phase 1 Habitat Survey, land West of Lovers Lane, Leiston, Associated Development Site 4 (Ref 1.9);
- Wood Group (2012) Sizewell C Consolidated Extended Phase 1 Habitat Survey Report 2007-2012 (Ref 1.10); and
- Wood Group (2012) Sizewell C National Vegetation Classification Survey Report 2007-2008 (Ref 1.11).

Other secondary data

1.2.11 A number of studies have been carried out by Suffolk Wildlife Trust (SWT) and SZC Co. and the following information has been reviewed when compiling this ecological baseline.

Suffolk Wildlife Trust (2003) Sizewell beach vegetation survey

1.2.12 This survey work comprised an NVC survey of the vegetation growing on sand and shingle habitats located on the seaward side of both the Sizewell B and C power station platforms (Ref 1.12). The full methodology and results of this survey are presented in **Annex 14A3.3**.

Annual monitoring of fen meadow communities within Sizewell Marshes SSSI

1.2.13 This monitoring work, undertaken by OHES Environmental Ltd on behalf of SWT, has been carried out annually within Sizewell Marshes since 1995, and has provided a large amount of detail concerning the fen meadow habitat (Ref 1.13). This data has been summarised within **Appendix 14B1**of this volume - Plants and Habitats Synthesis Report**.**

EDF Energy Estate dry grassland survey 2018

1.2.14 The purpose of the survey was to undertake an assessment of the character and condition of the grassland swards in six compartments of the EDF Energy Estate: Black Walks, Broom Covert, Leiston Common, Retsom's Field, Walk Barn and Whinney Hill. The fieldwork was undertaken

in July 2018 (Ref 1.14). The full methodology and results of this survey are presented in **Annex 14A3.3**.

b) Results

i. Desk-study

1.2.15 As outlined in **section 2.1,** citations for designated sites were reviewed to ascertain which habitats and/or plants are included as designated interest features of these sites. Full details of these sites are provided in **Appendix 14A2** of this volume – Designated Sites and summarised in **Table 1.1**.

Table 1.1: Summary of statutory designated sites

Designated Site	Designated Interest Feature
Minsmere to Walberswick Heaths and Marshes SAC (Ref 1.15)	Supports the following **Annex 1** habitats as a primary reason for selection: Annual vegetation of drift lines - Occurs on a well-developed beach strandline (the location just above the high-tide mark where tidal debris is deposited) of mixed sand and shingle and is the best and most extensive example of this restricted geographical type. Species include those typical of sandy shores, such as Sea Sandwort (*Honckenya peploides*) and shingle plants such as sea beet (*Beta vulgaris* ssp. *maritima*). European dry heaths - This type of vegetation is dominated by heather (*Calluna vulgaris*), western gorse (*Ulex gallii*) and Bell Heather (*Erica cinerea*). Habitat present as qualifying features, but not primary reason for selection: Perennial vegetation of stony banks - Comprises vegetated coastal shingle with plant species yellow horned-poppy (*Glaucium flavum*), rare Sea-kale (*Crambe maritima*) and Sea Pea (*Lathyrus japonicus*). Where sea spray is blown over the shingle, plant communities with a high frequency of salt-tolerant species such as thrift (*Armeria maritima*) and Sea campion (*Silene uniflora*) occur. These may exist in a matrix with abundant lichens.
Alde, Ore and Butley Estuaries SAC (Ref 1.16)	Supports the following **Annex 1** habitats as a primary reason for selection: Estuaries Habitat present as qualifying features, but not primary reason for selection:

Designated Site	Designated Interest Feature
	Mudflats and sand flats not covered by sea at low tide Atlantic salt meadows - Comprises saltmarsh that develops when halophytic vegetation colonizes soft intertidal sediments of mud and sand in areas protected from strong wave action.
Orford Ness to Shingle Street SAC (Ref 1.17)	Supports the following **Annex 1** habitats as a primary reason for selection: Coastal lagoons - The lagoons at this site have developed in the shingle bank adjacent to the shore at the mouth of the Ore Estuary. The salinity of the lagoons is maintained by percolation through the shingle, although at high tides sea water can overtop the shingle bank. The fauna of these lagoons includes typical lagoon species, such as the cockle (*Cerastoderma glaucum)*, the ostracod (*Cyprideis torosa*) and the gastropods (*Littorina saxatilis tenebrosa* and *Hydrobia ventrose*). The nationally rare starlet sea anemone (*Nematostella vectensis*) is also found at the site. Annual vegetation of drift lines - Orford Ness is an extensive shingle spit, some 15km in length. Drift line vegetation occurs on the sheltered, western side of the spit, at the transition from shingle to saltmarsh, as well as on the exposed eastern coast. The drift line community is widespread on the site and comprises sea beet and orache (*Atriplex spp*.) in a strip 2-5m wide. Perennial vegetation of stony banks - This spit supports some of the largest and most natural sequences in the UK of shingle vegetation affected by salt spray. The southern end of the spit has a particularly fine series of undisturbed ridges, with zonation of communities determined by the ridge pattern. Pioneer communities with Sea Pea and False Oat-grass (*Arrhenatherum elatius*) grassland occur. Locally these are nutrient-enriched by the presence of a gull colony; elsewhere they support rich lichen communities.
Minsmere to Walberswick Ramsar (Ref 1.18)	The site fulfils the following Ramsar criteria as justification for its selection: Ramsar Criterion 1*:* Contains a mosaic of marine, freshwater, marshland and associated habitats, complete with transition areas in between. Contains the largest continuous stand of reedbeds in England and Wales and a rare transition in grazing marsh ditch plants from brackish to fresh water. Ramsar Criterion 2: Supports nine nationally scarce plants.
Alde-Ore Estuary Ramsar (Ref 1.19)	The site fulfils the following Ramsar criteria as justification for its selection: Ramsar Criterion 2*:* Supports a number of nationally scarce plant

Designated Site	Designated Interest Feature
	species and British Red Data Book invertebrates.
Alde – Ore Estuary SSSI (Ref 1.20)	This site stretches along the coast from Bawdsey to Aldeburgh and inland to Snape. It includes Orford Ness, Shingle Street, Havergate Island, and the Butley, Ore and Alde Rivers. The site also contains a number of coastal formations and estuarine features including mud-flats, saltmarsh, vegetated shingle and coastal lagoons which are of special botanical and ornithological value. The notified plant and habitat interest features and NVC communities of this site are as follows: Saline coastal lagoons [1]SD1 - *Rumex crispus - Glaucium flavum* shingle community SD2 - *Cakile maritima-Honkenya peploides* strandline community Sheltered muddy shores (including estuarine muds) SM14 - *Atriplex portulacoides* saltmarsh Vascular plant assemblage
Blaxhall Heath SSSI (Ref 1.21)	Blaxhall Heath is one of the few fragments of the once extensive Sandlings Heath of coastal Suffolk and is a good example of this type of dry lowland heath. The notified plant and habitat interest features and NVC communities of this site are as follows: H8 - *Calluna vulgaris - Ulex gallii* heath SD11 - *Carex arenaria - Cornicularia aculeata* dune community U1 - *Festuca Ovina - Agrostis Capillaris - Rumex Acetosella* grassland
Cransford Meadow SSSI (Ref 1.22)	This site consists of two unimproved species-rich meadows which have developed in a shallow valley close to the headwaters of a tributary of the River Alde. The notified plant and habitat interest features and NVC communities of this site are as follows: MG5 - *Cynosurus cristatus - Centaurea nigra* grassland
Gromford Meadow SSSI	Gromford Meadow is a good example of an unimproved base-rich marsh on an alluvial soil with a high organic content. It borders the River

[1] SD1 and similar initials refer to the NVC habitat classification type.

Designated Site	Designated Interest Feature
(Ref 1.23)	Alde and is fed by springs. It is species-rich and contains a variety of characteristic fen meadow and marshland plants. The notified plant and habitat interest features and NVC communities of this site are as follows: M22 - *Juncus subnodulosus - Cirsium palustre* fen meadow
Iken Wood SSSI (Ref 1.24)	Iken Wood lies close to the banks of the River Alde and may well be the only ancient coppice wood on blown sand in Britain. It is the most interesting example of lowland coppice oakwood in Suffolk and has a distinctive flora typical of woods on light soils. The notified plant and habitat interest features and NVC communities of this site are as follows: W10 - *Quercus robur - Pteridium aquilinum - Rubus fruticosus* woodland
Leiston to Aldeburgh SSSI (Ref 1.25)	Leiston to Aldeburgh SSSI contains a rich mosaic of habitats including acid grassland, heath, scrub, woodland, fen, open water and vegetated shingle. This mix of habitats in close juxtaposition and the associated transition communities between habitats are unusual in the Suffolk Coast and Heaths. The variety of habitats support a diverse and abundant community of breeding and overwintering birds, a high number of dragonfly species and many scarce plants. The notified plant and habitat interest features and NVC communities of this site are as follows: H1 - *Calluna vulgaris - Festuca ovina* heath S4 - *Phragmites australis* swamp and reedbeds Lowland ditch systems SD1 - *Rumex crispus - Glaucium flavum* shingle community U1 *Festuca Ovina - Agrostis Capillaris - Rumex Acetosella* grassland Vascular Plant Assemblage W1 - *Salix cinerea - Galium palustre* woodland W2 - *Salix cinerea - Betula pubescens - Phragmites australis* woodland W6 - *Alnus glutinosa - Urtica dioica* woodland
Minsmere to Walberswick Heaths and Marshes SSSI (Ref 1.26)	This composite site is situated on the coast of Suffolk between Southwold in the north and EDF Energy Estate in the south. A small area is included within the northern portion of the EDF Energy Estate. It contains a complex series of habitats, notably mudflats, shingle beach, reedbeds, heathland and grazing marsh, which combine to create an area of exceptional scientific interest. The notified plant and habitat interest features and NVC communities of

Designated Site	Designated Interest Feature
	this site are as follows: H1 - *Calluna vulgaris - Festuca ovina* heath H8 - *Calluna vulgaris - Ulex gallii* heath Lowland ditch systems M22 - *Juncus subnodulosus - Cirsium palustre* fen meadow M23 - *Juncus effusus / acutiflorus - Galium palustre* rush pasture M27 - *Filipendula ulmaria - Angelica sylvestris* mire Population of Schedule 8 plant - *Filago lutescens*, Red-tipped Cudweed S2 - *Cladium mariscus* swamp and sedge-beds S26 - *Phragmites australis - Urtica dioica* tall-herb fen S4 - *Phragmites australis* swamp and reedbeds S7 - *Carex acutiformis* swamp Saline coastal lagoons SD1 - *Rumex crispus - Glaucium flavum* shingle community SD11 - *Carex arenaria - Cornicularia aculeata* dune community SD12 - *Carex arenaria - Festuca ovina - Agrostis capillaris* dune grassland SD2 - *Cakile maritima-Honkenya peploides* strandline community SD6 - *Ammophila arenaria* mobile dune community Sheltered muddy shores (including estuarine muds) SM14 - *Atriplex portulacoides* saltmarsh SM24 - *Elytrigia atherica* saltmarsh U1 - *Festuca Ovina - Agrostis Capillaris - Rumex Acetosella* grassland W6 - *Alnus glutinosa - Urtica dioica* woodland
Potton Hall Fields SSSI (Ref 1.27)	Potton Hall Fields are of special interest for their populations of the nationally rare Red-tipped Cudweed (*Filago lutescens*), several thousand of which have been recorded there. The plant occurs in only two other counties in Britain and, being listed on Schedule 8 of the Wildlife and Countryside Act, is protected under the provisions of Section 13.
Sandlings Forest SSSI (Ref 1.28)	This site is notified for its coniferous woodland which supports internationally important populations of woodlark (*Lullula arborea*) and nightjar (*Caprimulgus* *europaeus).* There are no notified plant and habitat interest features for this site but

Designated Site	Designated Interest Feature
	the broad habitat type present is coniferous woodland.
Sizewell Marshes SSSI (Ref 1.29)	Sizewell Marshes are important for their large area of lowland, unimproved wet meadows (fen meadow), reedbed, ditches with diverse aquatic flora and wet woodland which support outstanding assemblages of invertebrates and breeding birds. Several nationally scarce plants are also present. The notified plant and habitat interest features of this site and NVC communities are as follows: Lowland ditch systems M22 - *Juncus subnodulosus - Cirsium palustre* fen meadow M23 - *Juncus effusus / acutiflorus - Galium palustre* rush pasture S26 - *Phragmites australis - Urtica dioica* tall-herb fen Vascular plant assemblage
Snape Warren SSSI (Ref 1.30)	The site is a fine example of the lowland heathland of eastern England, which has been subject to considerable loss in the last 40 years. The vegetation is characterised by extensive areas of heath interspersed with acid grassland dominated by Common Bent (*Agrostis capillaris)*. The notified plant and habitat interest features and NVC communities of this site are as follows: H8 - *Calluna vulgaris - Ulex gallii* heath U1 - *Festuca Ovina - Agrostis Capillaris - Rumex Acetosella* grassland U4 - *Festuca ovina - Agrostis capillaris - Galium saxatile* grassland
Titsal wood Shadingfield SSSI (Ref 1.31)	Titsal Wood is an ancient woodland on boulder clay overlain by sand. The site is the most interesting example of the sloping type of East Suffolk Hornbeam wood. It has a rich flora, including ancient woodland plants and one scarce species the rare Thin-spiked Wood Sedge (*Carex strigose)*. The notified plant and habitat interest features and NVC communities of this site are as follows: W8 - *Fraxinus excelsior - Acer campestre - Mercurialis perennis* woodland.
Tunstall Common SSSI (Ref 1.32)	Tunstall Common is a fragment of the once extensive Sandlings Heath of coastal Suffolk and is a good example of this dry lowland heath type. Most of the site is dominated by heather (*Calluna vulgaris*) but Bell Heather (*Erica cinerea*) occurs locally especially in stands of young heather and on heather to grassland margins. Mature and degenerating stands of heather support a variety of heathland, lichens and mosses.

Designated Site	Designated Interest Feature
	Impoverished acid grassland characterised by Common Bent and Sheep's Fescue grasses occurs to the north, west and south but is subject to invasion by gorse and Bracken which now occupies substantial areas. Pine scrub originating from adjacent plantations has invaded part of the eastern boundary. The notified plant and habitat interest features and NVC communities of this site are as follows: H1 - *Calluna vulgaris - Festuca ovina* heath U1 - *Festuca Ovina - Agrostis Capillaris - Rumex Acetosella* grassland

1.2.16 The locations of these statutory designated sites are illustrated in **Figures 14A2.1** and **14A2.2** provided in **Annex 14A2.1**. Of these sites, a small area of Sizewell Marshes SSSI would be directly affected by land take to accommodate the proposed development. There would be no land take from any other statutory designated site.

1.2.17 There are six non-statutory CWSs located within 2km of the site, for which plants and habitats are cited interest features. These sites are summarised in **Table 1.2**.

Table 1.2: Summary of non-statutory designated sites (CWS)

CWS	Cited Interest Feature
Leiston Common CWS Number: Suffolk Coastal 105 (Ref 1.33)	Leiston Common supports lowland heath vegetation. Bell Heather, a rare plant in Suffolk, grows on Leiston Common together with more widespread plants for example Harebell (*Campanula rotundifolia*), Heath Bedstraw (*Galium saxatile*) and Tormentil (*Potentilla erecta*). Another notable and uncommon feature of the site is the presence of an extensive and diverse lichen flora.
Aldringham to Aldeburgh Disused Railway Line CWS Number: Suffolk Coastal 3 (Ref 1.34)	This section of disused railway line supports a species-diverse flora both on the line of the old track and on the gently sloping embankments. These include the nationally rare species Mossy Stonecrop (*Crassula tillea*) and Suffocated Clover (*Trifolium suffocatum*). The majority of this site was designated as part of the Leiston to Aldeburgh SSSI in 1999.

CWS	Cited Interest Feature
Dower House CWS Number: Suffolk Coastal 216 (Ref 1.35)	Grassland on the cliff top of the Dower House is a valuable example of unimproved dry acid/dry maritime grassland (grassland growing in a coastal location) of sufficient quality to qualify as a CWS. The sward composition includes species typically associated with acid grasslands and heaths such as Heath Dog-violet (*Viola canina*) and Heath Speedwell (*Veronica officinalis*), also species tolerant of calcareous conditions. Areas of bare ground and rabbit scrapings are important for drought tolerant annuals such as Common Cornsalad (*Valerianella locusta*) and Early Forget-me-not (*Myosotis ramosissima*) as well as the nationally scarce Mossy Stonecrop. Small areas of heather and Bell Heather are established on parts of the site gradually grading into Blackthorn (*Prunus spinosa*) scrub.
Suffolk Shingle Beaches CWS Number: Suffolk Coastal 4 (Ref 1.36)	The stretches of shingle beach along the Suffolk coast are of conservation importance for the range of shingle plants that grow there. Species include Sea Pea, Sea-kale (*Crambe maritima*), Sea Spurge (*Euphorbia papalias*), Sea Sandwort and Sea Bindweed (*Calystegia soldanella*).
Sizewell Levels and Associated Areas CWS Number: Suffolk Coastal 106 (Ref 1.37)	A large area (105 ha) of land, consisting of woodland, plantation, wet meadow, osier beds and scrub. The flora of the marshes includes a number of uncommon plants, for example Ragged-Robin (*Lychnis flos-cuculi*) and Purple-loosestrife (*Lythrum salicaria*).

1.2.18 The locations of these non-statutory designated sites are illustrated on **Figure 14A2.3** provided in **Annex 14A2.1**. Only the Suffolk Shingle Beaches CWS and the Sizewell Levels and Associated Areas CWS would be directly affected by the proposed development.

1.2.19 The desk-study identified many records for plant species within 2km of the site. The majority of the records are from the Minsmere to Walberswick Heaths and Marshes SSSI. To facilitate the interpretation of the large quantify of data, these have been sorted by location to identify: those recorded within or close to the site; those within the Minsmere to Walberswick Heaths and Marshes SSSI; and those outside these two

areas. The results are presented in **Annex 14A3.2**, whilst a summary is presented below.

1.2.20 The plant species identified within the site can be divided into three broad categories:

- species such as Frogbit (*Hydrocharis morsus-ranae*) and Divided Sedge (*Carex divisa*), associated with ditches and fen habitats present within Sizewell Marshes SSSI;
- species such as Sea Pea and dune fescue (*Vulpia fasciculata*), associated with sand dune and vegetated shingle habitat; and
- species characteristic of open, disturbed ground, especially the margins of arable fields, including Corn Spurrey and Shepherd's Cress.

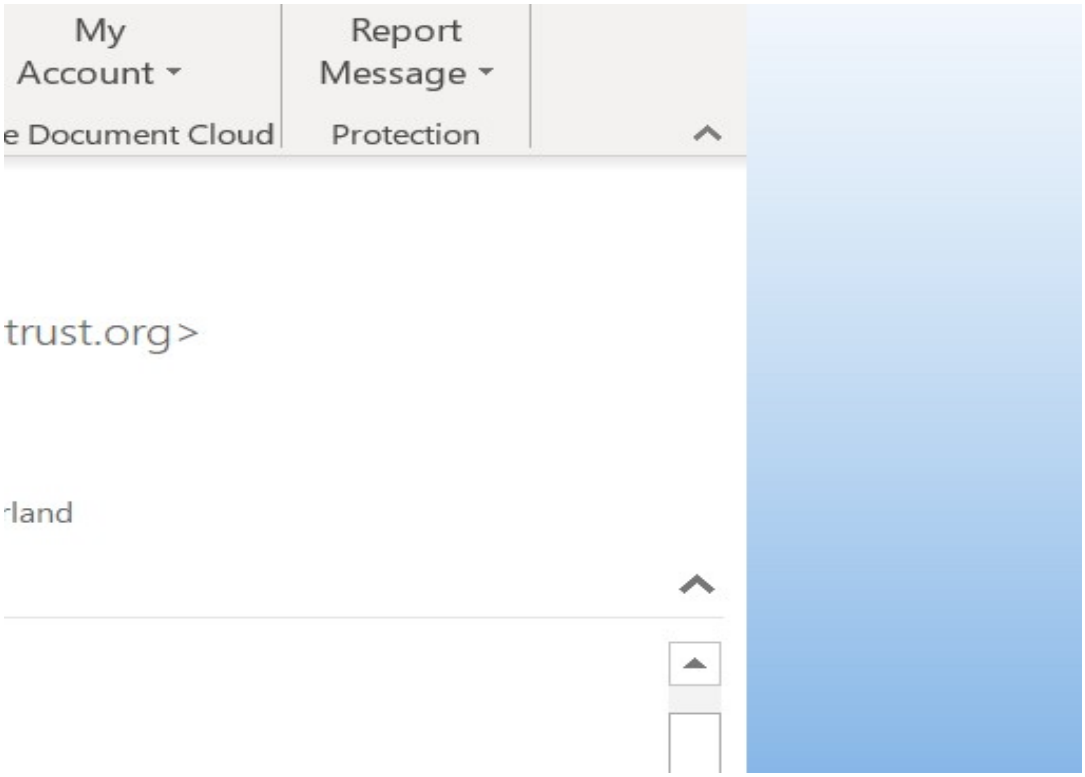
1.2.21 The table in **Annex 14A3.2** has identified the presence of three plant species protected under Schedule 8 of the Wildlife and Countryside Act: Red-tipped Cudweed, Jersey Cudweed (*Gnaphalium luteoalbum*) and Deptford Pink (*Dianthus armeria*). All three species are poor competitors, requiring open, disturbed ground such as arable field margins, waste ground and road verges to establish.

1.2.22 Nine species listed under Section 41 of the NERC Act were identified through the desk-study: Greater Butterfly-orchid (*Platanthera chlorantha*); Man Orchid (*Aceras anthropophorum*); Divided Sedge; Marsh Stitchwort (*Stellaria palustris*); Small-flowered Catchfly (*Silene gallica*); Deptford Pink (also legally protected see paragraph 1.2.21 above); Prickly Saltwort (*Salsola kali subsp. kali*); Red-tipped Cudweed; and Tubular Water-dropwort (*Oenanthe fistulosa*).

1.2.23 Deptford Pink has been recorded growing between the existing Sizewell B power station and the main platform in open sandy soils. Red-tipped Cudweed has only been recorded from open sandy ground within the Royal Society for the Protection of Birds (RSPB) Minsmere Reserve, whilst Jersey Cudweed has been recorded from Aldringham, on the golf course road verge and an area of arable reversion and in 2019, in urban areas of

Leiston where it is increasing as a 'pavement weed'. Divided Sedge and Tubular Water-dropwort are present within Sizewell Marshes SSSI. Therefore, Deptford Pink (see **Plate 1.1**), Divided Sedge and Tubular Water-dropwort may be directly affected by the proposed development.

Plate 1.1: Location of Deptford Pink



1.2.24 The Deptford Pink has declined rapidly in range and is now known to inhabit only about 15 sites in the UK, mainly in the south. It prefers light, sandy, acidic soils and requires open conditions to grow well. It can be found on disturbed ground, such as tracks and field edges, along hedgerows, and in dry pasture (Ref 1.38). Therefore, it is quite likely that the sandy conditions of the existing sea defence shown in **Plate 1.1** is suitable habitat for the plant. The Species Recovery Trust (Ref 1.39) indicates that Deptford Pink can behave as both an annual and biennial and that translocation of both adult plants and young rosettes would be required for the best chance of success.

1.2.25 SBIS also provided records of non-native invasive plant species listed under Schedule 9 of the Wildlife and Countryside Act. Nine species have been identified, of which three have been recorded within the site: Nuttall's Waterweed (*Elodea nuttallii)* has been recorded from ditches within Sizewell Marshes SSSI; Japanese Rose (*Rosa rugosa*) has been recorded from Sizewell Beach; and Rhododendron (*Rhododendron ponticum*) has been recorded from within the woodland of Kenton Hills.

ii. Secondary data

1.2.26 Wood Group identified a range of Phase 1 habitat types being present within the site, as shown in **Table 1.3**. The majority are listed as habitats of principal importance under Section 41 of the NERC Act and the majority are also targeted for action under the Suffolk BAP.

Table 1.3: Habitat types recorded within the site

SBIS Broad Habitat	Phase 1 Habitat Type	NERC Section 41 Habitat	Suffolk BAP Habitat
Conifer woodland	Conifer woodland	No	No
Lowland heath (including acid grassland)	Lowland heath Acid grassland	Yes	Yes
Reedbed	Swamp	Yes	Yes
Coastal flood plain grazing marsh	Marshy grassland	Yes	Yes
Vegetated shingle	Shingle/cobbles	Yes	Yes
Sand dune	Dune grassland	Yes	Yes
Wet woodland	Broad-leaved woodland	Yes	Yes
Mixed woodland	Mixed woodland	Yes	Yes
Arable field margins (not identified by SBIS data but present within site)	Arable field margins (Not identified by Phase 1 but present within site)	Yes	Yes
Hedgerows (not identified by SBIS data but present within site)	Hedgerows	Yes	Yes

Dense scrub (includes two small former sand pits)	Scrub	No	No

1.2.27 The full results of this survey work are presented in **Annex 14A3.3** and the Phase 1 habitat map is presented on **Figure 14A3.1** provided in **Annex 14A3.1**.

1.2.28 Wood Group NVC survey of Sizewell Marshes SSSI determined the distribution of vegetation communities and sub-communities across the SSSI. The most prevalent communities recorded were: M23 *Juncus effusus Galium palustre* rush pasture community;

- M22 Juncus subnodulosus –Cirsium palustre fen meadow community;
- S26 Phragmites australis –Urtica dioica tall herb fen community;
- S4 Phragmites australis reedbed; and
- W5 *Alnus glutinosa* wet woodland community.

1.2.29 The detailed results of this survey are presented in **Annex 14A3.3** while **Figure 14A3.2** provided in **Annex 14A3.1** shows the distribution of communities within the study area.

iii. Other secondary data

1.2.30 The SWT NVC coastal survey identified that the coast supports a diverse plant assemblage with a range of coastal vegetation communities present, principally the SD7 *Ammophila arenaria – Festuca rubra* semi-fixed dune community, and the SD6 *Ammophila arenaria* mobile dune community.

1.2.31 The OHES Environmental Ltd botanical monitoring studies within Sizewell Marshes SSSI have shown that there is significant botanical variation between the fen meadow plots as well as annual variation in the abundance and distribution of plant species recorded. A detailed discussion and review of the monitoring data is presented within **Appendix 14B1** of this volume - Plants and Habitats Synthesis Report.

1.3 Field surveys – primary data

a) Approach

1.3.1 Field surveys have focused on the habitat types present within and immediately adjacent to the site, with desk-study data being used to inform the baseline further afield.

1.3.2 Following on from the work undertaken by Wood Group, Arcadis Consulting (UK) Limited (formerly Hyder Consulting, and hereafter referred to as Arcadis) carried out further surveys between 2014 and 2016. This survey work was designed to update the existing data and to fill any gaps identified within the information.

1.3.3 The following studies carried out by Arcadis have been used to inform this baseline and are all presented in **Annex 14A3.4**:

- Arcadis (2014) Sizewell C NVC survey (Ref 1.40);
- Arcadis (2015) Survey of arable weeds (Ref 1.41);
- Arcadis (2015) Survey and assessment of hedgerows within the site (Ref 1.42);
- Vegetation Survey and Assessment Ltd, Bryophyte Survey Baseline Bryophyte Assessment – Report for Arcadis (Ref 1.43);
- Biocensus (2015) Lichen survey at Sizewell Power Station – Report for Hyder Consulting (Ref 1.44); and

- Arcadis (2019) (Ref 1.45) Phase 1 habitat survey and NVC survey of area of Sizewell Marshes SSSI to accommodate footpath to bypass Rosary Cottages as part of the SZB relocated facilities proposals[2].

- Arcadis (2019) (Ref 1.46) Phase 1 and NVC survey of two sandpits. The purpose of this was to survey in more detail the vegetation of two sandpits located either side of the bridleway to Upper Abbey Farm in response to requests from Suffolk County Council.

1.3.4 Note that due to the small area covered by the 2019 NVC surveys, details have not been mapped on the NVC figure but the results have been described briefly in the main text of this appendix.

1.3.5 The NVC surveys were focused on habitat within Sizewell Marshes SSSI likely to be lost to accommodate the main platform. The lichen and bryophyte survey focused on coastal habitats which supported the most diverse lichen and bryophyte assemblages, and which could be indirectly affected by changes in air quality and habitat loss. The scope of both the NVC and lower plant surveys were developed in consultation with the statutory and non-statutory consultees following a gap analysis of the available data.

1.3.6 The arable weed survey focused on the arable fields located within the site.

b) Methods

1.3.7 For the full methodology of all surveys, please refer to the reports presented in **Annex 14A3.4**.

1.3.8 The 2014 NVC survey followed the methodology outlined in the NVC user handbook (Ref 1.47).

[2] Please note that since the completion of this survey, the footpath option is no longer going through Sizewell Marshes SSSI.

1.3.9 The arable weed surveys comprised a walkover survey of the margins of the arable fields, recording the arable weed species present. Surveys involved walking along the margins of all arable fields within the site and compiling a list of species. The arable weed data was then reviewed against guidance produced by Plantlife (Ref 1.48).

1.3.10 The bryophyte survey involved a walkover survey of coastal habitats, stopping at selected sample locations, and recording the presence and estimated abundance of all mosses and liverworts within a 2-3 metre(m) radius of each sample point. Sample points were selected to cover all habitat types present. The lichen survey methodology followed a similar sampling methodology.

c) Results

1.3.11 The NVC surveys identified that the habitat within the portion of Sizewell Marshes SSSI due to be lost to accommodate the main platform and crossing comprised wet woodland (mainly the W5 *Alnus glutinosa - Carex paniculata* woodland community), reedbed (which comprised a mixture of S4 *Phragmites australis* swamp and S26 *Phragmites australis- Urtica dioica* tall-herb fen), fen meadow (largely comprising the M22 *Juncus subnodulosus - Circium palustre* fen meadow), and ditches which supported a diverse range of aquatic plant communities.

1.3.12 The Phase 1 habitat survey and NVC survey of the sandpits identified that the sandpits supported a mixture of semi-natural broadleaved woodland (W8 *Fraxinus excelsior-Acer campestre-Mercurialis perennis* woodland, between a *Hedera helix* and *Geranium robertianum* sub-community), dense scrub (poor W24 *Rubus fruticosus-Holcus lanatus* underscrub and W22 *Prunus spinosa-Rubus fruticosus* scrub), species-poor semi-improved grassland (species-poor and degraded MG1 *Arrhenatherum elatius* grassland, *Festuca rubra* sub-community), tall ruderal vegetation (OV24 *Uritca dioica-Galium aparine*) and occasional scattered mature trees. The woodland canopy structure comprised scrubby secondary woodland with scattered mature Pedunculate Oak (*Quercus robur*), Ash (*Fraxinus excelsior*), Sweet Chestnut (*Castanea sativa*) and Sycamore (*Acer pseudoplatanus*), with a sub canopy of young oak (*Quercus* sp.) and Ash. The understorey comprised a scrubby shrub layer of Hawthorn (*Crataegus*

monogyna), Blackthorn, Elder (*Sambucus nigra*) and English Elm (*Ulmus procera*). The ground flora within this area was dominated by Ivy (*Hedera helix*), with Herb-Robert (*Geranium robertianum*), Garlic Mustard (*Alliaria petiolata*), Lords-and-Ladies (*Arum maculatum*), Wood Avens (*Geum urbanum*) and Common Nettle (*Urtica dioica*). Suckering Blackthorn and Stinking Hellebore (*Helleborus foetidus*) were also recorded. Areas of dense continuous scrub and scattered scrub were recorded within both sandpits, comprising predominantly of Bramble (*Rubus fruticosus* agg.) Small areas of species-poor semi-improved grassland were recorded at both sandpits with encroaching Bramble and ruderal vegetation. Dominant grass species recorded comprised Red Fescue (*Festuca rubra*) with other grass species recorded comprising Creeping Bent (*Agrostis stolonifera*), Timothy (*Phleum pratense*), Yorkshire-fog (*Holcus lanatus*), Perennial Rye-grass (*Lolium perenne*) and Cock's-foot (*Dactylis glomerata*) with few forb species present. The area of tall ruderal vegetation comprised predominantly Common Nettle and Cleavers, with other species including Bramble, Bindweed (*Calystegia* sp) Red Campion and Black Horehound (*Ballota nigra*) recorded occasionally.

1.3.13 The arable margins were mainly devoid of weed species, with the arable crops being intensively managed and treated with herbicide. Weeds were restricted to small areas where crops have failed to establish. Small Nettle (*Urtica urens*), Fat-hen (*Chenopodium album* agg.) and Scented Mayweed (*Matricaria recutita*) were the dominant weed species recorded. In total, 19 species were identified, including the species Corn Spurrey and Shepherd's Cress. Although these are listed on the Red Data Book for the United Kingdom (UK) (Ref 1.49), and are therefore uncommon, they are not regarded as nationally scarce. The weed species recorded are presented in the arable weed report presented in **Annex 14A3.4**.

1.3.14 The Phase 1 habitat survey of the proposed temporary accommodation campus location identified that the fields comprise arable farmland with very few arable weeds present. Weed species recorded included Fat-hen, Scented Mayweed, Scarlet Pimpernel (*Anagallis arvensis*) and Common Field-speedwell (*Veronica persica*).

1.3.15 The bryophyte survey identified a range of bryophyte species characteristic of acidic grassland and shingle habitats. No scarce species were identified,

and the bryophyte assemblage comprised common and widespread species only. The lichen flora was well developed, with 64 species recorded, the majority being common widespread species. Further details of the lichen and bryophyte assemblage is discussed under coastal vegetation in **section 4.3** of this appendix.

1.4 Baseline conditions – ecological features and their importance

a) Assessment methodology

1.4.1 This section describes the plants and habitats baseline and assigns an ecological value to each of the plant and habitat feature identified. This assessment will then be used, in conjunction with a description of the extent and magnitude of the predicted impacts of the scheme, to carry out the detailed EcIA presented in **Volume 2, Chapter 14** of the **ES**.

1.4.2 To comply with both the CIEEM Guidelines for EcIA and with the standard EIA methodology used elsewhere within the **ES**, both methodologies have been used to evaluate the receptors. Full details of both assessment methodologies are presented in **Volume 1, Chapter 6** of the **ES** (Doc Ref. 6.2) and **Appendix 14A1** of this volume– Introduction to the Ecological Baseline.

b) Description and assessment of ecological features

1.4.3 This section describes the plants and habitats baseline and assesses the ecological value for each plant and habitat receptor. The baseline has been divided into two broad features:

- designated sites and their cited plant and habitat interest features (excluding Sizewell Marshes SSSI); and
- habitat types found within and adjacent to the site (including Sizewell Marshes SSSI).

1.4.4 Figures have been produced to aid the interpretation of the plants and habitats baseline, presented in **Annex 14A3.1**. The figures are as follows:

- **Figure 14A3.1** shows the Phase 1 habitat map for habitats located within and in close proximity to the site.

- **Figure 14A3.2** shows the results of the NVC survey work.

1.4.5 Designated sites and their plant and habitat interest features have been detailed in **Appendix 14A2** of this volume– Designated sites.

i. Arable

Description

1.4.6 Most of the site comprises arable fields with field boundaries comprising native, mainly species-poor, hedgerows.

1.4.7 The sandy arable fields are used for the cultivation of a variety of crops, including potatoes and onions. Cultivation is intensive, often under plastic, resulting in "clean" crops with weed species being restricted to the margins of the fields or small patches within the fields where crops have failed to establish. The Phase 1 habitat survey describes the margins to the arable fields as being up to 2m in width and supporting relatively few ruderal and herb species. Arable field margins are listed on Section 41 of the NERC Act and are targeted for conservation action within the Suffolk BAP.

1.4.8 The arable margins are largely devoid of weed species, with only 19 weed species identified across all of the margins surveyed. Small Nettle, Fat-Hen and Scented Mayweed were the dominant weed species recorded. The arable weed data was then reviewed against guidance, with the weed assemblage scoring below the threshold required to identify a site of county importance. Two annual weed species identified, Corn Spurrey and Shepherd's Cress, are uncommon in the UK, being listed in the Red Data Book for vascular plants. Corn Spurrey is described as "Vulnerable" and are therefore considered to be facing a high risk of extinction in the wild, whilst Shepherd's Cress is described as "Near Threatened" and is likely to qualify for a threatened category soon. These two species are widely distributed across the arable margins within the site, albeit at a low abundance, and have also been recorded as being abundant on areas of arable land that have been sown to acid grassland (see paragraph 1.4.56).

Apparently germinating in response to the disturbance of the soil suggests that they are relatively widespread in the seed bank of arable fields in the local vicinity.

1.4.9 In 2016, a Phase 1 habitat survey was undertaken of the arable fields in the proposed location for the temporary accommodation campus. Eleven species of arable weed were recorded, these being: Common Fiddleneck (*Amsinckia micrantha*), Musk-mallow (*Malva moschata)*, Redshank (*Persicaria maculosa*), Common Fleabane (*Pulicaria dysenterica*), Scarlet Pimpernel, Small Nettle, Mugwort (*Artemisia vulgaris*), Black Bryony (*Tamus communis*), Common Field-speedwell and Common Poppy (*Papaver rhoeas*). As above, the arable weeds data was then reviewed against guidance (Ref. 1.48), with the weed assemblage again scoring below the threshold required to identify a site of county importance.

Assessment

1.4.10 Given that arable habitat is widespread in Suffolk; the margins within the site, including the temporary accommodation campus location, support a low diversity of arable weed species and failed to meet the Plantlife criteria for margins of county importance; and the two rare species (Corn Spurrey and Shepherd's Cress) appear relatively widespread in the seedbank of local fields; then the arable margins located within the ZOI would:

- not be an IEF under the CIEEM guidelines; and
- be of low importance under the EIA-specific methodology.

ii. Woodland

Description

1.4.11 The site supports several woodland blocks comprising conifer plantation, mixed plantation and broad-leaved woodland. These are described in detail in the Phase 1 habitat survey in **Annex 14A3.3** (summarised below) and are illustrated on **Figure 14A3.1** provided in **Annex 14A3.1**.

Conifer plantation

1.4.12 The largest area of coniferous woodland within the site comprises the Goose Hill, Hilltop Covert, Nursery Covert and Kenton Hills complex. The Phase 1 habitat survey provided in **Annex 14A3.3**, describes the conifer woodland as plantation dominated by Corsican Pine (*Pinus nigra*) and Scots Pine (*Pinus sylvestris*). The understorey comprises scrub species including Elder and Holly (*Ilex aquifolium*), while Bracken (*Pteridium aquilinum*), Bramble (*Rubus fruticosa* agg.) and Common Nettle dominate the ground flora.

1.4.13 Along the edges of the coniferous plantation, some areas of broad-leaved woodland have been planted or have regenerated, including Pedunculate Oak, Silver Birch (*Betula pendula*) and Alder (*Alnus glutinosa*), with areas of Rhododendron and Gorse (*Ulex europaeus*) also present. Along the northern edge of Kenton Hills is a conspicuous line of mature trees, primarily Pedunculate Oak. The plantation woodland is dissected by rides throughout, supporting vegetation characteristic of open ground and sandy soils. Both Kenton and Goose Hills form part of the Sizewell Levels and Associated Areas CWS, although mainly because of the breeding bird assemblage that the trees support.

1.4.14 Coniferous plantation is not listed on either Section 41 of the NERC Act or Suffolk's Priority Species and Habitats list.

Mixed plantation

1.4.15 Small discrete areas of mixed plantation are located around the peripheries of the EDF Energy Estate. These include: Rookyard Wood, Sandlings Walk, Great Mount Wood, Coronation Wood and Fiscal Policy woodland (see **Figure 14A3.1**). These areas are described in detail in the consolidated Phase 1 survey report within **Annex 14A3.3** and are summarised below.

1.4.16 Fiscal Policy comprises an even mix of Corsican Pine, Silver Birch, Sweet Chestnut, Pedunculate Oak, Sycamore and Common Lime (*Tilia x europaea*). The understorey is well developed with frequent Holly and Elder, often covered in Honeysuckle (*Lonicera periclymenum*), Hawthorn

and Bramble, with locally abundant Gorse, particularly within the woodland margins. The ground flora comprises Lesser Celandine *(Ranunculus ficaria)*, Wood Speedwell (*Veronica montana*), Cow Parsley (*Anthriscus sylvestris*), Heath Dog-violet (*Viola canina*), Lords-and-Ladies, Snowdrop (*Galanthus nivalis*) and Cleavers.

1.4.17 Rookyard Wood comprises a similar mix of broad-leaved and coniferous species, including Pedunculate Oak, Silver Birch and Scots Pine. The shrub layer is dominated by Hawthorn, Elder, and Bramble. The ground flora is sparse in most places, with frequent Common Nettle and Bluebells (*Hyacinthoides non-scripta*).

1.4.18 Coronation Wood is located opposite the entrance to the Sizewell A power station and is a mixed plantation of Scots Pine and Sycamore. There is little understorey, and the ground flora has been suppressed due to both a lack of light from the canopy and the depth of pine needles. Note Coronation Wood would be felled as part of the Sizewell B relocated facilities proposals.

1.4.19 St James' Covert, located to the south of Sizewell Marshes SSSI, was originally a plantation, predominantly conifer, from which the majority of trees were clear-felled. Since then, some limited replanting has created a relatively open area fringed by even-aged broad-leaved plantation comprising a mix of species including Sycamore, Oak and Ash. The ground flora is limited to patches of Bramble, Bracken and Common Nettle.

Broad-leaved woodland

1.4.20 The Phase 1 habitat survey provided within **Annex 14A3.3**, describes a number of areas of broad-leaved woodland, including wet woodland and drier woodland.

1.4.21 The areas of wet woodland are located within Sizewell Marshes SSSI, with Alder, Ash and Penduculate Oak all present in the canopy, with occasional Downy Birch (*Betula pubescens*) and Poplar (*Populus nigra* agg.). The shrub layer most often comprises Goat Willow (*Salix cinerea*) as well as occasional saplings of the same broad-leaved species. Ground flora species regularly comprise Yellow Iris (*Iris pseudacorus*), Hemp-agrimony

(*Eupatorium cannabinum*), Rough Meadow-grass (*Poa trivialis*) and Common Nettle.

1.4.22 The Wood Group NVC survey provided within **Annex 14A3.3**, identified the majority of the wet woodlands as being dominated by Alder. They were mostly classified as W5 *Alnus glutinosa – Carex paniculata* woodland with smaller areas of W6 – *Alnus glutinosa – Urtica dioica* woodland around the fringes. The report also stated that W5 woodland has become infrequent in Suffolk river valleys, often restricted to peat along valley-side seepages, and that W6 is more frequent within Suffolk, but restricted to low-lying valley sides and partly drained floodplains. Rodwell (Ref 1.50) describes both communities as widespread across the British lowlands but becoming more local due to habitat loss and drainage. Small patches of W2 *Salix cineria – Betula pubescens* woodland are also present, along with W10 *Quercus robur – Pteridium aquilinum - Rubus fruticosus* woodland, on higher, drier areas.

1.4.23 The Arcadis NVC survey report provided within **Annex 14A3.4**, which focussed on the area in the north-eastern corner of Sizewell Marshes SSSI, describes the habitat as comprising wet woodland with a closed canopy of young Alder and Ash trees. The ground is slightly drier on the western edge, where Ash is dominant in the canopy. A mixture of shrub species, predominantly comprising Goat Willow and Raspberry (*Rubus idaeus*), has been recorded scattered beneath the main canopy. Mature trees are not present in this woodland. Twenty-five plant species characteristics of wetland have been recorded in the ground flora, the most abundant species being Rough Meadow-grass and Bittersweet *(Solanum dulcamara*). This woodland is attributable to the W5 *Alnus glutinosa – Carex paniculata* woodland community and was considered to correspond most closely to the W5a *Phragmites australis* sub-community. This is less diverse than the other W5 sub-communities. Rodwell indicates that W5 is a widely-distributed wet woodland community throughout the English lowlands, and W5a is the most common and widely-distributed of the W5 sub-communities. Wet woodland is listed in the citation for Sizewell Marshes SSSI but not as a notified feature. It is also listed under Section 41 of the NERC Act as well as being targeted for action in the Suffolk BAP. The Joint Nature Conservation Committee (Ref 1.51) estimate that there may be

50,000 to 70,000 hectare (ha) of wet woodland in the UK, whilst the Suffolk BAP estimated that in Suffolk there is less than 100ha of W5 remaining and 170ha of other wet woodland types.

1.4.24 Areas of dry broad-leaved woodland also occur as discrete copses on the drier sandy soils within the ZOI, including Ash Wood, Reckham Pits and The Grove.

1.4.25 Ash Wood is a broad-leaved woodland with dominant tree species including Oak, Ash and Sweet Chestnut. The ground flora is reasonably diverse, with Heath Dog-violet, Lords-and-Ladies, Common Nettle and Lesser Celandine. Bluebells also occur, along with large areas of Ivy. To the south-east of Ash Wood, the woodland habitats have been extended eastwards with landscape and screening planting creating Great Mount Wood, consisting of Corsican Pine with a range of deciduous species along the margins.

1.4.26 Reckham Pits Wood is predominantly deciduous woodland dominated by Silver Birch with some Corsican Pine. Holly and Bramble occur frequently within the understorey, with Honeysuckle, Bracken, Common Nettle, Cleavers, Herb-Robert and Wood-sorrel (*Oxalis acetosella*) also in abundance. Mistletoe (*Viscum album*) is apparent on some of the trees.

1.4.27 The woodland at The Grove comprises a linear belt of deciduous planting that includes Pedunculate Oak, Ash, Sweet Chestnut and Holly. The ground flora within the woodland is limited and is dominated by Common Nettle. To the north of The Grove are two small discrete plantations, Sandypytle Plantation and Doverow Plantation, supporting broad-leaved trees including Oak, Ash, Alder and occasional Scot's Pine. The understorey comprises largely Elder and young Alder trees, with evidence of some young plantation trees. The ground flora is relatively species-poor and is dominated by Bracken, Bramble and Nettle.

1.4.28 None of the woodland within the EDF Energy Estate is considered to constitute ancient semi-natural woodland, as none appear on the Ancient Woodland Inventory (Ref 1.52). However, broad-leaved woodland is listed under Section 41 of the NERC Act and under Suffolk's Priority Species and

Habitats list (Ref 1.3). The Suffolk BAP shows woodland cover across Suffolk to be sparse, particularly in the east of the county.

Assessment

1.4.29 It should be noted that whilst Kenton Hills, Reckham Pits, Goose Hill and Nursery Covert form part of the Sizewell Levels and Associated Areas CWS, this is mainly on account of the breeding bird assemblage that the trees support, as provided in **Appendix 14A7** of this volume- Ornithology, but there are also elements of acid grassland vegetation along the forest rides.

1.4.30 Given that the conifer plantations are composed of non-native trees and are not listed under either Section 41 of the NERC Act nor Suffolk's Priority Species and Habitats list, then when considered as a habitat type in its own right, the coniferous woodland present within the ZOI would:

- not be an IEF under the CIEEM guidelines; and
- be of low importance under the EIA-specific methodology.

1.4.31 It is considered that as the mixed woodlands are relatively recent in origin and are not listed under either Section 41 of the NERC Act nor Suffolk's Priority Species and Habitats list, then when considered as a habitat type in its own right, the coniferous woodland present within the ZOI would:

- not be an IEF under the CIEEM guidelines; and
- be of low importance under the EIA-specific methodology.

1.4.32 Given that broad-leaved woodland cover is relatively scarce in Suffolk, and that broad-leaved woodland is listed under Section 41 of the NERC Act as well as being targeted for action in the Suffolk BAP, then collectively the total broad-leaved resource located within the ZOI would be:

- an IEF at the county level under the CIEEM guidelines; and
- of medium importance under the EIA-specific methodology.

1.4.33 An exception to this would be the wet woodland within Sizewell Marshes SSSI. Given that this is listed in the citation for Sizewell Marshes SSSI but not as one of the specific designated interest features; that wet woodland is a relatively scarce habitat in the UK and in particular within Suffolk; and is listed under Section 41 of the NERC Act; then wet woodland would be assessed as:

- an IEF of national importance under the CIEEM guidelines; and
- of high importance under the EIA-specific methodology.

iii. Hedgerows and scrub

Description

1.4.34 A number of hedgerows divide the arable fields within the site. The Phase 1 habitat survey provided in **Annex 14A3.3**, describes the hedgerow network as comprising a mix of intact and defunct mainly species-poor hedgerows, dominated by a small number of shrub species including English Elm, Hawthorn, Blackthorn and Elder, with the occasional Pedunculate Oak. The ground flora is limited, being restricted to coarse grass species and arable weeds, as identified above. The hedgerows that flank the track to Upper Abbey Farm support a number of mature Oak and Ash trees and a diverse ground flora, including Dog's Mercury (*Mercurialis perennis*), Hart's-tongue (*Asplenium scolopendrium*), Ramsons (*Allium ursinum*), Heath Dog-violet, Wood Avens, Bluebell and Wood Spurge (*Euphorbia amygdaloides*), along with climbers including Hop (*Humulus lupulus*) and Black Bryony.

1.4.35 The Phase 1 habitat survey did not assess the importance of the hedgerows in relation to the Hedgerow Regulations (Ref 1.53). Arcadis, therefore, undertook a review of the hedgerows in 2016 and a total of six hedgerows are considered "Important" when assessed against the Wildlife and Landscape Criteria of the Hedgerows Regulations. All six are located along the western side of the site. The details of these six hedgerows are presented in the hedgerow results provided in **Annex 14A3.4**. They each support five or more woody species with a combination of additional features.

1.4.36 Hedgerows are listed under Section 41 of the NERC Act and Suffolk's Priority Species and Habitats list. At the last assessment (2004), there were an estimated 12,500 to 15,000km of species-rich hedgerow in Suffolk.

1.4.37 In addition to the areas of woodland described above, discrete areas of scrub are present within the site. See Consolidated Phase 1 report in **Annex 14A3.3** which describes in detail the area to the north of the Sizewell B power station, which comprised an extensive mound planted with native scrub and tree species, including Holly, Gorse, Silver Birch, Hornbeam (*Carpinus betulus*), Blackthorn and Hawthorn. In addition, two sandpits, historically used for the excavation of sand, are located just to the east of Upper Abbey Farm. The edges of these sandpits are covered in dense scrub, principally comprising Hawthorn and Elder, with occasional mature trees on the southern sandpit. Within both sandpits the ground flora was dominated by dense Common Nettle, and Cleavers with some open grassy areas dominated by Cock's-foot (*Dactylis glomerata*), and False-Oat Grass (*Arrhenatherum elatius*). Additional forbs included Bindweed (*Calystegia* sp.), Bramble, Alexanders (*Smyrnium olusatrum*), Red Campion, Lords and Ladies, Black Horehound, Ground-Ivy (*Glechoma hederacea*), Ivy, Lesser Burdock (*Arctium minus*), Herb-Robert and Hemlock (*Conium maculatum*).

1.4.38 Scrub is a relatively widespread habitat in the UK and is not listed under either Section 41 of the NERC Act or Suffolk's Priority Species and Habitats list. Whilst of limited intrinsic value in its own right, scrub does provide an important resource for fauna for both foraging and shelter. Its value has been recognised within the wider EDF Energy Estate with habitat creation for reptiles incorporating scrub planting and areas of scrub regeneration being managed for biodiversity benefit within clear fell areas of Kenton Hills.

Assessment

1.4.39 Given that the hedgerow network is relatively extensive in Suffolk, and that only a small number of important hedgerows have been identified, then the total hedgerow resource located within the ZOI would:

- not be an IEF under the CIEEM guidelines; and

- be of low importance under the EIA-specific methodology.

1.4.40 Given that scrub is not listed under either Section 41 of the NERC Act or Suffolk's Priority Species and Habitats then scrub vegetation would:

- not be an IEF under the CIEEM guidelines; and
- be of low importance under the EIA-specific methodology.

1.4.41 Given that the habitats supported by the sandpits other than broadleaved woodland are not listed under either Section 41 of the NERC Act or Suffolk's Priority Species and Habitats then the sandpits habitats would:

- not be an IEF under the CIEEM guidelines; and
- be of low importance under the EIA-specific methodology.

iv. Dry grassland

Description

1.4.42 Although predominantly comprising arable farmland, a number of areas of dry grassland habitat are present within the study area, including the grassland to the north of the Sizewell B power station, scattered areas of acid grassland, and arable reversion to acid grassland.

Main platform grassland

1.4.43 The desk-study data highlighted that the plant Deptford Pink, protected under Schedule 8 of the Wildlife and Countryside Act, grows on the area north of the existing Sizewell B power station. There are three grassland fields created during the construction of the Sizewell B power station. The Phase 1 habitat survey provided in **Annex 14A3.3** describes these fields as species-poor semi-improved grassland. Frequently occurring species include Cock's-foot (*Dactylis glomerata*), White Clover (*Trifolium repens*), Dandelions (*Taraxacum* agg.), Daisy (*Bellis perennis*), Bristly Oxtongue (*Picris echioides*) and Ribwort Plantain (*Plantago lanceolata*).

1.4.44 The NVC survey carried out by Wood Group provided in **Annex 14A3.3**, described these fields in more detail. Being sown, the grassland communities are not an exact fit to the NVC, but the following grassland communities are the "best fit" for the grassland present:

- SD8 - *Festuca rubra – Galium verum* fixed dune grassland;
- OV23 - *Lolium perenne – Dactylis glomerata* open ground vegetation; and
- MG7 - *Lolium perenne leys* and associated grassland.

1.4.45 SD8 - *Festuca rubra – Galium verum* fixed dune grassland – This is the most species-rich grassland habitat present, occupying the drier soils on the margins of the fields, with an average of 17.2 plant species per quadrat. Rodwell (Ref 1.54) describes this grassland community as relatively widespread on sandy dunes around the British coast, and this community is likely to best reflect the sand dune habitat present before the Sizewell B power station was constructed.

1.4.46 OV23 - *Lolium perenne – Dactylis glomerata* open ground vegetation – This less species-rich community occupies the majority of the fields and contained an average of only 10.3 plant species. Rodwell describes this grassland vegetation as common on disturbed or made ground, and ubiquitous across the British lowlands.

1.4.47 MG7 - *Lolium perenne leys* and associated grassland – This is a species-poor grassland community, with an average of only 5.3 plant species present, which occupied large areas of the field. Rodwell describes this grassland community as being abundant across the British Isles.

Acid grassland

1.4.48 Discrete areas of acid grassland are scattered across the study area, as described below.

1.4.49 The vegetation present within the rides that bisect the Goose Hill Conifer Plantation was surveyed in detail by the Wood Group NVC survey provided

in **Annex 14A3.3** and comprise acid grassland characteristic of sandy soils. The most widespread communities are U4b (the *Holcus lanatus – Trifolium repens* sub-community of the *Festuca ovina – Agrostis capillaris – Galium saxatile* acid grassland community) and U1c (the *Erodium cicutarium-Tessdalia nudicaulis* sub-community of the *Festuca ovina – Agrostis capillaris – Rumex acetosella* acid grassland community). These acid grassland communities are relatively species-rich, with between nine and twenty plant species on average per quadrat. They are typical of the Suffolk Sandlings landscape, which comprises a patchwork of remnant acid grassland and heath extending from Harwich to Great Yarmouth.

1.4.50 South of Lower Abbey Farm is a discrete area of acid grassland and scrub known as Black Walks. The sward is dominated by Sheep's-fescue (*Festuca ovina*) with an abundance of Common Bent and Sweet Vernal-grass (*Anthoxanthum odoratum*). *Cladonia* sp. lichen and Biting Stonecrop (*Sedum acre*) are frequent, together with Sand Sedge (*Carex arenaria*). Gorse is more prominent, and is scattered and dense in places, in addition to Blackthorn and Elder. The sward is kept short by extensive rabbit and occasional sheep grazing.

1.4.51 Located on the north-eastern edge of the site is Retsom's Field, a former arable field that has been treated with sulphur and sown with an appropriate seed mix so that acid grassland and heath have been successfully recreated. The Wood Group consolidated Phase 1 report in **Annex 14A3.3** describes the acid grassland of Retsom's Field as being a short grassland sward dominated by Sheep's-fescue and Common Bent. There is also a small area of heathland (dominated by heather), with the occasional presence of *Cladonia* sp. lichen and localised patches of Bracken.

1.4.52 To the south of Sizewell Marshes SSSI lies Leiston Common CWS and an adjacent field called Broom Covert. The citation for Leiston Common CWS describes the site as supporting acid grassland and heathland, including species such as Bell Heather, Harebell, Heath Bedstraw and Tormentil, with the additional presence of an extensive and diverse lichen flora.

1.4.53 The Wood Group consolidated Phase 1 report in **Annex 14A3.3** describes Leiston Common and the adjacent Broom Covert as semi-improved, grazed

acid grassland dominated by Sheep's-fescue with an abundance of Common Bent. Additional forb species include Sand Spurrey (*Spergularia rubra*), Lady's Bedstraw (*Galium verum*) and Cut-leaved Crane's-bill (*Geranium dissectum*). Scattered Gorse is particularly prominent across Broom Covert. Subsequent to 2016, Broom Covert was used to graze a large number of cattle over winter, this intensive grazing causing localised nutrient enrichment to the detriment of the acid grassland flora. Intensive winter grazing has subsequently ceased, and the acid grassland flora has been allowed to recover.

1.4.54 As described in 2018 EDF Energy Estate vegetation surveys of the grass heath mosaic (Ref 1.55) provided in **Annex 14A3.3**, in 2018 SZC Co. undertook a detailed botanical survey of the dry acid grassland areas within the EDF Energy Estate. The sites support a range of dry, often parched swards that grade from "lowland dry acid grasslands" to "fixed dune grasslands", with only Broom Covert supporting a single grassland type. This variability is reflected in the species composition of the constituent swards, with each site supporting distinctive suites of stress-tolerant, ruderal and competitive species. Nine notable plant species were recorded during the survey, including the nationally scarce Smooth Cat's-ear (*Hypochaeris glabra*). This local distinctiveness of the EDF Energy Estate grasslands is due to summer droughting and the influence of non-acidic sediments on the grassland substrates.

1.4.55 As identified in **Table 1.3,** acid grassland is listed under Section 41 of the NERC Act and Suffolk's Priority Species and Habitats. Acid grassland is relatively widespread in the UK. The Joint Nature Conservation Committee (Ref 1.56) states that there are 20,141ha of lowland dry acid grassland remaining in England, and Rodwell (Ref 1.57) describes both recorded acid grassland communities as being relatively widespread on suitable soils across the British lowlands. In Suffolk, however, acid grassland has declined in extent, with only 8% of the Suffolk Sandlings being extant. The acid grassland existing along the ride network of Goose Hill contributes towards the ecological interest of the Sizewell Levels and Associated Areas CWS, whilst Leiston Common is a CWS in its own right.

Arable reversion

1.4.56 Between 2013 and 2016, several former arable fields located at the northern, western and southern extremities of the EDF Energy Estate, including at Aldhurst Farm, were cultivated and sown with a seed mix consisting of grass species characteristic of acid grassland. The grass seed mix included a mixture of fescues and other fine grass species, and these fields now support species-poor semi-improved grassland. Plant species diversity is increasing within the fields, with forb species characteristic of acid grassland in this part of Suffolk, such as Common Stork's-bill (*Erodium cicutarium* agg.), Sheep's Sorel (*Rumex acetosella*), Bird's-foot (*Trifolium ornithopodioides*) and Hare's-foot Clover (*Trifolium arvense*), establishing. In addition, Corn Spurrey and Shepherd's Cress have been recorded. The growth within the different fields of grasses and wildflowers and species composition is varied, partly depending on the date of establishment, but the progression is towards species-rich acid grassland. Management activity to enhance this progression include the spreading of harvested heather seed and seed from species-rich acid grassland areas such as Leiston Common and Broom Covert. Plant species diversity, as of 2016, is not sufficiently diverse for these sown fields to be classified as unimproved acid grassland as per the Phase 1 classification, so they have been recorded as semi-improved acid grassland.

1.4.57 As of 2018, the newly-sown grassland on former arable fields is of local value, and would therefore not be an IEF, but it is envisaged that the ecological value of these fields will increase substantially over time as the sward diversity increases.

Assessment

1.4.58 With regards to the main platform grassland, none of these grassland types on the platform are particularly scarce, nor do they support rare or notable plant species; therefore, they are considered to be of local importance only. Notwithstanding this, the potential presence of the legally protected Deptford Pink situated between the Sizewell B power station and proposed main platform does require assessment within the **ES**. Given that Deptford Pink is nationally scarce, legally protected under Wildlife and Countryside

Act, and listed under Section 41 of the NERC Act, then Deptford Pink would be:

- an IEF of county under the CIEEM guidelines; and
- of medium importance under the EIA-specific methodology.

1.4.59 Given that acid grassland is listed under Section 41 of the NERC Act and a Suffolk BAP priority habitat, is of limited extent within the Suffolk Sandlings, and contributes towards the interest features of both Leiston Common and the Sizewell Levels and Associated Areas CWS, then the total acid grassland resource within the ZOI would be:

- an IEF at the county level under the CIEEM guidelines; and
- of medium importance under the EIA-specific methodology.

1.4.60 Given that the arable reversion is progressing towards acid type grassland which is listed under Section 41 of the NERC Act and a Suffolk BAP priority habitat, but which has not yet achieved the species-richness of established acid grasslands then the arable reversion (in its current baseline condition) would:

- not be an IEF at the county level under the CIEEM guidelines; and
- of low importance under the EIA-specific methodology.

v. Marshy grassland (fen meadow)

Description

1.4.61 The Phase 1 habitat classification “marshy grassland”, covers a broad spectrum of vegetation types, including those dominated by rush *(Juncus* sp.), Sedge (*Carex sp.*) and Meadow Sweet *(Filipendula ulmaria*). As described in **Table 1.1**, Sizewell Marshes SSSI supports a diverse mosaic of wetland habitats and, in particular, has been notified for supporting two distinct types of marshy grassland vegetation:

- NVC community - M22 - *Juncus subnodulosus* - *Cirsium palustre* fen meadow; and

- NVC community M23 - Juncus effusus/acutiflorus - Galium palustre rush pasture.

1.4.62 These two NVC communities are similar, being differentiated by the relative dominance of the rush (*Juncus*) species. In general, M22 prefers more base-rich substrates than M23, and M22 is the dominant community within Sizewell Marshes SSSI. The NVC survey work has not identified the presence of the cited M23 rush pasture community. As described in **Appendix 14B1** of this volume - Plants and Habitats Synthesis Report, the vegetation within Sizewell Marshes SSSI appears to have undergone a gradual transition from a rush pasture-dominated site to fen meadow.

1.4.63 The largest area of fen meadow is that found within Sizewell Marshes SSSI. The citation for Sizewell Marshes SSSI describes the area as follows:

> *"The site occupies a low-laying basin of deep fen peat. The water table is permanently high, with the area being prone to flooding, and there is an extensive network of ditches across the site"*

1.4.64 The fen meadow and ditch vegetation are described in detail, whilst reedbed and Alder carr (wet woodland) are also listed as habitat types present.

1.4.65 Sizewell Marshes SSSI is owned by SZC Co. The condition assessment for the Sizewell Marshes SSSI last undertaken by Natural England in 2009 describes it as being in favourable nature conservation status. Since then, anecdotal evidence from Christine Blyth (former EDF Biodiversity Manager) suggests that as of 2018/2019, Sizewell Marshes SSSI is in a less favourable condition due to a lack of grazing. As a result of this consideration, SWT and SZC Co. are implementing a cutting and grazing programme to restore condition. Whilst fen meadow is not specifically listed under Section 41 of the NERC Act, Purple Moor-grass (*Molinia caerulea*) and rush pasture is, and the fen meadow (together with rush

pasture) would fall within this wider habitat category. Fen meadow is also listed under Suffolk's Priority Species and Habitats.

1.4.66 The Sizewell Marshes SSSI has been subject to extensive, detailed survey, as provided in **Annex 14A3.3** and **Annex 14A3.4**. Each of the wet grassland habitat types present are described below.

1.4.67 The Wood Group consolidated Phase 1 habitat survey provided in **Annex 14A3.3** describes the fen meadow as characterised by an abundance of plant species, including Sweet Vernal-grass, Crested Dog's-tail (*Cynosurus cristatus*), Rough Meadow-grass and Yorkshire-fog, with rush-dominated stands comprising Soft-rush, Blunt-flowered rush (*Juncus subnodulosus*) and Jointed Rush (*Juncus articulatus*). There are also frequent occurrences of Bogbean (*Menyanthes trifoliata*), Marsh Pennywort (*Hydrocotyle vulgaris*), Large Bird's-foot-trefoil (*Lotus uliginosus*), Ragged-Robin, Quaking-grass (*Briza media*) and Bog Pimpernel (*Anagallis tenella*).

1.4.68 The Wood Group NVC survey presented in **Annex 14A3.3** identified that the fen meadow is characteristic of the remaining fen meadow in Suffolk, but that the suite of stands at Sizewell Marshes SSSI are notable for its variation and species composition, with considerable botanical variation between each of the marshy grassland fields. The majority of the fields are classified as M22 *Juncus subnodulosus – Cirsium palustre* fen meadow, with two sub-communities present, M22b the *Briza media – Trifolium sp.* sub-community and M22d the *Iris pseudacorus* sub-community. Although all the M22 present has been assigned to one of these two sub-communities, the NVC survey recognises that there is still considerable variation between these M22 vegetation stands, with affinities to other vegetation communities including MG8 *Cynosurus-Caltha* grassland and MG12 *Festuca arundinacea* grassland also identified.

1.4.69 Rodwell states that within the M22b sub-community, the rush/Sedge tier is not so dominant in its cover or density, thus allowing a rich suite of plants to develop amongst the Sedge and rush clumps (Ref. 1.58). The M22d sub-community does not support the same diversity of smaller forb (non-grass) species as M22b, but supports instead a range of species more associated with fen vegetation, including Common Reed, Purple-loosestrife and, most frequently, Yellow Iris. The Wood Group NVC survey and the Plants and

Habitats Synthesis Report (**Appendix 14B1**), both within **Annex 14A3.3**, presents a detailed description of the habitats present within the Sizewell Marshes SSSI and the variation between vegetation stands.

1.4.70 Rodwell describes M22 as a widespread plant community associated with wet, base-rich soils, with a particular concentration in East Anglia. The variation observed in the M22 sub-communities, together with a detailed review of the eco-hydrological conditions underlying the fen meadow, is presented within **Appendix 14B1** of this volume - Plants and Habitats Synthesis Report. Based on this analysis, it was possible to assign the M22 fen meadow to four separate Grades, or Zones, as shown in **Table 1.4**, with Grade 1 containing the most rich-fen indicator species and Grade 4 the least.

Table 1.4: The four grades of M22 (fen meadow) identified

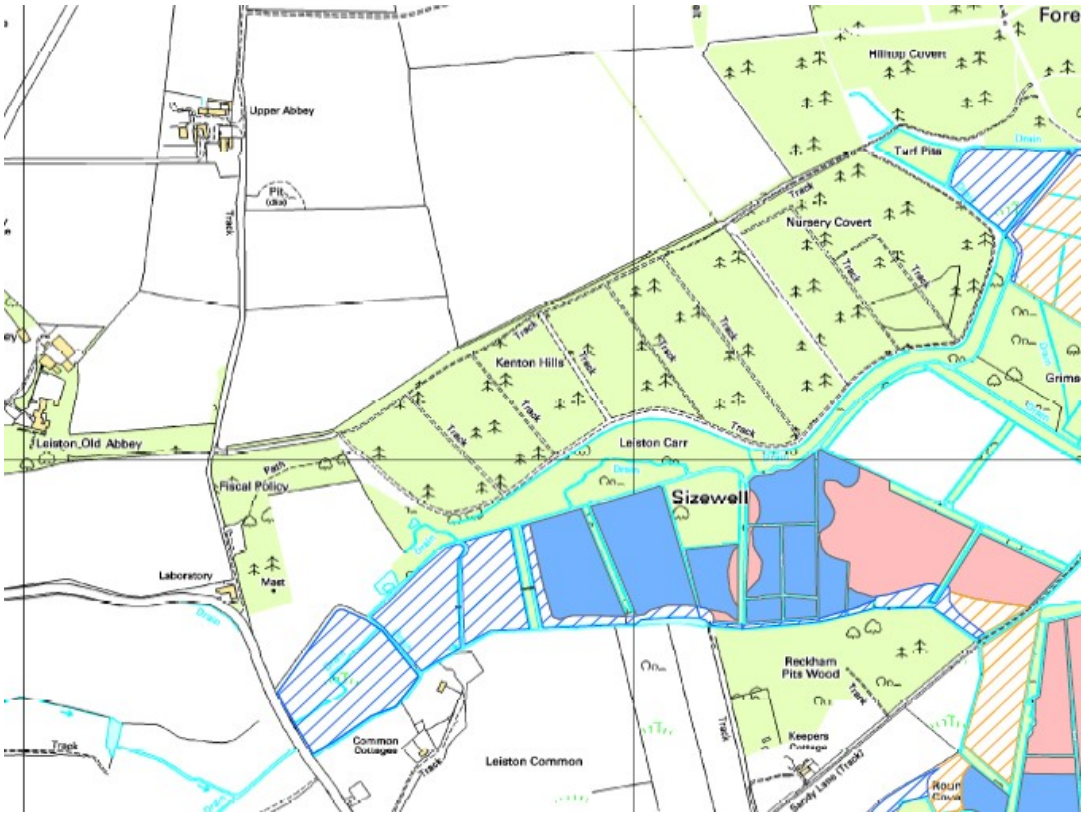
Grade of M22	Rational
Grade 1	Good quality fen meadow supporting relatively high numbers of principal rich-fen species and other mire species, including a suite of “low fertility” indicators.
Grade 2	Good quality fen meadow supporting a reasonable number of principal rich-fen species and other mire species, including a suite of “low fertility” indicators.
Grade 3	Fair quality fen meadow, supporting some principal rich-fen species and other mire species, with few “low fertility” indicators.
Grade 4	Drier fen meadow grading to rush pasture and dry grassland, supporting few principal rich-fen species and other mire species, with very few “low fertility” indicators.

1.4.71 The eco-hydrology work has also demonstrated that there is a strong relationship between the fen meadow communities (the NVC M22 community and sub-communities) and wet ground conditions, low fertility and neutral to basic pH, and that within Sizewell Marshes SSSI there are two plant species assemblages of particular value, these being:

- groups of low-growing ground-dwelling species; and
- species associated with low-nutrient and/or high lime content.

1.4.72 The distribution of the M22 fen meadow communities is presented in **Figure 14A3.2** whilst the distribution and extent of grades of fen meadow are presented on **Plate 1.2**.

Plate 1.2: Distribution of Fen Meadow Grades in Sizewell Marshes SSSI



1.4.73 As can be seen from the figures, the M22 fen meadow occupies the majority of Sizewell Marshes SSSI with about 60% of the total being Grade 1 and 2 fen meadow.

1.4.74 At the northern end of the EDF Energy Estate, just north of Dovehill and Sandypytle Plantations, is an area of rush pasture forming part of the wider Minsmere to Walberswick Heaths and Marshes SSSI. The Wood Group consolidated Phase 1 habitat survey as provided in **Annex 14A3.3** describes the vegetation here as being dominated by Soft-rush (*Juncus effusus*) and Hard Rush (*Juncus inflexus*) with abundant grass species including Yorkshire-fog, Common Reed (*Phragmites australis*) and Rough Meadow-grass.

1.4.75 On the eastern edge of the EDF Energy Estate, adjacent to Retsom's Field, is a field known as salt marsh with a large wader scrape. This field is classified as grazing marsh supporting vegetation dominated by Jointed Rush (*Juncus articulatus*), and some plants with a tolerance to salinity. Survey work from 1996 to 2006 indicates vegetation is dominated by Jointed Rush with some evidence of saltwater incursion. This area was described as dominated by Jointed Rush with abundant Yorkshire-fog and Creeping Bent with some Greater Birds-foot Trefoil (*Lotus pedunculatus*) but relatively few forb species. The vegetation is perhaps best described as a simple species-poor form of fen meadow M22b community. The Leiston drain at this point supports the A2 *Lemna minor* aquatic community, this having been identified by both the Wood Group and Arcadis NVC survey work (Ref 1.11 and Ref 1.40) presented within **Annex 14A3.3** and **Annex 14A3.4** respectively. This field forms part of the wider Minsmere to Walberswick Heaths and Marshes SSSI.

Assessment

1.4.76 Given that the two parcels of rush pasture to the north form part of the wider Minsmere to Walberswick Heaths and Marshes SSSI, that the fen meadow community within Sizewell Marshes SSSI is a qualifying feature of the SSSI and that fen meadow listed under Section 41 of the NERC Act Suffolk's Priority Species and Habitats, then the fen meadow and rush pasture within the ZOI would be:

- an IEF at the national level under the CIEEM guidelines; and
- of high importance under the EIA-specific methodology.

vi. Swamp

Description

1.4.77 The Wood Group consolidated Phase 1 habitat survey in **Annex 14A3.3** classifies vegetation dominated by Common Reed as swamp. There are stands of Common Reed (reedbed) located within Sizewell Marshes SSSI, and four newly created groundwater-fed lagoons at Aldhurst Farm have also been planted with Common Reed.

1.4.78 The Wood Group NVC survey of Sizewell Marshes SSSI provided in **Annex 14A3.3** identified two types of reedbed habitat: S26 *Phragmites australis – Urtica dioica* tall herb fen, and S4 *Phagmites australis* swamp and reedbed. The majority of the reedbed identified was classified as S26. Rodwell (Ref 1.59) states that this community is the most extensive of the reedbed types found in lowland Britain, and is composed of predominantly common species. The average number of plant species recorded within Sizewell Marshes SSSI was 6.8, making the stands rather species-poor. Only one stand of S4 was recorded, this being an area of wet reedbed located in the north-eastern corner of Sizewell Marshes SSSI. This stand was dominated by Common Reed, and the average number of plant species recorded was 4.3, making this a species-poor stand. S4 is a relatively widespread reedbed community.

1.4.79 A further NVC survey carried out by Arcadis, which concentrated on those parts of Sizewell Marshes SSSI that would be lost to accommodate the proposed development - see **Annex 14A3.4** for extent of survey area, confirmed the presence and distribution of S4 and S26. The S4 is species-poor and located on a wet substrate. Dense Common Reed dominates the vegetation, restricting the growth of other plant species. Fewer than ten plant species were recorded in each quadrat. Species growing amongst the Common Reed included Common Nettle, Cleavers and Hedge Bindweed (*Calystegia sepium*). The S26 reedbed comprises Common Reed and Common Nettle. The drier reedbed areas are moderately diverse, supporting 16 plant species per quadrat indicative of wetland habitat. Species recorded included Gipsywort (*Lycopus europaeus*), Hemp-agrimony, Water Mint (*Mentha aquatica*), Wild Angelica (*Angelica sylvestris*), Bittersweet and Cleavers. These species were sparsely distributed.

1.4.80 The newly-planted reedbed lagoons at Aldhurst Farm have developed extremely well with dense reed growth established by 2018, together with a diverse range of other wetland plants including Water-plantain (*Alisma plantago-aquatica*), Water-cress (*Rorippa nasturtium-aquaticum*) and Purple-loosestrife (*Lythrum salicaria*).

1.4.81 The Suffolk BAP states that reedbed is a habitat of limited extent, with approximately 5,000ha of reedbed across the UK but only 50 sites where

the extent of reedbed is greater than 20ha. There is a concentration of this habitat type in East Anglia, with the three largest reedbeds being located on the Suffolk Coast. Reedbed is listed on the citation for Sizewell Marshes SSSI and is listed under both Section 41 of the NERC Act and Suffolk's Priority Species and Habitats.

Assessment

1.4.82 Given that the reedbed community within Sizewell Marshes SSSI is cited as an interest feature of the SSSI, and that reedbed is listed under Section 41 of the NERC Act and Suffolk's Priority Species and Habitats, then the total reedbed resource within the ZOI would be:

- an IEF at the national level under the CIEEM guidelines; and
- of high importance under the EIA-specific methodology.

vii. Open water

Description

1.4.83 A large total area of open water is present across Sizewell Marshes SSSI in the form of the drainage ditches as well as a large lagoon in the north-eastern corner. Of the two, only the ditch network has been identified as a specific designated feature of Sizewell Marshes SSSI. Finally, several small ponds are present across the rest of the EDF Energy Estate.

1.4.84 The citation for the Sizewell Marshes SSSI describes the drainage ditches as supporting a diverse aquatic flora, including the nationally scarce species Soft Hornwort (*Ceratophyllum submersum*), Fen Pondweed (*Potamogeton coloratus*) and Whorled Water-milfoil (*Myriophyllum verticillatum*). The Wood Group Phase 1 habitat survey provided in **Annex 14A3.3** describes the ditches as being generally between 3m and 5m wide and supporting a diverse aquatic flora, including Greater Water-parsnip (*Sium latifolium*), Fool's-water-cress *(Apium nodiflorum*), Floating Sweet-grass (*Glyceria fluitans*) and Whorled Water-milfoil. Bank habitats are generally well-vegetated with a variety of Sedge and rush species in addition to Yellow Iris (*Iris pseudacorus)*, Water-cress, Fool's-water-cress

(*Apium nodiflorum*), Common Reed, Tubular Water-dropwort (*Oenanthe fistulosa*) and Water-plantain (*Alisma plantago-aquatica*).

1.4.85 The Wood Group NVC survey provided in **Annex 14A3.3** also describes a wide diversity of aquatic vegetation communities as being present, with floating, submerged and emergent vegetation considered as separate NVC communities existing within a single ditch. The NVC communities recorded have included: the A2 *Lemnor minor* aquatic community; the A3 *Spirodela polyrhiza – Hydrocharis morsus-ranae* community; the A4 *Hydrocharis morsus-ranae – Stratiotes aloides* community; and the A6 *Ceratophyllum submersum* community. The non-native aquatic species Water Fern (*Azolla filiculoides*) and Parrot's-feather (*Myriophyllum aquaticum*) have both been recorded as being present within the ditch network.

1.4.86 The Arcadis NVC survey provided in **Annex 14A3.4** confirmed the presence of NVC communities A2, A3 and A6 in the north-eastern corner of Sizewell Marshes SSSI. Two scarce aquatic plant species were recorded in the ditches sampled (the Leiston drain and the Sizewell ditch). These were Frogbit, which is uncommon but is recorded from more than 100 10km grid squares in Britain, and Soft Hornwort, a nationally scarce aquatic plant recorded from only between 16 and 100 10km grid squares. Nevertheless, it was noted that the ditches in this area do not support as diverse aquatic communities as elsewhere within the Sizewell Marshes SSSI, due to shading from dense riparian vegetation, highlighting the importance of regular ditch management in maintaining the aquatic flora.

1.4.87 The ditch network within Sizewell Marshes SSSI is cited as an interest feature of the SSSI, but not the open lagoon within the reedbed. Whilst ditches are not specifically listed under Section 41 of the NERC Act, eutrophic standing open water is listed, and the ditches (as well as the lagoon in the north-eastern corner of Sizewell Marshes SSSI) would fall within this habitat category. Ditches are also not listed under Suffolk's Priority Species and Habitats, but it could be argued that they form an integral part of fen meadow habitat, which is listed.

Assessment

1.4.88 Given that the ditch communities within Sizewell Marshes SSSI are cited as an interest feature, and that eutrophic standing open water is listed under Section 41 of the NERC Act then the total open water resource within the ZOI would be:

- an IEF at the national level under the CIEEM guidelines; and
- of high importance under the EIA-specific methodology.

viii. Coastal vegetation

Description

1.4.89 A linear strip of coastal vegetation is located adjacent to the eastern edge of the site, with a sand and/or shingle substrate. The sand substrate gives rise to grassland dominated by species including Sand Sedge and Marram Grass (*Ammophila arenaria*), whilst the shingle substrate supports scattered plants that are specialists of such habitat, including Sea Pea. To facilitate the description of the habitat types present, habitats seaward to the north and south of the proposed Sizewell C power station are considered separately.

1.4.90 North of the main platform is a narrow strip of coastal habitat located between the Leiston drain and the sea, which forms part of the Minsmere to Walberswick Heaths and Marshes SAC, Ramsar and SSSI. The SAC designation is due to the presence of shingle vegetation, in particular "*annual vegetation of drift lines*". Information supplied by the Joint Nature Conservation Committee states that this habitat type occurs on a well-developed beach strandline of mixed sand and contains shingle species such as Sea Sandwort and sea beet. Annual vegetation of drift lines (where extant) is a scarce habitat type, and the Joint Nature Conservation Committee (Ref 1.60) estimate only 100ha remain in England. The Natural England condition assessment for this unit to the north of the main platform, however, describes the vegetated shingle as being no longer present here, having been destroyed by coastal processes, with only a thin strip of bare unvegetated shingle remaining above the high tide mark. It is therefore

considered that the "*annual vegetation of drift lines*" feature is no longer present in this location, despite being the reason for the designation.

1.4.91 Located landward of the bare shingle at the high tide mark, vegetated areas are dominated by sand dune lying on top of the underlying shingle. The dune supports elements of dry heath vegetation, with both heather and Bell Heather being present. "*Lowland Dry Heath*" is an interest feature of the Minsmere to Walberswick Heaths and Marshes SAC. Therefore, the heath vegetation present to the north and seaward of the main platform is considered to form part of both the *"Lowland Dry Heath"* and the *"Perennial Vegetation of Stoney Banks"* SAC interest features.

1.4.92 The section of coast south of the main platform forms part of the Suffolk Shingle Beaches CWS, which is designated for its species-rich shingle and dune vegetation. In addition, both sand dune and vegetated shingle comprise Section 41 NERC Act habitats whilst also being listed under Suffolk's Priority Species and Habitats. The Suffolk BAP states coastal vegetated shingle is a scarce habitat type across the UK, with only approximately 4,000 to 5,000ha present, the majority of this at two locations, Dungeness and Orfordness. In Suffolk, there is approximately 859ha of vegetated shingle, 20% of the total UK resource of this habitat type. In contrast, the Suffolk BAP states that coastal sand dunes are relatively widespread in the UK, with approximately 56,000ha present. Within Suffolk, 66ha of sand dune are present, 0.1% of the UK resource.

North and seaward of the proposed Sizewell C power station

1.4.93 The Wood Group consolidated Phase 1 habitat survey provided in **Annex 14A3.3** did not survey the coastal habitats to the north of the main platform. This area has, however, been subject to an Arcadis NVC survey, as presented within **Annex 14A3.4**, and an assessment of the bryophyte and lichen assemblage present as presented within **Annex 14A3.4**. The Arcadis NVC survey provided in **Annex 14A3.4** describes the sequence of coastal habitats between the Leiston drain and the sea, with the Leiston drain forming the western boundary. Adjacent to this drainage ditch, to the east, is a linear reedbed, approximately 30m to 40m in width. To the east of this is a strip of windswept and stunted scrub which grades into a flat area of dune grassland that is approximately 100m wide. This culminates

in a low (1m high) dune ridge overlooking bare shingle and the high-tide mark (which is the eroded face of the low sand dune).

Dune grassland

1.4.94 The Wood Group NVC report provided in **Annex 14A3.3**, describes a variety of dune grassland communities being present, the most widespread community being SD12 *Carex arenaria – Festuca ovina – Agrostis capillaris* dune grassland. This is described as an undisturbed acid grassland community with abundant tussocks of Sheep's-fescue and mats of Sand Sedge, with a patchy carpet of bryophyte species and scattered Sheep's Sorrel (*Rumex acetosella*) below these two-dominant species. Other dune grassland communities identified included SD9 *Ammophilia arenaria – Arrhenathrum elatius* dune grassland, and SD11 *Carex arenaria – Corniculata aculeata* dune grassland.

1.4.95 The subsequent Arcadis NVC report provided in **Annex 14A3.4**, describes the dune grassland which forms a level area between the reedbed/scrub woodland and a low dune on the seaward edge. This area consists of a dense cover of Sand Sedge and Sheep's-fescue, with clumps of heather and Bell Heather as well as discrete mats of Sheep's Sorrel and C*ladonia* lichen. The presence of heather and Sheep's Sorrel indicates that the sand substrate is acidic in nature. This area was found to be species-poor, with only 11 plant species recorded. The flat dune grassland is attributable to the SD12 *Carex arenaria – Festuca ovina – Agrostis capillaris* dune grassland.

1.4.96 The Arcadis NVC report provided in **Annex 14A3.4** also describes in some detail the sand dune itself, which comprises a low (1m high) ridge on the seaward side of the dune grassland described above. The dune was observed to be actively eroding, and as of 2015, there are no areas of vegetated shingle on the seaward side of the dune. The dune is less consolidated than the dune grassland, but the plant species diversity is greater, with 21 species recorded. These include species indicative of less acidic conditions, such as Lady's Bedstraw, Spiny Restharrow *(Ononis spinosa*) and Sweet Vernal-grass. Both Sand Sedge and Sheep's-fescue are present in abundance, with Bell Heather and heather also present in

discrete patches. This sand dune grassland is also attributable to the SD12 *Carex arenaria – Festuca ovina – Agrostis capillaris* dune grassland.

1.4.97 Rodwell describes SD12 dune grassland as more frequent in northern and western England. Nevertheless, it does occur in scattered localities on the coast of south-east England, although it is a relatively uncommon plant community on the Suffolk Coast. SD12 favours areas of stable sand; this allow the process of leaching to occur, creating the acidic conditions required for this community to establish.

Bryophytes

1.4.98 The bryophyte report presented in **Annex 14A3.4** describes the assemblage present within the dune grassland and shingle habitats. Surveys confirmed the presence of a well-developed bryophyte element (often with cover greater than 30%) though lacking species diversity. A total of nine mosses were recorded, the most abundant of which were *Dicranum scoparium*, *Campylopus introflexus* and *Hypnum cupressiforme* var. *lacunosum*, *Pseudoscleropodium purum*, *Polytrichum juniperinum* and *Hypnum jutlandicum*. These bryophyte species are characteristic of acidic dune grassland. No scarce species were identified, the assemblage comprising species that are relatively common and widespread.

Lichens

1.4.99 The lichen report in **Annex 14A3.4** describes the lichen survey in detail. The habitats sampled were dune grassland/heath, scrub woodland, vegetated shingle and fence posts and concrete (WWII infrastructure). It was noted that the most diverse areas for lichen taxa were where grazing (from rabbits and deer) and/or trampling has maintained open areas and suppressed the growth of other more dominant plant species, such as grasses.

1.4.100 The lichen flora of the dune grassland habitat was found to be diverse, with 15 lichen taxa recorded; however, the flora is dominated by *Cladonia* species, with *Cladonia portentosa* and/or *Cladonia rangiformis* providing most of the cover. Some areas of dune grassland in the southern section of the survey area (outside the Minsmere to Walberswick Heaths and

Marshes SAC) support indicators of good quality fixed dune grassland habitat, including locally abundant *Cetraria aculeata* and *C. foliacea*. *C. aculeata* was not recorded within the Minsmere to Walberswick Heaths and Marshes SAC, and *C. foliacea* was only noted once. All of the lichen taxa recorded were considered to be widespread and of least concern (i.e. not threatened at the national scale, following Woods and Coppins (Ref 1.61)).

1.4.101 Within the dune grassland, patches of lichen heath (area of low-growing vegetation dominated by mats of lichen) have been identified with abundant *Cladonia portentosa* and *Cetraria aculeata.* Five taxa were recorded within the areas of lichen heath, all being of least concern.

1.4.102 Within the area of scrub woodland, 21 lichen taxa were recorded. No notable species were identified, although some were species that were not recorded elsewhere, so the scrub woodland did contribute to the overall lichen biodiversity.

1.4.103 Finally, fence posts and concrete were found to support additional lichens which included a number of nationally scare species, namely *Buellia stellulata, Caloplaca arcis, C. dichroa, C. albolutescens Verrucaria murina and Opegrapha rupestris.*

South and seaward of the proposed Sizewell C power station

1.4.104 The Wood Group NVC report provided in **Annex 14A3.4** describes the zonation of vegetation in this area. The vegetation follows a similar pattern to the vegetation north of the main platform but is more pronounced. From the eastern edge of the Sizewell A and B power stations there is a broad level area of dune grassland, culminating in a low (2m to 3m high) sand dune. In front of the dune is an area of vegetated shingle. In some places, this is covered by a thin layer of windblown sand, which then grades into bare shingle to the high-tide mark. The beach is wider here than to the north, and this has enabled the establishment of vegetated shingle.

1.4.105 The coastal vegetation here is complex for a number of reasons. In part, it is due to the fact that the habitat was disturbed, altered and subsequently restored when the Sizewell B power station was constructed, and a calcareous sand may have been used in the restoration. This has

encouraged colonisation by a number of plant species more characteristic of calcareous habitat, in contrast to the coastal habitat north of the main platform. The contrast between the species-poor acidic sand dune vegetation north of the proposed location for the main platform, and the more species-rich vegetation to the south in front of the Sizewell A and B power stations, was quite pronounced.

1.4.106 The Arcadis NVC report provided in **Annex 14A3.4** also identifies a number of uncommon plants recorded growing on the sand and shingle. These include Sea-kale, Sea Pea, Rush-leaved Fescue (*Festuca arenaria*) and Rat's-tail Fescue (*Vulpia myuros*). Three of these species (Sea Pea, Rush-leaved Fescue, and Rat's-tail Fescue) are considered to be nationally scarce[3]; Sea-kale is uncommon but would be classified as not scarce[4]. For further detail regarding scarce plant distributions, see Stewart *et al.* (Ref 1.62).

Dune grassland

1.4.107 The Arcadis NVC report provided in **Annex 14A3.4** describes the dune grassland as occupying a flat area between the base of the Sizewell A and B power stations and the sand dune ridge to the east. The low-growing sward (between 3cm and 5cm high) was found to be species-rich, with 28 grass and forb species recorded in the quadrats. The most abundant grass species are Red Fescues (*Festuca rubra sens. Lat*), Smooth Meadow-grass, Sheep's-fescue and Sweet Vernal-grass. The low-growing forbs recorded include Common Bird's-foot-trefoil (*Lotus corniculatus*), Strawberry Clover (*Trifolium fragiferum*), Buck's-horn Plantain (*Plantago coronopus*), English Stonecrop (*Sedum anglicum*), Lady's Bedstraw, Harebell (*Campanula rotundifolia*), Ribwort Plantain and Rough Hawkbit (*Leontodon hispidus*).

[3] Recorded from between 16 and 100 10km grid squares in Britain.

[4] Recorded in more than 100km squares in Britain.

1.4.108 Previous SWT NVC surveys as presented in **Annex 14A3.3** have noted the difficulty in assigning the sand dune and dune grassland here to a particular NVC community. The consensus is that the dune grassland most closely resembles SD8 *Festuca ovina – Galium verum* fixed dune grassland, in particular, the *Luzula campestris* sub-community. In SD8, Marram, which is usually the dominant grass on dunes, is replaced by Red Fescues and other herbaceous species to form a low, close-cropped short turf. Lady's Bedstraw, Common Bird's-foot-trefoil and Ribwort Plantain are indicative of the typical sub-community. SD8 is characteristic of calcareous fixed sands on dunes and coastal plains in Britain. It is widely distributed on the coast, and the typical sub-community of SD8 is the most common sub-community on southerly coasts.

Sand dune

1.4.109 The Arcadis NVC report provided in **Annex 14A3.4** describes the sand dune habitat as a low, narrow dune, between 2 and 3m in height and 5 and 6m in width. As with the dune grassland, the plant community is species-rich, with 37 plant species recorded. The most abundant grass species are Marram and Red Fescues, with a wide variety of forb species growing amongst the Marram tussocks. These include Common Bird's-foot-trefoil, Common Restharrow (*Ononis repens*), Sea Bindweed, Common Centaury (*Centaurium erythraea*) and Strawberry Clover. The majority of these species are indicative of less-acidic conditions than the plant species recorded on the sand dune located north of the main platform. Notwithstanding this, a small number of plant species indicative of slightly more acidic conditions were recorded, including both Sheep's Sorrel and Sheep's-fescue, but these plant species are present at low abundance.

1.4.110 This dune vegetation is attributable to the SD7 *Ammophilia arenaria – Festuca rubra* semi-fixed dune community, which is the characteristic vegetation type of less mobile sands around the British coast.

Vegetated shingle

1.4.111 Both the Wood Group and Arcadis NVC reports in **Annex 14A3.3** and **Annex 14A3.4** respectively, identify two areas of shingle along the Sizewell B power station frontage. Along the strand line (a line of washed-up

seaweed or other debris, marking a previous high-water level along the shore) is a sparse line of vegetation that comprises individual plants of Sea Sandwort, Sea-kale and Spear-leaved orache (*Atriplex prostrata*). These plants are present at a low density (between two and three individuals per square metre). This community was not sampled by quadrats due to the scarcity of the vegetation; nevertheless, it was possible to assign it to the SD2 *Honckenya peploides – Cakile maritima* strandline NVC community.

1.4.112 Just above the strandline, where windblown sand has begun to cover the shingle, there is a more established shingle vegetation community, comprising a mixture of sand specialists such as Marram and Sand Sedge, together with shingle specialists including Sea-kale, Sea-holly (*Eryngium maritimum*), Sea Pea and Sea Campion. The shingle vegetation is species-rich, with 18 species recorded.

1.4.113 This shingle vegetation is attributable to the SD1 curled dock *Rumex crispus - Glaucium flavum* shingle community and, in particular, the SD1a *Lathyrus japonicus* sub-community. This is due to the presence of species associated with sand and shingle. SD1 is the characteristic pioneer vegetation of maritime shingle on the coast of the warmer parts of the British Isles. It is a relatively uncommon vegetation type, with the Sea Pea sub-community largely restricted to the south-east coast. Vegetated shingle is of limited extent within the UK. The UK BAP for vegetated shingle (Ref. 1.63) estimated the extent of the habitat in England as being approximately 4000ha, with concentrations in East Anglia and on the South Coast, with Dungeness supporting the largest resource, at 1,600ha.

Bryophytes

1.4.114 The dune grassland along the main platform frontage supports only a small number of bryophytes (six). The most common of these was *Hypnum cupressiforme* var. *lacunosum*, which characteristically forms quite large mats on the ground. It was frequently joined by *D. scoparium* and *P. juniperinum*, whilst both *Bryum capillare* and *Ceratodon purpureus* occurred in small patches.

1.4.115 Much of the bryophyte interest of the dunes was found to be confined to informal foot tracks or areas where the dune face has been grazed low by

rabbits. The dune bryophyte community is a little more diverse than that of the dune grassland, with a total of 12 mosses recorded. These include the majority of the species present in the dune grassland (with the exception of *Dicranella heteromalla*) together with a few additional species. Five species are particularly characteristic of the sand-dune community: *Brachythecium rutabulum, B. albicans*, *B. capillare*, *D. scoparium* and *P. purum*.

1.4.116 The vegetated shingle strand-line community is well-developed only on the beach near Sizewell B power station. Although rich in definitive shingle plants, this vegetation community mostly lacks bryophytes, except in a few places where it is consolidated with a little sand. It was found to support a community of five mosses, three of which (*B. albicans*, *B. capillare* and *S. ruralis* var. *ruraliformis*) were found to occur at quite high cover. *C. purpureus* and *Bryum algovicum* var. *rutheanum* were occasional associates. No scarce species were identified, the assemblage comprising relatively common and widespread species across the British Isles.

Lichens

1.4.117 As found elsewhere, it was noted that the most diverse areas for lichen taxa were where grazing and/or trampling has maintained open areas and suppressed the growth of other more dominant plant species such as grasses. The lichen flora of the dune grassland habitat was found to be diverse, with 15 lichen taxa recorded. The flora is dominated by *Cladonia* species, with *Cladonia portentosa* and/or *Cladonia rangiformis* providing most of the cover.

1.4.118 Some areas of dune grassland were found to support indicators of good quality fixed dune grassland habitat, including locally abundant *Cetraria aculeata* and *C. foliacea*. All of the lichen taxa recorded are widespread and of least concern (i.e. not threatened at the national scale) following Woods and Coppins. Within the dune grassland, patches of lichen heath (areas of low-growing vegetation dominated by mats of lichen) were identified with abundant *Cladonia portentosa* and *Cetraria aculeate.* Five taxa were recorded within the areas of lichen heath, all being of least concern.

1.4.119 The majority of shingle in this area was considered too mobile to support a lichen flora; however, opposite the Sizewell B power station, fencing has allowed shingle vegetation to develop. Here, 15 lichen taxa were recorded, including two nationally scare species, *Bacidia chloroticula* and *Verrucaria murina.* Note that these nationally scarce species are recognised as being under recorded, so are perhaps more widespread than indicated.

Assessment

1.4.120 Given that the coastal vegetation to the north of the main platform forms part of the Minsmere to Walberswick Heaths and Marshes SAC, Ramsar and SSSI and contains elements of lowland heath (one of the SAC interest features and that coastal sand dunes are listed under Section 41 of the NERC Act and Suffolk's Priority Species and Habitats, then the coastal vegetation (north of the proposed Sizewell C power station) would be:

- an IEF at the international level under the CIEEM guidelines; and
- of high importance under the EIA-specific methodology.

1.4.121 This assessment is likely to apply to other areas of coastal dune and shingle habitat within SACs further afield (e.g. the Alde, Ore and Butley Estuaries SAC) where there is the potential for coastal change and/or recreational displacement impacts. Similarly, heathland habitat (e.g. within the Minsmere to Walberswick Heaths and Marshes SAC) could also be affected in this way and would also be considered to be of international/high importance.

1.4.122 Given that the coastal vegetation to the south of the main platform forms part of the Suffolk Shingle Beaches CWS, that both sand dune and vegetated shingle are listed under Section 41 of the NERC Act and Suffolk's Priority Species and Habitats, and that a number of nationally scarce plant species are present, together with a diverse lichen fauna; then the coastal vegetation (south of the main platform) would be:

- an IEF at the national level under the CIEEM guidelines; and
- of high importance under the EIA-specific methodology.

c) Summary of ecological features/receptors

1.4.123 Following a review of the known baseline within the ZOI, **Table 1.5** lists the ecological features/receptors and details which will be carried forward into the detailed assessment. Those carried forward are IEFs of sufficient conservation value that will be either directly or indirectly affected by the proposed development and require material consideration within the assessment.

1.4.124 The following habitat types within the site would be IEFs and taken forward for detailed assessment: broad-leaved woodland, wet woodland, fen meadow, reedbed, eutrophic standing open water, acid grassland and coastal vegetation. The cited plant and habitat qualifying features of designated sites that are regarded as IEFs were outlined in the **Appendix 14A2** of this volume – Designated Sites and includes Minsmere to Walberswick Heaths and Marshes SAC, SPA, Ramsar, and SSSI and Sizewell Marshes SSSI. Non-statutory sites identified in particular were the Sizewell Levels and Associated Areas CWS and Suffolk Shingle Beaches CWS.

Table 1.5: Ecological features taken forward for detailed assessment[5]

Feature/Receptor	Importance (CIEEM/EIA Methodology)	Justification	Scope In/Out
Arable habitat	Local/Low	Arable habitat is widespread in Suffolk, and the margins within the site support a low diversity of arable weed species and failed to meet the Plantlife criteria for margins of county importance. Therefore, this habitat type has been scoped out of the detailed assessment.	Scoped out
Conifer and mixed plantation	Local/Low	There will be habitat loss of this habitat type from within the Sizewell Levels and Associated Areas CWS, but this habitat type is composed of non-native trees, and is not listed on either Section 41 of the NERC Act or Suffolk BAP and has therefore been scoped out of the detailed assessment.	Scoped out
Broad-leaved woodland	County/Medium	There will be some habitat loss of this receptor. Woodland cover is scarce in Suffolk and broad-leaved is listed on both Section 41 of the NERC Act and Suffolk BAP. This habitat	Scoped in

[5] Please note that while a habitat may be scoped out of the ES and detailed assessment, it will still be included in Biodiversity Net Gain calculation and the Outline Landscape Environmental Management Plan (OLEMP), both of which are separate documents to the ES.

Feature/Receptor	Importance (CIEEM/EIA Methodology)	Justification	Scope In/Out
		type has therefore been scoped into the detailed assessment.	
Wet woodland (within Sizewell Marshes SSSI)	National/High	There will be direct habitat loss of this receptor. This habitat type is listed in the Sizewell Marshes SSSI citation although it is not listed as a designated interest feature. Wet woodland is a nationally scarce habitat type listed on both Section 41 of the NERC Act and Suffolk BAP. Wet woodland will be therefore be considered within the Sizewell Marshes SSSI receptor as a whole.	Scoped in
Hedgerow and scrub	Local/Low	There will be some minor direct habitat loss of this receptor. Scrub is a relatively common habitat but is not listed on either Section 41 of the NERC Act or the Suffolk BAP. The majority of hedgerows within the proposed development are not identified as important under the hedgerow regulations and there is a significant hedgerow resource within Suffolk. Therefore, scrub and hedgerows have been scoped out of the assessment.	Scoped out
Platform grassland	Local/Low	This is artificial habitat that has become established on Made Ground following the construction of Sizewell B relocated facilities. There will be direct habitat loss of this receptor. This is a species-poor habitat that is not listed on either Section 41 of the NERC Act or the Suffolk BAP; no scarce or legally protected plants have been identified. Therefore this habitat type has been scoped out of the detailed assessment.	Scoped out
Deptford Pink	County/Medium	A nationally scarce plant protected under the Wildlife and Countryside Act. The location where this species has been identified will be subject to severe disturbance and habitat supporting the plant will be lost. This species has therefore been scoped into the detailed	Scoped in

Feature/Receptor	Importance (CIEEM/EIA Methodology)	Justification	Scope In/Out
		assessment.	
Acid grassland	County/Medium	There will be direct habitat loss of this receptor, albeit temporary. Acid grassland is listed under Section 41 of the NERC Act and is a Suffolk BAP priority habitat. This habitat type is of limited extent within the Suffolk Sandlings; in addition, it does contribute towards the interest features of both Leiston Common and the Sizewell Levels and Associated Areas CWS. This habitat type has therefore been scoped into the detailed assessment.	Scoped in
Arable reversion to acid grassland (reptile receptor areas and Aldhurst farm)	Local/Low	There will be direct temporary habitat loss of this receptor within Aldhurst farm to accommodate a water management zone and material stockpiling. This is a species-poor habitat that is not listed on either Section 41 of the NERC Act or the Suffolk BAP; no scarce or legally protected plants have been identified. This habitat type is developing and yet to reach its full potential. For this reason, this habitat type has been scoped out.	Scoped out
Rush pasture and fen meadow (within Minsmere to Walberswick Heaths and Marshes SSSI and Sizewell Marshes SSSI)	National/High	Rush pasture is listed as a designated feature for both Minsmere to Walberswick Heaths and Marshes and Sizewell Marshes SSSI. There will be direct habitat loss of this habitat type within Sizewell Marshes SSSI only. It is a nationally scarce habitat listed on both Section 41 of the NERC Act and the Suffolk BAP. Habitat loss will be therefore be considered within the Sizewell Marshes SSSI receptor as a whole.	Scoped in
Reedbed (within Sizewell Marshes SSSI)	National/High	Listed in the citation and listed as a designated feature for Sizewell Marshes SSSI. There will be direct habitat loss of this receptor from within Sizewell Marshes SSSI. Reedbed is a nationally scarce habitat listed on both Section 41 of the NERC Act and Suffolk BAP.	Scoped in

Feature/Receptor	Importance (CIEEM/EIA Methodology)	Justification	Scope In/Out
		Loss of reedbed will therefore be considered within Sizewell Marshes SSSI receptor as a whole.	
Open water (ditches within Sizewell Marshes SSSI)	National/High	Listed on the citation and as a designated feature for Sizewell Marshes SSSI. There will be direct habitat loss of this receptor. Open water is a nationally scarce habitat listed on both Section 41 of the NERC Act and the Suffolk BAP. Loss of ditch habitat will therefore be considered within Sizewell Marshes SSSI receptor as a whole.	Scoped in
Shingle and sand dune vegetation (within Minsmere to Walberswick Heaths and Marshes SAC and SSSI)	International/High	Vegetated shingle and dunes are a nationally scarce habitat listed on both Section 41 of the NERC Act and Suffolk BAP; and both support national assemblages of plants that are nationally scarce. There will be no direct habitat loss of this receptor; however, this habitat type may experience indirect impacts and will be therefore be considered within the Minsmere to Walberswick Heaths and Marshes SAC and SSSI receptor as a whole.	Scoped in
Shingle and sand dune vegetation (within Suffolk Shingle Beaches CWS)	National/High	There will be direct habitat loss of this receptor. This is a nationally scarce habitat type listed on both Section 41 of the NERC Act and Suffolk BAP; and the CWS supports nationally an assemblage of rare plants. This habitat type has therefore been scoped into the detailed assessment.	Scoped in

References

1.1 Wildlife and Countryside Act, as amended. London: Her Majesty's Stationary Office, 1981. (Online) Available from: http://www.legislation.gov.uk/ukpga/1981/69.

1.2 Suffolk Biodiversity Partnership. Suffolk Local Biodiversity Action Plan. 2012. (Online) Available from: http://www.suffolkbiodiversity.org/biodiversity-action-plans.aspx (Accessed 01 March 2019).

1.3 Suffolk Biodiversity Information Service. Priority Species and Habitats. 2015 (Online) Available from: https://www.suffolkbis.org.uk/biodiversity/speciesandhabitats (Accessed 1 February 2019).

1.4 Natural Environmental and Rural Communities Act. London: Her Majesty's Stationary Office, 2006. (Online) Available from: http://www.legislation.gov.uk/ukpga/2006/16/contents.

1.5 Chartered Institute of Ecology and Environmental Management. Guidelines for Ecological Impact Assessment in the United Kingdom and Ireland. Terrestrial, Freshwater, Coastal and Marine. Winchester: CIEEM, 2018.

1.6 Joint Nature Conservation Committee. Handbook for Phase 1 habitat survey – a technique for environmental audit. Peterborough: JNCC, 2010.

1.7 Rodwell, J.S. National Vegetation Classification: Users' handbook. Peterborough: JNCC, 2006.

1.8 Entec Aldhurst Farm (East) Leiston: Extended Phase 1 Habitat Survey Report. Entec, 2010.

1.9 Amec. Land West of Lovers Lane, Leiston: Draft Extended Phase 1 Habitat Survey Report. Amec, 2011.

1.10 Amec. Sizewell C New Nuclear Power Station: Draft Extended Phase 1 Habitat Survey Report 2007. Amec, 2012.

1.11 Amec. Sizewell C New Nuclear Power Station: Draft National Vegetation Classification Survey Report 2007 – 2008. Amec, 2012.

1.12 Suffolk Wildlife Trust. Sizewell Beach SSSI Vegetation Survey. SWT, 2003.

1.13 OHES Environmental Ltd. Sizewell Marshes SSSI, Report on the Fen Meadow Vegetation Monitoring Programme. Work undertaken on behalf of Sussex Wildlife Trust. 1996-2016.

1.14 EDF Energy SZB (2018) Sizewell Estate Vegetation Surveys – Grass heath mosaic. Jonny Stone Vegetation Advisor.

1.15 Joint Nature Conservation Committee. Minsmere to Walberswick Heaths and Marshes SAC designation (UK0012809). JNCC, 2001. (Online) Available from: http://jncc.defra.gov.uk/ProtectedSites/SACselection/sac.asp?EUCode=UK0012809 (Accessed 01 February 2019).

1.16 Joint Nature Conservation Committee. Alde, Ore and Butley Estuaries SAC designation (UK0030076). JNCC, 2001. (Online) Available from: http://jncc.defra.gov.uk/protectedsites/sacselection/sac.asp?EUCode=UK0030076 (Accessed 01 February 2019).

1.17 Joint Nature Conservation Committee. Orfordness - Shingle Street SAC designation (UK0014780). JNCC, 2001. (Online) Available from: http://jncc.defra.gov.uk/ProtectedSites/SACselection/sac.asp?EUCode=UK0014780 (Accessed 01 February 2019).

1.18 JNCC. Minsmere to Walberswick Ramsar site details. (Online) Available at: http://jncc.defra.gov.uk/pdf/RIS/UK11044.pdf (Accessed 01 February 2019).

1.19 JNCC. Alde – Ore Ramsar site details. (Online) Available at http://jncc.defra.gov.uk/pdf/RIS/UK11002.pdf (Accessed 01 February 2019).

1.20 Natural England. Alde Ore Estuary SSSI Site Details (Online) Available from: https://designatedsites.naturalengland.org.uk/SiteDetail.aspx?SiteCode=S1003208 (Accessed 01 February 2019).

1.21 Natural England. Blaxhall Heath SSSI Site Details (Online) Available from: https://designatedsites.naturalengland.org.uk/SiteDetail.aspx?SiteCode=S1003460&SiteName=Blaxhall&countyCode=&responsiblePerson (Accessed 01 February 2019).

1.22 Natural England. Cransford Meadow SSSI Site Details (Online) Available from: https://designatedsites.naturalengland.org.uk/SiteDetail.aspx?SiteCode=S1003356&SiteName=Cransford&countyCode=&responsiblePerson= (Accessed 01 February 2019).

1.23 Natural England. Gromford Meadow SSSI Site Details (Online) Available from: https://designatedsites.naturalengland.org.uk/SiteDetail.aspx?SiteCode=S1004234&SiteName=Gromford&countyCode=&responsiblePerson= (Accessed 01 February 2019).

1.24 Natural England. Iken Wood SSSI Site Details (Online) Available from: https://designatedsites.naturalengland.org.uk/SiteDetail.aspx?SiteCode=S1002409&SiteName=Iken&countyCode=&responsiblePerson= (Accessed 01 February 2019).

1.25 Natural England. Leiston to Aldeburgh SSSI Site Details (Online) Available from: https://designatedsites.naturalengland.org.uk/SiteDetail.aspx?SiteCode=S2000370&SiteName=leiston&countyCode=&responsiblePerson= (Accessed 01 February 2019).

1.26 Natural England. Minsmere - Walberswick Heaths and Marshes SSSI. (Online) Available from: https://designatedsites.naturalengland.org.uk/SiteDetail.aspx?SiteCode=S1000721&SiteName=Minsmere&countyCode=&responsiblePerson (Accessed 01 February 2019).

1.27 Natural England. Potton Hall Fields SSSI Site Details (Online) Available from: https://designatedsites.naturalengland.org.uk/SiteDetail.aspx?SiteCode=S1006426&SiteName=Potton&countyCode=&responsiblePerson= (Accessed 01 February 2019).

1.28 Natural England. Sandlings Forest SSSI Site Details (Online) Available from: https://designatedsites.naturalengland.org.uk/SiteDetail.aspx?SiteCode=S2000433&SiteName=sandlings forest&countyCode=&responsiblePerson= (Accessed 01 February 2019).

1.29 Natural England. Sizewell Marshes SSSI Site Details (Online) Available from: https://designatedsites.naturalengland.org.uk/SiteDetail.aspx?SiteCode=S1003416&SiteName=sizewellmarshes&countyCode=&responsiblePerson=(Accessed 01 February 2019).

1.30 Natural England. Snape Warren SSSI Site Details (Online) Available from: https://designatedsites.naturalengland.org.uk/SiteDetail.aspx?SiteCode=S1000928&SiteName=snape warren&countyCode=&responsiblePerson (Accessed 01 February 2019).

1.31 Natural England. Titsal Wood Shadingfield SSSI Site Details (Online) Available from: https://designatedsites.naturalengland.org.uk/SiteDetail.aspx?SiteCode=S1001775&SiteName=Titsal&countyCode=&responsiblePerson= (Accessed 01 February 2019).

1.32 Natural England. Tunstall Common SSSI Site Details (Online) Available from: https://designatedsites.naturalengland.org.uk/SiteDetail.aspx?SiteCode=S1001812&SiteName=Tunstall&countyCode=&responsiblePerson= (Accessed 01 February 2019).

1.33 Suffolk Coastal. County Wildlife Site Citations LEISTON COMMON. Suffolk Coastal 105 (TM458633).

1.34 Suffolk Coastal. County Wildlife Site Citations DISUSED RAILWAYLINE (ALDRINGHAM – ALDEBURGH) Suffolk Coastal 3 (TM461619).

1.35 Suffolk Coastal. County Wildlife Site Citations DOWER HOUSE Suffolk Coastal 216 (TM47586514).

1.36 Suffolk Coastal. County Wildlife Site Citations SUFFOLK SHINGLE BEACHES Suffolk Coastal 4 (TM3338).

1.37 Suffolk Coastal. County Wildlife Site Citations SIZEWELL LEVELS & ASSOCIATED AREAS Suffolk Coastal 106 (TM463640).

1.38 Information from the Wildlife Trusts Website (online). Available at: https://www.wildlifetrusts.org/wildlife-explorer/wildflowers/deptford-pink (accessed February 2019).

1.39 Species Recovery Trust (online) Available at: http://www.speciesrecoverytrust.org.uk/Species%20Factsheets/New%20factsheets/New%20factsheet%20-%20dianthus.pdf (accessed February 2019).

1.40 Hyder (2014) Sizewell C NVC Survey.

1.41 Hyder (2015). Sizewell C Arable Weed Survey.

1.42 Hyder (2015) Assessment of hedgerows on the Main Development Site.

1.43 Vegetation Survey and Assessment LTD, Bryophyte Survey Baseline Bryophyte Assessment (2015). Report for Hyder Consulting.

1.44 Biocenus (2015) Lichen Survey (Report for Hyder Consulting).

1.45 Arcadis (2019) Sizewell B Relocated Facilities – NVC survey June 2019. Report for EDF Energy.

1.46 Arcadis. 2019. Sizewell C Sandpits – Targeted Surveys September 2019 Technical Note.

1.47 Rodwell, J.S, (2006), NVC Users' Handbook, 68 pages, ISBN 978 1 86107 574 1.

1.48 Byfield, A.J. and Wilson, P.J. Important Arable Plant Areas: Identifying Priority Sites for Arable Plant Conservation in the United Kingdom. Salisbury: Plantlife International, 2005.

1.49 Cheffings, C. and Farrell, L. The Vascular Plant Red Data Book List for Great Britain. JNCC, 2005.

1.50 Rodwell, J.S. British Plant Communities Volume One, Woodlands and Scrub. Cambridge University Press, 1991.

1.51 JNCC Wet Woodland Biodiversity Action Plan. (Online) Available at: http://jncc.defra.gov.uk/PDF/UKBAP_Tranche2-ActionPlans-Vol2-1998.pdf (Accessed 01 February 2019).

1.52 Suffolk Ancient Woodland Inventory. (Online) Available at: Multi-Agency Geographic Information for the Countryside. 2013. (http://magic.defra.gov.uk/MagicMap.aspx) (Accessed 01 February 2019).

1.53 The Hedgerows Regulations. 1997. (Online) Available from: http://www.legislation.gov.uk/uksi/1997/1160/contents/made (Accessed 1 March 2019).

1.54 Rodwell, J.S. British plant communities. Volume five. Maritime communities and vegetation of open habitats. Cambridge University Press, 2000.

1.55 EDF Energy SZB (2018) Sizewell Estate Vegetation Surveys – Grass heath mosaic. Jonny Stone Vegetation Advisor.

1.56 Joint Nature Conservation Committee. UK Lowland Grassland Habitats. 2014. (Online) Available from: http://jncc.defra.gov.uk/page-1431 (Accessed 01 April 2015).

1.57 Rodwell, J. S. (ed.) 1992. British Plant Communities. Volume 3 Grassland and montane communities. Cambridge University Press.

1.58 Rodwell, J.S. British Plant Communities Volume Two, Mire and Heaths. Cambridge University Press. 1991.

1.59 Rodwell, J.S. British Plant Communities Volume Four, Aquatic Communities, Swamps and Tall-Herb Fens. Cambridge University Press, 1995.

1.60 Joint Nature Conservation Committee. Extent and Distribution of UK Coastal Habitats. 2014. (Online) Available from: http://jncc.defra.gov.uk/page-5379.

1.61 Woods, R. G., and Coppins, B. J. A Conservation Evaluation of British Lichens and Lichenicolous Fungi. Peterborough: JNCC, 2012.

1.62 Stewart *et al*. Scarce Plants in Britain. Peterborough: JNCC, 1994.

1.63 Joint Nature Conservation Committee. Habitat account – Marine, coastal and halophytic habitats. (Online) Available from: http://jncc.defra.gov.uk/protectedsites/sacselection/habitat.asp?FeatureIntCode=H1220.

SIZEWELL C DEVELOPMENT – MAIN DEVELOPMENT SITE: VOLUME 2, CHAPTER 14:

APPENDIX 14A3 – PLANTS AND HABITATS

Documents included within this Appendix are as follows:

APPENDIX 14A3 PLANTS AND HABITATS

ANNEX 14A3.1 FIGURES (provided separately)

ANNEX 14A3.2 DESK STUDY

ANNEX 14A3.3 SECONDARY DATA

- Annex 14A3.3 Sizewell grassland surveys
- Annex 14A3.3 Phase 1 Habitat Survey Land West Lovers Lane
- Annex 14A3.3 Phase 1 Consolidated
- Annex 14A3.3 NVC Consolidated Report 2007-8
- Annex 14A3.3 NVC coast part 1
- Annex 14A3.3 NVC coast part 2
- Annex 14A3.3 Aldhurst Farm Phase 1

ANNEX 14A3.4 PRIMARY DATA

- Annex 14A3.4 Bryophyte Sampling Locations

- Annex 14A3.4 SZC Hedgerow Assessments – Hyder 2015
- Annex 14A3.4 SZC Arable weeds survey – Hyder 2015
- Annex 14A3.4 Bryophyte Baseline Assessment
- Annex 14A3.4 Sizewell lichen survey
- Annex 14A3.4 SZB RF Footpath alignment NVC Technical Note 2019
- Annex 14A3.4 SZC NVC 2014

VOLUME 2, CHAPTER 14: APPENDIX 14A3 – PLANTS AND HABITATS: ANNEX 14A3.2 DESK STUDY

Contents

Tables

Figures

None provided.

Plates

None provided.

1 Desk Study Results for Plants

1.1.1 Records for plants were requested from Suffolk Biodiversity Information Service (SBIS) in 2014 and 2018 for protected or otherwise notable species of conservation concern within 2km of the Sizewell C power station at the main development site (referred to throughout this volume as the "proposed development").

1.1.2 **Table 1.1** presents the desk-study results for plants. Please note the following abbreviations listed below:

- CITESB: Convention on International Trade in Endangered Species of Wild Fauna and Flora - (1.1)
- WCA8: Schedule 8 of the Wildlife and Countryside Act (1.2)
- NS: Nationally scarce (1.3)
- Suffolk Rare Plant (1.4)
- RLGB.Lr(NT): International Union for Conservation of Nature (IUCN) near threatened (1.5)
- RLGB.VU: IUCN vulnerable (1.5)
- RLGB.EN – IUCN endangered (1.5)
- HSD5: The Habitats Directive – Annex 5 (1.6)
- ScotBL: Scottish Biodiversity List (1.7)
- Sect.41: Section 41 of the Natural Environment and Rural Communities (NERC) Act (1.8)
- Sect.42: Section 42 of the NERC Act (1.8)
- UKBAP: UK Biodiversity Action Plan (1.9)
- NR(vp): Nationally Rare (1.10)

Table 1.1: Desk study results for plants.

Plant Species	Location	Status
Recorded Close to the Proposed Development		
Frogbit (*Hydrocharis morsus-ranae*)	Widespread within ditches in Sizewell Marshes SSSI	RLGB.VU
Man Orchid (*Aceras anthropophorum*)	Rabbit grazed lawn within existing power station	NS, RLGB.EN, Sect.41
Divided Sedge (*Carex divisa*)	Sizewell Marshes SSSI (Monitoring plot 37)	NS, RLGB.VU, Sect.41
Dune Fescue (*Vulpia fasciculate*)	Sizewell Beach	NS
Sand Soft-brome (*Bromus hordeaceus subsp. thominei*)	Sizewell Beach	NS
Mossy Stonecrop (*Crassula tillaea*)	Leiston common, Sizewell Levels and associated areas	NS
Sea Pea (*Lathyrus japonicus subsp. maritimus*)	Sizewell Beach	NS
Clustered Clover (*Trifolium glomeratum*)	Leiston common, Sizewell Levels	NS
Wild Pansy (*Viola tricolor*)	Sizewell Levels	NS
Perennial Flax (*Linum perenne*)	Sizewell Levels	RLGB.Lr(NT),
Corn Spurrey (*Spergula arvensis*)	Sizewell Headland in field gourds	RLGB.VU
Deptford Pink (*Dianthus armeria*)	Seaward edge the main platform	NS, RLGB.EN, Sect.41, WCA8
Henbane (*Hyoscyamus niger*)	Sizewell in garden	RLGB.VU
Smooth Cat's-ear (*Hypochaeris glabra*)	Sizewell Beach and Bridleway	RLGB.VU
Common Cudweed (*Filago vulgaris)*	Leiston common, Sizewell Levels	RLGB.Lr(NT),
Hound's-tongue (*Cynoglossum officinale*)	Sizewell Beach	RLGB.VU
Pyramidal Orchid (*Anacamptis pyramidalis*)	Sizewell Beach	CITESB
Sea Bindweed (*Calystegia soldanella*)	Sizewell Beach	Suffolk Rare Plant
Harebell (*Campanula rotundifolia*)	Sizewell Beach	Suffolk Rare Plant
Cornflower (*Centaurea cyanus*)	Sizewell Beach	ScotBL, Sect.41, Sect.42, UKBAP
Soft Hornwort (*Ceratophyllum submersum*)	Sizewell Belts	Suffolk Rare Plant
Sea-kale (*Crambe maritima*)	Sizewell Beach	Suffolk Rare Plant

Plant Species	Location	Status
Southern Marsh-orchid (*Dactylorhiza praetermissa*)	Sizewell Belts	CITESB
Sea-holly (*Eryngium maritimum*)	Sizewell Beach	ScotBL
Sea Spurge (*Euphorbia paralias*)	Sizewell Beach	CITESB
Yellow Horned-poppy (*Glaucium flavum*)	Sizewell Beach	Suffolk Rare Plant
Sheep's-bit (*Jasione montana*)	Sizewell Beach	Suffolk Rare Plant
Bee Orchid (*Ophrys apifera*)	Between dunes and power station	CITESB
Bulbous Meadow-grass (*Poa bulbosa*)	Sizewell Beach	NS
Annual Beard-grass (*Polypogon monspeliensis*)	Shingle around power station buildings	NS
Lesser Spearwort (*Ranunculus flammula subsp. flammula*)	Sizewell Belts	Suffolk Rare Plant
Curled Dock (*Rumex crispus subsp. uliginosus*)	Sizewell Beach	NS
Greater Bladderwort (*Utricularia vulgaris*)	Sizewell Belts	Suffolk Rare Plant
Minsmere Bird Reserve		
Frogbit (*Hydrocharis morsus-ranae*)	Minsmere Bird Reserve	RLGB.VU
Bulbous Meadow-grass (*Poa bulbosa*)	Minsmere Bird Reserve	NS
Grey Hair-grass (*Corynephorus canescens*)	Minsmere Bird Reserve	NR(vp), RLGB.Lr(NT)
Mossy Stonecrop (*Crassula tillaea*)	Minsmere Bird Reserve	NS
Whorled Water-milfoil (*Myriophyllum verticillatum*)	Minsmere Bird Reserve	RLGB.VU
Marsh-mallow (*Althaea officinalis*)	Minsmere Bird Reserve	NS
Shepherd's Cress (*Teesdalia nudicaulis*)	Minsmere Bird Reserve	RLGB.Lr(NT),
Marsh Stitchwort (*Stellaria palustris*)	Minsmere Bird Reserve	RLGB.VU, Sect.41
Corn Spurrey (*Spergula arvensis*)	Minsmere Bird Reserve	RLGB.VU
Small-flowered Catchfly (*Silene gallica*)	Minsmere Bird Reserve	NS, RLGB.EN, Sect.41, UKBAP
Good-King-Henry (*Chenopodium bonus-henricus*)	Minsmere Bird Reserve	RLGB.VU
Smooth Cat's-ear (*Hypochaeris glabra*)	Minsmere Bird Reserve	RLGB.VU

Plant Species	Location	Status
Red-tipped Cudweed (*Filago lutescens*)	Minsmere Bird Reserve	NS, RLGB.EN, Sect.41, WCA8
Common Cudweed (*Filago vulgaris*)	Minsmere Bird Reserve	RLGB.Lr(NT),
Tubular Water-dropwort (*Oenanthe fistulosa*)	Minsmere Bird Reserve	RLGB.VU, Sect.41.
Hound's-tongue (*Cynoglossum officinale*)	Minsmere Bird Reserve	RLGB.Lr(NT)
Heather (*Calluna vulgaris*)	Minsmere Bird Reserve	Suffolk Rare Plant
Sea Bindweed (*Calystegia soldanella*)	Minsmere Bird Reserve	Suffolk Rare Plant
Carline Thistle (*Carlina vulgaris*)	Minsmere Bird Reserve	Suffolk Rare Plant
Sea-kale (*Crambe maritima*)	Minsmere Bird Reserve	Suffolk Rare Plant
Common Spotted-orchid (*Dactylorhiza fuchsii*)	Minsmere Bird Reserve	CITESB
Southern Marsh-orchid (*Dactylorhiza praetermissa*)	Minsmere Bird Reserve	CITESB
Bell Heather (*Erica cinerea*)	Minsmere Bird Reserve	Suffolk Rare Plant
Sea Stork's-bill (*Erodium maritimum*)	Minsmere Bird Reserve	ScotBL
Sea-holly (*Eryngium maritimum*)	Minsmere Bird Reserve	ScotBL
Sea Spurge (*Euphorbia paralias*)	Minsmere Bird Reserve	CITESB
Rush-leaved Fescue (*Festuca arenaria*)	Minsmere Bird Reserve	NS
Small Cudweed (*Filago minima*)	Minsmere Bird Reserve	Suffolk Rare Plant
Yellow Horned-poppy (*Glaucium flavum*)	Minsmere Bird Reserve	Suffolk Rare Plant
Bluebell (*Hyacinthoides non-scripta*)	Minsmere Bird Reserve	WCA8
Marsh Pennywort (*Hydrocotyle vulgaris*)	Minsmere Bird Reserve	Suffolk Rare Plant
Smooth Cat's-ear (*Hypochaeris glabra*)	Minsmere Bird Reserve	RLGB.VU, ScotBL
Sheep's-bit (*Jasione montana*)	Minsmere Bird Reserve	Suffolk Rare Plant
Field Scabious (*Knautia arvensis*)	Minsmere Bird Reserve	Suffolk Rare Plant
Sea Pea (*Lathyrus japonicus*)	Minsmere Bird Reserve	NS-excludes, ScotBL
Brackish Water-crowfoot (*Ranunculus baudotii*)	Minsmere Bird Reserve	Suffolk Rare Plant
Lesser Spearwort (*Ranunculus flammula subsp. flammula*)	Minsmere Bird Reserve	Suffolk Rare Plant

Plant Species	Location	Status
Golden Dock (*Rumex maritimus*)	Minsmere Bird Reserve	ScotBL
Butcher's-broom (*Ruscus aculeatus*)	Minsmere Bird Reserve	HSD5
English Stonecrop (*Sedum anglicum*)	Minsmere Bird Reserve	Suffolk Rare Plant
Marsh Ragwort (*Senecio aquaticus*)	Minsmere Bird Reserve	Suffolk Rare Plant
Marsh Sow-thistle (*Sonchus palustris*)	Minsmere Bird Reserve	NS
Strawberry Clover (*Trifolium fragiferum subsp. fragiferum*)	Minsmere Bird Reserve	ScotBL
Clustered Clover (*Trifolium glomeratum*)	Minsmere Bird Reserve	NS
Bird's-foot Clover (*Trifolium ornithopodioides*)	Minsmere Bird Reserve	Suffolk Rare Plant
Suffocated Clover (*Trifolium suffocatum*)	Minsmere Bird Reserve	NS
Western Gorse (*Ulex gallii*)	Minsmere Bird Reserve	Suffolk Rare Plant
Heath Speedwell (*Veronica officinalis*)	Minsmere Bird Reserve	Suffolk Rare Plant
Recorded outwith Sizewell and Minsmere		
Frogbit (*Hydrocharis morsus-ranae*)	Wesetleton and Eastbridge	RLGB.VU
Bird's-nest Orchid (*Neottia nidus-avis*)	Theberton Wood	RLGB.Lr(NT)
Greater Butterfly-orchid (*Platanthera chlorantha)*	Theberton Wood	RLGB.Lr(NT), RLGB.VU, Sect.41
Dune Fescue (*Vulpia fasciculata*)	Thorpeness	NS
Mossy Stonecrop (*Crassula tillaea*)	Dower House and Thorpeness	NS
Sea Pea (*Lathyrus japonicus*)	Thorpeness	NS
Bur Medick (*Medicago minima*)	Thorpeness	NS, RLGB.VU
Clustered Clover (*Trifolium glomeratum*)	Thorpeness and Aldringham Walks	NS
Suffocated Clover (*Trifolium suffocatum*)	Thorpeness	NS
Sea-buckthorn (*Hippophae rhamnoides*)	Thorpeness	NS
Heath Dog-violet (*Viola canina*)	Dower House	RLGB.Lr(NT)
Sticky Stork's-bill (*Erodium lebelii*)	Thorpeness	NS
Shepherd's Cress (*Teesdalia nudicaulis*)	Thorpeness, Aldringham Churchyard	RLGB.Lr(NT),

Plant Species	Location	Status
Corn Spurrey (*Spergula arvensis*)	Thorpeness, Aldringham	RLGB.VU
Sand Catchfly (*Silene conica*)	Thorpeness,	NS, RLGB.VU
Good-King-Henry (*Chenopodium bonus-henricus*)	Thorpeness,	RLGB.VU,
Prickly Saltwort (*Salsola kali subsp. kali*)	Aldringham-cum-Thorpe	RLGB.VU, Sect.4
Dodder (*Cuscuta epithymum*)	Aldringham Walks and Common	NS
Marsh Sow-thistle (*Sonchus palustris*)	Westleton	RLGB.Lr(NT),
Common Cudweed (*Filago vulgaris*)	Thorpeness, Theberton, Eastbridge	RLGB.Lr(NT),
Jersey Cudweed (*Gnaphalium luteoalbum*)	Aldringham-cum-Thorpe	WCA8
Hound's-tongue (*Cynoglossum officinale*)	Thorpeness	RLGB.VU
White Sedge (*Carex canescens*)	Dunwich Heath	Suffolk Rare Plant
Sea-kale (*Crambe maritima*)	Dunwich	Suffolk Rare Plant
Yellow Horned-poppy (*Glaucium flavum*)	Dunwich	Suffolk Rare Plant
Corn Marigold (*Glebionis segetum*)	Leiston	RLGB.VU
Marsh St John's-wort (*Hypericum elodes*)	Docwra's Ditch	Suffolk Rare Plant
Wood-sorrel (*Oxalis acetosella*)	Dunwich	Suffolk Rare Plant
Heath Milkwort (*Polygala serpyllifolia*)	Dunwich	Suffolk Rare Plant
Bog Pondweed (*Potamogeton polygonifolius*)	Dunwich Heath	Suffolk Rare Plant
Bird's-foot Clover (*Trifolium ornithopodioides*)	Dunwich	Suffolk Rare Plant
Western Gorse (*Ulex gallii*)	Dunwich	Suffolk Rare Plant
Greater Bladderwort (*Utricularia vulgaris*)	Thorpeness	Suffolk Rare Plant

References

1.1 Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). 2017. (Online). Available from: https://cites.org/eng/disc/species.php (Accessed September 2019).

1.2 Wildlife and Countryside Act, as amended. London: Her Majesty's Stationary Office, 1981. (Online) Available from: http://www.legislation.gov.uk/ukpga/1981/69 (Accessed September 2019).

1.3 Stewart, A., Pearman, D.A. and Preston, C.D. 1994. Scarce Plants in Britain. Peterborough: JNCC.

1.4 Sanford, M. 2005. Suffolk Rare Plant Register, Suffolk Natural History, Vol 41.

1.5 IUCN. 2019. The IUCN Red List of Threatened Species. Version 2019-2. (Online) Available at: http://www.iucnredlist.org (Accessed July 2019).

1.6 Council Directive 92/43/EEC Conservation of Natural Habitats and of Wild Fauna and Flora (The Habitats Directive). 1992. (Online). Available from: http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:31992L0043 (Accessed September 2019).

1.7 Scottish Biodiversity List. 2013. Scottish Natural Heritage

1.8 Natural Environmental and Rural Communities Act. London: Her Majesty's Stationary Office, 2006. (Online) Available from: http://www.legislation.gov.uk/ukpga/2006/16/contents.

1.9 JNCC and Defra. 1994. UK Biodiversity Action Plan.

1.10 Preston, C.D., Pearman, D.A. & Dines, T.D. 2002. New Atlas Of The British And Irish Flora: An Atlas Of The Vascular Plants Of Britain, Ireland, The Isle Of Man And The Channel Islands.

EDF Energy SZB – Ecological Monitoring

Sizewell Estate Vegetation Surveys in 2018 – Grass-heath mosaic

July 2018

Undertaken on behalf of EDF Energy

Prepared by: **Jonny Stone Vegetation Advisor**

Prepared for: **Christine Blythe**
Biodiversity Manager
Property Services, Barnwood, EDF Energy

Jonny Stone Vegetation Advisor, Lavender Cottage, The Street, Easton, Woodbridge Suffolk IP13 0ED

This page has been left blank intentionally

Summary

1. Jonny Stone Vegetation Advisor has been commissioned by EDF Energy to undertake botanical surveys of the dry grasslands within the Sizewell Estate, Suffolk. This work forms part of a programme of ecological monitoring undertaken by EDF Energy on the Sizewell Estate.

2. The purpose of the agreed works is to undertake an assessment of the character and condition of the grassland swards in six compartments of the Sizewell Estate: Black Walks, Broom Covert, Leiston Common, Retsom's Field, Walk Barn and Whinney Hill. The fieldwork was undertaken in July 2018 during an extended period of low rainfall conditions when most swards were strongly parched.

3. The grassland sites were characterized by their environmental, floristic and physiognomic attributes in order to interpret the survey results and provide appropriate management recommendations.

4. The sites are located on plateau-margin slopes separating the Sandlings from the coastal embayments between Dunwich and Leiston. Much of the grassland has developed on the micaceous sands of the upper Norwich Crag. More acidic siliceous sands and gravels were found to outcrop at Leiston Common and parts of Black Walks and a small area of Broom Covert. Cover Silts were found to have accumulated on low ground, notably at Broom Covert.

5. The sites support a range of dry, often parched swards that grade from 'Lowland dry acid grasslands' to 'Fixed Dune Grasslands', with only Broom Covert supporting a single grassland type. This variability is reflected in the species composition of the constituent swards, with each site supporting distinctive suites of stress-tolerant, ruderal and competitive species. Nine notable plant species were recorded during the survey, including the Nationally Scarce Smooth Cat's-ear.

6. EDF Energy provided a draft survey methodology to assess the condition of the grasslands, based on JNCC's Common Standards Monitoring. This methodology was used to conduct all botanical assessments and reviewed to propose site-based amendments to accommodate the differing characters of the grasslands. Variations between the character and current condition of each grassland were identified and formed the basis for recommending adjustments to the management regimes to restore or maintain the grasslands.

7. This report demonstrates that the survey sites currently fail to meet the criterion for 'positive indicator' species proposed by EDF Energy and also the 'Indicators of Success' criterion used by Natural England's the Higher Level Stewardship Scheme. This is primarily due to the 'local distinctiveness' of the Estate grasslands, which are characterized by summer droughting and the influence non-acidic sediments on the grassland substrates. A revised list of stress-tolerant 'positive indicator' species is proposed based on the floristic composition of these swards.

8. The scope and number of issues identified by the assessments varied between sites: Walk Barn and Retsom's Field raised the least issues, while 9 issues were raised by the assessment of Broom Covert. In terms of species composition, the preponderance of primary competitors (Bracken and Ragwort) was of concern at several sites – notably at Leiston Common and Whinney Hill. Secondary competitors, such as Yorkshire Fog and False Oat-grass, were also widespread. In terms of sward structure, both sward height and the cover of plant litter were also of concern at several sites and exceeded national targets for SSSI grasslands.

9. Three contexts for management considerations were discussed, with associated recommendations:

   Landscape context
   Recommendation 1: the variability of the grassland swards is recognised as an asset deriving from variations in local geology and historical treatments.

   Management and grassland ecology

Recommendation 2: Several proposals for grazing management should be considered, to reduce sward height and the build-up of plant litter.
Recommendation 3: Several proposals for grassland topping should be considered, to reduce the role of primary and secondary competitors and to make grazing more effective.

Role of condition assessment
Recommendation 4: The proposed changes to condition attributes and their targets are accepted and adopted as useful measures to set and review management targets.
Recommendation 5: The assessment issues and rationales are employed in decision-making on management issues, and that they are periodically reviewed and adapted to better suit that process.

Contents

1. Introduction

1.1 Context

Jonny Stone Vegetation Advisor has been commissioned by EDF Energy to undertake botanical surveys of the dry grasslands within the Sizewell Estate, Suffolk. This work forms part of a programme of ecological monitoring undertaken by EDF Energy on the Sizewell Estate.

1.2 Objective

The purpose of the agreed works is to undertake an assessment of the character and condition of the grassland swards in six compartments of the Sizewell Estate. The survey areas are given in Table 1.

Table 1. Sizewell Estate: Areas for survey

Site Name	Code	Central NGR	Approximate Area (Ha)
Black Walks	BW	TM 457 655	12.2
Broom Covert	BC	TM 464 629	9.6
Leiston Common	LC	TM 458 634	11.8
Retsom's Field	RF	TM 471 651	12.9
Walk Barn	WB	TM 466 651	1.5
Whinney Hill	WH	TM 469 652	3.2

1.3 Tasks

(1) Grassland characters
The grassland sites were characterized by their environmental, floristic and physiognomic attributes in order to interpret the survey results and provide appropriate management recommendations.

(2) Survey methodology
EDF Energy provided a draft survey methodology based on JNCC's Common Standards Monitoring. This methodology was used to conduct all botanical assessments and reviewed to propose site-based amendments to accommodate the differing characters of the grasslands.

(3) Management recommendations
Variations between the character and current condition of each grassland were identified and formed the basis for recommending adjustments to the management regimes to restore or maintain the grasslands.

2. Survey methodologies

2.1 Fieldwork

The field methodology described in the brief was developed by EDF Energy in consultation with Suffolk Wildlife Trust; it is derived from JNCC's Common Standards Monitoring Guidance for Lowland Grassland Habitats (JNCC 2004a) and includes a suite of proposed indicator species. For more detailed definition of the terms used, and proposed variations from the method given in the brief, Robertson and Jefferson (2000) and JNCC (2004b) were consulted. The nomenclature of vascular plants follows Stace (2010); references to bryophytes follows Hill et al. (2008).

The survey is intended to follow a defined 'walkabout' route across each site, punctuated with periodic stops to assess the vegetation attributes within a 4 m^2 sample plot. Typically, 20 stops were made for large sites; this was reduced to 15 stops at the smaller Walk Barn and Whinney Hill sites.

Figure 1 shows the location of the sites, and of the walkabout routes across each site indicated in the brief. A series of more detailed site maps is included with the series of Site Accounts given in section 3.4.

Figure 1. Location of survey sites, showing the prescribed walkabout routes

The original set of attribute targets is given in Table 2, and the original set of 'positive target species' is shown in Table 3. Subsequent amendments are described in section 3.3.

Table 2. Attributes and their targets as issued in the contract brief

Frequencies: totals out of 20 stops

1-2= rare, 3-6= occasional, 7-12= frequent, All stops (<50% cover) = abundant, All stops (>50% cover) = dominant

Attribute		**Target**	**Method of assessment**
Habitat extent		No significant loss of feature	Comparative assessment with baseline aerial photographs/ appropriately scaled vegetation map
Bare ground (%)		At least 1% but no more than 10% cover consisting of firm, sunlit exposed bare ground	Visual assessment of bare ground visible without disturbing the vegetation
Vegetation structure	% cover of desirable dwarf shrub species	No more than 10% cover	Visual assessment
	% cover of Ulex species	Total gorse (*Ulex* sp.) and/or broom (*Genista* spp.) cover <50%, with <25% cover of common gorse (*Ulex europaeus)*	Visual assessment
Sward height		Generic standard= sward height should usually be 1-25cm	Average of direct measurements at points across stand
Litter		Target should be set to register high or increasing cover as unfavourable. As a generic standard, total extent should be no more than 25% cover of the sward	Structured observation
Vegetation composition	Positive indicators	Targets should be set to register a low or declining frequency of key indicators as unfavourable At least 4 species/taxa frequent and 6 species occasional throughout the sward (see table below)	Record presence, using structured walk
Negative indicators	Signs of ground disturbance	<1% of habitat heavily eroded	Visual assessment of cover using structured walk
	Negative species	<1% cover of exotic species (rhododendron, shallon, JKW) <5% cover of ragwort, nettle, greater plantain, spear thistle, creeping thistle, rosebay willowherb, common mouse-ear, milk thistle, daisy, soft rush (but see comment) <10% cover of trees and scrub <10% cover of dense bracken	Visual assessment of cover using structured walk
Indicators of local distinctiveness		To maintain distinctive elements at current extent/levels and/or in current locations	As appropriate and only if required

Table 3. Positive indicator species (yellow- first suggestions for 10 species)[a]

	Latin name	Common name	Present on site?[b]
Grassland species	*Aira spp.*	Hair-grass species	Yes, Retsoms
	Aphanes spp.	parsley-piert species	Yes, Retsoms
	Campanula rotundifolia	harebell	Probably present
	Centaurium erythraea	common centaury	Yes, Retsoms
	Cladonia spp.	cup lichen, genus of moss-like lichens	Likely
	Erodium cicutarium	common stork's-bill	Yes, Retsoms
	Galium saxatile	heath bedstraw	Very likely and present at least at Leiston Common and Retsoms
	Galium verum	lady's bedstraw	Very likely and present at least at Leiston Common and Retsoms
	Lotus corniculatus	common bird's-foot trefoil	Yes, Retsoms
	Hypochaeris radicata	Cat's-ear	Definitely
	Ornithopus perpusillus	little white bird's-foot	Yes, Retsoms
	Pilosella officinarum	mouse-ear hawkweed	Yes seen at least at Leiston Common and Retsoms
	Plantago coronopus	buck's-horn plantain	Yes at least at Retsoms and Leiston Common
	Rumex acetosella	sheep's sorrel	Yes, Retsoms
	Sedum acre	biting stonecrop or goldmoss stonecrop	Likely
	Veronica officinalis	heath speedwell or common speedwell	Yes, occurs at Retsoms and Leiston Common at least
	Viola spp.	violet species	Yes, Retsoms. Likely to be V. canina
Dwarf shrubs	*Calluna vulgaris*	Heather or ling	yes present at least on Leiston Common, Retsoms etc
	Erica cinerea	bell heather	yes present at least at Leiston Common, Retsoms etc
	Erica tetralix	cross-leaved heath	Possible if there are any wet heathy areas, but not in Suffolk Flora any further south than Westleton
Gramminoids	*Agrostis* spp.	bent species	yes
	Carex spp.	Sedge species	yes
	Danthonia decumbens	Heath grass	Very likely
	Deschampsia flexuosa	wavy hair-grass	Very likely
	Festuca spp.	Fescue species	Very likely

[a] This table is transcribed from the EDF Brief

[b] This column refers to previous survey data and professional judgement

2.2 Survey constraints and limitations

There were no physical constraints in conducting the site surveys.

The fieldwork was undertaken during the normal period for optimum species identification but was affected by the preceding period of low rainfall conditions. As is evident from the plot images provided as an electronic appendix to the report most swards were strongly parched.

Nonetheless, it is not believed that any significant omissions or cover under-estimates occurred within the closely-examined sample plots. However, casual species recognition when walking between plots was greatly compromised and it is likely that the presence of some species was not detected. For much of the flora, it was also not possible to estimate frequency of occurrence.

2.3 Presentation of the results

Character of the grasslands. Published surficial geological materials and soil types were reviewed to characterize the substrates present at each site. The floristics of the sample plots taken at each site were used to identify the character of the constituent grasslands in terms of the National Vegetation Classification syntaxa present. The sample plots also provided a representative flora for each site. The species recorded from the sample plots were allocated into one of eight categories, which are used to describe the character of each grassland-type. Where appropriate, notable species are highlighted.

Condition of the grasslands. The attributes used to assess the condition of each site are described, and the range of variation recorded from each site is given. The attributes include the extent of the grassland communities present on each site and the condition of the swards in terms of their composition and structure. In each case, each site is assessed against prescribed targets set for each attribute. Where particular attribute targets initially provided with the contract brief are at variance with the actual character of the grasslands, these are amended with appropriate justification.

An account of site condition is given as a series of tables paired with an annotated site map, with a summary of their collective conditions.

Grassland condition issues. Assessment of the condition of the surveyed grasslands raised a number of issues related to the perception of the character of the grasslands, to their actual and potential floristic composition, and to a range of factors that can be influenced by management. As appropriate, successful past and current interventions are identified.

3. Site Condition Assessment

3.1 Grassland characters

3.1.1 Landscape situation

The sites are located on plateau-margin slopes separating the Sandlings from the coastal embayments between Dunwich and Leiston. Following a recent British Geological Survey account (Lee et al. 2015) the area is underlain by the Chillesford Sand Member of the Norwich Crag, which is composed of well-sorted, fine- to medium-grained micaceous sands in a deposit up to 15 m thick. This occurs at or near the land surface of all sites except Leiston Common (BGS 1996). Overlying the Crag sands are the siliceous sands and gravels of the Colchester Formation - part of the Kesgrave Catchment Subgroup of sediments laid down by the River Thames prior to the Anglian glaciation (c.400 k.a.). Apart from Leiston Common, these more acidic sands also outcrop over parts of Black Walks and a small area of Broom Covert. This deposit may also be overlain by glacio-fluvial sands and gravels (Moorlock et al. 2000). Recent research indicates that the area was also subject to subsequent aeolian deposition of Cover Silt (e.g. Scheib & Lee 2010). Subsequent periglacial activity is likely to have led to slumping of the more acidic siliceous sands of the plateau over the less acidic micaceous sands of the valley sides, and to accumulation of the more fertile Cover Silt downslope.

The modern soils are mapped as the Newport 4 Association, composed largely of typical brown sand soils represented by the Newport Series (Soil Survey of England and Wales 1983). These occur widely in the immediate area and are slightly stony with loose sandy subsoils; the topsoil textures are often sandy loam due to the presence of wind-blown silts. In patches where silts have been washed out of the topsoil, the sands may be sufficiently acid for the surface organic accumulations to be washed from the topsoil deeper into the ground, forming the dark-coloured subsoil layer diagnostic of the Redlodge Series, a humo-ferric podzol (Hodge et al. 1984). These soils are most likely to form where siliceous sands occur at the surface and might occur on Leiston Common and the higher parts of Black Walks and Broom Covert.

3.1.2 Grassland types

The sites support a range of dry, often parched grasslands that grade from 'Lowland dry acid grasslands' (sens. JNCC 2004a) to 'Fixed Dune Grasslands' (sens. JNCC 2004b). The former accord with the perception of the Suffolk Sandlings as supporting solely acid grasslands, but the dry neutral swards common especially on accumulations of wind-blown silts and soft crag sand exposures in the South Sandlings are a particularly distinctive – if rather cryptic – feature of this landscape. Rodwell et al. (2007) provide a European context for these types of grassland.

The range of grassland-types ('syntaxa') are given in Table 4 to sub-community level or as intermediate stands between two published syntaxa.

Table 4. Dry parched grasslands recorded from the Sizewell estate (Site codes as for Table 1)

NVC Code	Title	Site BW	BC	LC	RF	WB	WH
Lowland dry acid grasslands							
	Festuca ovina-Agrostis capillaris-Rumex acetosella community						
U1b	Typical sub-community	•					
U1c	*Erodium cicutarium-Teesdalia nudicaulis* sub-community			•	•	•	
U1d	*Anthoxanthum odoratum-Lotus corniculatus* sub-community	•		•		•	
U1d/MG1a	U1d/*Arrhenatheretum elatioris* grassland, *Festuca rubra* sub-community	•					
U1d/SD8	U1d/*Festuca rubra-Galium verum* dune grassland				•		
U20a	*Pteridium aquilinum-Galium saxatile* community, *Anthoxanthum odoratum* sub-community						•
Fixed dune grasslands							
SD8a	*Festuca rubra-Galium verum* dune grassland, Typical sub-community		•				
SD10b	*Carex arenaria* dune community, *Festuca ovina* sub-community	•				•	
SD12a	*Carex arenaria, Festuca ovina-Agrostis capillaris* dune grassland, *Anthoxanthum odoratum* sub-community						•
Other							
MG6a	*Lolio-Cynosuretum cristati*, Typical sub-community				•		

Lowland dry acid grasslands

These swards represent the drier extremes of this vegetation in Britain and bear a closer resemblance to Breckland grasslands (Ratcliffe 1977) than to the bulk of acid grasslands found over much of lowland Britain. Where Bracken is not present in any quantity, the swards are typically characterized by a perennial flora dominated by fine-leaved grasses and Sheep's Sorrel amongst which lichens and bryophytes often form a carpet, most prolific in sunlit gaps in the sward. These regeneration gaps are frequently initiated by summer droughting or ground disturbance and tend to be locii for populations of stress-tolerant ephemeral species. This is the *Festuca ovina-Agrostis capillaris-Rumex acetosella* community (U1), represented by variants assigned to different sub-communities within the NVC (Rodwell 1992; Cooper 1997; Sanderson 1998).

One common variant on the Sizewell Estate is particularly prone to parching and can be composed largely of ephemeral annuals. Squirrel-tail Fescue, Wall Speedwell and Early Forget-me-not are particularly common here. These swards are found at Leiston Common, Retsom's Field and Walk Barn and can be assigned to the *Erodium cicutarium-Teesdalia nudicaulis* sub-community (U1c).

A second type of *Festuca-Agrostis-Rumex* grassland lacks the range of ephemerals of the first variant but is still prone to occasional parching. It is assigned to the Typical sub-community (U1b). Here, as at Black Walks, Common Bent and Sheep's Sorrel are abundant, in this case forming a short sward amongst a patchy bryophyte carpet dominated by drought-tolerant pleurocarp mosses, notably *Pseudoscleropodium purum*, *Hypnum cupressiforme* agg. and *Rhytidiadelphus squarrosus*.

The third variant is most favoured by only mildly acidic soils and tends to be transitional to other types of grassland. This is the *Anthoxanthum odoratum-Lotus corniculatus* sub-community (U1d), which is typically composed of mixtures of stress-tolerant and more generalized perennials, with only few annual species. Occurring at Black Walks, Walk Barn and Leiston Common, Sweet Vernal-grass, Common Bent and Sheep's Sorrel usually dominate, with gaps typically occupied by Squirrel-tail Fascue and Early Hair-grass. The swards also tend to support populations of mildly competitive grasses such as Yorkshire Fog. At Walk Barn, Bracken can be an aggressive colonist and Ragwort is frequently scattered through the sward.

The *Anthoxanthum odoratum-Lotus corniculatus* sub-community may assemble rapidly on formerly cultivated land, as it has at Black Walks, where stands of this immature grassland are classed as intermediate with the ranker mesotrophic *Arrhenatheretum elatioris* community (U1d/MG1a). Species of this syntaxa may also contribute with those of fixed dune grasslands to form a sward which is both drought-prone and mildly acidic, but – as on Retsom's Field – is somewhat intermediate between the two (U1d/SD8).

At Whinney Hill, bracken has intruded through an area of dry acidic grassland to produce vegetation referred to the *Anthoxanthum odoratum* sub-community of the *Pteridium aquilinum-Galium saxatile* community (U20a). Floristically, the bracken stand is similar to the neighbouring fixed dune grassland and is likely to represent an undermanaged version of it; interestingly, two of the frequent associates to bracken – Creeping Soft-grass and Lesser Stitchwort – are intolerant of drought-stress and only persist in infrequently grazed swards.

Fixed dune grasslands

Three communities of fixed dune grasslands are recognized. At Broom Covert, the swards are typically dominated by Common Bent, Red Fescue, Sand Sedge and Lady's Bedstraw; a number of mesophytic herbs such as Common Mouse-ear, Ribwort Plantain and Yarrow are common associates. This suite of species is typical of the *Festuca rubra-Galium verum* community (SD8), characteristic of moderately dry, infertile and usually calcareous sands on coastal dune systems and sand plains around the British coast. The vegetation takes much of its character from the somewhat less droughty and impoverished conditions that come with long stability of the sand surface but the low rainfall climate in Suffolk and stock-grazing play an important part in determining the nature of the soil and the composition of the sward. This grassland is best referred to the Typical sub-community (SD8a) – rather than the *Luzula campestris* sub-community of more silicaceous (acidic) sands.

On Whinney Hill, Sheep's Fescue is frequently the most abundant grass in areas where Bracken is subdued, sharing dominance with Common Bent and occasionally Sand Sedge. Sheep's Sorrel is the only frequent forb,

with occasional Heath Bedstraw, Cat's-ear and heather. This sward is best placed in the *Anthoxanthum odoratum* sub-community of the *Carex arenaria-Festuca ovina-Agrostis capillaris* community (SD12a). This type of sward develops where stabilised sands on dunes and sand plains are moderately to strongly acidic - through long-continued leaching - and are open to grazing.

Similar vegetation occurs at Black Walks and Walk Barn, though here dense swathes of Sand Sedge dominate and the appearance of several mesophytes place these stands within the *Festuca ovina* sub-community of the *Carex arenaria* dune community (SD10b).

Other grassland
One further grassland type is recorded from the low-lying parts of Retsom's Field, which grade from dry acid grassland to rush-pasture. There is an abrupt shift in species composition on the margins of the dry grassland to a damp, neutral transitional sward that can be referred to the Typical sub-community of the *Lolio-Cynosuretum cristati* (MG6a).

3.2 Constituent species

3.2.1 General
Eighty-one species were recorded in sample plots from the 6 sites. Appendix 1 gives a list of these species and provides information about their occurrence within the sample plots, their behaviour and status as indicators of heathland and semi-natural grassland in Suffolk.

With few exceptions, the species are annuals (25 species) or perennials (50 species). The perennials are largely Hemicryptophytes (39 species), with 3 Chamaephytes, 3 rhizomatous Geophytes and 5 Phanerophytes (*sensu* Smith 1913). The remaining species are short-lived perennials that often behave as annuals or as biennials.

3.2.2 Community character species

Annual species
The proportion of annuals is relatively high for grasslands and is indicative of patches of sward thinning or of bare ground within the sward. This attribute is characteristic of dry grasslands that are prone to summer-droughting.

As shown in Table 5, the highest numbers of annual species recorded in the sample plots occur on Leiston Common and Walk Barn, and are particularly prolific on the Common, where up to 10 different species were recorded in each plot. Not surprisingly, these two sites support areas of the *Erodium cicutarium-Teesdalia nudicaulis* sub-community (U1c). Conversely, far fewer ephemeral species were recorded from Black Walks and Whinney Hill and form an insignificant part of the grassland flora here, particularly on Whinney Hill.

Table 5. The contribution of annual species to site floras

Site	No. of annual species	Average number in plots	Proportion of stress-tolerant annuals
Black Walks	7	1.3	88 per cent
Broom Covert	10	1.9	29 per cent
Leiston Common	16	5.6	85 per cent
Retsom's Field	12	4.1	41 per cent
Walk Barn	15	3.5	79 per cent
Whinney Hill	6	1.0	87 per cent

Group 1. Stress tolerant annuals
Over half these annual species are classed as stress-tolerant ruderals and, with two further species that specialize in colonising largely bare ground (R/SR strategy), are typical of dry, infertile grasslands associated with acid or basic substrates. This suite of 17 species forms Group 1. The most common representatives of this group are Squirrel-tail Fescue and Early Hair-grass.

Group 2. General annuals

The remaining suite of annuals - Group 2 - tend to be associated with circum-neutral and often more fertile conditions. They do occur in dry grasslands but are also often found in ruderal habitats - such as field margins on sand - and in neutral, often semi-improved grasslands.

As shown in Table 5, Group 1 accounts for at least 79 per cent at four of the six sites. On Retsom's Field and Broom Covert, however, the majority of annual species occurrences belong to Group 2. Although Group 1 species do occur as colonists of bare ground within these swards, mesophytic species such as Soft Brome and Common Vetch are more frequent.

Competitor species

Two suites of competitive species are recognised. The primary competitors are widely recognised as aggressive colonists that can dominate patches where they have successfully colonised. The second suite are known as competitors that may indicate a reduction in the stresses related to drought and lack of fertility; their spread normally represents a drift away from a favourable condition.

Group 3. Primary competitors

Several plants are included within Group 3, which is defined as a suite of those species whose proliferation in particular areas most clearly indicates negative change.

Injurious weeds. Three species - Creeping Thistle, Broad-leaved Dock and Common Ragwort - are potentially subject to measures of enforcement to prevent the spread of weeds on private land, under the Weeds Act 1959. Note that The Weeds Act has been subsequently amended by the Ragwort Control Act 2003.

Other strong competitors. Two further species are included here: Bracken and Common Nettle. Bracken is associated with acid, infertile sites and Nettle with circum-neutral fertile conditions. Both species tend to spread through under-management of grasslands and build-up of their litter can dramatically alter soil conditions.

Group 4. Secondary competitors

A number of other species, including coarse grasses like Yorkshire Fog and False Oat-grass, tend to indicate a drift towards less stressed conditions associated with factors such as elevated fertility; they are often a sign of under-management, particularly when coupled with atmospheric N-deposition. Bulky plants such as the coarse grasses also tend to out-compete smaller species when they proliferate.

Table 6 gives an indication of the significance of competitive species in the sward composition of each survey site. Species occurring in more than two samples at any site are shown, differentiated into minor (•) and major (♦) constituents.

Table 6. Competitor species. Site codes are as given in Table 1.

Group	Species	Site					
		BW	BC	LC	RF	WB	WH
3	Bracken		•			♦	♦
	Common Ragwort	♦	•	♦	♦	•	
	Creeping Thistle		•				
4	Cock's-foot	•	♦	•	♦		
	Creeping Soft-grass						♦
	False Oat-grass	•			♦		•
	Field Horsetail				♦		
	Perennial Ryegrass		♦				
	Tufted Vetch				•		
	White Clover		•				
	Yorkshire Fog	♦	♦	♦	♦	♦	♦

In Group 3, Ragwort is the most widespread species and is a significant competitor on Black Walks, Leiston Common and Retsom's Field. Bracken is a major competitor of the swards on Walk Barn and Whinney Hill.

In Group 4, a number of broad-leaved grasses are widespread at several sites, but only one species, Yorkshire Fog, is a serious competitor. This tussock grass is widely recognised as a weed of dry grasslands where atmospheric nitrogen deposition is coupled with under-management.

Non-competitive herbaceous perennials

All herbaceous perennials have been defined as competitors (as above), or as non-competitive perennials. Of these, a group of stress-tolerant perennials are separated from those with a more generalist strategy.

Group 5. Stress-tolerant perennials

A group of 17 typically stress-tolerant perennial species were recorded from the sample plots on the survey sites at widely varying frequencies. Stress tolerance is typically associated with species which are favoured by sub-optimal growing conditions, as competition is less intense. In this context, stresses are primarily low levels of available soil moisture, potentially coupled with low concentration of available nutrients and high concentrations of hydroxyl ions (low pH). Stress tolerant species have a limited distribution in the general countryside and are largely confined to suitable substrates that have not been improved for agriculture.

Group 6: General perennials

This is a suite of 16 perennial species with a rather broader tolerance of environmental conditions than Group 5. Three sub-groups are recognised:

6a: Typified by Common Bent, this sub-group is most commonly associated with mildly acidic grasslands and frequently forms the core of such grasslands in Suffolk. The weak scrambler Common Stitchwort is an indicator of under-managed swards.

6b: Neutral grasslands. This sub-group is particularly frequently at Broom Covert and, to a lesser extent, at Retsom's Field. It is only occasionally recorded at the other sites.

6c: Probable hay-species. This suite of species, largely made up of Crested Dog's-tail and Red Clover, is typical of neutral grasslands and may derive from supplemental feeding. They are almost entirely restricted to Retsom's Field and would not normally be expected to inhabitat this kind of grassland. The sub-group may represent successful colonists from introduced feed-hay.

As shown in Table 7, the highest numbers of stress-tolerant perennials recorded in the sample plots occur on Walk Barn and Whinney Hill, where Sweet Vernal Grass and Sheep's Fescue can be particularly prolific. Conversely, only Sheep's Sorrel is frequent in the Leiston Common grasslands, where stress-tolerant annuals often form the bulk of the sward. Walk Barn and Whinney Hill also support the highest number of these species per sample plot.

Table 7 also shows stress-tolerant perennials as a proportion of all non-competitive herbaceous perennials. This metric shows the relatively high proportion of stress-tolerant perennials at Walk Barn, in marked contrast to Broom Covert, Leiston Common and Retsom's Field. At these sites, Group 5 perennials play a very subordinate role in the species composition of the grassland.

Table 7. The contribution of stress-tolerant perennial species to site floras

Site	No. of stress-tolerant perennials	Average number in plots	Proportion of non-competitive herbaceous perennials
Black Walks	7	1.7	45 per cent
Broom Covert	9	2.7	32 per cent
Leiston Common	3	1.4	31 per cent
Retsom's Field	6	1.7	23 per cent
Walk Barn	10	4.4	68 per cent
Whinney Hill	12	4.1	51 per cent

Woody plants

Group 7. Woody plants
This small group of phanerophytes are colonists from surrounding scrub and woodland and are a normal component of these dry grasslands in low numbers. These species were rarely recorded in the sample plots. No species is more than occasional in the surveyed open grasslands, though stands of gorse are present on Broom Covert and Black Walks.

Lower plants
The overall ground cover of all lichens and bryophytes were recorded from each plot.

Group 8. Lower plants
The lichen flora appeared to be solely composed of *Cladonia* species from three guilds: bare ground colonists, stable bare ground generalists and species growing on decayed organic matter. The bryophyte flora was not identified to species but common pleurocarps noted include *Brachythecium albicans* (typical of sunlit dry grasslands) as well as those listed below. Acrocarps were rarely encountered.

As shown in Table 8, Leiston Common supports an extensive lichen ground flora. This is likely to reflect the high level of direct sunlight reaching the soil surface and may also indicate the strongly parching character of the soil. The paucity of ground lichens at the other sites may be an indication of the young age of the swards, lower incident radiation caused by vegetation shading, or a lower intensity of parching resulting from the soil type or the amount of organic matter on the soil surface.

As the bryophytes were not identified to species level, those tolerant of strong parching are not distinguished from the bulky pleurocarps often associated with immature grassland (e.g. *Brachythecium rutabulum*) or general conditions (e.g. *Pseudoscleropodium purum*). Notwithstanding, one species was noted when present: *Rhytidiadelphus squarrosus*. This moss grows in well-lit situations and is particularly responsive to elevated nitrogen, which is often derived from atmospheric deposition (Londo 2002).

Table 8. Contribution of lower plants to site floras

Site	No. of plots	No. of plots with lichens	No of plots with bryophytes	No. of plots with *Rhytidiadelphus squarrosus*
Black Walks	20	6	16	0
Broom Covert	20	0	9	4
Leiston Common	20	14	18	3
Retsom's Field	20	0	10	0
Walk Barn	15	7	15	5
Whinney Hill	15	1	9	0

3.2.3 Overall stress-tolerance in the Sizewell Estate dry grasslands
Table 9 sums the stress-tolerant annuals and perennials and the presence of lichens in the sample plots. This total provides a metric describing the floristic character of the grasslands in terms of stress-tolerance and clearly distinguishes the relatively severe conditions indicated at Walk Barn and Leiston Common from those experienced by the flora at Black Walks and Broom Covert. The distinctive differences in the proportions of annuals to perennials to lichens are highlighted in each site account (section 3.4). It is also used in re-aligning which species – and how many species - should be used to assess the condition of the grasslands, as discussed in section 3.3.

3.2.4 Notable plant species
Nine notable plant species were recorded during the survey, as listed in Table 10. One species – Smooth Cat's-ear – is classed as Nationally Scarce (recorded in less than 100 10x10 km squares in the British Isles (Stewart et al. 1994)). While this status has not been revoked, more recent 'Red Lists' are based on a 'threat status'. In both the Great Britain list (Cheffings et al. 2005) and the England list (Stroh et al. 2014) the cat's-ear is classed as 'Vulnerable'. Shepherd's Cress and Common Cudweed are classed as 'Near Threatened' in both Red Lists and all three species are 'Suffolk Rarities' (Suffolk Biological Records Centre 2005). The England lists includes

some species – such as Heather, Harebell and Tormentil – that have declined markedly in their extent due to loss of habitat and/or nitrogen deposition (Stevens et al. 2011).

Table 9. Proportion of stress-tolerant species in site floras

Group	Average number in plots					
Site	BW	BC	LC	RF	WB	WH
Group 1: Stress-tolerant annuals	1.3	1.9	5.6	4.1	3.5	1.0
Group 5: Stress-tolerant perennials	1.7	2.7	1.4	1.7	4.4	4.1
Group 8: Lower plants (lichens)	0.3	0.0	0.7	0.0	0.4	0.1
Sum	3.3	4.6	7.4	5.8	8.3	5.2

Table 10. Notable plant species recorded in plot samples

Taxon	Red Data Book	GB Red List	England Red List	Suffolk status
Hypochaeris glabra	Nationally Scarce	VU	VU	Vulnerable
Teesdalia nudicaulis	-	NT	NT	Near Threatened
Filago vulgaris	-	NT	NT	Near Threatened
Calluna vulgaris	-	LC	NT	-
Campanula rotundifolia	-	LC	NT	-
Filago minima	-	LC	NT	-
Potentilla erecta	-	LC	NT	-
Carex binervis	-	-	-	Locally rare
Ulex gallii	-	-	-	Locally Scarce

Table 11 records the number of occurrences within sample plots at each site. Walk Barn plots recorded five different notable species in low numbers. The plots in Leiston Common recorded part of a large population of Smooth Cat's-ear.

Table 11. Occurrence of notable species in sample plots (site codes as in Table 1)

Notable species		Site					
		BW	BC	LC	RF	WB	WH
Heather	*Calluna vulgaris*			[a]	[b]		1
Harebell	*Campanula rotundifolia*					2	
Small Cudweed	*Filago minima*			1		1	
Common Cudweed	*Filago vulgaris*				1		
Smooth Cat's-ear	*Hypocharis glabra*		1	14		3	
Tormential	*Potentilla erecta*						2
Shepherd's Cress	*Teesdalia nudicaulis*					2	
Green-ribbed Sedge	*Carex binervis*						1
Western Gorse	*Ulex gallii*					1	

Note [a]: Known to have been introduced

Note [b]: Two blocks of heather were introduced into treated areas of Retsom's Field in non-sampled areas

3.3 Condition attributes

It should be noted that - with the exception of Whinney Hill[1] - the sites are non-SSSI and need not be held to such stringent targets. The condition of Whinney Hill was last assessed in August 2015 and found to be 'Favourable'; the distribution and density of bracken at that time were described as 'scattered' and within limits set by the assessment.

[1] Minsmere-Walberswick Heaths and Marshes SSSI – Unit 55

3.3.1 Habitat Extent

For each site, the extent of grassland was established by excluding other habitats. Long-established stands of bracken and gorse were mapped and excluded from the condition assessment. The blocks of heather introduced onto Retsom's Field were similarly excluded. All exclusions are noted in the site accounts. At some sites, scattered scrub, bracken and ragwort have been retained in the sward without being topped – either as a deliberate measure or because of difficult ground conditions. These areas are included in the assessment wherever a grassland flora is present and would be key targets for future assessments of habitat extent.

At several sites, land has been reverted from cultivation in recent decades, and these are also included in the assessment and are often distinguished by being referred to a different syntaxon within the NVC; they may also be more prone to invasion by competitive species.

3.3.2 Sward composition

'Positive indicator' species. Using the suite of 'positive indicator' species provided in Table 3, Table 12 provides scores for the list of 'yellow species' and for all species listed in that table. Following the target of "At least 4 species/taxa frequent and 6 species occasional throughout the sward" it is apparent that ***all sites fail this target as it stands***. The list provided is largely made up of stress-tolerant perennials, with only 1 stress-tolerant annual taxon (Hair-grasses). Rather confusingly, 6 generalist species and one 'negative indicator' are also included.

Table 12. Initial scores of 'positive indicator' species

Site	Yellow species Frequency	No.	All species Frequency	No.
Black Walks	Abundant	0	Abundant	1
	Frequent	2	Frequent	2
	Occasional	2	Occasional	4
	Rare	0	Rare	1
Broom Covert	Abundant	1	Abundant	2
	Frequent	0	Frequent	2
	Occasional	0	Occasional	0
	Rare	3	Rare	4
Leiston Common	Abundant	2	Abundant	3
	Frequent	3	Frequent	4
	Occasional	0	Occasional	0
	Rare	0	Rare	1
Retsom's Field	Abundant	0	Abundant	1
	Frequent	2	Frequent	2
	Occasional	2	Occasional	3
	Rare	0	Rare	2
Walk Barn	Abundant	1	Abundant	2
	Frequent	2	Frequent	4
	Occasional	2	Occasional	3
	Rare	1	Rare	3
Whinney Hill	Abundant	0	Abundant	1
	Frequent	2	Frequent	3
	Occasional	3	Occasional	3
	Rare	2	Rare	5

Unfortunately, there are several issues regarding the selection of species and the target set:

a) Of the 10 'yellow' species/taxa, 3 were not recorded by the samples from any site. These include Cross-leaved Heath which, as is pointed out, is a species of wet heath, and Wavy Hair-grass, which is can be regarded as a 'negative indicator' by Natural England[2] when its cover is greater than 25 per cent, as it has been shown to be very responsive to atmospheric nitrogen deposition (e.g. Berendse et al. 1993).

[2] Common Standards Monitoring guidance for Lowland heathland, p8.

b) The ‘yellow species’ list also includes two species – Red Fescue and Cat’s-ear - which are generalist perennials and not restricted to dry grasslands.

c) The broader list contains a further 7 species that were not recorded in the samples.

d) Perhaps the most significant issue is the setting of a very high target, which requires all ten of the ‘yellow species’ to be present or, if the whole list is considered, for the grasslands present to be limited to those that would develop on a strongly acidic substrate. Actually - as described in section 3.1.1 - most of the grasslands occur on crag sands, which are typically circumneutral in reaction, and the swards of most sites are composed of more than one NVC syntaxa.

HLS Indicators of Success. A list of ‘positive indicator’ species is also employed within the Higher Level Stewardship agreement covering the dry Sizewell Estate grasslands. The presence and effectiveness of these species as ‘positive indicators’ is discussed below:

Common Cudweed *Centaureum erythraea* - Common Cudweed is listed as a potential 'positive indicator' species in Table 3 and noted as occurring on Retsom's Field. However, it was not recorded in the survey samples, however, and is not listed as a 'criteria' species for heathland or grassland within the Suffolk County Wildlife Site System. This may reflect its common occurrence on disturbed patches of often fertile sandy soils in both arable and brownfield contexts.

Common Stork’s-bill *Erodium cicutarium* is both listed in Table 3 and recorded as 'frequent' from Leiston Common. It was also recorded as 'occasional' and 'rare' on Walk Barn and Retsom's Field, respectively. However, it is not listed as a 'criteria' species for heathland or grassland within the Suffolk County Wildlife Site System. This is likely to reflect its prevalence as a weed of sandy, disturbed ground, frequently in association with arable land. For this reason, the species has not been proposed as an effective 'positive indicator' species.

Heath Bedstraw *Galium saxatile* is both listed in Table 3 and as a 'criteria' species for heathland within the Suffolk County Wildlife Site System. It was recorded as 'occasional' on Walk Barn and Whinney Hill and retained as a 'positive indicator' species in Table 13.

Wood Sage *Teucrium scorodonia* was not identified as a 'positive indicator' species in Table 3 and was not recorded in the assessment plots at any site. It is, however, a 'criteria' species for heathland within the Suffolk County Wildlife Site System. It is not proposed as an effective ‘positive indicator’ species in Table 13.

Sheep’s Sorrel *Rumex acetosella* is listed as a 'positive indicator' species in Table 3. The species is not, however, used as a 'criteria' species for either heathland or grassland within the Suffolk County Wildlife Site System. Although it is a useful indicator of acidic conditions, it may have been regarded as too commonly occurring in woodland, scrub and tall herb vegetation on sandy soils to be an effective indicator of either heathland or grassland. In the present survey, Sheep's Sorrel was typically 'frequent' or 'abundant' at all sites except Broom Covert, where it was recorded as 'rare'. Notwithstanding, it is proposed as effective indicator of acidic (as opposed to circum-neutral) soils on the Sizewell Estate.

Mouse-ear Hawkweed *Pilosella officinarum* is given as a 'positive indicator' species in Table 3, with records noted from Leiston Common and Retsom's Field. The species is not, however, used as a 'criteria' species for either heathland or grassland within the Suffolk County Wildlife Site System. This may be due to its frequent occurrence on other forms of infertile grassland, notable chalk grassland and grey dunes. It was not recorded in the present survey and not given as a proposed 'positive indicator' species in Table 13.

Lichens. The majority of terricolous lichens likely to occur are currently placed within the *Cladonia* genus, including that group formerly separated within the *Cladina* genus. Other species present on this kind of grassland are mostly members of the *Cetraria* and *Peltigera* genera. All ground-dwelling members of the *Cladonia* genus are regarded as 'positive indicators' in Table 3 and regarded as a positive habitat feature of both heathlands and grasslands within the Suffolk County Wildlife Site

System. Ground-dwelling lichens were recorded as a feature of all sites except Retsom's Field and Broom Covert and retained as a 'positive indicator' in Table 13.

As noted in section 3.4, ***all sites currently fail this criterion***. As noted above, all or large parts of each survey site does not support the range or frequencies of most of these taxa. This is, unfortunately, a failing in the application of a generic set of indicators to a suite of semi-natural grassland types occurring within a specific set of landscape conditions.

Revised list of 'positive indicator' species. A revised list of 'positive indicator' species is proposed to better reflect the range of NVC syntaxa present on the six sites and to account for the local distinctiveness of these grasslands[3]. This revised list is intended to provide a monitoring tool applicable to the assessment of the grassland types that have developed on the Sizewell Estate. They do not replace the national lists of 'positive indicator' species but provide a locally-significant means by which the condition of these grasslands can be assessed through time. As shown in Table 13, the bulk of the constituent species equate to the stress-tolerant annuals and perennials defined in section 3.2.2 and now known to be present in the surveyed grasslands. The list spans those species typical of dry acidic and circum-neutral swards in East Anglia, while excluding those that are particularly common or rarely occurring. The group of indicators is intended to be employed for each grassland.

Table 13. Proposed 'positive indicator' species for Sizewell Estate dry grasslands

Group 1: Stress-tolerant annuals	
Aira caryophyllea	Silver Hair-grass
Aira praecox	Early Hair-grass
Cerastium semidecandrum	Little Mouse-ear
Erophila verna	Common Whitlowgrass
Filago minima	Small Cudweed
Filago vulgaris	Common Cudweed
Hypochaeris glabra	Smooth Cat's-ear
Myosotis ramosissima	Early Forget-me-not
Trifolium arvense	Hare's-foot clover
Trifolium striatum	Knotted Clover
Veronica arvensis	Wall Speedwell
Vicia lathyroides	Spring Vetch

Group 5: Stress-tolerant perennials	
Anthoxanthum odoratum	Sweet Vernal Grass
Carex arenaria	Sand Sedge
Carex pilulifera	Pill Sedge
Festuca ovina agg.	Sheep's Fescue
Galium saxatile	Heath Bedstraw
Galium verum	Lady's Bedstraw
Leontodon saxatilis	Lesser Hawkbit
Lotus corniculatus	Bird's-foot Trefoil
Luzula campestris	Field Woodrush
Phleum bertolonii	Smaller Cat's-tail
Rumex acetosella	Sheep's Sorrel

Group 8. Lower plants	
Cladonia spp.	Ground lichens

The proposed targets for these 'positive indicator' species are shown in Table 14. It is important to recognise that different targets are set for each site in order to reflect the different grassland types present, as defined in section 3.1.2. It should also be noted that the targets are set to reflect the current condition of each site and are neither 'stretch' targets nor ones indicating a degraded condition.

Greater numbers of stress-tolerant annuals are anticipated from an assessment of Leiston Common than from Whinney Hill. This is in line with both the NVC communities present at these sites and also the presence and frequency of occurrence of these types of species recorded in the sample plots. Similarly, the character of Leiston Common, being situated on sands and gravels rather than crag sand, favours the development of ground lichens and 'favourable' condition requires that future assessments continue to record these taxa as 'frequent' in the sample plots. In contrast, the targets for this attribute at Whinney Hill place considerably more emphasis on the occurrence of stress-tolerant perennials, as these play a much more significant role in the character of the swards.

All sites currently pass the targets set in Table 14 and are in favourable condition for this attribute, as defined in Table 13 and 14.

[3] Following Common Standards Monitoring Guidance for Lowland Grassland Habitats, p8.

Table 14. Proposed site-specific targets for 'positive indicator' species

Strategy:	Annuals		Perennials		Lichen taxa
Black Walks	Occasional	2	Frequent	1	Occasional
			Occasional	2	
Broom Covert	Rare	3	Frequent	2	
			Rare	3	
Leiston Common	Frequent	3	Frequent	1	Frequent
	Occasional	4	Occasional	1	
Retsom's Field	Frequent	1	Frequent	2	
	Occasional	1	Occasional	1	
Walk Barns	Frequent	1	Frequent	3	Occasional
	Rare	4	Occasional	2	
Whinney Hill	Occasional	1	Frequent	3	Rare
			Occasional	2	

Frequencies: totals out of 20 stops: 1-2= rare, 3-6= occasional, 7-12= frequent, All stops (<50% cover) = abundant, All stops (>50% cover) = dominant

Dwarf shrub species. The attribute 'desirable dwarf shrub species', with a target of 'no more than 10% cover' is retained in this assessment though it is not currently a meaningful tool for management decision-making in the open grasslands. It is assumed that the attribute refers to the proportionate cover of heather species that it is anticipated would occupy the sites and in this capacity is used to limit that proportion on the resulting grass-heath habitat. Only Whinney Hill and Leiston Common support any *Calluna* within the grassland feature. This dwarf shrub currently occurs with <1% cover.

Negative indicator species. Using the suite of 'negative indicator' species provided in Table 2, Table 15 provides scores against the target set for this attribute. A 'tick' indicates that no issue was recorded and the attribute target was met. Bracken and Ragwort are identified as significant 'negative indicator' species at several sites, in accord with Table 6.

Table 15. Initial scores of 'negative indicator' species, showing potential attribute issues

	BW	BC	LC	RF	WB	WH
Exotic species	✓	✓	✓	✓	✓	✓
Negative species	Ragwort	✓	Ragwort	Ragwort	✓	✓
Trees and shrub cover	✓	✓	✓	✓	✓	✓
Gorse cover	✓	✓	✓	✓	✓	✓
Dense bracken cover	✓	✓	✓	✓	Bracken	Bracken

The following proposals are made to amend this group of attributes:

Negative species. The most significant competitors (i.e. Group 3. Primary competitors (see section 3.2)) are retained (excluding Bracken). Following Natural England's approach, indicators of 'nutrient enrichment and unfavourable condition' are also selected for inclusion, replacing the 7 species given in Table 2 that were not recorded in any sample plot. These are drawn from Group 4. Secondary competitors used comprise Cock's-foot, Creeping Soft-grass, False Oat-grass, Field Horsetail, Perennial Ryegrass, Tufted Vetch, White Clover, Yorkshire Fog. Targets are proposed as follows:

Group 3. Primary competitors (excluding Bracken): <5% cover estimated by visual assessment. This will continue to 'flag-up' Ragwort at the same sites.

Group 4. Secondary competitors: Summed occurrences of all listed species in 20 sample plots at a site <40 (or equivalent if less than 20 plots). This target highlights current assessment issues at Broom Covert (overly frequent Cock's-foot, Perennial Ryegrass and Yorkshire Fog) and Retsom's Field (overly frequent Yorkshire Fog and False Oat-grass).

Tree and shrub cover. The initial target of '<10% cover' is far too high to be a meaningful threshold for remedial action. All sites have <1% cover except Broom Covert and this is proposed as the revised target.

Gorse cover. Gorse cover at Broom Covert and Black Walks is a significant component of the swards, where patches of long-established gorse scrub are present. However, the current target for European Gorse ('<25% cover' over the whole feature) is far too high a limit for acceptable change. It is proposed that a new general target of '<5% over the whole feature' is adopted, with the facility to increase the threshold at particular sites if a management policy allows for patches of scattered scrub above this general target.

Dense bracken cover. The current target is '<10% of dense bracken'. At the time of survey, there are potential issues at Whinney Hill, Broom Covert and Leiston Common, where 'advancing or recovering fronts' equal or exceed this cover value. While 'dense bracken' is currently only an issue along the western margin of Broom Covert – and does not exceed the stipulated target – an 'early-warning' target would be useful at these sites. As 'dense bracken' infers that the grassland flora is at risk of being extinguished, whereas 'advancing or recovering fronts' indicate that the grassland flora is essentially intact, it is proposed that:

Dense bracken cover should not exceed 1% of the grassland feature;

Advancing or recovering fronts should not exceed 10% of the grassland feature.

These targets should also have the facility to increase the threshold at particular sites if a management policy allows for patches of scattered scrub above this general target. At the current time, these attribute targets should highlight issues at each site and allow appropriate decisions on management policy to be maintained or initiated.

3.3.3 Sward structure

The primary attributes of sward height, plant litter and bare ground cover are given in Table 16 directly from the sample plots taken at each site. The cover of bryophytes and lichens are also presented and used in relation to both the amount of plant litter and to bare ground cover. The range of average values given varies between sites and those falling outside the prescribed target are highlighted in red.

Table 16. Sward structure attributes, showing potential attribute issues in red

	BW	BC	LC	RF	WB	WH
Sward height (cm)	16.6	14.9	5.2	22.8	22.4	16.9
Plant litter (%)	21.1	**50.0**	21.9	22.3	10.1	**27.5**
Bare ground (%)	0.2	**0.5**	1.2	1.9	0.3	0.1
Bryophyte cover (%)	30.5	3.6	38.5	9.1	41.9	15.5
Lichen cover (%)	0.8	0.0	11.2	0.0	6.6	0.1
Ground disturbance (%)	<1	**>1**	**>1**	<1	<1	<1

Sward height. Sward height is defined as the tallest layer of non-flowering stems. Average values across all sites varies from 5.2 cm at Leiston Common to over 20 cm at Retsom's Field and Walk Barn. All sites fall within the prescribed target limits for this attribute, though it should be noted that there is little variation in sward height across large parts of Retsom's Field.

Plant litter. Plant litter is generally higher than would be desirable, except at Walk Barn where it is most favourable. The generally rather higher values may reflect the loss of much tiller growth amongst the grasses as a result of the sustained period of low rainfall in the preceding weeks. The high value given for Broom Covert appears to be the result of the build-up of residual plant litter over several years and is of some concern as the proportion of both lower plant and bare ground cover is typically very subdued and litter cover in several plots is almost continuous. The target is also exceeded at Whinney Hill, and this is clearly related to under-grazing, and much of the sward is very thick.

Bare ground. Bare ground cover is rather low for the types of grassland present, which may reflect the lack of strongly parching droughts in recent years. The attribute is only considered to be of concern at Broom Covert as elsewhere ephemeral species and lower plant cover tend to occupy patches lacking perennials, which concurs with the expected response follow a series of years with few drought periods.

Ground disturbance. This attribute could only be assessed by observation during the walkabout survey. On the Common, ground disturbance by rabbit warrening and latrine scrapes have had a significant impact on the sward, and the overall levels of ground disturbance are judged to exceed the target value. At Broom Covert

animal tracks and other signs of ground disturbance also exceeded the target. At neither site have the levels of ground disturbance affected much more than 1%.

Levels of grazing. A plot-based estimate was made on a scale of 0-3:

0 = No sign of recent nibbling, or of recent rabbit pellets.

1 = Occasional evidence of recently nibbled shoots or occasional rabbit pellets in the plot. Equivalent to light grazing, insufficient to prevent an increase in sward height.

2 = Sward showing evidence of sufficient nibbling – or of frequent rabbit pellets. Equivalent to grazing pressure sufficient to maintain sward height and gradually reduce it after the main flush of vegetation growth.

3 = Heavy grazing pressure, with most young shoots nibbled maintaining a short sward. Rabbit pellets at least frequent.

Levels of grazing *per se* was rarely observed to be more than occasional except at Leiston Common where the more intensely grazed patches around the warren areas were permanent short swards.

3.4 Site accounts

(tabulated accounts given overleaf)

Site name	**Black Walks**	Central NGR TM 457 655
Site area 12.2 ha	Date of assessment 18th July 2018	Surveyor – Jonny Stone
Report code BW	Sample plot data Table 17	Site map Figure 2
Survey constraints:	Species presence and extent potentially affected by the preceding period of low rainfall conditions.	

Site character

General	The Walks are composed of dry acid grasslands of various ages on acid sands - grading downslope to fixed-dune grasslands on circum-neutral crag sands.
Geology	Lower slopes Norwich Crag (micaceous sands) Upper slopes to south and west Kesgrave subgroup (siliceous sands and gravels) Potential Cover Silt overlay
Land-use history	Mapped as 'Rough Grazing' in Land Utilisation Survey 1933-1949. On Google Earth, two large blocks (east and west) appear to have been taken into cultivation at some time prior to 1999, when they have been allowed to revert to rough grazing.
Grassland types	U1b *Festuca ovina-Agrostis capillaris-Rumex acetosella* community, Typical sub-community U1d *Festuca ovina-Agrostis capillaris-Rumex acetosella* community, *Anthoxanthum odoratum-Lotus corniculatus* sub-community U1d/MG1a *Festuca ovina-Agrostis capillaris-Rumex acetosella* community, *Anthoxanthum odoratum-Lotus corniculatus* sub-community – intermediate with *Arrhenatheretum elatioris* grassland, *Festuca rubra* sub-community SD10b *Carex arenaria* dune community, *Festuca ovina* sub-community

Composition	No.	Average per plot	Proportion
Stress-tolerant annuals	7	1.3	88 % of annuals
Stress-tolerant perennials	7	1.7	45 % of non-competitive herbaceous perennials
Stress-tolerance ranking		LOW [6th of 6]	
Notable plant species		-	

Site condition

Attribute	**Target**	**Assessment**
Habitat extent	No significant loss of feature	All woodland blocks are excluded from the feature. Included are stands of ruderal and scattered gorse scrub, eutrophic scrub and trees. PASS

Grassland composition

Positive indicator species[a] - original	At least 4 species/taxa frequent and 6 species occasional throughout the sward.	All species frequency: Abundant 1 Frequent 2 Occasional 4 Rare 1 FAIL (see proposed)
- proposed	Annuals: Occasional 2 Perennials Frequent 1; Occasional 2 Lichen taxa Occasional	PASS
HLS Indicators of Success	Sheep's Sorrel (Frequent) Lichens (Occasional)	FAIL
Desirable dwarf shrub species	No more than 10% cover	PASS
Negative indicator species - exotics	<1% cover	PASS

Cont'd …

Attribute	Target	Assessment
- negative species (original)	<5% cover of ragwort, nettle, greater plantain, spear thistle, creeping thistle, rosebay willowherb, common mouse-ear, milk thistle, daisy, soft rush	FAIL (see proposed)
- negative species (proposed)	Group 3. Primary competitors (excluding Bracken): <5% cover estimated by visual assessment. Group 4. Secondary competitors: Summed occurrences of all listed species in 20 sample plots at a site <40 (or equivalent if less than 20 plots).	FAIL – issue: Ragwort widespread in non-U1b PASS
- *Ulex* species (original)	Total gorse and/or broom cover <50%, with <25% cover of common gorse	PASS
- *Ulex* species (proposed)	<5% over the whole feature	PASS – issue: European Gorse on old grassland
- trees and scrub (original)	<10% cover	PASS
- trees and scrub (proposed)	<1% cover	PASS
- dense bracken (original)	<10% cover	PASS
- bracken (proposed)	Dense bracken cover should not exceed 1%; Advancing or recovering fronts should not exceed 10%	PASS PASS
Sward structure		
- sward height	1-25cm	Average 16.6 cm Range U1b (4-13 cm); SD10b (16-20 cm); U1d (4-20 cm); U1d/MG1a (25-30 cm). PASS – issue: limited grazing activity on non-U1b
- plant litter	No more than 25% cover	21.1% PASS – issue: elevated plant litter cover in ex-arable areas
- bare ground	At least 1% but no more than 10% cover consisting of firm, sunlit exposed bare ground	0.2% PASS as significant cover of lower plant flora
- ground disturbance	<1% of habitat heavily eroded	PASS

Issues	Ragwort widespread in non-U1b European Gorse on old grassland Limited grazing activity on non-U1b Elevated plant litter in ex-arable areas

[a] Frequencies: totals out of 20 stops
1-2= rare, 3-6= occasional, 7-12= frequent, All stops (<50% cover) = abundant, All stops (>50% cover) = dominant

Figure 2. Black Walks plot locations

Microsoft product screen shot(s) reprinted with permission from Microsoft Corporation Scale 1:5,000

Table 17. Black Walks: species composition and sward structure of 20 sample plots (see Figure 2)

NVC	U1b					SD10b		U1d							U1d/MG1a					
Sample plot	9	10	11	12	13	1	8	2	3	4	5	14	15	16	6	7	17	18	19	20
Group 1: Stress-tolerant annuals																				
Aira praecox	3	2	3	3	3			3	3			2						2		
Myosotis discolor												2								
Myosotis ramosissima							1		1			1	2	1				1		
Veronica arvensis									1			1								
Vulpia bromoides					1				6	4	2		4							
Group 2: General annuals																				
Crepis capillaris						2							1							
Vicia sativa nigra																			1	
Group 3: Primary competitors																				
Rumex obtusifolius																1				
Senecio jacobaea						4	1		1	1	1	1	1	2		1	2	4	2	5
Urtica dioica										2					1	2	1	1		
Group 4: Secondary competitors																				
Arrhenatherum elatius							1				1				2	2				
Dactylis glomerata																	2	2	2	2
Carduus nutans														1						
Holcus lanatus		1				5	2	3	4	8	6		3	2	10	10	9	5	2	9
Silene latifolia															4	2				
Group 5: Stress-tolerant perennials																				
Anthoxanthum odoratum							2					2	9	8						
Carex arenaria					3	8	9							1						
Carex pilulifera						4							4						5	
Festuca ovina agg.	4																			
Galium verum					1													2		
Luzula campestris												2		5						
Rumex acetosella	7	9	8	5	6	2	5	8	5	8	6	4	4	4		2	1	4	2	
Group 6: General perennials [6a]																				
Agrostis capillaris	7	3	10	7	7	5	2	10	10	1	8	5	4	7	1	1	6	8	9	2
Festuca rubra agg.						4	3											2	6	6
Stellaria graminea						1	2	1			4	1	6	1		2	9			5
Group 6: General perennials [6b]																				
Achillea millefolium						1	1													
Cerastium fontanum					1					1	1			2					1	
Plantago lanceolata						1														
Poa pratensis sens. lat.		1																1		
Group 6: General perennials [6c]																				
Trisetum flavescens							1													
Group 7: Woody plants																				
Ulex europaeus seedling				1																
Height (cm)	4	3	13	4	8	20	16	17	12	18	14	4	20	17	25	30	26	25	25	30
Bryophyte cover (%)	70	80	30	90	95	30	20	10	5	10	20	95	10	30	0	0	0	10	5	0
Lichen cover (%)	5	1	1	5	2	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Litter (%)	1	1	15	2	1	50	20	10	20	5	10	1	15	10	60	60	30	30	20	60
Bare ground (%)	0	1	1	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
Rabbit activity (ex3)	1	1	1	2	1	0	1	1	1	1	1	1	1	1	1	0	0-	1	1	1
Sheep activity (ex3)	1	0	0	0	1	0	0	0	1	0	1	0	0	1	0	0	0	0	0	0

Site name	**Broom Covert**	Central NGR TM 464 629
Site area 9.6 ha	Date of assessment 4th July 2018	Surveyor – Jonny Stone
Report code BC	Sample plot data Table 18	Site map Figure 3
Survey constraints:	Species presence and extent potentially affected by the preceding period of low rainfall conditions.	

Site character

General		These fixed-dune grasslands have developed on circum-neutral crag sands, grading from acid sands in the south and southwest.	
Geology		Lower slopes Norwich Crag (micaceous sands) Upper slopes to south and west Kesgrave subgroup (siliceous sands and gravels) Potential Cover Silt overlay	
Land-use history		Mapped as 'Rough Grazing' in Land Utilisation Survey 1933-1949. On Google Earth, some low-lying areas are clearly over-trampled in association with stock management.	
Grassland types		SD8a *Festuca rubra-Galium verum* dune grassland, Typical sub-community	
Composition	No.	Average per plot	Proportion
Stress-tolerant annuals	10	1.9	29 % of annuals
Stress-tolerant perennials	9	2.7	32 % of non-competitive herbaceous perennials
Stress-tolerance ranking		MID [5th of 6]	
Notable plant species		Smooth Cat's-ear *Hypochaeris glabra*	

Site condition

Attribute	**Target**	**Assessment**
Habitat extent	No significant loss of feature	The current southern boundary has recently been defined by a fence. There are 3 exclusions from the grassland feature: • areas of nettle, thistle and eutrophic scrub in the southern part of the site; • dense bracken along the western margin; • stands of thick gorse-dominated scrub. With these exclusions, the feature itself includes scattered scrub, trees and advancing bracken. PASS – Issues: status of excluded areas

Grassland composition

Positive indicator species[a] - original	At least 4 species/taxa frequent and 6 species occasional throughout the sward.	All species frequency: Abundant 2 Frequent 2 Occasional 0 Rare 4 FAIL (see proposed)
- proposed	Annuals: Rare 3 Perennials: Frequent 2; Rare 3	PASS
HLS Indicators of Success	Sheep's Sorrel (Rare)	FAIL
Desirable dwarf shrub species	No more than 10% cover	PASS
Negative indicator species - exotics	<1% cover	PASS
- negative species (original)	<5% cover of ragwort, nettle, greater plantain, spear thistle, creeping thistle, rosebay willowherb, common mouse-ear, milk thistle, daisy, soft rush	PASS

Cont'd

Attribute	Target	Assessment
- negative species (proposed)	Group 3. Primary competitors (excluding Bracken): <5% cover estimated by visual assessment. Group 4. Secondary competitors: Summed occurrences of all listed species in 20 sample plots at a site <40 (or equivalent if less than 20 plots).	PASS FAIL – Issue: Widespread Cock's-foot, Perennial Ryegrass and Yorkshire Fog
- *Ulex* species (original)	Total gorse and/or broom cover <50%, with <25% cover of common gorse	PASS (see proposed)
- *Ulex* species (proposed)	<5% over the whole feature	FAIL – Issue: Cover of scattered European Gorse
- trees and scrub (original)	<10% cover	PASS (see proposed)
- trees and scrub (proposed)	<1% cover	FAIL – Issue: Cover of trees and shrubs
- dense bracken (original)	<10% cover	PASS
- bracken (proposed)	Dense bracken cover should not exceed 1%; Advancing or recovering fronts should not exceed 10%	PASS PASS – Issue: Potential advance of excluded bracken areas
Sward structure		
- sward height	1-25cm	Average 14.9 cm Range: SD8a (3-28 cm) PASS – Issue: Levels of grazing during growing season
- plant litter	No more than 25% cover	50.0% FAIL – Issue: Generally elevated plant litter cover
- bare ground	At least 1% but no more than 10% cover consisting of firm, sunlit exposed bare ground	0.5% FAIL – issue: Bare ground absent except in limited parched areas
- ground disturbance	<1% of habitat heavily eroded	>1% FAIL – issue: Localised damage to sward by stock

Issues
Status of excluded areas Widespread Cock's-foot, Perennial Ryegrass and Yorkshire Fog Cover of scattered European Gorse Cover of trees and shrubs Potential advance of excluded bracken areas Levels of grazing during growing season Generally elevated plant litter cover Bare ground absent except in limited parched areas Localised damage to sward by stock

[a] Frequencies: totals out of 20 stops
1-2= rare, 3-6= occasional, 7-12= frequent, All stops (<50% cover) = abundant, All stops (>50% cover) = dominant

Figure 3. Broom Covert plot locations

Microsoft product screen shot(s) reprinted with permission from Microsoft Corporation Scale 1:5,000

Table 18. Broom Covert: species composition and sward structure of 20 sample plots (see Figure 3)

NVC	SD8a																			
Sample plot	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Group 1: Stress-tolerant annuals																				
Vulpia bromoides		3	4	3			3		1	5										
Aira praecox					1															
Hypochaeris glabra													1							
Veronica arvensis								1												
Myosotis ramosissima							1													
Vicia lathyroides													1							
Group 2: General annuals																				
Trifolium dubium			2							2		1	1						1	1
Geranium molle																		1		
Bromus hordeaceus	1	3	3	3	3		3	2	2	3	3	2	3	2	2	2	1	2	2	1
Vicia sativa nigra												1								
Group 3: Primary competitors																				
Cirsium arvense											1						5	2	4	
Senecio jacobaea					1		1								1			2	2	
Pteridium aquilinum		1				1		1												
Group 4: Secondary competitors																				
Dactylis glomerata	5	6		2				2	1		1	1		4	2	2	1		1	
Lolium perenne	2	4	3	1			1	2	1	4	6	2	2	2	1			1	1	3
Trifolium repens			2		1					2		1	1							
Carduus nutans					1															
Holcus lanatus		1	3			1		1	1	1				2	3			3	2	2
Group 5: Stress-tolerant perennials																				
Rumex acetosella										1										
Anthoxanthum odoratum						2														
Festuca ovina agg.		1	1							1										
Carex arenaria	8	1	5	2	3		3	6	8			6	3	5	4	2	5	4	7	8
Galium verum	8	8	5	7	7	9	8	6	6	7	8	3	7	5	7	9	2	7	2	1
Leontodon saxatilis																	1	1		
Lotus corniculatus			1				1													
Veronica chamaedrys	1								4					1		2		1		
Phleum bertolonii														1						1
Group 6: General perennials [6a]																				
Agrostis capillaris	5	2	6	5	3	8	5	6	7	6	5	2	3	7	5	2		2	4	2
Festuca rubra agg.	6	8	6	7	9	4	8	8	7	6	5	9	9	7	7	7	10	9	8	10
Hypochaeris radicata											1									
Group 6: General perennials [6b]																				
Cerastium fontanum		1	4	4	4		3	2	3	3	2	3	3	2	2		1	2	2	1
Plantago lanceolata			1	1	1	1	2	1	1		1	1	2	1	3	3	1	2	1	1
Poa pratensis sens. lat.	1	4	1					1	2	3	2	2	2	3	3	2	2	2	1	1
Achillea millefolium		3	2	3		1	1	1		3	1				3	3	1	4	2	1
Taraxacum agg.								1			1	1		1	1		1	1	1	1
Group 7: Woody plants																				
Ulex europaeus seedling			1																	
Sward height (cm)	22	20	18	4	8	10	3	5	26	5	26	22	4	21	7	8	28	24	20	16
Bryophyte cover (%)	0	1	1	1	30	0	30	0	0	0	1	1	5	0	0	0	0	1	0	0
Lichen cover (%)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bryophyte negatives					Rs		Rs						Rs					Rs		
Plant litter (%)	50	40	60	50	30	40	10	80	30	50	80	80	10	80	20	10	80	50	70	80
Bare ground	0	0	0	5	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0
Cattle activity	✓		✓		✓		✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	✓
Rabbit activity (ex 3)	1	0	0	2	2	1	2	1	1	1	1	1	2	1	1	1	0	0	1	0

Site name	**Leiston Common**	Central NGR TM 458 634
Site area 11.8 ha	Date of assessment 6th July 2018	Surveyor – Jonny Stone
Report code LC	Sample plot data Table 19	Site map Figure 4
Survey constraints:	Species presence and extent potentially affected by the preceding period of low rainfall conditions.	

Site character

General		The Common supports dry acid grassland on acid sands, grading to bracken-heather stands around its periphery.	
Geology		Kesgrave subgroup (siliceous sands and gravels) Potential Cover Silt overlay	
Land-use history		Early Ordnance Survey maps show a large area of the southern part of the Common was in cultivation in the early years of the twentieth century. The Common was mapped as 'Rough Grazing' in Land Utilisation Survey 1933-1949.	
Grassland types		U1c *Festuca ovina-Agrostis capillaris-Rumex acetosella* community, *Erodium cicutarium-Teesdalia nudicaulis* sub-community U1d *Festuca ovina-Agrostis capillaris-Rumex acetosella* community, *Anthoxanthum odoratum-Lotus corniculatus* sub-community	
Composition	No.	Average per plot	Proportion
Stress-tolerant annuals	16	5.6	85 % of annuals
Stress-tolerant perennials	3	1.4	31 % of non-competitive herbaceous perennials
Stress-tolerance ranking		HIGH [2nd of 6]	
Notable plant species		Small Cudweed *Filago minima* Smooth Cat's-ear *Hypochaeris glabra* [Heather *Calluna vulgaris* introduced]	

Site condition

Attribute	**Target**	**Assessment**
Habitat extent	No significant loss of feature	Excluded areas are dense bracken stands beneath scattered trees. Restoration area north of The Studio is also excluded from the grassland feature PASS

Grassland composition

Positive indicator species[a] - original	At least 4 species/taxa frequent and 6 species occasional throughout the sward.	All species frequency: Abundant 3 Frequent 4 Occasional 0 Rare 1 FAIL (see proposed)
- proposed	Annuals: Frequent 3; Occasional: 4 Perennials: Frequent 1; Occasional 1 Lichen taxa: Frequent	PASS
HLS Indicators of Success	Common Stork's-bill (Occasional) Sheep's Sorrel (Frequent) Lichens (ground) (Frequent)	FAIL
Desirable dwarf shrub species	No more than 10% cover	PASS
Negative indicator species - exotics	<1% cover	PASS
- negative species (original)	<5% cover of ragwort, nettle, greater plantain, spear thistle, creeping thistle, rosebay willowherb, common mouse-ear, milk thistle, daisy, soft rush	FAIL (see proposed)

Attribute	Target	Assessment
- negative species (proposed)	Group 3. Primary competitors (excluding Bracken): <5% cover estimated by visual assessment. Group 4. Secondary competitors: Summed occurrences of all listed species in 20 sample plots at a site <40 (or equivalent if less than 20 plots).	FAIL – Issue: Ragwort locally common PASS – Issue: Yorkshire Fog frequent in the centre of the site
- *Ulex* species (original)	Total gorse and/or broom cover <50%, with <25% cover of common gorse	PASS
- *Ulex* species (proposed)	<5% over the whole feature	PASS
- trees and scrub (original)	<10% cover	PASS
- trees and scrub (proposed)	<1% cover	PASS
- dense bracken (original)	<10% cover	PASS
- bracken (proposed)	Dense bracken cover should not exceed 1%; Advancing or recovering fronts should not exceed 10%	PASS PASS
Sward structure		
- sward height	1-25cm	Average 5.2 cm Range U1c (1-12 cm); U1d (11-12 cm) PASS
- plant litter	No more than 25% cover	21.9% PASS – Issue: High plant litter values in the centre of the site
- bare ground	At least 1% but no more than 10% cover consisting of firm, sunlit exposed bare ground	1.2% PASS
- ground disturbance	<1% of habitat heavily eroded	>1% FAIL (PASS) – Issue: Extensive area affected by rabbit activity

Issues

Ragwort locally common Yorkshire Fog frequent in the centre of the site High plant litter values in the centre of the site Extensive area affected by rabbit activity

[a] Frequencies: totals out of 20 stops
1-2= rare, 3-6= occasional, 7-12= frequent, All stops (<50% cover) = abundant, All stops (>50% cover) = dominant

Figure 4. Leiston Common plot locations

Microsoft product screen shot(s) reprinted with permission from Microsoft Corporation Scale 1:5,000

Table 19. Leiston Common: species composition and sward structure of 20 sample plots (see Figure 4)

NVC	U1c																		U1d	
Sample plots	1	2	3	4	5	6	7	8	10	11	13	14	15	16	17	18	19	20	9	12
Group 1: Stress-tolerant annuals																				
Aira caryophyllea		3	2												1					
Aira praecox		4	4	4	3	3	2		2	3		4	3	4	4	2	5	2		
Arenaria serpyllifolia	1	1	3	3				1			2									
Cerastium semidecandrum		2		3			2	2	1		3	3	2			1	2	1		
Erodium cicutarium		2		1	2	1	3	2			2	1	1							
Erophila verna			2	2	1	2	2						1					1		
Filago minima	1																			
Hypochaeris glabra	1	3	2	3	3	2	2		1	1	1	2	1		1	1				
Myosotis ramosissima			1											3	3	2	1	2		
Trifolium striatum	5	4																		
Veronica arvensis	2	2	2	2	1										1	1	1	1		
Vicia lathyroides	1	2	2	1	1					1										
Vulpia bromoides	3	5	4	2		2	2	3	3		6	7	2	5	1	4	7			
Group 2: General annuals																				
Bromus hordeaceus								2			2									1
Geranium molle	1				2		1		1											
Ornithopus perpusillus			1																	
Group 3: Primary competitors																				
Senecio jacobaea	1	1	1											4	4	1	1	4		
Group 4: Secondary competitors																				
Dactylis glomerata		1								1	3									3
Holcus lanatus	4	1	1			2	1	5	6	5	3	1	1	1					3	
Group 5: Stress-tolerant perennials																				
Anthoxanthum odoratum	7	1									2								1	10
Festuca ovina agg.					1					1										
Rumex acetosella	4	7	2	6	4	6	6	3	6	4	5	5	5	6	7	7	4	6	2	1
Group 6: General perennials [6a]																				
Agrostis capillaris	2	6	5	6	6	6	7	6	4	7	5	7	5	4	1	1	1	1	7	4
Festuca rubra agg.	6	4	5	7	7	3	4	6	6	6	5	3	2	6	2	2	5	2	6	4
Hypochaeris radicata		2	1	1	1						2	1								2
Group 6: General perennials [6b]																				
Achillea millefolium	2																			
Cerastium fontanum	2	1	2	2			1		1				1						1	1
Plantago lanceolata	3																		1	
Poa pratensis sens. lat.	1																			
Group 7: Woody plants																				
Rubus fruticosus agg.														1						
Sward height (cm)	5	2	4	1	2	2	5	12	2	8	7	6	2	8	5	4	2	3	11	12
Bryophyte cover (%)	1	30	15	30	60	90	50	2	10	15	0	5	80	99	90	40	60	90	2	0
Lichen cover (%)	0	1	60	5	1	0	1	0	1	1	0	1	1	1	60	10	70	10	0	0
Bryophyte negatives													Rs	Rs				Rs		
Plant litter (%)	40	5	5	5	5	1	10	70	50	20	30	30	2	1	0	50	2	1	70	40
Bare ground	5	2	0	2	1	1	0	2	5	0	2	1	1	0	0	0	0	0	1	0
Stock activity																				
Rabbit activity (ex 3)	1	2	1	2	2	1	1	1	2	1	1	1	1	1	1	1	1	1	1	0

Site name	**Retsom's Field**	Central NGR TM 471 651
Site area 12.9 ha	Date of assessment 17th July 2018	Surveyor – Jonny Stone
Report code RF	Sample plot data Table 20	Site map Figure 5
Survey constraints:	Species presence and extent potentially affected by the preceding period of low rainfall conditions.	

Site character

General		Retsom's Field is composed of circum-neutral crag sands supporting swards intermediate between dry acid grassland and fixed-dune grassland. Two peripheral blocks of heather were created when the field was taken out of cultivation.	
Geology		Norwich Crag (micaceous sands) Potential Cover Silt overlay	
Land-use history		Mapped as 'Arable' in Land Utilisation Survey 1933-1949. Taken out of cultivation in 1995.	
Grassland types		U1d/SD8 *Festuca ovina-Agrostis capillaris-Rumex acetosella* community, *Anthoxanthum odoratum-Lotus corniculatus* sub-community – intermediate with *Festuca rubra-Galium verum* dune grassland U1c *Festuca ovina-Agrostis capillaris-Rumex acetosella* community, *Erodium cicutarium-Teesdalia nudicaulis* sub-community MG6a *Lolio-Cynosuretum cristati*, Typical sub-community	
Composition	No.	Average per plot	Proportion
Stress-tolerant annuals	12	4.1	41% of annuals
Stress-tolerant perennials	6	1.7	23 % of non-competitive herbaceous perennials
Stress-tolerance ranking		MID [3rd of 6]	
Notable plant species		Common Cudweed *Filago vulgaris* [Heather *Calluna vulgaris*] introduced	

Site condition

Attribute	**Target**	**Assessment**
Habitat extent	No significant loss of feature	The two blocks of introduced heather were excluded from the grassland feature, as indicated in the prescribed survey route (Figure 1). Transitional swards to rush pasture are included, but deliberately under-sampled. PASS – Issue: status of excluded areas

Grassland composition

Positive indicator species[a] - original	At least 4 species/taxa frequent and 6 species occasional throughout the sward.	All species frequency: Abundant 1 Frequent 2 Occasional 3 Rare 2 FAIL (see proposed)
- proposed	Annuals: Frequent 1; Occasional 1 Perennials: Frequent 2; Occasional 1	PASS
HLS Indicators of Success	Common Stork's-bill (Rare) Sheep's Sorrel (Occasional)	FAIL
Desirable dwarf shrub species	No more than 10% cover	PASS
Negative indicator species - exotics	<1% cover	PASS
- negative species (original)	<5% cover of ragwort, nettle, greater plantain, spear thistle, creeping thistle, rosebay willowherb, common mouse-ear, milk thistle, daisy, soft rush	PASS (see proposed)

Attribute	Target	Assessment
- negative species (proposed)	Group 3. Primary competitors (excluding Bracken): <5% cover estimated by visual assessment. Group 4. Secondary competitors: Summed occurrences of all listed species in 20 sample plots at a site <40 (or equivalent if less than 20 plots).	PASS – Issue: Ragwort widespread with low cover FAIL – Issue: Widespread Yorkshire Fog and False Oat-grass
- *Ulex* species (original)	Total gorse and/or broom cover <50%, with <25% cover of common gorse	PASS
- *Ulex* species (proposed)	<5% over the whole feature	PASS
- trees and scrub (original)	<10% cover	PASS
- trees and scrub (proposed)	<1% cover	PASS
- dense bracken (original)	<10% cover	PASS
- bracken (proposed)	Dense bracken cover should not exceed 1%; Advancing or recovering fronts should not exceed 10%	PASS PASS
Sward structure		
- sward height	1-25cm	Average 22.8 cm Range U1d/SD8 (8-35 cm); U1c (12-20 cm); MG6a (12 cm) FAIL – Issue: Sward often exceeds height limit
- plant litter	No more than 25% cover	22.3 % PASS (droughted areas of sward raise the average)
- bare ground	At least 1% but no more than 10% cover consisting of firm, sunlit exposed bare ground	1.9% PASS (highest bare ground cover amongst sites)
- ground disturbance	<1% of habitat heavily eroded	PASS

Issues	Ragwort widespread with low cover Widespread Yorkshire Fog and False Oat-grass Sward often exceeds height limit

[a] Frequencies: totals out of 20 stops
1-2= rare, 3-6= occasional, 7-12= frequent, All stops (<50% cover) = abundant, All stops (>50% cover) = dominant

Figure 5. Retsom's Field plot locations

Microsoft product screen shot(s) reprinted with permission from Microsoft Corporation Scale 1:5,000

Table 20. Retsom's Field: species composition and sward structure of 20 sample plots (see Figure 5)

NVC	U1d/SD8															U1c				MG6a
Sample plot	1	2	3	4	5	6	11	12	13	14	15	16	17	19	20	7	10	8	9	18
Group 1: Stress-tolerant annuals																				
Aira caryophyllea						1										3	2	3		
Aira praecox																		1		
Filago vulgaris																1				
Trifolium arvense			1	2	2	2		1	2				4		1	2	4	1	2	
Trifolium striatum																1	3		3	
Vulpia bromoides			4	5	4	3	1	1		1		2			7	4	6	7	4	
Group 2: General annuals																				
Bromus hordeaceus	5	1	3	4	3	1	1													
Crepis capillaris	1	1		1	2	2				1			1	1			1	1	1	
Erodium cicutarium						1														
Trifolium dubium				1		1			1							1	1		2	
Vicia hirsuta		1	2	3	2	1	1	1	1		1		1						2	
Vicia sativa nigra		1	1			1	1		2	2	1		2	1		1	1		1	
Group 3: Primary competitors																				
Cirsium arvense							3													3
Senecio jacobaea	2	1	2	1	1			1		1	1	1	2	1		1	1	2	1	
Group 4: Secondary competitors																				
Agrostis stolonifera																				7
Arrhenatherum elatius	2	1	1		1			2	1	2	1	1	2	1						2
Dactylis glomerata		1	1					1	1		1	1	1							
Elytrigia repens														1						
Equisetum arvense		1					2	1		1		2	1	1						2
Holcus lanatus	3	3	3	3	5	4	6	4	4	8	7	6	5	6	2	6	5	2	5	8
Lolium perenne							2													
Trifolium repens														3						6
Vicia cracca							1	1												1
Group 5: Stress-tolerant perennials																				
Anthoxanthum odoratum	10	9	6	7	9	9	1	4	10	3	7	8	8	5	8				4	
Carex arenaria																		3		
Festuca ovina agg.						1														
Lotus corniculatus		1	4		1			1						5						
Luzula campestris									1											
Rumex acetosella	2		1	2	2	1			1			1				1	2			
Group 6: General perennials [6a]																				
Agrostis capillaris	4	7	8	8	6	5	10	9	5	8	8	7	6	10	2	9	7	6	10	4
Festuca rubra agg.		1	1							2										
Hypochaeris radicata	2	2	3	2	1	2	1	2	1	2	1	1	2	2	3	2	3	2	1	
Stellaria graminea	5	2	1									2	1							
Group 6: General perennials [6b]																				
Cerastium fontanum		1			1	1		1	1	2	1	1				2		3	3	2
Plantago lanceolata	3	3	2	3	3	2	1	4	3	2	3	4	4	2	2		1		1	
Poa pratensis sens. lat.							1	1	1	1			3							
Rumex acetosa														1						
Group 6: General perennials [6c]																				
Cynosurus cristatus			1	1	2		1	2	1	2	1	1	3			1				4
Lathyrus pratensis					2		1		1											3
Ranunculus acris														1						2
Trifolium pratense	2	2		1	2		5	5		1	2	2	3	4						2
Trisetum flavescens			1																	
Group 7: Woody plants																				
Crataegus monogyna sap.											1		1							
Height (cm)	30	35	18	20	30	20	35	25	25	25	35	30	25	8	25	13	12	12	20	12
Bryophyte cover (%)	80	0	20	20	0	20	0	0	0	0	0	1	0	1	0	10	10	10	10	0
Lichen cover (%)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Litter (%)	20	10	20	20	30	20	5	5	5	5	5	10	30	0	70	20	50	80	40	0
Bare ground (%)	0	0	0	0	0	0	0	0	5	5	0	0	5	0	1	0	10	2	0	10
Rabbit (ex3)	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	1	1	2	0	0
Sheep (ex3)	0	0	0	0	0	0	1	1	1	1	1	1	1	1	2	1	1	2	0	2

Site name	**Walk Barn**	Central NGR TM 466 651
Site area 1.5 ha	Date of assessment 12th July 2018	Surveyor – Jonny Stone
Report code WB	Sample plot data Table 21	Site map Figure 6
Survey constraints:	Species presence and extent potentially affected by the preceding period of low rainfall conditions.	

Site character

General		Walk Barn is mapped as being composed of crag sands and supports a small area of fixed-dune grassland grading to parched acid grassland.	
Geology		Norwich Crag (micaceous sands) Potential Cover Silt overlay	
Land-use history		This site was not shown as heathland when mapped in 1905 and the Google Earth 1945 aerial shows the northern part of the sites as arable. Mapped as 'Grassland' in Land Utilisation Survey 1933-1949.	
Grassland types		U1c *Festuca ovina-Agrostis capillaris-Rumex acetosella* community, *Erodium cicutarium-Teesdalia nudicaulis* sub-community U1d *Festuca ovina-Agrostis capillaris-Rumex acetosella* community, *Anthoxanthum odoratum-Lotus corniculatus* sub-community SD10b *Carex arenaria* dune community, *Festuca ovina* sub-community	
Composition	No.	Average per plot	Proportion
Stress-tolerant annuals	15	3.5	79% of annuals
Stress-tolerant perennials	10	4.4	68 % of non-competitive herbaceous perennials
Stress-tolerance ranking		HIGH [1st of 6]	
Notable plant species		Harebell *Campanula rotundifolia* Small Cudweed *Filago minima* Smooth Cat's-ear *Hypochaeris glabra* Shephard's Cress *Teesdalia nudicaulis* Western Gorse *Ulex gallii*	

Site condition

Attribute	**Target**	**Assessment**
Habitat extent	No significant loss of feature	Narrow strip of dense bracken under trees excluded. PASS

Grassland composition

Positive indicator species[a] - original	At least 4 species/taxa frequent and 6 species occasional throughout the sward.	All species frequency: Abundant 2 Frequent 3 Occasional 3 Rare 3 FAIL (see proposed)
- proposed	Annuals: Frequent 1; Rare 4 Perennials: Frequent 3; Occasional 2 Lichen taxa: Occasional	PASS
HLS Indicators of Success	Common Stork's-bill (Occasional) Heath Bedstraw (Rare) Sheep's Sorrel (Frequent) Lichens (ground) (Occasional)	FAIL
Desirable dwarf shrub species	No more than 10% cover	PASS
Negative indicator species - exotics	<1% cover	PASS
- negative species (original)	<5% cover of ragwort, nettle, greater plantain, spear thistle, creeping thistle, rosebay willowherb, common mouse-ear, milk thistle, daisy, soft rush	PASS

Attribute	Target	Assessment
- negative species (proposed)	Group 3. Primary competitors (excluding Bracken): <5% cover estimated by visual assessment. Group 4. Secondary competitors: Summed occurrences of all listed species in 20 sample plots at a site <40 (or equivalent if less than 20 plots).	PASS PASS
- *Ulex* species (original)	Total gorse and/or broom cover <50%, with <25% cover of common gorse	PASS (see proposed)
- *Ulex* species (proposed)	<5% over the whole feature	PASS
- trees and scrub (original)	<10% cover	PASS
- trees and scrub (proposed)	<1% cover	PASS
- dense bracken (original)	<10% cover	PASS
- bracken (proposed)	Dense bracken cover should not exceed 1%; Advancing or recovering fronts should not exceed 10%	PASS FAIL – Issue: Advancing Bracken front
Sward structure		
- sward height	1-25cm	Average 22.4 cm Range U1c (4-23 cm); U1d (14-45 cm); SD10b (24-27 cm) FAIL – Issue: Sward height often exceeds target
- plant litter	No more than 25% cover	10.1% PASS (lowest cover amongst sites)
- bare ground	At least 1% but no more than 10% cover consisting of firm, sunlit exposed bare ground	0.1% PASS (extensive bryophyte cover)
- ground disturbance	<1% of habitat heavily eroded	<1% PASS

Issues	Advancing Bracken front Sward height often exceeds target

[a] Frequencies: totals out of 20 stops
1-2= rare, 3-6= occasional, 7-12= frequent, All stops (<50% cover) = abundant, All stops (>50% cover) = dominant

Figure 6. Walk Barn plot locations

Microsoft product screen shot(s) reprinted with permission from Microsoft Corporation Scale 1:5,000

Table 21. Walk Barn: species composition and sward structure of 15 sample plots (see Figure 6)

NVC	U1d								U1c					SD10b	
Plot sample	1	2	10	11	12	13	14	15	3	4	5	6	7	8	9
Group 1: Stress-tolerant annuals															
Aira praecox		5		3	2	2	1	2	5	3	4	4			4
Cerastium semidecandrum										2					
Erophila verna										1		1	1		
Filago minima											2				
Hypochaeris glabra											2	2	2		
Myosotis ramosissima										2					1
Spergularia rubra	1														
Teesdalia nudicaulis			1								3				
Trifolium arvense										1			2		
Trifolium striatum	1														
Veronica arvensis										1		2	1		
Vulpia bromoides	4	4		5	1	2	3		4	4	3	6	6		
Group 2: General annuals															
Erodium cicutarium										1	1	2			
Ornithopus perpusillus		1							1	2	1	3	3		2
Vicia sativa nigra									1						
Group 3: Primary competitors															
Pteridium aquilinum	9	7	8	8	5	1		1							
Senecio jacobaea						1	1	2	1						
Group 4: Secondary competitors															
Dactylis glomerata		1													
Holcus lanatus	7	2		2		1	1	1		1			1		
Group 5: Stress-tolerant perennials															
Anthoxanthum odoratum	8	7	7	6	10	9	7	4	10	4			1		1
Campanula rotundifolia					1	1									
Carex arenaria		3	3	1	2	2	3	3	2	3	2			9	8
Festuca ovina agg.			6												
Galium saxatile			5											1	2
Leontodon saxatilis	1	1					1		1	1	1	1	2		
Luzula campestris			3						1	2		1	1	3	
Phleum bertolonii	1														
Plantago coronopus												2			
Rumex acetosella	3	4	3	4	1	3	2	5	5	5	5	5	6	3	5
Group 6: General perennials [6a]															
Agrostis capillaris	2	2	6	7	6	7	9	10	2	4	4	6	6	6	8
Festuca rubra agg.	3			2											
Hypochaeris radicata									1				1	1	
Stellaria graminea	2			2											
Group 6: General perennials [6b]															
Achillea millefolium	4														
Cerastium fontanum												2	1		
Plantago lanceolata	2	2							1						
Poa pratensis sens. lat.									1	1					
Taraxacum agg.	1														
Group 7: Woody plants															
Ulex gallii		4													
Sward height (cm)	45	30	35	36	32	23	14	17	23	8	4	7	11	27	24
Bryophyte cover (%)	60	1	5	20	30	25	20	45	90	70	80	90	90	1	1
Bryophyte negatives				Rs	Rs	Rs	Rs	Rs					Rs		
Lichen cover (%)	0	0	0	0	0	0	0	0	1	1	80	10	5	1	1
Plant litter (%)	10	5	3	5	5	10	5	15	1	2	1	5	5	70	10
Bare ground	0	0	0	0	0	0	0	0	0	5	0	0	0	0	0
Rabbit activity (ex 3)	0	1	0	0	0	0	0	0	1	1	1	1	1	0	0
Sheep activity	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Site name	**Whinney Hill**	Central NGR TM 469 652
Status	Minsmere-Walberswich Heaths and Marshes SSSI Unit 55 [4.4 ha] Favourable (5th August 2015)	
Site area 3.2 ha	Date of assessment 13th July 2018	Surveyor – Jonny Stone
Report code WH	Sample plot data Table 22	Site map Figure 7
Survey constraints:	Species presence and extent potentially affected by the preceding period of low rainfall conditions.	

Site character

General		Whinney Hill is composed of crag sands supporting and extensive area of fixed dune grassland.	
Geology		Norwich Crag (micaceous sands) Potential Cover Silt overlay	
Land-use history		Early Ordnance Survey maps show the site as rough grassland in 1905 and heathland in 1928. Mapped as 'Rough Grazing' in Land Utilisation Survey 1933-1949.	
Grassland types		SD12a *Carex arenaria, Festuca ovina-Agrostis capillaris* dune grassland, *Anthoxanthum odoratum* sub-community U20a *Pteridium aquilinum-Galium saxatile* community, *Anthoxanthum odoratum* sub-community	
Composition	No.	Average per plot	Proportion
Stress-tolerant annuals	6	1.0	87 % of annuals
Stress-tolerant perennials	12	4.1	51 % of non-competitive herbaceous perennials
Stress-tolerance ranking		MID [4th of 6]	
Notable plant species		Heather *Calluna vulgaris* Tormentil *Potentilla erecta* Green-ribbed Sedge *Carex binervis*	

Site condition

Attribute	**Target**	**Assessment**
Habitat extent	No significant loss of feature	Excluded areas of dense bracken with trees. PASS

Grassland composition

Positive indicator species[a] - original	At least 4 species/taxa frequent and 6 species occasional throughout the sward.	All species frequency: Abundant 1 Frequent 3 Occasional 3 Rare 5 FAIL (see proposed)
- proposed	Annuals: Occasional 1 Perennials: Frequent 3; Occasional 2 Lichen taxa: Rare	PASS
HLS Indicators of Success	Heath Bedstraw (Occasional) Sheep's Sorrel (Frequent) Lichens (ground) (Rare)	FAIL
Desirable dwarf shrub species	No more than 10% cover	PASS
Negative indicator species - exotics	<1% cover	PASS
- negative species (original)	<5% cover of ragwort, nettle, greater plantain, spear thistle, creeping thistle, rosebay willowherb, common mouse-ear, milk thistle, daisy, soft rush	PASS

Attribute	Target	Assessment
- negative species (proposed)	Group 3. Primary competitors (excluding Bracken): <5% cover estimated by visual assessment. Group 4. Secondary competitors: Summed occurrences of all listed species in 20 sample plots at a site <40 (or equivalent if less than 20 plots).	PASS PASS – Issue: Widespread Yorkshire Fog and Creeping Soft-grass in U20a.
- *Ulex* species (original)	Total gorse and/or broom cover <50%, with <25% cover of common gorse	PASS
- *Ulex* species (proposed)	<5% over the whole feature	PASS
- trees and scrub (original)	<10% cover	PASS
- trees and scrub (proposed)	<1% cover	PASS
- dense bracken (original)	<10% cover	FAIL (see proposed)
- bracken (proposed)	Dense bracken cover should not exceed 1%; Advancing or recovering fronts should not exceed 10%	FAIL – Issue: Residual dense bracken FAIL – Issue: Rejuvenating bracken fronts
Sward structure		
- sward height	1-25cm	Average 16.9 Range SD12a (4-29 cm); U20a (9-24 cm) PASS – Issue: Limited grazing activity throughout
- plant litter	No more than 25% cover	27.5 % Fail – Issue: Somewhat elevated plant litter throughout
- bare ground	At least 1% but no more than 10% cover consisting of firm, sunlit exposed bare ground	0.1% PASS (gaps typically filled with bryophyte cover)
- ground disturbance	<1% of habitat heavily eroded	<1% PASS

Issues	Widespread Yorkshire Fog and Creeping Soft-grass in U20a. Residual dense bracken Rejuvenating bracken fronts Limited grazing activity throughout Somewhat elevated plant litter throughout

[a] Frequencies: totals out of 20 stops
1-2= rare, 3-6= occasional, 7-12= frequent, All stops (<50% cover) = abundant, All stops (>50% cover) = dominant

Figure 7. Whinney Hill plot locations

Microsoft product screen shot(s) reprinted with permission from Microsoft Corporation Scale 1:5,000

Table 22. Whinney Hill: species composition and sward structure of 15 sample plots (see Figure 7)

NVC	SD12a								U20a						
Sample plot	6	7	8	9	11	12	13	14	1	2	3	4	5	10	15
Group 1: Stress-tolerant annuals															
Aira praecox		1	5	3	2	2	1								
Trifolium arvense												1			
Veronica arvensis														1	
Vulpia bromoides					4	5						2		6	2
Group 2: General annuals															
Bromus hordeaceus hordeaceus													1		
Ornithopus perpusillus												1			
Group 3: Primary competitors															
Pteridium aquilinum	2	6	1	5	2	4	7	8	1	7	5	5	5	4	5
Senecio jacobaea													1		
Urtica dioica													1		
Group 4: Secondary competitors															
Arrhenatherum elatius												1	2	2	
Carex hirta												7			
Holcus lanatus	4	3						2	5	1	4	3	7	2	2
Holcus mollis	5						2		7	8	4	4	6		2
Lolium perenne													2		
Trifolium repens									1				4		
Vicia cracca												2			
Group 5: Stress-tolerant perennials															
Anthoxanthum odoratum	2	2	1			2					1	1		2	
Carex arenaria	1	8	2	2	2	3	3	1						1	1
Carex binervis	1														
Carex pilulifera									4						
Calluna vulgaris		1													
Festuca ovina agg.	7	6	8	10	6	8	8	7						1	1
Galium saxatile		2	2	1							2				
Luzula campestris	3	3		3	2	2	3	3	2	2	3				5
Phleum bertolonii													2		
Potentilla erecta								1			1				
Rumex acetosella		3	3	3	6	5	2	2		1		2	5	5	2
Veronica chamaedrys												2			
Group 6: General perennials [6a]															
Agrostis capillaris	9	7	2	3	7	7	5	5	10	10	10	9	7	10	10
Festuca rubra													1		
Hypochaeris radicata		2						1	2	1		2	1		
Stellaria graminea	1	3				1	1	2	5	2	3	2	5	2	2
Group 6: General perennials [6b]															
Achillea millefolium													1		
Cerastium fontanum	1							1	1	1			2		
Plantago lanceolata												1	1		
Poa pratensis sens. lat.		2			2		1			1			2		3
Poa trivialis									1	1					
Rumex acetosa												1	1		
Group 6: General perennials [6c]															
Trifolium pratense													1		
Group 7: Woody plants															
Quercus robur seedling								1							
Rubus fruticosus agg.	1	1										1			
Height (cm)	14	12	4	13	14	16	20	29	22	20	18	20	18	9	24
Bryophyte cover (%)	0	5	50	40	70	30	20	5	0	0	0	0	0	10	2
Lichen cover (%)	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Litter (%)	40	30	2	45	5	30	30	20	40	40	30	30	30	20	20
Bare ground (%)	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Rabbit (ex3)	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0
Sheep (ex3)	0	0	0	1	1	1	0	0	0	0	0	0	0	1	0

4. Grassland condition and management

4.1 Summary of sward composition assessments

4.1.1 Initial 'positive indicator' list

All sites fail this target as it stands. As noted in section 3.3.2, this list is largely made up of stress tolerant perennials, with only one stress-tolerant annual taxon (Hair-grasses). The list is also compromised by the inclusion of six generalist species and one species which, when occurring in with more than 25 per cent, is regarded by Natural England as a 'negative indicator'.

4.1.2 HLS Indicators of Success

Only seven taxa are included in this list, of which only four taxa were recorded in the survey plots. Of these, only two were recorded as 'Frequent' (Sheep's Sorrel and Lichens (ground)). All sites failed the target of two 'Frequent' and two 'Occasional' indicator species. While Sheep's Sorrel and ground lichens where constant associates of the dry acid grassland types, Common Stork's-bill was an infrequent component of the suite of annual species of dry grasslands, and the perennial Heath Bedstraw was restricted to the few locations with suitably stable and slightly moist grassland.

4.1.3 Revised list of 'positive indicator' species. A revised list of 'indicator' species was drawn up from the pool of stress-tolerant species recorded from the survey sites, using Natural England's advice on 'local distinctiveness', to better reflect the range of NVC syntaxa present. All sites passed the revised site-specific targets for this criterion (Tables 13 and 14), which are intended to provide a locally-significant means by which the condition of these grasslands can be assessed through time.

4.2 Summary of assessment issues

The site-specific issues identified during the assessment – as given in section 3.4 – are summarized in Table 23. These issues are often related to a failure to meet the specified attribute targets but should be viewed as 'triggers' for decision-making with regard to management policies or operations.

The comments given in the Table form the basis of a series of management considerations discussed in section 4.3

Table 23. Summary of assessment issues

Attribute	Comment	Affected sites
Habitat extent	For a number of sites, other habitats were excluded from assessment of the grassland feature. This may not concur with management policy, where excluded areas are intended to form part of the feature.	Broom Covert Retsom's Field
Grassland composition		
Group 3. Primary competitors (excluding Bracken)	The only Group 3 species of concern is Ragwort; this species is typical of most Sandlings dry grasslands where parching is significant. Populations of Ragwort fluctuate markedly and, while treatments may be required to control the size of a population, it is unreasonable to expect management to exclude the species without compromising the regeneration gaps required by stress-tolerant annuals.	Black Walks Leiston Common Retsom's Field
Group 4. Secondary competitors	Most sites support swards containing a suite of common grasses that are typically only minor constituents of the grassland communities in which they occur, as defined by the NVC. Their frequency is widely recognised as a measure of elevated fertility and/or under-management.	Broom Covert Leiston Common Retsom's Field Whinney Hill

Cont'd

Attribute	Comment	Affected sites
European Gorse	European (Common) Gorse is an aggressive colonist of dry acid grasslands and, as mature, strongly grazed examples of this habitat are uncommon in the Sandlings, the attribute target has been reduced to provide an 'early warning' of its encroachment.	Black Walks Broom Covert
Trees and shrubs	As with gorse, tree and shrub colonisation is likely to be a continuous factor affecting floristic composition and sward structure. An early-warning target is adopted here as the relaxation of grazing intensity in areas where short seedlings and saplings are already present can leading to rapid change.	Broom Covert
Bracken	The presence of bracken as an attribute is separated into 'advancing/recovering fronts' and 'dense' bracken to improve management decision-making. The former may be controlled by topping, whereas the build-up of litter beneath dense bracken requires greater management effort to restore favourable grassland.	Broom Covert Walk Barn Whinney Hill
Sward structure		
Sward height	This complex attribute masks considerable variation in sward height in different parts of a site as well as at different times of the stocking regime. Variations in the level of rabbit activity and atmospheric nitrogen deposition are also significant here as is the relation to the presence of Group 4 Secondary competitors. In general, however, the majority of grasslands lack a sufficient area of short, open sward and tend to have an abundance of stands near to or above the recommended target height. This is usually assessed as a sign of under-management by grazing which may, in most cases, be long-standing.	Black Walks Broom Covert Retsom's Field Walk Barn Whinney Hill
Plant litter	A related attribute is the proportion of plant litter in the sward. At several sites, the amount of litter exceeds the target and is likely to have had an impact on stress-tolerant annual populations as well as seedling recruitment and the presence of lower plants. This drought year may have generated more plant litter but the high temperatures may have also aided in the breakdown of litter.	Black Walks Broom Covert Leiston Common Whinney Hill
Bare ground	The lack of strong parching conditions in recent years is likely to have reduced the extent of this attribute at most sites, as the ground has been colonised by seedlings and the light-demanding lower plants. At most sites, therefore, it was considered that the perennial patches of ground prone to parching were sufficient to meet the lower target.	Broom Covert
Ground disturbance	Low levels of ground disturbance are regarded as a positive factor in creating bare ground conditions, especially where they receive high sunlight and disturbance is not accompanied by fertilization. At two sites, disturbed areas exceed the target, though at Leiston Common this can be accepted as an integral feature of the grassland.	Broom Covert Leiston Common

4.3 Grassland management considerations

4.3.1 Landscape context

The sites lie entirely within the 'Estate Sandlands' landscape-type[4] of the Suffolk Sandlings, which supports much of the 'heathland' habitat found in the county. However, the Estate dry grasslands are situated on the margins of this landscape-type, where the acid (siliceous) sands feather out to reveal the circum-neutral (micaceous) crag sands beneath. This is reflected in the types of grassland that occur on the sites which, although typically dry, may be influenced by soils of varying natural levels of acidity and fertility.

The degree of variation is akin to other areas of the country where, for example, types of wet and dry heath occur in a mosaic of remaining semi-natural fragments. The preservation of this natural diversity on the Sizewell Estate is best assured by taking account of the differing characters of the grasslands that have developed.

Two further factors act to increase this diversity. The first is the land-use history of each site, which includes long-established treatment as arable land, and shorter periods of cultivation, as well as long periods of rough-grazing. The second is the relative isolation of each site from each other or the proximity of modern cultivated land. In each instance, the maturity of different areas of grassland, varying degrees of species migration and the proximity of different swards to sources of nutrients, are each likely to influence their response to management.

> ***Recommendation 1:*** the variability of the grassland swards is recognised as an asset deriving from variations in local geology and historical treatments, and one which is able to support suites of stress-tolerant annuals, perennials and lower plants that span dry acid grasslands and fixed dunes.

4.2.2 Management and grassland ecology

The range of grassland types is dependent not only upon the low fertility and droughtiness of the substrates they have developed upon, but also upon the processes that enable immigration of species and the perpetuation of species populations at each site.

Immigration of species to each site and between different swards at any site may partly depend on the movement of stock and supplementary feed. Both can be important determinants of the species-richness of the grasslands. Similarly, well-lit regeneration sites within the swards may be critical for the establishment of plant species, and this may be a function not only of gap creation by stock and droughting but also of ensuring that shading by tall vegetative growth or plant litter is minimalized. This can only be achieved by repeated defoliation by grazing or cutting.

Similarly, free-flowering throughout the growing season is best achieved by ensuring that the sward height before and in the early part of the growing season is kept sufficiently low to ensure that high-light levels stimulate the production of flowering stems. When grazing is relaxed mid-season, this will allow structural diversity to increase in the swards and provide a mosaic of over-wintering sites and short turf areas.

Most primary and secondary competitors may need supplementary management by topping. The perennial grasses, Creeping Thistle and Bracken all tend to be most susceptible to topping at the peak of their growth, and certainly before flowering has completed. At some point in mid-season, the utilization of sugars in their existing tissues is increasingly replaced by the drawdown of the current year's production into their over-wintering organs. If un-damaged, each species would return with the same vigour in the following year. In some circumstances, the regrowth from topping may provide fresh grazing for stock, especially in drier summers. However, repeated topping at least once a year is often necessary to subdue growth.

One example of work-in-progress is the recent bracken-cutting at Whinney Hill and Leiston Common. In both cases, dense Bracken or advancing fronts have been successfully stalled with the partial recovery of the underlying grassland and grass-heath. Nonetheless, constant effort is needed to further weaken the extensive rhizome network and restore competitive vigour to the emerging swards.

[4] http://www.suffolklandscape.org.uk/landscape_map.aspx

Recommendation 2: General management by grazing appears to have been under-stocked for some years. This seems to be the only explanation for the build-up of plant litter and generally high sward height at some sites. It is recommended that target average sward heights are established at affected sites for the end of the winter season and for each quarter of the growing season. Targets should aim to increase the early season 'bite' of low-growing palatable shoots, ensure that there is no strong 'flush' of vegetative growth in the first third of the growing season and that (a) extensive patches of short turf are produced by the end of the second third, and (b) over-wintering patches are allowed to develop by the end of the season. The impact of the grazing regime at each site should be assessed towards the end of the growing season and adjustments for the following year planned. If appropriate, winter grazing at a low stocking rate should be undertaken at sites where average sward heights during the growing season significantly exceed these targets.

Recommendation 3: Areas to be topped at each site are identified by the end of the first third of the growing season and conducted during the second third. Operations should be spread over the sites over a number of weeks. Where competitive plants are thought to be spreading, more intensive topping should be carried out. The impact of the topping regime should be assessed towards the end of the growing season and adjustments for the following year planned. The circumstances where stock favour the regrowth should be recorded and reported. If appropriate, supplemental late winter topping should be undertaken in areas where potential benefits are recognised.

4.2.3 Role of condition assessment

This first condition assessment of the dry grasslands has provided an initial overview of the characters of the dry grasslands in terms of the substrates on which they have developed, the classification of the range of grassland types present and the types of plant species of which they are composed. The assessment has also revised the initial attributes and their targets following a survey of their actual floristic composition and sward structures. Although 'Pass' and 'Fail' determinations are made against these targets, the immediate considerations are the range of assessment issues that were observed. Each issue is intended to be a recognition that the actual condition of the swards is at variance with their character. Most issues are, at least to some extent, historical, in that they have been developing for some time and may originate in past land uses or differing perceptions of the characters of the grasslands. All issues can be influenced by management, which, in almost all cases, can be reduced to revisions of the stock and topping regimes.

Periodic assessments of the grassland condition are therefore a potentially valuable tool to review management policies, targets and the success of operations to achieve or maintain them.

Recommendation 4: It is recommended that the proposed changes to condition attributes and their targets are accepted and adopted as useful measures to set and review management targets in line with the grassland characters of each site.

Recommendation 5: It is also recommended that the assessment issues and rationales are employed in decision-making on management issues, and that they are periodically reviewed and adapted to better suit that process.

5. References

Berendse F., Aerts R. & Bobbink R. (1993) Atmospheric nitrogen deposition and its impact on terrestrial ecosystems. In Vos C.C. & Opdam P. (Eds.) Landscape Ecology of a Stressed Environment, pp. 104-121.

British Geological Survey (1996) Saxmundham. England and Wales Sheet 191. Solid and Drift Geology. 1:50 000. British Geological Survey, Nottingham.

Cheffings C.M. & Farrell L. (Eds), Dines T.D., Jones R.A., Leach S.J., McKean D.R., Pearman D.A., Preston C.D., Rumsey F.J. & Taylor I. (2005) The Vascular Plant Red Data List for Great Britain. Species Status 7: 1-116. Joint Nature Conservation Committee, Peterborough.

Cooper E.A. (1997) Summary descriptions of the National Vegetation Classification grassland and montane communities. UK Nature Conservation No. 14. Joint Nature Conservation Committee, Peterborough.

Hill M.O., Blackstock T.H., Long D.G. and Rothero G.P. (2008) A Checklist and Census Catalogue of British and Irish Bryophytes. British Brological Society, Middlewich.

Hodge C.A.H., Burton R.G.O., Corbett W.M., Evans R. & Seale R.S. (1984) Soils and Their Use in Eastern England. Bulletin No. 13. Soil Survey of England and Wales, Harpenden.

JNCC (2004a) Common Standards Monitoring Guidance for Lowland Grassland Habitats. Version February 2004. JNCC, Peterborough.

JNCC (2004b) Common Standards Monitoring Guidance for Sand Dune Habitats. Version August 2004. JNCC, Peterborough.

Lee J.R., Woods M.A. & Moorlock B.S.P. (Ed.) (2015) British Regional Geology: East Anglia. Fifth Edition. British Geological Survey, Nottingham.

Londo G. (2002) Is *Rhytidiadelphus squarrosus* (Hedw.) Warnst. increasing in the The Netherlands? - Lindbergia 27: 63-70.

Moorlock B.S.P., Hamblin R.J.O., Booth S.J. & Morigi A.N. (2000) Geology of the Country around Lowestoft and Saxmundham. Memoir for 1:50 000 Geological Sheets 176 and 191 (England and Wales). British Geological Survey, Nottingham.

Ratcliffe D.A. (ed.) (1977) A Nature Conservation Review. Volume 1. Cambridge University Press, Cambridge.

Robertson H.J. & Jefferson R.G. (2000) Monitoring the condition of lowland grassland SSSIs I English Nature's rapid assessment method. English Nature Research Reports No. 315. English Nature, Peterborough.

Rodwell J.S. (ed.) (1992) British Plant Communities. Volume 3. Grassland and Montane Communities. Cambridge University Press, Cambridge.

Rodwell J.S. (ed.) (2000) British Plant Communities. Volume 5. Maritime Communities and Vegetation of Open Habitats. Cambridge University Press, Cambridge.

Rodwell J.S., Morgan V., Jefferson R.G. & Moss D. (2007) The European context of British Lowland Grasslands. JNCC Report No. 394. Joint Nature Conservation Committee, Peterborough.

Sanderson N.A. (1998) A review of the extent, conservation interest and management of lowland acid grassland in England. Volume I. Research Report No. 259. English Nature, Peterborough.

Scheib A. & Lee J. (2010). The application of regional-scale geochemical data in defining the extent of aeolian sediments: the Late Pleistocene loess and coversand deposits of East Anglia, UK. Quaternary Newsletter. 120. 5-14.

Soil Survey of England and Wales (1983) 1:250,000 Soils of England and Wales. Sheet 4: Eastern England. Ordnance Survey, Southampton.

Smith W.G. (1913) Raunkier's 'life-forms' and statistical methods. Journal of Ecology 1 (1), pp. 16-26.

Stace C. (2010) New Flora of the British Isles. Third Edition. Cambridge University Press, Cambridge.

Stevens C., Duprè C., Gaudnik C., Dorland E., Dise N., Gowing D., Bleeker A., Alard D., Bobbink R., Fowler D., Vandvik V., Corcket E., Mountford J.O., Aarrestad P.A., Muller S. & Diekmann M. (2011) Changes in species composition of European acid grasslands observed along a gradient of nitrogen deposition. *Journal of Vegetation Science* 22: 207–215.

Stewart A., Pearman D.A. & Preston C.D. (1994) Scarce Plants in Britain. JNCC, Peterborough.

Stroh P.A., Leach S.J., August T.A., Walker K.J., Pearman D.A., Rumsey F.J., Harrower C.A., Fay M.F., Martin J.P., Pankhurst T., Preston C.D. & Taylor, I. (2014) A Vascular Plant Red List for England. Botanical Society of Britain and Ireland, Bristol.

Suffolk Biological Records Centre (2005) Rare Plant Register for Suffolk.

Appendix 1. Species recorded from sample plots: their behaviour, location and local status

Each taxon is listed within one of eight species groups, defined in section 3.3.2. Under the 'Behaviour' column, the life history and established strategy is given (*sensu* Grime et al. 2007) – see explanations below.

Life-history
The life-cycles of species have been classified following Grime et al. (2007). As, summer annual; Aw, winter annual; B, usually biennial; M, monocarpic perennial (of duration 2 years or, usually, more); P, polycarpic perennial.

CSR (Competitor, Stress-tolerator, Ruderal characterisation)
Plant strategy theory postulates that there are two main determinants of plant distribution in most habitats (Grime et al., 2007). The first factor is stress, which constrains growth, and the second is disturbance, which destroys biomass. If both these factors are absent and conditions are optimal for plant growth, then the plant community composition is determined by competition between the species. It is possible to classify each plant species into functional types based on their responses to competition (C), stress (S) and disturbance (R). Each species is given a score for each of these factors and these are combined to provide a characterisation of each plant community and the environment in which it exists.

The grassland sites are: BC, Broom Cover; BW, Black Walks; LC, Leiston Common; RF, Retsom's Field; WB, Walk Barn; WH, Whinney Hill. For each species, the number of occurrences in sample plots for each site is given. In the final columns, CWS refers to the species lists given as criteria within the Suffolk County Wildlife Site system[5] for 'Heathland' and 'Grassland'.

Taxon name		Behaviour		Grassland site						CWS	
		Life	CSR	BC	BW	LC	RF	WB	WH	Heath	Grass
Group 1: Stress-tolerant annuals											
Aira caryophyllea	Silver Hair-grass	AW	SR			3	4			o	
Aira praecox	Early Hair-grass	AW	SR	1	9	15	1	11	6	o	
Arenaria serpyllifolia	Slender Sandwort	AWS	SR			6					
Cerastium semidecandrum	Little Mouse-ear	AW	SR			11		1			
Erophila verna	Common Whitlowgrass	AW	SR			7		3			
Filago minima	Small Cudweed	AW	SR			1		1		o	
Filago vulgaris	Common Cudweed	AW	SR				1				
Hypochaeris glabra	Smooth Cat's-ear	AW	SR	1		14		3		o	
Myosotis discolor	Changing Forget-me-not	AW	SR		1					o	
Myosotis ramosissima	Early Forget-me-not	AW	SR	1	6	6		2		o	
Spergularia rubra	Sand Spurrey	ASW	SR					1		o	
Teesdalia nudicaulis	Shepherd's Cress	AW	SR					2		o	
Trifolium arvense	Hare's-foot Clover	AW	R/SR				12	2	1		
Trifolium striatum	Knotted Clover	AW	R/SR			2	3	1			o
Veronica arvensis	Wall Speedwell	AWS	SR	1	2	9		3	1		
Vicia lathyroides	Spring Vetch	AW	SR	1		6				o	
Vulpia bromoides	Squirrel-tail Fescue	AW	SR	6	5	15	13	11	5		
Group 2: General annuals											
Bromus hordeaceus	Soft Brome	AW	R/CR	19		3	7		1		
Crepis capillaris	Smooth Hawk's-beard	AW	R/SR		2		11				
Erodium cicutarium agg.	Common Stork's-bill	AWS	R/CSR			9	1	3			
Geranium molle	Dove's-foot Cranesbill	AWS	R/CSR	1		4					
Ornithopus perpusillus	Bird's-foot	AW	SR/CSR			1		7	1	o	
Trifolium dubium	Lesser Trefoil	AWS	R/SR	6			6				
Vicia hirsuta	Hairy Tare	AW	R/CR				11				
Vicia sativa nigra	Narrow-leaved Vetch	AW	R/CR	1	1		12	1			o
Group 3: Primary competitors											
Cirsium arvense	Creeping Thistle	P	C	4			2				
Senecio jacobaea	Common Ragwort	M/P	CR/CSR	5	13	8	15	4	1		
Rumex obtusifolius	Broad-leaved Dock	P	C/CSR		1						
Pteridium aquilinum	Bracken	P	C	3				7	15		
Urtica dioica	Common Nettle	P	C		5				1		
Group 4: Secondary competitors											
Agrostis stolonifera	Creeping Bent	P	CR				1				
Arrhenatherum elatius	False Oat-grass	P	C/CSR		4		12		3		
Carduus nutans	Musk Thistle	M	R/CR	1	1						

[5] http://www.suffolkbis.org.uk/sites/default/files/CWS/Public%20Web%20Docs/CWSSelectionCriteria.pdf

Carex hirta	Hairy Sedge	P	C/CSR						1		
Dactylis glomerata	Cock's-foot	P	C/CSR	12	4	4	7	1			
Elytrigia repens	Common Couch	P	C/CR				1				
Equisetum arvense	Field Horsetail	P	CR				8				
Holcus lanatus	Yorkshire Fog	P	CSR	11	15	13	20	8	10		
Holcus mollis	Creeping Soft-grass	P	C/CSR						8		
Lolium perenne	Perennial Ryegrass	P	CR/CSR	16			1		1		
Silene latifolia	White Campion	P/A	R/CR		2						
Trifolium repens	White Clover	P	CR/CSR	5			2		2		
Vicia cracca	Tufted Vetch	P	C/CSR				3		1		
Group 5: Stress-tolerant perennials											
Anthoxanthum odoratum	Sweet Vernal Grass	P	SR/CSR	1	4	5	16	12	7		o
Calluna vulgaris	Heather	P	S/SC						1	o	
Campanula rotundifolia	Harebell	P	S/CSR					2		o	
Carex arenaria	Sand Sedge	P	SC/CSR	17	4		1	12	10	o	
Carex binervis	Green-ribbed Sedge	P	S						1		
Carex pilulifera	Pill Sedge	P	S		3				1	o	
Festuca ovina agg.	Sheep's Fescue	P	S	3	1	2	1	1	10		
Galium saxatile	Heath Bedstraw	P	S/CSR					3	4	o	
Galium verum	Lady's Bedstraw	P	SC/CSR	20	2						o
Leontodon saxatilis	Lesser Hawkbit	P/M	SR/CSR	2				8			o
Lotus corniculatus	Bird's-foot Trefoil	P	S/CSR	2			5				o
Luzula campestris	Field Woodrush	P	S/CSR		2		1	6	11		
Phleum bertolonii	Smaller Cat's-tail	P	SR/CSR	2				1	1		
Plantago coronopus	Buck's-horn Plantain	M+	SR/CSR					1			
Potentilla erecta	Tormentil	P	S/CSR						2		o
Rumex acetosella	Sheep's Sorrel	P	SR/CSR	1	18	20	9	20	12		
Veronica chamaedrys	Germander Speedwell	P	S/CSR	5					1		
Group 6: General perennials											
6a											
Agrostis capillaris	Common Bent	P	CSR	19	20	20	20	15	15		
Festuca rubra agg.	Red Fescue	P	CSR	20	5	20	3	2	1		
Hypochaeris radicata	Cat's-ear	P	CSR	1		7	19	3	6		
Stellaria graminea	Lesser Stitchwort	P	CSR		10		5	2	12		
6b											
Achillea millefolium	Yarrow	P	CSR	14	2	1		1	1		
Cerastium fontanum	Common Mouse-ear	P/A	R/CSR	17	5	9	12	2	5		
Plantago lanceolata	Ribwort Plantain	P	CSR	17	1	2	17	3	2		
Poa pratensis sens.lat.	Smooth Meadow-grass	P	CSR	16	2	1	5	2	6		
Poa trivialis	Rough Meadow-grass	P	R/CSR						2		
Rumex acetosa	Common Sorrel	P	CSR				1		2		
Taraxacum agg.	Dandelion	P	R/CSR	9				1			
6c											
Cynosurus cristatus	Crested Dog's-tail	P	R/CSR				12				o
Lathyrus pratensis	Meadow Vetchling	P	CSR				4				
Ranunculus acris	Meadow Buttercup	P	CSR				2				
Trifolium pratense	Red Clover	P	CSR				12		1		
Trisetum flavescens	Yellow Oat-grass	P	CSR		1		1				
Group 7: Woody plants											
Crataegus monogyna sap.	Common Hawthorn	P	SC				2				
Quercus robur seed.	Pedunculate Oak	P	SC						1		
Rubus fruticosus agg.	Bramble	P	SC			1			3		
Ulex europaeus seed	European Gorse	P	SC	1	1						
Ulex gallii	Western Gorse	P	SC					1		o	
Group 8. Lower plants											
Bryophytes				9	16	18	10	15	9		
Ground lichens				0	6	14	0	7	1		

NNB Generation Company

Land West of Lovers Lane, Leiston

Associated Development Site 4

DRAFT Extended Phase 1 Habitat Survey Report

December 2011

AMEC Environment & Infrastructure UK Limited

NNB Generation Company

Land West of Lovers Lane, Leiston

Associated Development Site 4

DRAFT Extended Phase 1 Habitat Survey Report

December 2011

AMEC Environment & Infrastructure UK Limited

Report for

Christine Blythe
NNB Generation Company
Barnett Way
Barnwood
Gloucester
GL4 3RS

Main Contributors

Chris Hill

Issued by

[redacted]

Chris Hill

Approved by

[redacted]

Emma Toovey

AMEC Environment & Infrastructure UK Limited

17 Angel Gate, City Road, London EC1V 2SH,
United Kingdom
Tel +44 (0) 207 843 1400
Fax +44 (0) 207 843 1410

Doc Reg No. 28130ca140

r:\projects\28130 sizewell ecology studies\reports\associated development sites\4 land west of lovers lane\28130 ad land west of lovers lane (site 4) xp1 final draft i2.doc

Certificate No. FS 13881 Certificate No. EMS 69090

Disclaimer

This report has been prepared in a working draft form and has not been finalised or formally reviewed. As such it should be taken as an indication only of the material and conclusions that will form the final report. Any calculations or findings presented here may be changed or altered and should not be taken to reflect AMEC's opinions or conclusions.

Copyright and Non-Disclosure Notice

Third Party Disclaimer

Document Revisions

No.	Details	Date
1	Final Draft i1	July 2011
2	Final Draft i2	Dec 2011

Contents

1. Introduction

1.1 Background

An area of land directly north of the Sizewell 'B' Power Station has been identified as having the potential to accommodate a new nuclear plant. NNB Generation Company (EDF) has identified a number of additional sites for a variety of developments associated with the new build proposals at Sizewell that will be located beyond the current EDF landholding. AMEC has been commissioned by EDF to provide an initial ecological appraisal of each of these sites to inform the site selection process and support any future planning submissions.

Land west of Lovers Lane, Leiston (National Grid Reference: TM 455 628) (Refer to **Figure 1.1** for location details) has been identified as a potential site for associated development. This report summarises the findings of an extended Phase 1 Habitat Survey for the Site that includes a desk study exercise. This report identifies potential ecological receptors, should the site be re-developed and makes recommendations for further work where appropriate.

1.2 Site Context

The Site is situated on the north eastern edge of Leiston, Suffolk, bound by Valley Road to the north, Lover's Lane to the east, a railway track to the west and Associated Development Site 5 (Land west of Lover's Lane) to the south. The Site is on the boundary between the urban environment of Leiston to the west and the wider predominately agricultural landscape of arable fields and hedgerows to the north and east.

1.3 Scheme Description

The sites proposed for associated development are currently at a preliminary stage of scoping with detailed scheme plans yet to be confirmed. Notwithstanding this, current proposals for land at Land west of Lovers Lane, Leiston include the development of the Site to support industrial and warehousing facilities.

2. Methodology for Data Collection

2.1 Desk Study

A data-gathering exercise was undertaken to obtain information relating to statutory and non-statutory nature conservation sites, priority habitats and species, and legally protected and controlled species (see Boxes 1 and 2).

Box 1 Designated Wildlife Sites, and Priority Habitats and Species

Statutory nature conservation sites

Internationally important sites: Special Areas of Conservation (SACs) and candidate SACs, Special Protection Areas (SPAs) and proposed SPAs, Sites of Community Importance, Ramsar sites and European offshore marine sites.

Nationally important sites: Sites of Special Scientific Interest (SSSIs) that are not subject to international designations and National Nature Reserves (NNRs)

Local Nature Reserves (LNRs) are statutory sites that are of importance for recreation and education as well as nature conservation. Their level of importance is defined by their other statutory or any non-statutory designation (e.g. if an LNR is also an SSSI but is not an internationally important site, it will be of national importance). If an LNR has no other statutory or non-statutory designation it should be treated as being of district-level importance for biodiversity (although it may be of greater socio-economic value).

Non-statutory nature conservation sites

Sites of county importance: In Suffolk, County Wildlife Sites (CWS) are designated by the Suffolk CWS panel (which includes representatives from from Suffolk County Council, Suffolk Biological Records Centre (SBRC), Suffolk Wildlife Trust and Natural England). Suffolk Wildlife Trust (SWT) monitors all planning applications for any potential impact on County Wildlife Sites.

Priority habitats and species

In this report, the geographic level at which a species/habitat has been identified as a priority for biodiversity conservation is referred to as its level of 'species/habitat importance'. For example, habitats and species of principal importance for the conservation of biological diversity in England (see the first bullet point below) are identified as of national species/habitat importance reflecting the fact that these species/habitats have been defined at a national level. The level of importance therefore pertains to the species/habitat as a whole rather than to individual areas of habitat or species populations, which cannot be objectively valued, other than for waterfowl, for which thresholds have been defined for national/international 'population importance'.

- National importance: Habitats and species of principal importance for the conservation of biological diversity in England. These are listed on: http://www.defra.gov.uk/wildlife-countryside/pdf/biodiversity/s41-nerc-may2008species.pdf and http://www.defra.gov.uk/wildlife-countryside/pdf/biodiversity/s41-nerc-may2008habitats.pdf. These include those UK Biodiversity Action Plan (UK BAP) priority habitats and species that occur in England.
- National importance: Species listed as being of conservation concern in the relevant UK Red Data Book (RDB) or the Birds of Conservation Concern[1] Red List.
- National importance: Nationally Scarce species, which are species recorded from 16-100 10x10km squares of the national grid.
- National importance: Ancient woodland (i.e. areas that have been under continuous woodland cover since at least 1600).
- County importance: Species listed in the Suffolk LBAP.

[1] Eaton, M.A. et al. (2009). Birds of Conservation Concern 3: the population status of birds in the United Kingdom, Channel Islands and Isle of Man. *British Birds* **102**:296-341.

Box 2 Legally Protected and Controlled Species

Legal protection

Many species of animal and plant receive some degree of legal protection. For the purposes of this study, legal protection refers to:

- Species included on Schedules 1, 5 and 8 of the *Wildlife and Countryside Act 1981* (as amended), excluding species that are only protected in relation to their sale (see Section 9[5] and 13[2]), reflecting the fact that the proposed development does not include any proposals relating to the sale of species;
- Species included on Schedules 2 and 5 of The *Conservation of Habitats and Species Regulations* 2010; and
- Badgers, which are protected under the *Protection of Badgers Act 1992*.

Legal control

Schedule 9 of the *Wildlife and Countryside Act 1981* (as amended) lists species of animal that it an offence to release or allow to escape into the wild and species of plant that it is an offence to plant or otherwise cause to grow in the wild.

Data were gathered for:

- European and Ramsar sites on or within 5km, of the site;
- Nationally statutory designated sites on or within 2km of the site;
- Non-statutory designated sites of nature conservation interest located on or within 1km of the site;
- Records of legally protected and priority species to a distance of 1km from the site boundary; and
- Water bodies within 500m of the site, not separated from the site by barriers to great crested newt (*Triturus cristatus*) movement (e.g. major roads, rivers, etc.).

This contextual information is important as it may point to notable species that could occur on the site itself. Sources of desk study information are listed in **Table 2.1**.

Table 2.1 Sources of Desk Study Information

Topic	Date	Source of Information
Statutory nature and non-statutory nature conservation sites.	2011	Suffolk Biological Records Centre (SBRC)
Records of priority and legally protected species	2011	SBRC
Ancient woodland	2011	SBRC
Potential great crested newt aquatic habitat	2011	1:10,000 Ordnance Survey maps

2.2 Field Surveys

2.2.1 Habitats

A Phase 1 Habitat survey of the site and its surrounds was undertaken by an AMEC ecologist on the 25th of March 2011; during the survey, distinct habitats were identified and any features of interest subjected to a more detailed description in a target note (TN)[2]. As the standard Phase 1 Habitat survey methodology is mainly concerned with vegetation communities, the survey was extended[3] to allow for the provision of information on other ecological features, including identification of the presence/potential presence of legally protected and otherwise notable species.

2.2.2 Species

The methodologies used to establish the presence/potential presence of specific species/species groups are summarised below. These relate to those species/biological taxa that the desk study and habitat types present indicated could occur on the site.

Badgers

During the survey the on-site habitats were assessed for their potential to provide suitable areas for sett excavation and badger foraging. Any evidence of badger activity was also recorded, such as:

- Setts - comprising either single holes or a series of holes likely to be connected underground;
- Hairs - usually with a white root, black band, white tip (often caught in sett entrances/fences/vegetation);
- Footprints – located in soft mud, often in sett entrances;
- Evidence of foraging – usually in the form of 'snuffle holes' (small scrapes created by badgers searching for insects and earthworms);
- Latrines - badgers usually deposit faeces in holes or scrapes in the ground; and
- Paths - particularly around setts or leading to feeding areas.

Mammal paths and snuffle holes were assumed to be created by badgers if the character of the path (in terms of size) was appropriate, and if other field signs were in close vicinity.

Bats

A general assessment of the suitability of the habitats on the site to support roosting, foraging and commuting bats was made. Mature trees were inspected for evidence of cavities, splits, cracks, loose bark and dense and woody ivy (*Hedera helix*) growth that could be used by bats

[2] Joint Nature Conservation Committee (2007). *Handbook for Phase 1 habitat survey - a technique for environmental audit*. JNCC, Peterborough.

[3] Institute of Environmental Assessment (1995). *Guidelines for Baseline Ecological Assessment*. E&FN Spon, London.

for roosting. Furthermore, any buildings or structures on site were inspected externally for suitable access or egress points.

Birds

The habitats on site were assessed for their potential to support any nesting or foraging bird species or assemblages of notable species.

Great Crested Newts

Where access was possible, on and off-site water bodies (within 500m) identified by the desktop study, with their associated terrestrial habitats, were assessed for their potential to support great crested newt suitable habitats including generally still water bodies with adjacent woodland or grassland areas where there is invertebrate prey potential.

Reptiles

The site and wider survey area were assessed for their potential to provide sheltering, foraging and breeding habitats for the four common reptile species: slow worm (*Anguis fragilis*), viviparous lizard (*Zootoca vivipara*), grass snake (*Natrix natrix*) and adder (*Vipera berus*). These native reptile species generally require open areas with mixed-height vegetation, such as heathland, rough grassland, open scrub or (in the case of grass snake) water body margins. Suitable well drained and frost free areas are needed so that they can survive the winter.

Other Species

In addition, an assessment was made of the potential for the site to support any other species considered to be of value for biodiversity conservation, including those that were identified as occurring within the local area by the desk study.

3. Site Baseline

3.1 Policy and Legislative Context

3.1.1 Policy Context

Relevant policies are listed in **Table 3.1**, along with an outline of the issues included in these policies that would need to be taken into account when considering development of the site, and when undertaking an ecological appraisal.

Table 3.1 Policy Issues to be considered

Policy Reference	Policy Issue
National planning policies	
Planning Policy Statement 9 (PPS9) [4]: Biodiversity and geological conservation.	The identification of effects on: designated sites of international, national and local importance; protected species, habitats and species of principal importance for the conservation of biodiversity in England; and ancient woodland and veteran trees. The identification of measures to mitigate adverse effects and of opportunities for enhancing biodiversity.
Regional planning policies	
The East of England Plan[5]. **Policy ENV3 of the Regional Spatial Strategy (RSS) for the East of England**	Proper consideration should be given to the potential effects of development on the conservation of habitats and species outside designated sites, and on species protected by law. Planning authorities and other agencies should ensure that the region's wider biodiversity, earth heritage and natural resources are protected and enriched through the conservation, restoration and re-establishment of key resources. This will be achieved by ensuring new development minimises damage to biodiversity and earth heritage resources by avoiding harm to local wildlife sites and, wherever possible, achieving net environmental gains in development sites through the retention of existing assets, enhancement measures, and new habitat creation.

[4] Office of the Deputy Prime Minister (2005). *Planning Policy Statement 9: Biodiversity and Geological Conservation.* HMSO.

[5] Government Office for East of England (2008). *The East of England Plan*. Cambridge.

Policy Reference	Policy Issue
Local planning policies	
Suffolk Coastal Local Plan ("Saved" policies incorporating 1st and 2nd Alterations 2001 and 2006")	The council seek to protect, restore, maintain and enhance biodiversity interests. Planning permission would not be granted for development that results in significant harm to biodiversity interests unless there is no satisfactory alternative, all statutory and regulatory requirements are met and suitable mitigation and compensation measures are provided.
Reviewed Suffolk Coastal Core Strategy & Development Management Policies	**DM 27** - Development will not be permitted where there is an unacceptable impact on biodiversity and geodiversity having a regard to: the status and designation of sites habitats and species, the need to avoid the loss and fragmentation of important sites and habitats: and the impact and effectiveness of mitigation measures.
SP14 - Biodiversity and Geodiversity and **DM27 – Biodiversity and Geodiversity**	**SP14 -** Biodiveristy and geodiversity will be protected and enhanced using a framework based on a network of Wildlfie corridors; rivers coast and estuaries, idenitfied habitats and geodiversity features, landscape character areas and protected species.
Other policies	
UK Biodiversity Action Plan (UK BAP) (Biodiversity Reporting and Information Group, 2007)	Effects on priority habitats and species listed in the UK BAP.
The Suffolk Local Biodiversity Action Plan (LBAP).	Effects on priority habitats and species listed in the Suffolk LBAP.

3.2 Desk Study Results

3.2.1 European and Ramsar Sites

Four Sites are located within 5km of the site and these sites are listed and summarised in **Table 3.2** below.

Table 3.2 European and Ramsar Designated Conservation Sites within 5km of the Site

Site	Type of designation	Area (ha)	Ecological interest	Grid Reference	Approximate distance (m) and direction from site
Minsmere to Walberswick Heaths and Marshes	Ramsar Site,	2018.92	The site contains a mosaic of marine, freshwater, marshland and associated habitats complete with transition areas in between. It contains the largest continuous stand of reedbeds in England and Wales and rare transition in grazing marsh ditch plants from brackish to fresh water.	TM 477 747	2500m, NE

Site	Type of designation	Area (ha)	Ecological interest	Grid Reference	Approximate distance (m) and direction from site
			This site supports nine nationally scarce plants and at least 26 red data book invertebrates. As well as an important assemblage of rare breeding birds associated with marshland and reedbeds.		
Minsmere to Walberswick Heaths and Marshes	Special Protection Area (SPA)	2019.55	The reserve is designated as an important breeding, roosting and feeding site for many bird species with over 100 resident species and around a further 240 species of migratory visitors being recorded at the site. The site is of particular conservation importance for great bittern (*Botaurus stellaris*), western marsh harrier (*Circus aeruginosus*), pied avocet (*Recurvirostra avosetta*), savi's warbler (*Locustella luscinioides*), bearded reedling (*Panurus biarmicus*) and reed bunting (*Emberiza schoeniclus*).	TM 456 666	2500m, NE
Minsmere to Walberswick Heaths and Marshes	Special Area of Conservation (SAC)	1265.52	The principal reason for the designation of this site are the two Annex I habitats which it supports. Annual vegetation of drift lines occurs on a well developed beach strandline and is the best and most extensive example of this restricted geographical type. European dry heaths occupy an extensive area of this site on the east coast of England, which is at the extreme easterly range of heath development in the UK	TM 468 682	2500m, NE
Sandlings	SPA	3405.71	The Sandlings SPA is a large area formerly dominated by heathland which has been used for conifer forestry and arable agriculture resulting in remnant areas of heath. Restoration work has restored many areas with heathland supporting acid grassland and heather-dominated plant communities with dependent invertebrate and bird communities of conservation value. Woodlark (*Lullula arborea)* and Nightjar (*Caprimulgus europaeus)* have adapted to breeding in the conifer forest, using areas that have recently been felled and recent plantation, as well as areas managed as open ground.	TM 464 622	600m, SE

3.2.2 Statutory Nature Conservation Sites

Two statutory wildlife sites were recorded within 2km of the site boundary and are listed and summarised in **Table 3.3** below.

Table 3.3 Statutory Nature Conservation sites within 2km of the Site

Site	Type of designation	Area (ha)	Ecological interest	Grid Reference	Approximate distance (m) and direction from site
Sizewell Marshes	SSSI	105.39	Habitats consist of marsh, reedbed and wet woodland with adjacent heathland and beach with a broad range of wildflower species including four species of orchid, yellow rattle (*Rhinanthus minor*), ragged-robin (*Lychnis flos-cuculi*), bogbean (*Menyanthes trifoliata*) and lady's smock (*Cardamine pratensis*). The site also supports a broad range of faunal species including otter, water vole, kingfisher, water rail and barn owl, bittern and bearded tit.	TM 454 636	390m, N
Leiston-Aldeburgh	SSSI	69.57	The area comprises a mosaic of acid grassland, heathland, sand sedge, bracken, coarse grasses and scrub. Supporting a diverse range of invertebrate species	TM 462 622	600m, SE

3.2.3 Non-statutory Nature Conservation Sites

There are three non-statutory nature conservation sites within 1km of the site. These sites are listed and summarised in **Table 3.4**.

Table 3.4 Non-Statutory Nature Conservation Sites within 1km of the Site

Site	Type of designation	Area (ha)	Ecological interest	Grid Reference	Approximate distance (m) and direction from site
Sizewell Levels and Associated Areas	CWS	105.33	A large area of land, consisting of woodland, plantation, wet meadow, osier beds and scrub.	TM 463 640	670m, NE
Leiston Common	CWS	1.37	Leiston Common is an important site for wildlife conservation in Suffolk.	TM 458 633	340m, NE

Site	Type of designation	Area (ha)	Ecological interest	Grid Reference	Approximate distance (m) and direction from site
			Bell heather, a rare plant in Suffolk, grows on Leiston Common together with more widespread plants for example harebell, heath bedstraw and tormentil alongwith an extensive and diverse lichen flora.		
Disused railway line (Aldringham – Aldeburgh)	CWS	4.63	This section of disused railway supports species-diverse flora both on the line of the old track and on the gently sloping embankments. Plants typical of lightly trampled conditions include the nationally rare species mossy stonecrop and an unusual species of clover; suffocated clover.Colourful wild flowers such as knapweed and bird's-foot trefoil grow amongst scattered scrub on the embankments, attracting butterflies in good numbers.	TM 461 619	800m, SE

3.2.4 Protected or Notable Species

A number of protected or notable species have been recorded within 1km of the site as outlined in **Table 3.5**.

Table 3.5 Protected and Otherwise Notable Species Recorded within 1km of the Site

Species common name	Species biological name	Number of records	Date (most recent)	Distance of nearest recording from site (m)
Mammals				
Badger	*Meles meles*	1	1993	1000, E
Brown long-eared bat	*Plecotus auritus*	1	2001	790, E
Common pipistrelle bat	*Pipistrellus pipistrellus*	2	1999	500, N
Noctule	*Nyctalus noctula*	1	1990	Exact location unknown.
Serotine	*Eptesicus serotinus*	1	1990	Exact location unknown.
Hedgehog	*Erinaceus europaeus*	1	1990	Exact location unknown.

Species common name	Species biological name	Number of records	Date (most recent)	Distance of nearest recording from site (m)
Otter	*Lutra lutra*	3	2008	600, N
Water Shrew	*Neomys fodiens*	1	1991	Exact location unknown.
Reptiles and amphibians				
Adder	*Vipera berus*	1	1998	Exact location unknown.
Slow worm	*Anguis fragilis*	3	1999	500, SE
Viviparous Lizard	*Zootoca vivipara*	1	1994	300, SE
Grass Snake	*Natrix natrix*	2	2008	950, N
Birds				
Arctic Skua	*Stercorarius parasiticus*	1	1995	Exact location unknown.
Barn Owl	*Tyto alba*	3	1999	Exact location unknown.
Bewick's Swan	*Cygnus columbianus*	1	1995	Exact location unknown.
Bittern	*Botaurus stellaris*	8	1999	Exact location unknown.
Black-Throated Diver	*Gavia arctica*	1	1995	Exact location unknown.
Bullfinch	*Pyrrhula pyrrhula*	3	1999	Exact location unknown.
Common Scoter	*Melanitta nigra*	1	1995	Exact location unknown.
Corn Bunting	*Emberiza calandra*	1	1999	Exact location unknown.
Cuckoo	*Cuculus canorus*	2	1993	Exact location unknown.
Curlew	*Numenius arquata*	1	1993	Exact location unknown.
Dunnock	*Prunella modularis*	2	1993	Exact location unknown.
Grasshopper Warbler	*Locustella naevia*	3	1993	Exact location unknown.
Grey Partridge	*Perdix perdix*	5	1999	Exact location unknown.
Hawfinch	*Coccothraustes coccothraustes*	1	1994	Exact location unknown.
House Sparrow	*Passer domesticus*	1	1994	Exact location unknown.

Species common name	Species biological name	Number of records	Date (most recent)	Distance of nearest recording from site (m)
Lapwing	*Vanellus vanellus*	2	1993	Exact location unknown.
Lesser Spotted Woodpecker	*Dendrocopos minor*	3	1994	Exact location unknown.
Linnet	*Carduelis cannabina*	3	1999	Exact location unknown.
Little Tern	*Sternula albifrons*	1	1999	Exact location unknown.
Marsh Tit	*Poecile palustris*	2	1993	Exact location unknown.
Red-Backed Shrike	*Lanius collurio*	1	1993	Exact location unknown.
Red-Necked Phalarope	*Phalaropus lobatus*	1	1995	Exact location unknown.
Reed Bunting	*Emberiza schoeniclus*	3	1995	Exact location unknown.
Skylark	*Alauda arvensis*	6	2002	Exact location unknown.
Song Thrush	*Turdus philomelos*	5	2002	Exact location unknown.
Spotted Flycatcher	*Muscicapa striata*	2	2002	Exact location unknown.
Starling	*Sturnus vulgaris*	2	1993	Exact location unknown.
Tree Pipit	*Anthus trivialis*	1	1994	Exact location unknown.
Turtle Dove	*Streptopelia turtur*	6	2004	Exact location unknown.
Willow Tit	*Poecile montanus*	2	1994	Exact location unknown.
Woodlark	*Lullula arborea*	1	1997	540, NE
Wryneck	*Jynx torquilla*	2	1994	Exact location unknown.
Yellowhammer	*Emberiza citrinella*	2	1993	Exact location unknown.
Invertebrates				
Norfolk Hawker	Aeshna isosceles	1	2005	1000 E
Oak Hook-tip	Watsonalla binaria	3	2002	1000 N
Rosy Minor	Mesoligia literosa	2	1997	1000 NE
Rosy Rustic	Hydraecia micacea	3	1999	1000 N

Species common name	Species biological name	Number of records	Date (most recent)	Distance of nearest recording from site (m)
Shoulder-striped Wainscot	Mythimna comma	1	1996	780 NE
Small Phoenix	Ecliptopera silaceata	4	2002	1000 N
Small Square-spot	Diarsia rubi	5	1999	1000 N
White Ermine	Spilosoma lubricipeda	4	2002	1000 N
White Letter Hairstreak	Satyrium w-album	1	2004	900N
Grayling	*Hipparchia semele*	2	1995	950 N
Cinnabar	*Tyria jacobaeae*	2	1996	780 NE
Dark-Barred Twin-Spot Carpet	*Xanthorhoe ferrugata*	2	2002	1000 N
Bombus muscorum	*Bombus (Thoracombus) muscorum*	1	1998	Exact location unknown.
Buff Ermine	*Spilosoma luteum*	1	1998	Exact location unknown.
Cinnabar	*Tyria jacobaeae*	2	2008	Exact location unknown.
Dark-Barred Twin-Spot Carpet	*Xanthorhoe ferrugata*	1	1996	Exact location unknown.
Euroleon nostras	*Euroleon nostras*	1	2001	Exact location unknown.
Garden Tiger	*Arctia caja*	1	1996	Exact location unknown.
Ghost Moth	*Hepialus humuli*	1	1998	Exact location unknown.
Grey Dagger	*Acronicta psi*	1	2007	Exact location unknown.
Hedge Rustic	*Tholera cespitis*	1	1996	Exact location unknown.
Mottled Rustic	*Caradrina morpheus*	1	1998	Exact location unknown.
Mouse Moth	*Amphipyra tragopoginis*	1	1996	Exact location unknown.
Oak Hook-Tip	*Watsonalla binaria*	1	1996	Exact location unknown.
Ring Ouzel	*Turdus torquatus*	1	1995	Exact location unknown.
Roseate Tern	*Sterna dougallii*	1	1995	Exact location unknown.
Shaded Broad-Bar	*Scotopteryx chenopodiata*	1	1996	Exact location unknown.
Shoulder-Striped Wainscot	*Mythimna comma*	1	1996	Exact location unknown.

Species common name	Species biological name	Number of records	Date (most recent)	Distance of nearest recording from site (m)
Silver-Studded Blue	*Plebejus argus*	1	1998	Exact location unknown.
Small Heath	*Coenonympha pamphilus*	1	1995	Exact location unknown.

3.3 Field Survey Results

3.3.1 Habitats

Figure 3.1 presents the Phase 1 Habitat survey map. The following sections describe the habitats on and around the site.

Site Context and Surrounding Habitats

The Site is situated on the north eastern edge of Leiston, Suffolk, bound by Valley Road to the north, Lover's Lane to the east, a railway track to the west and Site 5 to the south. The Site is on the boundary between the urban environment of Leiston to the west and the wider predominately agricultural landscape of arable fields with boundary hedges and tree-lines with occasional copses and broom or gorse coverts.

On-site Habitats

The Site consists of a large arable field (c.20ha), bound by hedgerows and a field margin formed by a non-continuous strip of rank semi-improved grassland between 0.5m and 2m wide, with occasional patches of bramble (*Rubus fruticosus agg*) and tall ruderal vegetation. Dominant grass species consist of cocks-foot (*Dactylus glomerata*), Yorkshire fog (*Holcus lanatus*) with more locally frequent tufted hair grass (*Deschampsia cespitosa);* whilst the predominant ruderal species are Alexander's (*Smyrnium olusatrum),* common nettle (*Urtica dioica*), self heal (*Prunella vulgaris*), cleavers (*Galium aparine*), germander speedwell (*Veronica chamaedrys*) and spear thistle (*Cirsium vulgare*).

Species-poor continuous hedgerows bound the site and consist predominately of hawthorn (*Crataegus monogyna*) with interspersed ash (*Fraxinus excelsior*), dog rose (*Rosa canina*) and willow (*Salix sp.*). Hedgerows are absent along the western boundary where a stretch of railway track borders the site, this section is comprised of dense thickets of bramble and gorse (*Ulex europaeus*).

A small area of wet marshland with some shallow standing water is located just east of centre in the arable field, with the area thought to have once been a pond. The flora here changes along a moisture gradient, with grasses and ruderals matching the field margins located around the edge of this area, changing to plants associated with marshland and more aquatic habitats towards the centre; dominant species here include common reedmace (*Typha latifolia*) and soft rush (*Juncus effusus*).

Trees are absent from the site with the exception of two mature oaks located in the hedgerow that forms the boundary between Site 4 and Site 5.

3.3.2 Species

Badger

Desk study results provided one record of badger within 1km of the Site; however no evidence of badgers was recorded during the walkover survey. The field margins on site are suitable to provide foraging opportunities however the predominantly arable habitat is sub-optimal to support sett establishment.

Bats

The desk study contained records of common pipistrelle (*Pipistrellus pipistrellus*), noctule (*Nyctalus noctula*), serotine (*Eptesicus serotinus*) and brown long eared bat (*Plecotus auritus)* in the local area however results from the Sizewell Bat Survey Report 2010 (Ref: 28130ca068) identified serotine, soprano pipistrelle (*Pipistrellus pygmaeus*) common pipistrelle, Leisler's bat (Nyctalus leisleri), myotis bats (*Myotis sp.*) noctule, Nathusius' pipistrelle (*Pipistrellus nathusii*), brown long-eared bat and barbastelle (*Barbastella barbastellus*) within the nearby locality.

The two mature trees located in the boundary hedge with Site 5 have the potential to support roosting bats. These trees had features including broken limbs, cracks, crevices and bark flakes that would be suitable for bat roosts. The field margins and hedgerows on site could provide foraging and commuting habitat for bats roosting in the vicinity, both in trees and in the residential buildings near to the site.

Birds

Desk study results provided multiple records of notable bird species, including woodlark (*Lullula arborea*), skylark (*Alauda arvensis*), bittern (*Botaurus stellaris*), barn owl (*Tyto alba)* red-backed shrike (*Lanius collurio*), little tern (*Sternula albifrons*) and wryneck (*Jynx torquilla*), which receive additional protection under Schedule 1 of the Wildlife and Countryside Act (1981). No protected or moderate to high conservation status species however, were recorded nesting or potentially breeding within or around the site. In particular, no ground nesting birds, such as Skylark [BoCC[6] Red list].

No protected or moderate to high conservation status species however, were recorded nesting or potentially breeding within or around the site. In particular, no ground nesting birds, such as Skylark [BoCC[7] Red list].

The hedgerows around the boundary of the site are likely to support several common or garden species, including the following which were recorded during the walkover: chiffchaff (*Phylloscopus collybita*) sparrow (*Passer domesticus*) and blue tit *(Cyanistes caeruleus).*

[6] Birds of Conservation Concern

[7] Birds of Conservation Concern

Great Crested Newt

There are no records of great crested newts within 500m of the Site. The on-site habitats provide limited habitat suitability for great crested newt, as waterbodies are absent and the majority of the site consists of an intensively farmed arable field, which is sub-optimal terrestrial habitat. The field margins of ruderals and scrub could potentially provide suitable habitat to support newts. There are 4 waterbodies identified during the desk study within 500m that have ecological connectivity with the site habitats however none of these were suitable to support great crested newt following the site visit. Details of these waterbodies are provided in Appendix C. As such, this site is considered to be of negligible value for this species.

Reptiles

The desk study identified all four common native reptile species within the surrounding area. Suitable reptile habitats on-site was limited to the field margins of rank grassland, scrub and ruderal vegetation. These habitats have the potential to provide sheltering and foraging habitat for the species of reptile identified during the desk study although the lack of aquatic habitat may limit the suitability for grass snake.

Other Species

A number of notable invertebrates were recorded within 1km of the Site. The majority if these records are over 10 years old and lie within Leiston Common and Sizewell Levels and Associated Areas County Wildlife Sites; where the habitats consist of woodland plantation, wet meadow, scrub and heath. The predominatley arable habitats, with limited marginal vegetation within Associated Development Site 4 are not thought suitable to support a similar community of notable invertebrates.

4. Conclusions and Recommendations

4.1 Summary

An Extended Phase 1 Habitat Survey was undertaken for the Site in parallel with a desk top study of readily available ecological information. The following potential ecological receptors within the potential zone of influence of the development proposals are outlined below:

4.1.1 Designated Sites

International/European statutory Designated Sites
Four international/European statutory designated sites are located within 5km of the Site:

- Sandlings SPA/ Site of Special Scientific Interest (SSSI) (600m south east).
- Minsmere to Walberswick Heaths and Marshes Special Protection Area (SPA) (2.5km north east).
- Minsmere to Walberswick Heaths and Marshes Ramsar Site (2.5km north east).
- Minsmere to Walberswick Heaths and Marshes Special Area of Conservation (SAC)(2.5km north east).

Given the proximity of these sites, particularly the Sandlings SPA, and the absence of detailed proposals for the Site, there is potential for these sites to be affected by the proposed development and as such should be taken into account within any further design and assessment.

National Statutory Designated Sites
Two national statutory designated sites are located within 2km of the Site:

- Sizewell Marshes SSSI (390m north).
- Leiston-Aldeburgh SSSI (600 south east).

Given the proximity of these sites and the absence of detailed proposals for the Site, there is potential for these sites to be affected by the proposed development and as such should be taken into account within any further design and assessment.

Non-Statutory Designated Sites
Three non-statutory designated sites are located within 1km of the Site:

- Leiston Common (340m north east).
- Sizewell Levels and Associated Areas County Wildlife Site (CWS)(670m north east).
- Disused railway line (Aldringham – Aldeburgh) (800m south east).

Given the proximity of these sites and the absence of detailed proposals for the Site, there is potential for these sites to be affected by the proposed development and as such should be taken into account within any further design and assessment.

4.1.2 Habitats

The Site comprises of a large arable field with a discontinuous field margin. The fields are fringed by species-poor boundary hedges with a few interspersed mature tree stands, and a small dried out pond comprising swamp vegetation.

Despite the habitats on-site being generally of low quality, they do have the potential to support species which are considered important to biodiversity conservation, or are afforded protection by statute.

4.1.3 Species

The following protected species and species groups have been identified as being potentially present on site:

- Bats (roosting, foraging and commuting).
- Nesting birds.
- Reptiles.

Recommendations are provided below in order to inform any Ecological Impact Assessment (EcIA) and scheme design and also to ensure compliance with the relevant wildlife legislation and planning policy relating to these species.

4.2 Ecological Impact Assessment

It is recommended that this report (and future survey findings) is used to form the basis of an EcIA once additional information relating to the scheme design becomes available. This should assess the effects of the development on the biodiversity receptors identified in section 4.1, as well as informing any masterplanning and detailed design of an ecological enhancement and mitigation strategy where appropriate.

4.2.1 Habitats Regulations Assessment (HRA)

There are four European or ramsar sites within 5km of the Site, the nearest being 600 m to the south (Sandlings SPA). At this stage, detailed development proposals for the site have not been established. It is considered unlikely that the development proposals will result in effects on these designated areas or the features for which they have been designated however, in the absence of more information this cannot be scoped out at this stage. As such, there is the potential that a Habitats Regulations Assessment (HRA) would need to be undertaken for the site.

The need for Habitat Regulations Assessment is set out within Article 6 of the EC Habitats Directive 1992, and interpreted into British law by the Conservation of Habitats and Species Regulations 2010. The ultimate aim of HRA is to "*maintain or restore, at favourable conservation status, natural habitats and species of wild fauna and flora of Community interest*"

(Habitats Directive, Article 2(2)). This aim relates to habitats and species, not the European sites themselves, although the sites have a significant role in delivering favourable conservation status.

It is recommended that consultation should commence with Natural England in order to establish their expectations particularly in relation to the need for undertaking HRA for this site.

4.2.2 Masterplanning

Development proposals for the Site are still in their very early stages and as such, it is not appropriate at this stage to provide any detailed assessment of effects upon ecological receptors and protected species. As such, we have provided below a number of broad recommendations and principles that can be further refined once more detailed designs become available.

According to PPS93 there is a need to 'enhance biodiversity in green spaces and among developments so that they are used by wildlife and valued by people'. Furthermore, there is a requirement by policy to consider the BAP priority species that may occur on the Site. In order to adequately address these requirements, it is recommended that there is specialist ecological input into the development of the scheme design from the outset. This will ensure that the new development retains existing habitats used by protected and notable species on the site, as well as incorporating features within the design to enhance the habitats for biodiversity in general. Such features may include:

- Retention of tree and scrub lines which may be used by foraging and commuting bats;
- The creation of aquatic habitat, including reinstating unmanaged ponds:
- Increasing botanical diversity by planting native fruit and flower-bearing species (of local provenance): this will in turn increase invertebrate diversity and thus prey for bats and herpetofauna;
- Provision of artificial roost sites for bats through installation of appropriate boxes and other roost spaces incorporated within new buildings;
- Avoidance of excessive lighting, particularly around artificial bat roost sites and commuting and foraging habitat;
- Installing hibernacula – these involve loose, inert fill being dug into, and piled up above the ground. The material is then covered in top soil and turf with the edges left to expose the fill and allow access for reptiles and amphibians;
- Stag beetle pyramids - these consist of a number of logs half buried into the ground vertically. While providing a source of rotting dead wood and shelter for invertebrates, they also provide sheltering, hibernating and basking locations for herpetofauna;
- Retaining a graded edge to grassland habitats, with a long grass sward, ruderal species and scrub buffer between short sward grass and denser scrub/woodland; and

- Further guidance is provided in the publications 'Biodiversity by Design', 'Habitat Management for Bats' and 'Herpetofauna Workers' Manual'[8].

4.3 Further Studies

Further survey work is recommended to establish the status of any protected or otherwise notable species or assemblages of species present or potentially present on site. The findings of this additional survey work will inform the scheme design and any necessary mitigation strategy that may be required to comply with legislation of planning policy. Such information can also provide baseline data against which the success of future restoration and enhancement work can be measured through monitoring.

4.3.1 Bats

Due to the level of protection afforded to bats and the potential for them to be effected by the development proposals, it is recommended that tree inspections, emergence and activity surveys are undertaken in order to ascertain the level of bat activity within and around the Site.

Detailed external inspections of the trees should be undertaken in order to identify any direct evidence of usage by bats. If appropriate these should be followed up by emergence/re-entry surveys at dusk or dawn.

Activity surveys should also be undertaken across the site using a pre-defined transect. These surveys will aim to highlight which bat species use the area and where the highest areas of usage are.

Should bats be found to use the site there would be a requirement to design a mitigation strategy taking into account the available guidance and advice[9]. If roosts are identified It may be necessary to obtain a licence from Natural England to destroy the roost and to mitigate for its loss. This may also have an effect on the timing of the removal of trees and/or buildings, which may need to be scheduled to avoid breeding and/or hibernation periods (May-September and November-March respectively).

4.3.2 Birds

The site has the potential to support notable bird species. As such it is recommended that a suite of Common Bird Census (CBC)[10] surveys should be undertaken in order to determine the species assemblage utilising the Site and habitats in close proximity to the Site.

[8] Bullock, D. J., Oldham, R. and Corbett, K. (1998). Habitats and their management. In: Gent, A. H. and Gibson, S. D. eds. Herpetofauna workers' manual. Joint Nature Conservation Committee, Peterborough, pp61-73.

[9] Mitchell-Jones, A. J. (2004) Bat mitigation guidelines. English Nature, Peterborough.

[10] Gilbert G, Gibbons, D.W. and Evans, J. (1998). Bird Monitoring Methods. RSPB, Sandy.

4.3.3 Reptiles

Due to the level of protection afforded to reptiles it is recommended that a presence/ likely absence survey is conducted to establish the presence of reptile species in suitable habitat on the site in line with best practice guidelines[11,12] should development proposals result in the direct loss of habitats with the potential to support these species. This will involve laying artificial reptile refugia across areas of suitable habitat. Refugia would then be examined on a subsequent seven survey visits combined with early-morning walkover surveys to search for basking animals. Surveys are seasonally constrained and must be undertaken between April and September, with optimal survey periods being late April-May and September. It is likely that, should the presence of reptiles be identified, the total number of survey visits may need to be increased to 20 in order to make population estimates.

4.4 Other Recommendations

4.4.1 Nesting Birds

All active bird nests are legally protected under the Wildlife and Countryside Act (1981, as amended). This means that, with certain exceptions, it is illegal to intentionally or recklessly destroy an actively used nest during the breeding season, which is considered to be between March and August inclusive.

In order to minimise this risk of contravening legislation, site clearance should be completed outside the breeding bird season when active nests are not present. Where site clearance outside the breeding bird season is not possible, an ecologist will need to carefully inspect vegetation prior to clearance to ensure that active nests are not present. Should an active nest be found, it will be left in-situ and undisturbed until the young have fledged.

[11] Griffiths, R. and Inns, H. (1998). Surveying. *In*: Gent, A. H. and Gibson, S. D. eds. *Herpetofauna workers' manual*. Peterborough, Joint Nature Conservation Committee, pp1-13.

[12] Froglife (1999). *Reptile survey: an introduction to planning, conducting and interpreting surveys for snake and lizard conservation*. Froglife Advice Sheet 10. Froglife, Halesworth.

644000 645000 646000 647000

264000 263000 262000

N

Remains of Leiston Abbey (Premonstratensian)
Leiston Old Abbey
Old Abbey
Kenton Hills
Grimseys
Leiston Carr
Aldhurst Farm
Abbey Road
Fiscal Policy
Sizewell Belts
Lover's Lane
Reckham Pits Wood
Sewage Works
Leiston Common
Sandy Lane (Track)
Pit (dis)
Brick Kiln Farm
Rookyard Wood
Sch
B1122
Pit (dis)
Sewage Works
Valley Road
Broom Covert
LEISTON CP
Works
B1119
Caravan Park
F Sta
Sizewell Crossing
School
B1069
PO
School
Crown Farm
Halfway Cottages
Cupola
Pol Sta
STON
School
Grimsey's Lane
Red House
Hawsell's Farm
Golding's Lane
Ogilvie Homes
The Walks
Dismantle

644000 645000 646000 647000

REPRODUCED WITH THE PERMISSION OF ORDNANCE SURVEY ON BEHALF OF HER MAJESTY'S STATIONERY OFFICE. © CROWN COPYRIGHT (2011). ALL RIGHTS RESERVED. BRITISH ENERGY plc PART OF EDF ENERGY LICENCE 100019324

Key:

Site boundary

0 0.5 Kilometres

Scale: 1:10,000 @ A3

H:\Projects\28130 Sizewell Ecology Studies (Sub File)\5 Design\Drawings\GIS\MapInfo\Workspaces

EDF

Associated Development Site 4
Extended Phase 1 Habitat Survey Report

Figure 1.1
Site boundary plan

November 2011
28130-A205.mxd tugwc

amec

LEISTON CP

N

Sewage Works

LANE

The Studio

VALLEY ROAD

263000

263000

SI

A

17m

Caravan Park

EASTLANDS ROAD

Ind Est

KING GEORGE'S AVENUE

Sizewell Crossing

Crown Lodg

Key:

- Site boundary
- Native species-poor hedgerow
- A — Arable land
- SI — Poor semi-improved grassland
- Marshy grassland

0 150 Meters

Scale: 1:3000 @ A3

H:\Projects\28130 Sizewell Ecology Studies (Sub File)\5 Design\ Drawings\GIS\MapInfo\Workspaces

EDF

Associated Development Site 4
Extended Phase 1 Habitat Survey Report

Figure 3.1
Phase 1 Habitat Plan

November 2011
28130-A206.mxd tugwc

amec

Appendix A
Relevant Legislation

Bats

All British bat species are listed in Schedule 5 of *The Wildlife and Countryside Act 1981* (as amended). The Act transposes into UK law the Convention on the Conservation of European Wildlife and Natural Habitats (commonly referred to as the 'Bern Convention'). All British bat species are listed on Schedule 5 of the Act in respect of Section 9, which makes it an offence, *inter alia*, to:

- Intentionally or recklessly kill, injure, or take (handle) a bat;
- Intentionally or recklessly damage, destroy or obstruct access to any structure or place that a bat uses for shelter or protection; and
- Intentionally or recklessly disturb a bat while it is occupying a structure or place that it uses for shelter or protection.

British bat species receive further protection under Regulation 41 of the *The Conservation of Habitats and Species Regulations 2010*, which make provision for the purpose of implementing European Union Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora 1992. All British bat species are listed on Annex IV of the Directive, which means that member states are required to put in place a system of strict protection as outlined in Article 12, and this is done through inclusion on Schedule 2 of the Regulations, which makes it an offence, *inter alia*, to:

- Deliberately capture, injure or kill any bat;
- Deliberately disturb a bat, in particular any disturbance which is likely:

  (a) to impair their ability

    (i) to survive, to breed or reproduce, or to rear or nurture their young, or

    (ii) to hibernate or migrate

  (b) to affect significantly the local distribution or abundance of the bat species; or
- Damage or destroy a breeding site or resting place of a bat.

In addition, five British bat species are listed on Annex II of the *Habitats Directive*. These are:

- Greater horseshoe bat (*Rhinolophus ferrumequinum*);
- Lesser horseshoe bat (*Rhinolophus hipposideros*);
- Bechstein's bat (*Myotis bechsteinii*);
- Barbastelle (*Barbastella barbastellus*); and

- Greater mouse-eared bat (*Myotis myotis*).

As Annex II species under the Habitats Regulations, the Directive requires the designation of Special Areas of Conservation (SACs) by EC member states to ensure that their populations are maintained at a favourable conservation status. Where bats occur outside SACs the level of legal protection that these species receive is the same as for other bat species, however their inclusion on Annex II serves to underline their conservation significance and it is therefore less likely that adequate mitigation for loss of roosts of these species will be possible.

For projects in England: Further details of the above legislation, and of the roles and responsibilities of developers and planners in relation to bats, can be found in Natural England's *Bat Mitigation Guidelines*, which can be downloaded from the NE website: http://naturalengland.etraderstores.com/NaturalEnglandShop/IN136

Birds

With certain exceptions[13], all wild birds, their nests and eggs are protected by the *Wildlife and Countryside Act 1981* (as amended). Therefore, it is an offence, *inter alia*, to:

- Intentionally take, damage or destroy the nest of any wild bird while it is in use or being built;
- Take or destroy the egg of any wild bird.

Bird species listed on Schedule 1 of the Act receive further protection, thus for these species it is also an offence to:

- Disturb any bird while it is nest building, or is at a nest containing eggs or young; or disturb the dependent young of any such bird.

Reptiles

The four widespread[14] species of reptile that are native to Britain, namely viviparous lizard, slow worm, adder and grass snake, are listed on Schedule 5 of the *Wildlife and Countryside Act 1981* (as amended) and are afforded limited protection under Section 9 of this Act. This makes it an offence, *inter alia*, to:

- Intentionally kill or injure any of these species.

[13] Some species, such as game birds, are exempt in certain circumstances.

[14] The two other native species of British reptile (sand lizard *Lacerta agilis* and smooth snake *Coronella austriaca*) receive a higher level of protection under the *Wildlife and Countryside Act* 1981 (as amended). However, the distribution of these species is restricted to a limited number of sites in particular geographic locations.

Appendix B
Desk Study Data

December 2011
Doc Reg No. 28130ca140

Sizewell Levels and Associated Areas

Sizewell Marshes

SIZEWELL BELTS

Sizewell Belts

Sizewell Levels and Associated Areas, Reckham Pits wood

Sizewell Levels and Associated Areas, Leiston Common

Leiston Common

SUFFOLK COAST & HEATHS

Leiston-Aldeburgh

Sandlings

The Walks

Aldringham to Aldeburgh Disused Railway Line

LEISTON CP

Data Enquiry

- 1 Km Search Area
- Site 4

Protected, Locally Scarce and Rare Species

- ★ Record Locations (for grids of 6 fig. or greater)

County Wildlife Sites

Suffolk Wildlife Trust Reserve

SSSI

SPA

AONB

SUFFOLK BIOLOGICAL RECORDS CENTRE

Suffolk Biological Records Centre
Ipswich Museum, High Street
Ipswich, IP1 3QH
Tel: 01473 433571

NORTH
Grid North

Scale 1:14000

Entec (Land West of Lovers Lane (site 4) TM 455 628)
1 Km Data Enquiry

PRODUCED BY	Ben Heather
CHECKED BY	
DRAWING No.	
DATE	10/02/2011

Appendix C
Assessment of Waterbodies

December 2011
Doc Reg No. 28130ca140

Table C1 Waterbodies within 500m of the Site Boundary

Ref no.	Water body	Nat Grid Ref	Distance/direction from Study area (m) - (WSA = within study area)	Approximate Area (m2)	Description
WB15	Brick Kiln Garden Pond	TM447643	479m, N	900	Located adjacent to Brick Kiln Farm this is a stocked fishing pond with a number of wildfowl present. Minimal aquatic vegetation is present while the pond possess a combination of sheer sides and deep water with a covering of dense bramble and common reed mace (*Typha latifolia).*
WB17	Halfway Cottage Field Pond	TM461626	145m, N	150	No standing water is present as this area consists of a reed bed.
WB17a	Valley Road Pond	TM451629	WSA	-	Pond not present
WB17b	Valley Road Field Pond	TM455629	379m, E	-	Pond not present

EDF Energy

Sizewell C New Nuclear Power Station: Terrestrial and Freshwater Ecology, and Ornithology

Draft Extended Phase 1 Habitat Survey Report 2007-2012

June 2012

AMEC Environment & Infrastructure UK Limited

Report for

EDF Energy

Main Contributors

Alastair Miller

Issued by

[redacted]

Lynn Whitfield

Approved by

[redacted]

Lynn Whitfield

AMEC Environment & Infrastructure UK Limited

17 Angel Gate, City Road, London EC1V 2SH,
United Kingdom
Tel +44 (0) 207 843 1400
Fax +44 (0) 207 843 1410

Doc Reg No. 28130ca365i1

h:\projects\28130 sizewell ecology studies\reports\sizewell main site\consolidated reports 2012\phase 1 habitat\28130 phase 1 consolidated report draft.doc

EDF Energy

Sizewell C New Nuclear Power Station: Terrestrial and Freshwater Ecology, and Ornithology

Draft Extended Phase 1 Habitat Survey Report 2007-2012

June 2012

AMEC Environment & Infrastructure UK Limited

Certificate No. FS 13881 Certificate No. EMS 69090

In accordance with an environmentally responsible approach, this document is printed on recycled paper produced from 100% post-consumer waste, or on ECF (elemental chlorine free) paper

Disclaimer

This report has been prepared in a working draft form and has not been finalised or formally reviewed. As such it should be taken as an indication only of the material and conclusions that will form the final report. Any calculations or findings presented here may be changed or altered and should not be taken to reflect AMEC's opinions or conclusions.

Copyright and Non-Disclosure Notice

Third Party Disclaimer

Document Revisions

No.	Details	Date
	Draft report	June 2012

Contents

1. Introduction

1.1 Purpose of this Report

An area of land directly north of Sizewell B Nuclear Power Station, which is located near Leiston in Suffolk, has been identified as having the potential to accommodate the proposed development of one or more new nuclear reactors. This proposed development is known as Sizewell C. The site of the proposed development has an approximate central National Grid Reference (NGR) of TM473640.

AMEC Environment & Infrastructure UK Ltd ('AMEC') was commissioned in 2007 to provide terrestrial and freshwater ecological, and ornithological services in relation to Sizewell C. The purpose of this report, which outlines the findings of the extended phase 1 habitat survey work undertaken in the period 2007-2012, is to inform the design of Sizewell C and the Environmental Statement for the scheme.

1.2 Survey Area and Scope

The survey area and methodologies used have been adopted following consultation with statutory and non-statutory consultees and other stakeholders, taking into account best practice guidelines, and site-specific and project-specific characteristics. The survey area adopted is precautionary in that it allows for the iterative development of the scheme design by covering a larger area than is likely to be affected by the proposals. Based on the information available at the time the survey was undertaken, it was assessed that the relevant Zones of Influence of the proposed development would be likely not to extend further than the defined study area.

2. Methods

2.1 2007 Survey

The survey was based on the phase 1 habitat ecological survey methodology (JNCC, 2003). Distinct habitats were identified and mapped, and any features of nature conservation interest were subject to a more detailed description in a target note. As the standard phase 1 habitat survey methodology is, in the main, concerned only with vegetation communities, the survey was extended (IEA, 1995) to allow for the provision of information on other important ecological features, particularly to identify the presence/potential presence of legally protected species, such as bats, badger (*Meles meles*), great crested newt (*Triturus cristatus*) and water vol (*Arvicola amphibius*).

2.2 2012 Survey

Extensions to the original survey area were surveyed and any change in on-site habitats or management was noted. Survey extension areas were located to the north and south of the EDF land holdings (see Figure 2.1), in order to cover the entire EDF Estate.

2.3 Personnel

In 2007, the site was surveyed on 27, 28 and 29 March by Emma Toovey, and in 2012 the extended area was surveyed by Alastair Miller on 3, 4 and 5 April 2012. Both are senior ecologists experienced in the phase 1 habitat survey methodology. Results

3. Results

3.1 Overview

The locations of the various habitats recorded during the surveys are shown on the phase 1 habitat map provided in Figure 3.1. The locations of the target notes are also shown on this figure.

The survey area can be separated into those habitats found on drier, sandier soils to the west and south of the Sizewell Estate and those in lower-lying areas across the estate, chiefly the Sizewell Belts, which are influenced by a high water table. Drier habitat areas are composed largely of agricultural farmland, primarily consisting of ploughed arable fields and hedgerow networks integrated with broad-leaved and coniferous plantation and semi-natural woodland habitats. Within and around these areas, dry grasslands comprising a mixture of improved, semi-improved swards (both acidic and neutral in nature) can be found, notably Leiston Common, Broom Covert and Retsoms Field. These areas also include some rural infrastructure including a number of farms and residential dwellings.

More regularly inundated habitats comprise a variety of well established and ecologically diverse wetland habitats, including extensive grazing marshes and lowland unimproved wet meadow, swamp and wet woodland (often including mosaics with dense and scattered scrub), as well as open water (freshwater and brackish) in the form of ditches and ponds. Furthermore, the proximity of the survey area to the coastline provides vegetated shingle and dune grassland habitats to the east of the proposed power station site.

3.2 Habitats

3.2.1 Dunes and Shingle

Vegetated shingle habitats lie parallel to the shoreline, beyond which a narrow dune system occurs. Bare shingle habitats are found along the beach that runs parallel to the eastern boundary of the power station site (TN1). Vegetation along the beach is limited with some occasional growth that generally includes yellow-horned poppy (*Glaucium flavum*), wood sage (*Teucrium scorodonia*) and sea kale (*Crambe maritima*).

Moving away from the sea, the habitats succeed into a poorly developed dune system (TN2) where dune grassland communities have been heavily disturbed as a result of regular use by the public. Marram grass (*Ammophila arenaria*) and bracken (*Pteridium aquilinum*) dominate these habitats with scattered patches of sea buckthorn (*Hippophae rhamnoides*), gorse (*Ulex europaeus*) and broom (*Cytisus scoparius*) locally abundant, particularly in the dune slacks where a variety of moss and lichen species also occur. On the dune system further inland, scrub and rank grassland habitats become more widespread and dominant. A thin strip of marram and wavy hair-grass (*Deschampsia flexuosa*) dominated grassland is present with common occurrences of sea couch (*Elytrigia atherica*), bramble (*Rubus fruticosus* agg.), dandelion (*Taraxacum officinale*) and sea spurge (*Euphorbia paralias*).

3.2.2 Grassland and Scrub

Grassland habitats across the survey area are generally semi-improved and acidic in nature (some areas have been re-instated and are currently grazed), with some smaller areas of semi-improved or poor semi-improved neutral grassland. Habitat enhancement in the form of acid grassland reversion from arable fields and coniferous woodland has also been undertaken, primarily as part of the ongoing reptile management plan. Grazing meadows/marshy grasslands are referred to in detail below under the Wetlands section.

Semi-improved neutral grassland

Land previously associated with the construction zone of Sizewell B power station is located to the west of the dune grassland habitats (TN3) and to the north of the existing nuclear facilities. The typical dune plant communities do not occur on this land as natural processes have been arrested and the hydrology and pedology of the area have been irreversibly altered. Habitats within this area include semi-improved tussocky rank grassland with planted native scrub species around the periphery of the disturbed area. The rank grassland is dominated by cock's-foot (*Dactylis glomerata*) and wavy hair grass with locally frequent occurrences of marram. Herb species including wild carrot (*Daucus carota*), curled dock (*Rumex crispus*), common couch (*Elytrigia repens*), creeping thistle (*Cirsium arvense*) and dandelion frequently occur. A relatively dense and even distribution of planted native scrub species occurs within the tussocky grassland around the periphery of the disturbed area and includes Corsican pine (*Pinus nigra* ssp. *laricio*), holly (*Ilex aquifolium*), gorse, alder (*Alnus glutinosa*), silver birch (*Betula pendula*), hornbeam (*Carpinus betulus*), blackthorn (*Prunus spinosa*) and hawthorn (*Crataegus mongyna*).

Immediately to the north of Sizewell B power station site there are three fields of poor semi-improved grassland (sheep grazed pasture) (TN4) that are maintained at a very low sward height during early spring but left ungrazed for the remainder of the year. Frequently occurring species include cocksfoot, white clover (*Trifolium repens*), dandelion, daisy (*Bellis perennis*), bristly oxtongue (*Picris echioides*) and ribwort plantain (*Plantago lanceolata*). These areas of pasture are fragmented by belts of semi-natural broad-leaved woodland that comprise silver birch, pedunculate oak (*Quercus robur*), hawthorn, blackthorn, hornbeam, alder and holly. A temporary gravel/shale construction track has been laid within these fields and connects the site to the foreshore.

Several other small fields or discrete areas of semi-improved or poor semi-improved neutral grassland are present within the EDF land holdings.

Mosaic of scattered scrub/neutral grassland and swamp/tall emergent vegetation

Habitats around the confluence of the two ditches draining out of the Sizewell Belts comprise a mosaic of neutral grassland (TN5) on drier soil, with the presence of tall emergent vegetation, notably common reed (*Phragmites australis*), hemp-agrimony (*Eupatorium cannabinum*) and bulrush (*Typha latifolia*) along the ditch edges. Open areas have been colonised predominantly by nettle (*Urtica dioica*), bramble, cow parsley (*Anthriscus sylvestris*), hogweed (*Heracleum sphondylium*) and bracken, while scrub has gradually invaded forming secondary woodland and becoming very dense in places. A small dense scrubby island has formed to the north of the footbridges, which is effectively surrounded by ditches on all four sides. This small island is dominated entirely by a dense scrub community, including willow (*Salix* spp.), alder and silver birch, with a ground flora comprising predominantly bracken, common reed and nettles.

To the south of the two footbridges, dense and scattered scrub occurs on damp neutral poor semi-improved grassland, which often tends to swamp (largely dominated by common reed). Also present in the ground layer are tussocks of hard rush (*Juncus inflexus*), cock's-foot and nettle.

Acid grassland

Leiston Common, Broom Covert and two fields adjacent to Sandy Lan, are all areas of semi-improved grazed acid grassland dominated by sheep's fescue (*Festuca ovina*) and an abundance of common bent (*Agrostis capillaris*), fine-leaved sheep's-fescue (*Festuca filiformis*) and sweet vernal grass (*Anthoxanthum odoratum*). Ribwort plantain, sand spurrey (*Spergularia rubra*), lady's bedstraw (*Galium verum*), creeping buttercup (*Ranunculus repens*), round-leaved crane's-bill (*Geranium rotundifolium*), dandelion and scentless mayweed (*Tripleurospermum inodorum*) are also locally apparent. Scattered gorse is particularly prominent across Broom Covert.

Around Leiston Common in particular, scattered silver birch is present to the east of the common, while discrete areas of oak and silver birch often form more of a wooded habitat. Evidence of extensive bracken encroachment and removal was also recorded. In addition to which, moderate localised heather coverage was apparent and some scattered gorse. The grassland at Black Walks is similar in species composition; however, gorse is more prominent and is scattered and dense in places in addition to blackthorn (*Prunus spinosa*) and elder (*Sambucus nigra*), while *Cladonia* sp. lichen, and biting stonecrop (*Sedum acre*) are more frequent and sand sedge (*Carex arenaria*) is often locally abundant. Many of these sites have a short sward height, due to heavy grazing by rabbits.

A further area of acid grassland has been re-instated on the previously arable Retsom's field to the north east of the survey area and exhibits a sward dominated again by sheep's-fescue and common bent and is regularly grazed by sheep and rabbits. A small area of regenerating heathland (TN6) has also been created within Retsom's field and is now dominated by heather (*Calluna vulgaris*), with occasional presence of *Cladonia* sp. lichen and localised patches of bracken.

Acid grassland (arable reversion)

Two large previously arable fields at Upper Abbey Farm (TN7) and the northern part of Rosery field (Sizewell Hall Farm) (TN7) are in the process of reversion to tussocky dry acid grassland with a range of mixed woody shrub areas. The fields have light sandy soils and were in continuous arable cultivation for a considerable time, growing field-scale vegetables and winter cereals; however, both sites have been ploughed, cultivated and rolled with a grass mixture drilled in 2010. The seed composition was collected from local dry acid grassland included sheep's fescue, sheep's sorrel (*Rumex acetosella*), common bent, wavy hair grass (*Deschampsia flexuosa*), tormentil (*Potentilla erecta*) and heath bedstraw (*Galium saxatile*). At the time of the 2012 survey the sward was sparse, suggesting that neither grassland area was yet fully established.

Acid grassland (coniferous plantation reversion)

Kenton Hills and Rookyard Wood (TN8) are two coniferous and mixed plantation woodlands with extensive areas of acid grassland reversion management under way. Habitat management in both areas has involved the creation of woodland rides and glades by felling trees and removing tree stumps. Acid grassland has been established by natural regeneration and in some

places by sowing. Species composition comprises predominantly common bent, sheep's fescue and sheep's sorrel.

3.2.3 Woodland

Semi-natural broad-leaved woodland

Wet woodland habitats are found on low-lying regularly inundated land at Grimseys (TN9) and extending northwards towards Sandlings Walk. Alder, ash (Fraxinus excelsior) and oak are all present in the canopy over most of the stand, with occasional downy birch (*Betula pubescens*) and poplar (*Populus nigra* agg.). The shrub layer most often comprises goat willow (*Salix cinerea*) as well as occasional saplings of the same broad-leaved species. Given the widespread inundation of this habitat, wetland species regularly comprise iris (*Iris pseudacorus*), hemp-agrimony, blackcurrant (*Ribes nigrum*), with rough meadow grass (*Poa trivialis*) and nettles constant, in addition to common reed, which is locally dominant. In places, climbing stems of honeysuckle (*Lonicera periclymenum*) are occasional on the trunks of some trees.

Distinct areas of deciduous woodland on drier ground also occur within the survey area. Reckham Pits (TN10) to the south of the Sizewell Belts is predominantly deciduous woodland dominated by silver birch with rare occurrences of Corsican pine. Holly and bramble occur frequently within the understorey with honeysuckle, bracken, common nettle, cleavers (*Galium aparine*), herb Robert (*Geranium robertianum*) and wood sorrel (*Oxalis acetosella*) also in abundance. Mistletoe (*Viscum album*) was apparent within some of the trees.

Ash Wood (TN11), located to the north of Ash Wood Cottages, is semi-natural broad-leaved woodland with dominant tree species including oak, ash and sweet chestnut. The ground flora is reasonably well established with dog violet, lords-and-ladies, common nettle, lesser celandine and fat-hen (*Chenopodium album*) in the marginal areas close to the arable fields. Bluebells (*Hyacinthoides non-scripta*) also occur occasionally along with large areas of creeping ivy. To the south-east of Ash Wood the woodland habitats have been extended, creating Great Mount Wood through the planting of Corsican pine with a deciduous woodland species edge that includes pedunculate oak, ash, sweet chestnut (*Castanea sativa*) and holly, linking up with a further belt of deciduous woodland to the west, referred to as The Grove.

Sandypytle and Dovehill Plantation woodlands (TN12) are plantation in origin but now comprise largely mature and established broad-leaved trees including oak, ash, alder and occasional Scots pine (*Pinus sylvestris*), but tending to alder carr within the damper, low-lying areas. The understorey comprises largely elder and younger alder trees, with evidence of some young plantation trees. Ground flora comprises bracken, bramble, honeysuckle, nettle, creeping soft grass (*Holcus mollis*), red campion (*Silene dioica*) and climbing corydalis (*Ceratocapnos claviculata*). Damper, more regularly inundated areas in both woodlands gave rise to more abundant common reed, yellow flag iris and nettles; within Dovehill Plantation, however, a variety of tall herbs are more frequent, including blackcurrant, common valerian (*Valeriana officinalis*) and meadowsweet (*Filipendula ulmaria*).

Between the Sizewell Belts grazing marshes and the power station complex, a long continuous strip of now established but previously plantation woodland (TN13) comprises a mix of oak, alder, ash and sycamore, with mature lines of alder bordering the ditch to the west of the woodland. Understorey species comprise bramble, hawthorn and elder, while the ground flora is dominated by nettle, ground ivy, cleavers and cock's-foot. This woodland was cleared for the installation of two large pylons, which has resulted in a ruderal/scrub mix of gorse, bramble,

elder and other scattered trees, with cock's-foot, rough meadow-grass, hemlock (*Conium maculatum*) and nettles dominating the ground flora.

Other pockets and belts of woodland across the survey area are often dominated by oak, beech (*Fagus sylvatica*), alder or silver birch, particularly along the southern edge of the Kenton Hills/ nursery Covert plantation woodland, as well as the long strip of woodland to the east of Walk Barn (The Grove).

Plantation broad-leaved woodland

A strip of established plantation broad-leaved woodland borders the eastern edge of Kenton Hills (TN14) and include a mixture of beech, oak, silver birch, willow and alder. The understorey comprises scattered rhododendron or willow scrub, with a ground flora often dominated by bramble, nettle and bracken.

Plantation coniferous woodland

A large block of coniferous plantation (TN8) dominated by Corsican pine is located across the central part of the study area encompassing Leiston Carr, Kenton Hills, Nursery Covert, Dunwich Forest and Goose Hill. These woodlands are essentially coniferous although some felled areas have been planted with deciduous species including pedunculate oak, silver birch, alder, sweet chestnut, goat willow (*Salix caprea*) and holly.

The understorey comprises some deciduous species including honeysuckle-covered elder and holly, while bracken, bramble and common nettle heavily dominate the ground flora, in addition to spear thistle (*Cirsium vulgare*), locally frequent climbing corydalis and cleavers. Along the edges of the coniferous plantation, some areas of broad-leaved woodland species have been planted including pedunculate oak, goat willow, silver birch and alder, with areas of rhododendron (*Rhododendron ponticum*) and gorse. The plantation woodland is dissected by rides throughout with a composition as noted above with a limited understorey of holly, elder, hawthorn. Bracken, bramble and common nettle also heavily dominate the ground flora in these locations. Recently felled areas are also often planted with Corsican pine saplings and are commonly invaded by gorse.

Other smaller blocks or strips of coniferous woodland, generally comprising Corsican pine and/or Scots pine, are located across the survey area, particularly around the Greater Gabbard substation, as well as young plantation to the immediate north of Sizewell B power station.

Mixed plantation woodland

Several woodland blocks comprise mixed plantation woodland; these include Rookyard Wood, Sandlings Walk, Great Mount Wood and the Fiscal Policy woodland between Leiston Carr and Lover's Lane.

The fiscal policy woodland (TN15) comprises an even mix of Corsican pine, silver birch, sweet chestnut, pedunculate oak, sycamore (*Acer pseudoplatanus*) and common lime (*Tilia x europaea*). The understorey is well developed with frequent holly and elder (*Sambucus nigra*), often covered in honeysuckle, hawthorn and bramble with locally abundant gorse, particularly within the woodland margins. The ground flora at the time of the 2012 survey comprised lesser celandine (*Ranunculus ficaria*), wood speedwell (*Veronica montana*), cow parsley (*Anthriscus sylvestris*), dog violet (*Viola canina*), lords-and-ladies (*Arum maculatum*), snowdrop (*Galanthus nivalis*) and cleavers. Non-native rhododendron bushes are also locally abundant.

Rookyard Wood (TN8) comprises a similar mix of broad-leaved and coniferous species including oak, silver birch, sweet chestnut and Scots pine. The scrub layer is often dominated by hawthorn, elder, brambles, bracken and nettles in places; while the ground flora was sparse in most places, with frequent nettles and bluebells. Large areas have been felled and cleared however, and open grassland often corresponds with acid grassland conditions, with sheep's fescue, sheep sorrel and common bent. Several rides have been widened in order to provide habitat enhancement for reptiles.

Coronation Wood is predominantly medium-age and comprises Corsican pine with occasional mature European silver fir (*Abies alba*), beech and pedunculate oak, the latter particularly towards the southern end of the wood. A recently planted section (c. 30m x 20m) of oak and sweet chestnut occurs in the south eastern corner. The canopy is largely closed with little understorey other than occasional small open areas with patches of bracken and bramble, with the ground layer dominated by leaf litter, climbing corydalus and Yorkshire fog (*Holcus lanatus*). A dense 2m-wide band of scrub, mainly bramble with some gorse and hawthorn, occurs along the northern boundary.

3.2.4 Open water and wetland habitats

Open water and wetland habitats occur extensively across the survey area where the water table is high. The majority of the water bodies are man-made in the form of drainage channels (created historically for agricultural purposes), lagoons and pools, now managed for the benefit of biodiversity. The wetland habitats include grazing marshes (rush pasture and fen meadow), drainage ditches and swamp.

Marshy grassland and running water

An extensive dyke system occurs across a large proportion of the EDF Estate. Within the boundaries of the Sizewell Marshes SSSI, this area is also referred to as the Sizewell Belts. Marshy grassland (lowland unimproved wet meadow) (TN16) occurs between the dykes in lower-lying areas and is characterised by an abundance of plant species including sweet vernal grass (*Anthoxanthum odoratum*), crested dog's-tail (*Cynosurus cristatus*), rough-stalked meadow-grass and Yorkshire fog, with often rush-dominated stands comprising soft rush (*Juncus effusus*), blunt-flowered rush (*Juncus subnodulosus*) and jointed rush (*Juncus articulatus*). Frequent occurrences of bogbean (*Menyanthes trifoliata*), marsh pennywort (*Hydrocotyle vulgaris*), large bird's-foot-trefoil (*Lotus uliginosus*), ragged robin (*Lychnis flos-cuculi*), lesser yellow rattle (*Rhinanthus minor*), quaking grass (*Briza media*) and bog pimpernel (*Anagallis tenella*) were also noted during the survey.

The dykes are generally between 3 and 5m in width and the majority have a flow that varies in strength. They support a diverse aquatic flora including greater water parsnip (*Sium latifolium*), fool's watercress (*Apium nodiflorum*), floating sweet-grass (*Glyceria fluitans*) and whorled water-milfoil (*Myriophyllum verticillatum*). Bank habitats are generally well vegetated with a variety of sedge (*Carex spp.*) and rush (*Juncus spp.*) species in addition to yellow flag iris, watercress (*Nasturtium officinale*), fool's watercress (*Apium nodiflorum*), common reed and common reedmace; tubular water dropwort (*Oenanthe fistulosa*) and water plantain (*Alisma plantago-aquatica*) were also noted occasionally.

At the time of survey in 2012, a large, recently re-profiled area of open water was recorded within grazing marshes to the north of Sandlings Walk and to the east of Goose Hill plantation.

The northern extent of the EDF holdings incorporate a section of grazing marshes (TN17), crossed by a number of ditches. The species composition is similar to sections of the Sizewell Belts, which tend towards rush pasture, with an abundant mixture of soft rush and hard rush, Yorkshire fog, red fescue, rough meadow grass and frequent common reed; the network of freshwater ditches comprised similar species to those found in Sizewell Belts dykes. To the east of the BE landholding boundary, grazing fields are on slightly elevated ground and consequently drier; as such, rushes are less frequent and the sward is grassier in composition. In addition, gorse is more apparent, forming dense clumps within the fields.

Swamp and open water

Large areas dominated by common reed and reedmace also occur within the survey area, particularly south of Grimseys (TN18), as well as along the edge of the main Sizewell Belts dyke, which runs from Reckham Pits Wood in a north easterly direction, draining northwards to the Sluice at Minsmere. Theses swamp habitats are situated on an area of deep fen peat with a permanently high water table. These habitats are bordered by an extensive ditch system, which is prone to flooding. An area of open water (TN19) is situated within a reedbed and further surrounded by wet woodland. The shorelines of this open water body and along the edges of the dykes in this area are generally completely dominated by common reed and reedmace.

Large sections of the habitats to the south of Sandlings Walk comprise a mosaic (TN20) of swamp, scrub and established broad-leaved woodland. Areas can be divided into drier habitats, only inundated for part of the year and ground flora tending to neutral grassland, and damper swamp habitats inundated for most of the year, dominated by common reed. These areas show seral succession to dense scrub and also established woodland, where silver birch and alder have become established and attain heights of 10-15m.

Several small ponds were also recorded across the survey area, within plantation coniferous woodland, open arable farmland

3.2.5 Agricultural Land

Arable fields

As noted above, ploughed arable fields cover a large proportion of the EDF land holdings. The field margins vary in composition and diversity across the survey area. In the main, the margins are 2m in width, but in some places are wider (up to 6m), and support ruderal and herb species including broad-leaved dock (*Rumex obtusifolius*), red dead-nettle (*Lamium purpureum*), field speedwell (*Veronica persica*), common ragwort, common nettle, cocksfoot, false oat-grass (*Arrhenatherum elatius*), herb Robert, teasel (*Dipsacus fullonum*) and hoary plantain (*Plantago media*). Round-leaved crane's-bill (*Geranium rotundifoilum*), lesser celandine and wood spurge (*Euphorbia amygdaloides*) also frequently occur with scattered encroaching scrub species such lesser burdock (*Arctium minus*), blackthorn and bramble in abundance. Common reed also occurs in the margins where wetter soil conditions exist.

Field margins

The fields have well established although narrow margins comprising false oat-grass, common ragwort (*Senecio jacobaea*), common nettle, red dead-nettle, broad-leaved dock and herb Robert. Belts of deciduous woodland often dissect the arable fields and comprise pedunculate oak, silver birch, alder, white willow (*Salix alba*) and sycamore.

As noted previously, the arable fields within the survey area comprised ploughed fields at the time of the survey and have been planted with, amongst other crops, wheat, barley, onion, potatoes and beet. The margins are well-established in places with false oat-grass, common ragwort, common nettle, red dead-nettle, broad-leaved dock, bracken and herb Robert commonly present. Several narrow belts of deciduous woodland dissect the arable fields immediately to the north of Nursery Covert.

Hedgerows

More than 50 hedgerows occur within the survey area, generally adjacent to and dissecting arable or improved fields. The hedgerow network is a mixture of often tree-lined, intact and defunct hedgerows, and is most extensive and well connected around the agricultural land of Upper Abbey farm.

Intact species-poor hedgerows are dominated largely by just one or two species including hawthorn, blackthorn or hornbeam with occasional elder and pedunculate oak trees. They commonly occur on the agricultural land and are often heavily managed, particularly when adjacent to roads.

Although classified as species-poor, given the paucity of wooded species within their vicinity, the parallel hedgerows running north to south along the Upper Abbey farm track (TN21) to beyond the Round House do in places exhibit a comparatively species-rich understorey, which may include lords-and-ladies, dog's mercury (*Mercurialis perennis*), hart's tongue (*Asplenium scolopendrium*), cleavers, cocksfoot, false oat-grass, common nettle, ramsons (*Allium ursinum*), dog violet, hairy brome (*Bromus ramosus*), herb Robert and wood avens (*Geum urbanum*). Bluebell and wood spurge also occasionally occur along with climbers including hop (*Humulus lupulus*) and black bryony (*Tamus communis*).

3.2.6 Built-Up, Hardstanding and Amenity Land

The power station site itself contains little in the way of natural or semi-natural habitats, consisting of largely built-up (power station buildings of Sizewell B) or hard-standing ground (walkways, footpaths, roads and car parks).

To the north and west of Coronation Wood, areas/strips of short amenity grassland were noted, comprising predominantly mosses, common bent and annual meadow-grass (*Poa annua*) with frequent common forbs including daisy (*Bellis perennis*), early forget-me-not (*Myosotis ramosissima*), yarrow (*Achillea millefolium*), spear thistle (*Cirsium vulgare*), dovesfoot cranesbill (*Geranium molle*) and common storksbill (*Erodium cicutarium*). Verges had been planted with cultivated daffodils. Occasional patches of spring beauty (*Claytonia perfoliata*) and bugloss (*Anchusa arvensis*) were also noted along the southern part of verge. These areas also contained frequent ragwort (*Senecio sp*.) and patches of dense scrub, predominantly gorse.

Young ornamental trees and shrubs were recorded bordering these hardstanding areas, with woodland to the west and a high concrete wall covered in dense climbers to the east.

3.3 Fauna

The potential for each conservation-notable species or group of species to occur within the survey area, based on the habitats present, is discussed below.

3.3.1 Badger

The landscape within and around the survey area comprises well connected stretches of woodland, including Ash Wood, Grove Wood, Reckham Pits and Coronation Wood (broad-leaved, mixed and coniferous), with wooded or scrubby corridors or hedgerows connecting the landscape along many field boundaries, all of which offer secure and sheltered sett-building and commuting habitat for badgers.

Given the low-lying nature of the Sizewell Belts (most of these habitats are below the water table), the lack of effective soil drainage leaves much of this habitat largely unsuitable for sett-building; however, the largely cattle managed wet meadows within the Belts do offer high quality foraging for badgers' favoured prey item, earthworms (*Lumbricus terrestris*). The area surrounding the Sizewell Belts is generally very flat with land use on the sandy/gravel soils dominated by arable farming, particularly for root crops, such as potatoes, carrots, onions, peas and sugar beet, and to a lesser extent cereals such as sweet corn. These crops provide good alternative seasonal foraging for badgers.

3.3.2 Bats

The survey area comprises a mosaic of wetland habitats, woodland, hedgerows, grassland and scrub. This range of habitats provides optimal foraging and commuting habitat for many of the native bat species in the UK. Additionally, areas of mature woodland, farm buildings and residential dwellings within the estate are suitable to support roosting bats.

3.3.3 Otter

The wetlands present within the survey area provide extensive habitat conditions and foraging resources. Within the Sizewell Belts in particular, there is extensive cover for use by commuting and sheltering otters, including dense emergent vegetation (comprising reeds, greater pond sedge, nettles etc.), large stands of reed beds, tree-lined ditches and extensive areas of wet woodland. There is likely to be a reliable source of fish prey as well as a seasonal foraging resource in the form of frogs and toads. There is also good habitat connectivity to the north with a sizeable additional foraging resource in the extensive reed beds of the Minsmere Levels and wider Minsmere/Yox River catchment. In addition, there are low levels of disturbance to waterways and wetland areas across much of the Sizewell Belts.

3.3.4 Water Vole

Wetland habitats including the ditch network, swamp and marshy grassland within the survey area include large areas of optimal habitat for water voles. In addition, ditches within the survey area provide an important ecological link between Sizewell and Minsmere to the north. These water courses are likely to form an important dispersal route for water voles, linking populations at Sizewell with those found in Suffolk's coastal marshes to the north.

3.3.5 Birds

The range of wetland, woodland, coastal and farmland habitats present have the potential to support a range of breeding, foraging and wintering birds, potentially including conservation-notable species such as bittern (*Botauris stellaris*) and marsh harrier (*Circus aeruginosus*).

3.3.6 Reptiles

The mosaic and extent of habitats present within the survey area are suitable to support the four common native reptile species most notably common lizard, (*Zootoca vivipara*) adder *(Vipera berus*), grass snake (*Natrix natrix*) and slow worm (*Anguis fragilis*).

3.3.7 Amphibians

The water bodies and ditches across the survey area are judged to be sub-optimal to support breeding great crested newt due to the high fish populations, brackish conditions in areas, strong flows and the presence of wildfowl. However, this species is known to be present further afield and terrestrial habitats within the survey area are suitable to support this species.

As part of a re-introduction project funded by the Herpetological Conservation Trust (HCT) and the Beckwith Trust, two ponds were created on Retsoms Field in 2004 specifically for natterjack toad (*Bufo calamita*), in line the aims of the UK Biodiversity Action Plan for the species (ADAS/Suffolk Wildlife Trust, 2005).

3.3.8 Invertebrates

The mosaic of wetland, aquatic and terrestrial habitats present within the wider survey area provides environmental conditions that are likely to support notable and scarce assemblages of invertebrate species.

4. Summary

The Extended Phase 1 Habitat Survey has characterised the habitats within the survey areas, comprising the entirety of EDF's Sizewell Estate.

The land within the survey area comprises an extensive mosaic of agricultural farmland primarily consisting of ploughed arable fields and hedgerow networks integrated with deciduous and coniferous plantation and semi-natural woodland habitats, semi-improved and improved neutral and acid grassland swards, dense and scattered scrub and general rural infrastructure including a number of farms and residential dwellings. Due to the high water table in areas across the Sizewell Estate, a variety of well-established and ecologically diverse wetland habitats are present including open water (freshwater and brackish) in the form of ditches and ponds, marshland, fen and lowland unimproved wet meadow. Coastal areas to the east of the survey area consist of vegetated shingle and dune grassland habitats. In addition to a number of acid grassland fields across the survey area, a small area displaying reversion to heath is present within an acid grassland field to the north east of the survey area.

The wider survey area is known to be of considerable botanical interest, particularly within the grazing meadows and dykes of Sizewell Belts, and in turn, the associated assemblages of invertebrates are also of particular note.

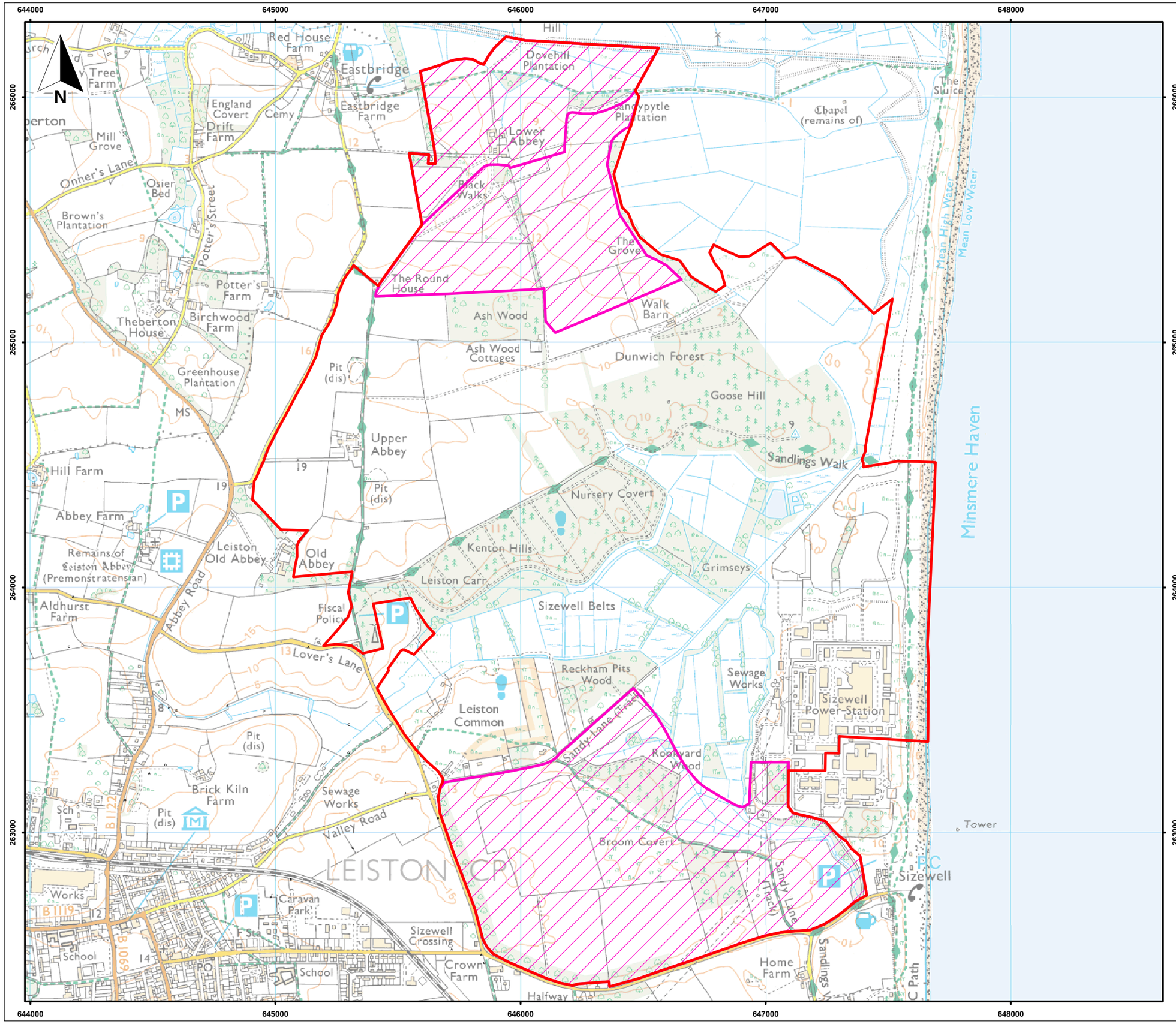
The survey area offers excellent potential to support badger foraging and sett-building; foraging, commuting and roosting bats and native reptile species within the grassland and scrub habitats and woodland edges; and foraging, dwelling places and cover habitat for water voles and otter. Natterjack toads are known to be present within this mosaic of habitats, and there is some potential for the area to support great crested newts, given the widespread occurrence of ditches and several discrete pools within the survey area.

5. References

ADAS/Suffolk Wildlife Trust (2008). Sizewell Land Management Annual Review 2007-2008.

Institute of Environmental Assessment (1995). *Guidelines for Baseline Ecological Assessment.* E & FN Spon, London.

Joint Nature Conservation Committee (2007). *Handbook for Phase 1 Habitat Survey – A Technique for Environmental Audit.* JNCC, Peterborough.



Key:

- Survey area boundary
- Additional area surveyed 2012

0 375 750

Metres

Scale: 1:15,000 @ A3

H:\Projects\28130 Sizewell Ecology Studies (Sub File)\5 Design\Drawings\GIS\ArcGIS\mxd

EDF

Sizewell C Extended Phase 1 Habitat Survey Report 2007-2012

Figure 2.1
Survey area

June 2012
28130-A413a.mxd tugwc

amec

644000 645000 646000 647000 648000

266000 265000 264000 263000

N

Key:

- Survey area boundary
- Swamp
- Standing water
- Running water
- Semi-natural broad-leaved woodland
- Plantation coniferous woodland
- Plantation broad-leaved woodland
- Plantation mixed woodland
- Semi-improved neutral grassland
- Semi-improved acid grassland
- Marshy grassland
- Dune grassland
- Built-up hardstanding
- Amenity grassland
- Bracken
- Scattered trees
- Pond
- Species-poor hedgerow (intact)
- Species-poor hedgerow (defunct)
- Species-poor hedgerow with trees
- A Arable land
- I Improved grassland
- SI Poor semi - improved grassland
- Scrub (scattered)
- Scrub (dense / continuous)

0 375 750
Metres

Scale: 1:15,000 @ A3

H:\Projects\28130 Sizewell Ecology Studies (Sub File)\5 Design\Drawings\GIS\ArcGIS\mxd

EDF

Sizewell C Extended Phase 1 Habitat Survey Report 2007-2012

Figure 3.1
Phase 1 habitat survey map

June 2012
28130-A414a.mxd tugwc

amec

EDF Energy

Sizewell C New Nuclear Power Station: Terrestrial and Freshwater Ecology, and Ornithology

Draft National Vegetation Classification Survey Report 2007-2008

June 2012

AMEC Environment & Infrastructure UK Limited

Report for

EDF Energy

Main Contributors

Jonny Stone [Ecology, Land & People]
Graham Burt-Smith [AMEC]

Issued by

[redacted]

Lynn Whitfield

Approved by

[redacted]

Lynn Whitfield

AMEC Environment & Infrastructure UK Limited

17 Angel Gate, City Road, London EC1V 2SH,
United Kingdom
Tel +44 (0) 207 843 1400
Fax +44 (0) 207 843 1410

Doc Reg No. 28130RR363i1

h:\projects\28130 sizewell ecology studies\reports\sizewell main site\consolidated reports 2012\nvc\28130 nvc consolidated report 2007-8 draft.doc

EDF Energy

Sizewell C New Nuclear Power Station: Terrestrial and Freshwater Ecology, and Ornithology

Draft National Vegetation Classification Survey Report 2007-2008

June 2012

AMEC Environment & Infrastructure UK Limited

Certificate No. FS 13881

Certificate No. EMS 69090

Disclaimer

This report has been prepared in a working draft form and has not been finalised or formally reviewed. As such it should be taken as an indication only of the material and conclusions that will form the final report. Any calculations or findings presented here may be changed or altered and should not be taken to reflect AMEC's opinions or conclusions.

Copyright and Non-Disclosure Notice

Third Party Disclaimer

Document Revisions

No.	Details	Date
1	Draft Report	June 2012

Contents

1. Introduction

1.1 Purpose of this Report

An area of land directly north of Sizewell B Nuclear Power Station, which is located near Leiston in Suffolk, has been identified as having the potential to accommodate the proposed development of one or more new nuclear reactors. This proposed development is known as Sizewell C. The site of the proposed development has an approximate central National Grid Reference (NGR) of TM473640.

AMEC Environment & Infrastructure UK Ltd ('AMEC') was commissioned in 2007 to provide terrestrial and freshwater ecological and ornithological services in relation to Sizewell C. The purpose of this report, which outlines the findings of the National Vegetation Classification (NVC) survey work undertaken in the period 2007-2008, is to inform the design of Sizewell C and the Environmental Statement for the scheme.

1.2 Survey Area and Scope

The survey area and methodologies used have been adopted following consultation with statutory and non-statutory consultees and other stakeholders, taking into account best practice guidelines, and site-specific and project-specific characteristics. The survey area adopted is precautionary in that it allows for the iterative development of the scheme design by covering a larger area than is likely to be affected by the proposals.

1.2.1 2007 Survey

The proposed new build site and surrounding habitats lie within the Suffolk Coast and Heaths Natural Area. Natural Areas have been formally defined as 'biogeographic zones which reflect the geological foundation, the natural systems and processes and the wildlife in different parts of England, and provide a framework for setting objectives for nature conservation' (Biodiversity: The UK Steering Group Report, HMSO, 1995).

Detailed surveys were required in order that the quality and species composition of the habitats could be put into local, regional and national perspective. In particular a key aim of this work was to assess the degree to which the preliminary works area fitted within the context of the surrounding area. A survey area was therefore identified which comprised:

- The preliminary works area (PWA) proposed at the time and a surrounding 200m zone;
- All of the significant habitat (i.e. any habitat other than open arable fields) within 100m of the indicative location of the access road; and
- Selected dykes to the north of the PWA which were vulnerable to potential pollutants arsing from the construction phase. These had little past survey data and their nature conservation importance and their vulnerability to such impacts was

not defined. The work would also form a baseline for monitoring once a hydrological assessment has been conducted and site design has advanced.

Habitats within the 2007 Survey Area

Preliminary Works Area – Made Ground

The preliminary works area comprises open sheep-grazed pasture on low-lying made ground, fringed by a tall, steep bund on the coastal side that supports rough grassland and scrub. Other areas to the south of the pasture are young plantation woodland at pre-pole stage.

Coastal Habitats

The survey area of the coastal habitats includes the area of dune grasslands and shingle within the preliminary works area together with a block of these habitats to the north. The survey area is therefore defined to the west as being the base of the screening mound, and to the east as the foreshore. The southern boundary is adjacent to the existing power stations, while the northern boundary extends beyond the screening mound.

Marshland Habitats

The marshland vegetation surveys cover an area which comprises marshes within the Sizewell Marshes SSSI, principally the Goose Hill Marshes and Goodham Marsh, together with the block of marshland to the east of Goose Hill called the Salt Marsh. Much of the survey area is occupied by fen meadows, though reedbeds and wet woodland feature in particular blocks.

Grazing Marshes Dyke Survey

A more extensive study area to the north was selected for the survey of dyke aquatic vegetation survey for reasons described above. For this habitat, the survey area therefore includes dykes within the hydrological unit that comprises Goose Hill Marsh, the Salt Marsh and the Minsmere Levels south of the New Cut.

Dry Woodlands and Rides

The survey of the dry woodlands and the ride network within them is restricted to Kenton and Goose Hills.

1.2.2 2008 Survey

During 2008, further surveys were carried out in an expanded survey area incorporating additional blocks of semi-natural habitat around the likely build area, for the following reasons.

- To provide a more precise quantitative and qualitative understanding of the habitat and plant species which may be impacted by works within the preliminary works area.
- To provide a better understanding of the habitats and plant communities of the wider Sizewell Marshes area and in particular areas of hydrological sensitivity. These may be affected by changes in water quality or water table regime arising from the works, or in the case of the dyke system, these may be sensitive to pollutants arising from the construction phase.

- To undertake the necessary scientific and technical work in order to develop robust mitigation and enhancement measures that are credible and also fit within the current management framework of the Sizewell Marshes.

Habitats within the 2008 Survey Area

Aquatic vegetation of the Sizewell Marshes SSSI dykes

In 2008, the 2007 survey area was extended to include the dykes over the remainder of Sizewell Marshes SSSI. These dykes are similarly vulnerable to potential contaminants and also to the possible impacts of a change in hydrological condition. The combined survey area of this habitat therefore provides a coherent data set which would identify all sensitive areas and support development of mitigation and enhancement measures. It would also form part of the data set used for the hydrological assessments. Finally, it would be useful in informing the long-term management of the Company's Estate.

Terrestrial areas of Sizewell Marshes SSSI

The 2007 survey included blocks of fen meadow, reedbed and wet woodland that fall within 200m of the Preliminary Works Area. In 2008, the survey area was extended to cover the entire extent of these habitats within the Sizewell Marshes SSSI, with additional assessment of adjacent valley slope grassland on part of the southern margin of the SSSI, and Leiston Carr on its northern edge.

In including this additional area, the assessment of the terrestrial habitats over the rest of Sizewell Marshes SSSI completes the vegetation data set for EDF's floodplain landholding begun in 2007. This provides an up-to-date assessment of the current fen communities, defining their condition, extent and location on the site. Such information is needed for the impact assessment and will also be required in order to characterise the eco-hydrological sensitivities of the features.

Survey of Goose Hill and Kenton Hills woodland rides

In 2007, the botanical survey of the woodlands and rides of Goose Hill and Kenton Hills included areas containing semi-natural habitat along and in the vicinity of the proposed access road route and construction compound. The survey identified the planted dry woodland as having considerable potential for restoration to heathland by virtue of the remnant vegetation along the rides and the sandy soils. Attention was also drawn to the floristic links between the acid dune vegetation of the coast and this area.

In 2008, further survey provided supplemental coverage of the ride vegetation on the higher ground of Goose Hill and the eastern parts of the Kenton Hills. This fieldwork provides a boundary to the area of remnant heathland vegetation within the survey area, and provides a sound science and evidence base for the possible development of a mitigation strategy for this area. When combined with the assessment undertaken in 2007, the survey helps to identify (a) the target vegetation communities which could be restored and (b) those areas of high quality vegetation which could be used as a source for seeds or direct planting.

Survey of the coastal embankment habitats

In 2008, the grassland and scrub habitats of the coastal embankments falling within the PWA were formally sampled. These data can be used to characterise these vegetation stands within

the framework of the National Vegetation Classification, and complete the vegetation data set for the PWA.

The areas surveyed in 2007 and 2008 are shown in Figure 1.1.

2. Methods

2.1 Desk Study

A desk study was undertaken to try to identify the development of habitats within the survey area. This process included reference to a number of local documentary sources:

- Biodiversity Action Plan. British Energy Plc (2007);
- The Sizewell Integrated Land Management Plan (ADAS, 2006);
- Sizewell Annual Management Plan Reviews (ADAS 2004, 2005 & 2006);
- The Sizewell Beach Vegetation Survey (Stone, 2003);
- Sizewell Marshes SSSI citation (Natural England website) and site condition assessments (undertaken by English Nature, 2003);
- Citations relating to other statutory and non-statutory designated sites of nature conservation interest;
- Various reports on the woodland and fen meadow vegetation of the Sizewell Marshes SSSI (Parmenter 1996, 1998, 2000 & 2001; Stone, 2004a & 2006);
- A wide ranging botanical survey of the grazing marsh ditch systems of the Suffolk and Essex coasts, which included the Sizewell Marshes and Minsmere Levels, conducted on behalf of the Nature Conservancy Council by Wolfe-Murphy, Leach and Doarks (1991);
- Results reported by Casey *et al*. (1993), Casey (1998) and Hemphill (2006) into botanical monitoring of the Sizewell Marshes grazing marsh dykes system;
- Information was sought from British Energy regarding the composition and character of the made ground within the preliminary work area, and details of the seed mixes and woody stock;
- Aerial photographs that were supplied by British Energy and the OS 1:10000 base map of the area.

Desk study information was requested in 2007 and, given the number of previous surveys and the information obtained in 2007, no additional desk study was undertaken to inform the 2008 survey.

2.2 Field Survey

2.2.1 National Vegetation Classification Survey Methodology

For the survey of plant communities, the framework of the National Vegetation Classification was adopted wherever possible. The NVC is used by all of the national conservation agencies and bodies as a tool to describe, assess and interpret plant communities. Habitats are prioritised for designation as SSSIs using the NVC, which also enables site-specific data to be evaluated against the "national average" thereby helping to understand the conditions prevailing on that site.

The standard methodology is for an experienced botanical surveyor, using professional judgement, to identify homogenous areas of vegetation by eye. These stands of vegetation are then classified by identifying species and their abundance within small sub-samples (quadrats) in order to determine the community type.

At Sizewell, most stand boundaries were mapped on the ground by eye, and either followed management boundaries, such as a field edge, or sharp transitions from one vegetation type to another, identified from aerial photographs. Where stand boundaries were diffuse, or differences between areas of vegetation could not be judged by eye, stand boundaries were established by comparing plant lists taken from adjacent samples and judging the approximate locations of significant changes in the composition of stands.

Within each stand, the vegetation was sampled to determine the species present and their abundance. Samples sizes are proscribed by the published methodology according to the type of habitat, and are normally a 2m x 2m quadrat. Locations of these quadrats were recorded with a ten-digit Garmin 160 GPS which is rated as having a 3m accuracy (which was a little less in practice). Each species in the sample (including bryophytes) had their abundance rated using the Domin[1] scale in Table 2.1.

Table 2.1 The Domin Scale

Domin Value	% Cover
10	1-100
9	76-90
8	51-75
7	34-50
6	26-33
5	11-25
4	4-10

[1] The Domin scale is a method of assessing the abundance of species within a small sample area and was developed by early European plant scientists (specifically Dr Domin from the former Republic of Czechoslovakia) to assist the objective description of vegetation communities. It is thought to be the most accurate method to use in the field, and was adopted by the NVC for the national system.

Domin Value	% Cover
3	Many individuals (scattered)
2	A few individuals (clumped)
1	1-2 individuals

Floristic tables were prepared for each stand, or group of similar stands, detailing the species present, their frequency of occurrence in stand samples (Table 2.2) and the range of abundance scores recorded. Where five quadrats or more were recorded, the frequency of each species over the quadrats as a whole was calculated and indicated in the last column of the table.

Table 2.2 Frequency Categories Used in Vegetation Tables

Frequency	Range (%)
V	81-100
IV	61-80
III	41-60
II	21-40
I	1-20

Significant species that were recorded outside of the quadrat but within the stand were recorded at the foot of the floristic tables. Percentage cover of total vegetation, total bryophytes, leaf litter and bare ground were also noted. The community types were compared with the data in the NVC (Rodwell 1991-2000a) and allocated to an NVC community. Each community title is composed of a code, e.g. “MG1”, denoting the habitat type "MG" for mesotrophic grassland, community 1, and is given a name based on the most common species, e.g. MG1 is the *Arrhenatherum elatius* grassland, as this grass is characteristic of the community. These communities are often further divided into sub-communities, where a group of sampled stands form a particularly distinctive type of the main community. The community code is then followed by a letter, e.g. MG1(a), and the sub- community is also given a name based on characteristic species.

Botanical names are given according to Stace (1997).

NVC survey is *not* designed to provide a total inventory of all plant species that may be found on a site. Detailed inventory work requires several visits through the season and preferably over more than one year. This has effectively been achieved within parts of the survey area through the repeated plant surveys of previous years.

2.2.2 2007 Survey

The fieldwork was undertaken between May and September 2007 inclusive.

The standard NVC methodology described in section 2.2.1 was employed wherever possible in each habitat, while a number of habitat-specific forms of the NVC methodology were used as appropriate. In addition, some stands required an alternative strategy to assess their character, as the vegetation is not satisfactorily represented by the NVC. These alternatives are:

Preliminary Works Area - Made ground

The areas within the preliminary works area that were planted by shrub and tree stock also contain areas of rough grassland, but large parts of these stands are now shaded by the young canopies and neither the fragmentary herbaceous flora nor the composite young scrub and woodland fall within the purvieu of the NVC. Therefore, they were not formally sampled, and the areas are briefly described in terms of the NVC communities to which the scrub, tall herb and rough grassland stands can be referred.

Coastal Habitats

The strandline assemblage was sampled by walking along the upper part of the foreshore, and recording species present on the strandline at 20 representative locations. This strategy was adopted as the constituent species were very sparse, and often separated by several metres of bare shingle or sand. The occurrence of the strandline was itself sporadic, and no particular beach zones were identified which best exemplified a developed form of this vegetation. In addition to species presence, a record was made of their comparative frequency, according to the version of the DAFOR scale (Table 2.3) adapted for use on vegetated shingle by Doody and Randall (2003) as follows:

Table 2.3 The DAFOR Scale

Dominant	The species appears at most (>60%) stops and it covers more than 50% of each sampling unit;
Abundant	Species occurs regularly throughout a stand, at most (>60%) stops and its cover is less than 50% of each sampling unit;
Frequent	Species recorded from 31-60% of stops;
Occasional	Species recorded from 11-30% of stops;
Rare	Species recorded from up to 10% of stops.

Marshland Habitats: Wet Woodlands

The two blocks of wet woodland were somewhat limited in extent, and in order to produce an effective number of samples, plot centres were selected throughout the survey area for this habitat-type. In following standard NVC methodology and sampling the canopy, shrub and field/ground layers separately as nested plots, sections of woodland edge were incorporated within the samples. The samples may therefore include some species that do not occur within the woodland itself, but are restricted to its edge.

Grazing Marshes Dyke Survey

In contrast with the previous aquatic vegetation surveys of the study area[2], the NVC method uses a sample plot size of 4 m^2, which in practice was normally configured as a 4 x 1 metre along a stretch of seemingly homogeneous aquatic vegetation within the dyke channel. 132 plots were sampled throughout the study area, taking one sample per dyke section, or the equivalent density on longer reaches. Using repeated 'grabs' of a grapnel for the floating and submerged flora, all plant species within the plot were recorded, including emergents. The bank itself was not sampled, as the focus of the survey was on the most vulnerable aquatic vegetation.

Dry Woodlands and Rides

The vegetation characters of the recently replanted areas within Kenton and Goose Hills do not correspond closely to the NVC. The areas are recorded using species lists, and described in terms of the NVC communities to which various vegetation stands can be referred.

2.2.3 2008 Survey

The fieldwork was undertaken between May and September 200, inclusive, and followed the same methodology adopted for the 2007 surveys. Throughout the report, reference is made to the Suffolk Wildlife Trust compartment numbering system (Suffolk Wildlife Trust, 1993) and to formal names sometimes applied to parts of the SSSI, such as Goose Hill Marsh.

The framework of the National Vegetation Classification (NVC) (Rodwell 1991a, 1991b, 1992, 1995, 2000) was employed as a descriptor for all semi-natural habitats, and other vegetation stands wherever possible[3].

Botanical names are given according to Stace (1997) for vascular plants; the authorities for mosses, liverworts and lichens are Smith (2004), Paton (1999) and Dobson (2005) respectively. Stoneworts and freshwater algae follow the nomenclature given in John, Whitton & Brook (2002).

Sizewell Marshes dyke vegetation survey

The NVC sampling method uses a plot size of 4m^2, which in practice was normally configured as a 4 x 1 metre plot along a stretch of seemingly homogeneous aquatic vegetation within the dyke channel. 136 plots were sampled throughout the study area, taking one sample per dyke section, or the equivalent density on longer reaches. Using repeated 'grabs' of a grapnel for the floating and submerged flora, all plant species within the plot were recorded, including emergents. The bank itself was not sampled, as the focus of the survey was on the aquatic, rather than marginal, vegetation.

This method is in line with the use of the NVC as the UK standard and is therefore different to that employed by earlier surveys (see section 2). Nonetheless, it has been possible to gain a broad correlation between the various classifications.

[2] A number of surveys have been undertaken: Wolfe-Murphy et al. (1991) reported on survey work of dykes on the Sizewell Belts and Minsmere Levels. Casey et al. (1993), Casey (1998) and Hemphill (2006) have reported on the results of monitoring surveys of the Sizewell Belts grazing marsh dyke system.

[3] This is consistent with the 2007 Report. It should also be noted that an NVC survey is not designed to provide a total inventory of all plant species that may be found on a site. Where plants of interest were seen outside of sample locations, these were noted and are included as applicable in the stand descriptions.

In presenting the results of this survey in section 3, the plot samples have been combined for analysis and presentation with the eleven samples taken in 2007 from the area of Sizewell Marshes SSSI shown in Figure 1.1. The 'community' names given in the 2007 report for these samples are thus discarded, and the samples are regarded as forming part of the larger data set collected in 2008. This allows all sampled dykes on Sizewell Marshes SSSI to be considered in this report.

Sizewell Marshes - fen meadows, reedbeds and wet woodland

Fen meadow samples were 2 x 2m in area, reedbed samples were 4 x 4m (or 10 x 10m in species-poor stands) and wet woodland samples were 50 x 50m, with nested sample areas for the shrub, field and ground layers. All vascular plants, bryophytes and ground lichens were recorded from the sample areas.

In presenting the results of this survey in section 3, the plot samples have been combined for analysis and presentation with the samples taken in 2007 from the area of Sizewell Marshes SSSI shown in Figure 1.1. The 'community' names given in the 2007 report for these samples are thus discarded, and the samples are regarded as forming part of the larger data set collected in 2008. This allows all sampled terrestrial habitats on Sizewell Marshes SSSI to be considered in this report.

Goose Hill and Kenton Hills – woodland rides

All woodland ride samples were 2 x 2m in area. All vascular plants, bryophytes and ground lichens were recorded from the sample areas.

In order to characterise the ride vegetation displaying features of remnant heathland, samples from the relevant communities identified by the 2007 survey were combined with those of 2008 and re-analysed to produce more precisely defined stands. This allows all sampled rides with this character from Goose Hill and Kenton Hills to be considered in this report.

Coastal embankment – habitats

Grassland samples were 2 x 2m in area. Sampled scrub stands were 4 x 4m where practicable.

2.3 Personnel

Jonny Stone undertook the majority of the field survey on the Sizewell site. He has been a vegetation ecologist working in nature conservation since 1985, and has a BSc in Geography from Durham University. Jonny specialises in vegetation survey and its application in site restoration and management, and has been conducting the annual vegetation monitoring programme at Sizewell Marshes since 2003. Jonny has been involved in training the NVC methodology since the late 1980s and has recently undertaken NVC surveys for Natural England, Defence Estates and Suffolk Wildlife Trust, amongst others.

Sampling of the dyke vegetation was also carried out by Kirsty Spencer (*nee* Smith). Kirsty is an experienced vegetation surveyor, with considerable experience of aquatic plant identification. She has surveyed these habitats throughout the UK and has been with ELP for the last 7 years. Kirsty has a BSc in Conservation Management.

3. Results

3.1 Desk Study

3.1.1 Preliminary Works Area – Made Ground

The landward part of the preliminary works area comprises open sheep-grazed pasture on low-lying made ground, fringed by the tall, steep screening mound on the coastal side, which supports rough grassland and scrub. Other areas to the south of the pasture are young plantation woodland at pre-pole stage. The screening mound and these landward areas are the product of works associated with the building of Sizewell 'A' and 'B' Stations (adjacent to its southern boundary). It is understood that the made ground is composed of marine dredgings, largely sands and gravels, or early Pleistocene Norwich Crag[4], that were imported to form a stable landsurface on top of the valley peats.

The seed-mix used to create the sheep-grazed pastures is unknown, though it is understood that *Festuca arundinacea* was a significant constituent. The young grasslands are described by the Phase 1 survey in the Integrated Land Management Plan (ADAS 2006) as 'restored acid grassland'.

3.1.2 Coastal Habitats

Walmsey and Davey (1997a) describe the Sizewell area as underlain by early Pleistocene Norwich Crag that has produced deep, brown, calcareous sandy soils on the uplands above the beach. The Holocene marine deposits that form the beach at Sizewell overlie the Crag and are composed of layers of aggregate, ranging from fine sand to coarse flint shingle. The shingle is assumed to have derived as glacial sediments deposited offshore which have been reworked with rising sea levels to be redeposited along the coast, and from active erosion of existing coastal cliffs consisting of crag deposits and the Westleton Member. According to Sneddon and Ranwell (1994), the beach substrates are at the sandy extreme of shingle substrates. However, the material is very heterogeneous, with some areas predominantly coarse shingle (Walmsey and Davey 1997a,b).

The beach has undergone a period of extensive restoration following major physical disturbance associated with the construction of Sizewell B power station in Suffolk between 1987 and 1993. The restoration, along a 1-km stretch of the coastline, included revegetating an area of compacted shingle beach and a low dune ridge between the low cliffs and banks of the coastline and the active shingle banks and beach on the seaward side. Further details are provided below.

The vegetation of the coastal strip can be divided into two broad habitats: the zone of vegetated shingle up to the dune ridge, and the dune vegetation extending from, and including, the dune ridge and the coastal grasslands on the landward side of the bund.

[4] Norwich Crag is a marine deposit laid down c.2.1-1.6 million years ago, and consist of sands, gravels and clays, as well as shells and other fossils.

3.1.3 Vegetated Shingle

The fringing shingle beach at Sizewell occurs on the seaward side of the coastal dunes throughout the length of coastal frontage. In general, it extends 50-80 metres inland of the low water mark, although only the area clear of the high water mark is vegetated. Even here, the vegetation is sparse. In total, the shingle extends to around 10 ha in area.

The shingle beach in front of the operational site was extensively disturbed during the construction of Sizewell B and this has been restored and re-planted with plant communities typical of the adjacent undisturbed areas.

According to Walmsey and Davy (1997a) the vegetation on the shingle beach is dominated by a few perennials that grow clonally, particularly *Honkenya peploides, Lathyrus japonicus* and *Ammophila arenaria*. R*umex crispus* is a widespread and distinctive component of the vegetation. Although the dominants are perennial, *Glaucium flavum* and *Senecio viscosus,* both species that flower and fruit once in the life cycle, are widespread and common. Other species are more locally abundant, such as *Beta vulgaris* ssp. *maritima, Calystegia soldanella, Ononis repens* and *Carex arenaria*. At the landward edge, the characteristic shingle beach species are mixed with typical dune species.

The shingle beach vegetation at Sizewell that existed in July 1988 during the power station construction has been described in Sneddon and Randall (1994) with reference to their shingle classification (Sneddon and Randall 1993). Post-restoration, Walmsey and Davey (1997b) used this classification to give a more up-to-date assessment, and recorded:

SH21 *Ammophila arenaria-Rumex crispus-Senecio viscosus* community

SH22 *Glaucium flavum* dominated pioneer community

SH26 *Honkenya peploides-Silene maritima* pioneer community

According to Rodwell (2000a), all three kinds of vegetation are all subsumed within one NVC community, the *Rumex crispus-Glaucium flavum* shingle community (SDI), which is an example of the 'perennial vegetation of stony banks' categorised under Annex 1 of the EU ‘Habitats’ Directive.

At the seaward edge the dominant shingle beach species decline and a limited number of distinct strandline species were reported by Walmsey and Davey (1997b), e.g. *Cakile maritima* and *Salsola kali,* associated with *Crambe maritima, G. flavum* and *Senecio viscosus* to form sparse vegetation cover. In the NVC scheme, this corresponds to the *Honckenya peploides-Cakile maritima* strandline community (SD2), which represents the 'annual vegetation of drift lines' included under Annex 1 of the EU ‘Habitats’ Directive.

Vegetated shingle in general is a globally restricted habitat, of which the UK contains a significant proportion. The presence of habitats listed in Annex 1 of the Habitats Directive is one of the primary reasons for the SAC and SPA notification of the Minsmere and Walberswick Heaths and Marshes. The SAC and SPA boundary includes all shingle to the north of the restored northern area.

The remaining areas of vegetated shingle along the Suffolk Coast, which are not the subject of a statutory nature conservation designation, are designated as a County Wildlife Site. This covers the shingle around the front of, and to the south of, the operational site.

3.1.4 Dune Vegetation

The coastal dune system stretches from Sizewell village to Minsmere and is evident throughout the 2km of coast fronting the operational site, although it never extends more than 100m inland. Landward of the shingle the area of restored dune ridge in front of 'B' Station is 2-5m high. It is of variable stability; in parts the ridge consists of loose wind-blown sand, dominated by *Ammophila arenaria*, while elsewhere the sand is fully stabilized and entirely vegetated, with *C. arenaria* predominant (Walmsey and Davey 1997b). From a limited number of samples, the ridge-top vegetation was classified by Stone (2003) as predominantly the *Ammophila arenaria* mobile dune community (SD6 within the NVC). The *Ammophila*-dominated samples from in front of the power stations were assigned to the SD6e *Festuca rubra* sub-community. This is often transitional to the kind of vegetation found on the vegetated shingle area, and the two assemblages share many species. The *Carex arenaria* group of samples to the north were assigned to the SD6g *Carex arenaria* sub-community. This can be an extremely stable vegetation, and, in time, may gradually give way to the more acidophilous component of the vegetated shingle area. These determinations do not include the dune vegetation north of the screening mound.

Behind the dune ridge is a linear area of gently undulating semi- and fixed-dune grassland. This area is almost completely vegetated and the sand largely or wholly stabilised. The vegetation is dominated by sparse grasses and broadleaved herbs. Many of the uncommon plant species of the dune grasslands are annuals which do best in slightly disturbed areas; these conditions extend southwards around the edge of the 'A' and 'B' station sites. The coastal grassland habitat is essentially a dry acidic one, with affinities to heathland. It is nutrient-poor and generally contains little organic matter (Stone 2003).

The coastal grassland areas used in connection with the construction of Sizewell B were heavily disturbed, but have now been restored and vegetation establishment has been carried out, as described in Walmsey (1986). Similar areas, such as in front of the A Station, have in the past demonstrated the capacity to relatively quickly develop communities of disturbed ground flora, with occasional rare or uncommon species.

Stone (2003) took ten samples of these coastal grasslands, and separated swards containing *Ononis repens* from those where the moss *Hypnum cupressiforme* covered a significant part of the plots. It was recognised that the range of variability between swards, and their generally rather acidophilous character, complicated a straightforward allocation within the NVC. The collective samples were regarded as representing two sub-communities of the *Ammophila arenaria-Festuca rubra* semi-fixed dune community (SD7), though lacking one of the community constants, *Ammophila arenaria*. Sample areas containing *Ononis repens* were referred to *Ononis repens* sub-community (SD7c), and the remainder were accommodated within the *Hypnum cupressiforme* sub-community (SD7b).

Coastal sand dunes are a UK BAP Priority Habitat, although those at Sizewell are limited in extent and largely outside BE's ownership. Those areas to the north of the operational site are within the Minsmere and Walberswick SAC and SPA boundary, and hence can be regarded as being of International importance.

3.1.5 Marshland Habitats

The grazing marshes occupy a low-lying basin of deep peat and are primarily important for the herb-rich unimproved fen meadows that support a wide range of plants and animals, particularly birds and invertebrates. The SSSI marsh fields within the survey area were assessed as being in

'Favourable' condition in 2003, and are included in the area monitored by the Fen Meadow Vegetation Monitoring Programme initiated in 1996, along with the Salt Marsh area.

The Sizewell Marshes area is managed by Suffolk Wildlife Trust (SWT). Parmenter (1996) believed it to be the best example of calcareous fen vegetation in Suffolk, although this is an overstatement if the site is considered with other SSSI/SAC calcareous fens both along the coast and through the Waveney and Little Ouse valleys. The vegetation is primarily assigned to the *Juncus subnodulosus-Cirsium palustre* fen-meadow (M22) within the NVC, though the SWT monitoring surveys highlight the field-to-field variability of species composition, which acts to increase the species-richness of the site at the landscape scale. In particular, a brackish element to the flora is discerned in some parts of the marshes, which may be the product of salt incursion by marine flooding or the redistribution of saline groundwater.

The Salt Marsh area, which lies to the east of the Sizewell Marshes SSSI, is classified as permanent pasture although it is a reclaimed marsh and not part of the estuarine saltings as its name suggests. The soils of Salt Marsh are marine mud deposits and relic sand dune slack areas supporting plant species that have some tolerance to salinity and are somewhat distinct from the freshwater fen meadows. The marsh is also managed by SWT, and includes a wildfowl and wader scrape dug in 2003.

Prior to the acquisition of Sizewell Marshes by BE in 1992, insufficient grazing and other management had reduced the floristic diversity of the marsh, and had allowed the dykes to become choked with invasive scrub. All of the marsh within the SSSI is now subject to the SWT Management Plan, which has enabled historical neglect to be reversed through the introduction of grazing stock and the more proactive control of scrub in the dykes. The Marshes fields were entered into a Suffolk River Valleys Environmentally Sensitive Area (ESA) Agreement in 1993, and the marshes are maintained by local graziers using Suffolk Redpoll and Hereford/Charolais cattle. Topping[5], with some mowing management, is also undertaken. A Water Level Management Plan was prepared by the Environment Agency in 1998, providing a framework for the control of water levels.

Monitoring results over the period 2000 to 2004 (Stone, 2004a, 2006) suggest a slight deterioration in habitat quality, with a decline in average species richness over that period, although average species richness remains greater than that in 1996 when the monitoring commenced. Part of the cause of this decline is identified an increased dominance of tall species, in particular Jointed Rush (*Juncus articulatus*), which tend to shade out the lower growing species. However, changes in species composition in individual plots also indicate a possible change in hydrological conditions, with some plots being indicative of increased dryness and others of increased waterlogging. Overall, the dynamic nature of the vegetation is emphasised. The ability to generalise from these restricted monitoring plots to the whole of the wetland SSSI without such conclusions being corroborated by a broader survey is further emphasised.

The reedbeds within the survey area are located in discrete blocks within and to the south of 'Goodram' Marsh. They were recorded as *Phragmites australis-Urtica dioica* fen (S26) or as wet woodland in the 1993 SWT survey (Casey *et al*., 1993). Subsequently, areas of encroaching willow and alder scrub have been cleared, and the understorey has spread across

[5] Topping is the cutting down of grasses and herbs that have grown too long to be attractive to grazing animals.

the managed area to produce reed-dominated vegetation. Recently, the central area of this marsh has been excavated to produce an area of open water.

The wet woodland area within the Marshes was comprehensively surveyed by Parmenter (2001) who recorded a number of interesting transitions between *Quercus* spp.-*Betula* spp.-*Deschampsia flexuosa* woodland (W16) on drier ground within the marsh, forms of *Alnus glutinosa-Urtica dioica* woodland (W6) on the deep peats, and *Salix cinerea-Betula pubescens-Phragmites australis* woodland (W2) representing areas of thick willow scrub. The *Alnus-Urtica* woodland formed the majority of the wet woodland in this account.

Since only part of the wet woodland block is included within the survey area (Figure 1.1), some of the sample areas included in Parmenter's 2001 survey, and thus in the community tables, fall outside the current assessment. It is thus not possible to interpret directly the woodland types that do fall within the current assessment, but a careful consideration of the community-types is required, as Rodwell (1991 p96) regards *Alnus-Urtica* woodland in this type of location as potentially the product of eutrophication attendant upon the drying out of superficial peats.

The wet woodlands occupying the area known as Turf Pits, and the shallow alley that drains into it, were not covered by the 2001 survey.

Fens, reedbeds and wet woodlands are National, Suffolk and British Energy BAP Priority Habitats.

3.1.6 Grazing Marshes Dyke Survey

English Nature (now Natural England) completed an assessment of Sizewell Marshes SSSI in 2006 and concluded that the SSSI was in 'Favourable' condition. No specific assessment has been made of the condition of the dyke habitat, although the water quality and species diversity is generally good. The dykes are included in the 'Favourable' assessment of the SSSI as a whole.

Parmenter (2001) notes that drainage within the dyke system at Sizewell Marshes is predominantly north-eastwards, via the Inland Drainage Board (IDB) drain, towards Minsmere Level, and that:

While much of the water irrigating the upper valley is derived from the chalk aquifer and is therefore alkaline, the coastal part of the survey area is quite strongly affected by brackish water, derived either from coastal flooding (1953 and c.2000) or from the saline aquifer which is contiguous with the freshwater aquifer. The other main source of water is from rainfall, although surface water runoff and perhaps quite acidic water originating in superficial sand and gravel deposits is probably a significant influence on the vegetation adjacent to Kenton Hills and Goose Hill.

At Goose Hill Marsh, Casey *et al*. (1993), Casey (1998) and Hemphill (2006) report on three 20 metre dyke sections that fall within the study area. In describing the vegetation, these authors employed the classification developed for the Essex and Suffolk coastal marshes (Wolfe-Murphy *et al*., 1991; Doarks & Leach, 1990). The sample plots (17, 18, 19 in their reports) all fall within Aquatic End group A3, which is characterised by a floating carpet of duckweed (*Lemna minor* and *L. trisulca*) above a submerged growth of Soft Hornwort (*Ceratophyllum submersum*). Casey (1998) notes that *C. submersum* is:

… a Nationally Scarce species which is normally associated with brackish dykes but in the case of Sizewell is found in abundance in a number of freshwater dykes. The dykes which support this species are bordered by cattle- grazed pastures. The edges of the dykes are well-grazed and the aquatic zones therefore receive good amounts of light.

In these dyke sections, *Spirodela polyrhiza* and *Hydrochaeris morsus-ranae* were also recorded. Hemphill (2006) reports that dykes 17 and 18 were last managed in 1998, and dyke 19 in 2005.

The Sizewell Marshes wetland area discharges into a channel called Leiston Brook/Beck that flows in a northerly direction behind the flood defences. This channel flows into the Minsmere River shortly before it outfalls into the North Sea through the Minsmere Sluice 3.2 km to the north east (Parmenter, 2001). Within the large block of grazing marsh south of the New Cut and including the Salt Marsh, the dyke waters clearly grade from fresh to brackish, a feature which is noted within the SSSI citation. As a consequence, dykes within the marshes contain very diverse aquatic plant communities, with brackish and freshwater types represented. The most diverse flora is found in dykes in the freshwater marshes that are not shaded by trees, though the transition from fresh to brackish water increases floral diversity at the landscape scale. Species recorded include the Nationally Scarce Whorled Water Milfoil (*Myriophyllum verticillatum*).

In summary, it is apparent from these previous reports that the extensive ditch system within Sizewell Marshes supports a diverse aquatic flora which includes the Nationally Scarce Soft Hornwort (*Ceratophyllum submersum*), Fen Pondweed (*Potamogeton coloratus*) and Whorled Water-milfoil (*Myriophyllum verticillatum*). Following a restoration programme of sediment clearance and scrub removal, the management objective for the dyke system is to maintain a range of successional habitats. Management of the water levels and rotational control of invasive scrub and emergent species are key to achieving this.

The dyke system forms part of the coastal and floodplain grazing marsh, and is thus a UKBAP and Suffolk LBAP habitat.

3.1.7 Dry Woodlands and Rides

Kenton and Goose Hills woodland is a large block of mainly conifer woodland which extends to 85.34 ha (211 acres). It is managed for a number of objectives including timber, landscape, wildlife conservation and public recreation (ADAS 2006). The woodland is located on the moderate slopes of a Norwich Crag promontory capped with glacial sands and gravels. The slopes include a shallow valley forming the southern junction between the hills, which descends to the Turf Pits. This area is excluded from consideration, and is covered as part of the wet woodland survey. The dry woodland also contains pit areas, which are understood to contain rabbit warrens.

Kenton and Goose Hills comprise mainly Corsican Pine (*Pinus nigra ssp. laricio*) and Scot's Pine (*Pinus sylvestris*) of a uniform age. Blocks of mixed deciduous woodland and stands of *Quercus rubra* are also present. A narrow block of mature Maritime Pine (*Pinus radiata*) is located on the east footslope of Goose Hill. The plantation is subject to a long-term restructuring plan, agreed with the Forestry Commission in 2000, to provide a less even age profile, by selective thinning, clear felling and re-planting. Implementation of the Plan has begun and will ensure a sustainable supply of timber, conservation benefits and an enhanced environment for visitors. The overriding function of the afforested area, however, is providing a screen to Sizewell B, and it is therefore principally important from a landscape perspective.

Bioscan UK Ltd (1992) assessed the suitability of the woodland for a potential heathland seed bank. They found that all felled and replanted areas were relatively poor in species, usually being dominated by bracken, rosebay willowherb and bramble. Heathland species were few in number and generally sparse where they occurred, except for *Agrostis canina*[6], a common constituent of heathlands and acid grasslands. No heathers were found.

3.2 Field Survey

3.2.1 2007 Survey

A total of 387 vegetation samples were taken from the survey areas defined in Section 1.2. Only established semi-natural habitats within each survey area were surveyed in detail, with the exception of the young grasslands on made ground within the preliminary work area.

Analysis of the data has defined 39 communities, which are summarised in Table 3.1. Each community where samples were taken is coded according to the habitat it occurs in. For example, Community DG11 *Anthoxanthum odoratum-Arrhenatherum elatius* has the prefix 'DG' as it forms one of a group of 'Dune Grasslands'. It should be noted that the coding used is specific to this survey as many of the communities recorded did not fit well within the standard NVC codes. In some instances, such the fen meadows and dry woodland rides, this has allowed a greater definition of the range of variation found within stands of vegetation in particular habitat types. In other cases, such as the young grasslands found on made ground within the preliminary works areas, the distinct stands are not well described by the national classification, and it is preferable to signal their distinctiveness from published communities.

The areas covered by these communities are shown on Figure 3.1. The vegetation data are included in **Appendix A,** with one table for each community. Where several similar communities are identified in particular habitats, a synoptic table is included in the accounts, each table presents the summary data for the group of communities, which allows for comparison of their floristic characters.

Table 3.1 Summary of Vegetation Communities Present within the Study Area

	Survey Vegetation-Type	NVC Community
Preliminary Works Area – Made Ground		
Young grasslands	Community YG1 – *Festuca rubra-Veronica arvensis* acid grassland	SD8 *Festuca rubra-Galium verum* fixed dune grassland (b) *Luzula campestris* sub-community – immature variant
	Community YG2 – *Dactylis glomerata – Medicago lupulina* community	OV23 *Lolium perenne-Dactylis glomerata* community (d) *Arrhenatherum elatius-Medicago lupulina* sub-community

[6] This taxon is probably what is today called *Agrostis vinealis*.

	Survey Vegetation-Type	NVC Community
	Community YG3 – *Festuca arundinacea-Poa trivialis* tall grassland	*MG7 Lolium perenne* **leys and related grasslands** (b) *Lolium perenne-Poa trivialis* leys
Coastal Habitats		
Vegetated shingle	Strandline assemblage	SD2 *Honckenya peploides-Cakile maritima* strandline community
	Community VS4 – *Lathyrus japonicus-Crambe maritima* community	SD1 *Rumex crispus-Glaucium flavum* shingle community (b) *Lathyrus japonicus* sub-community
Dune grasslands	Community DG5 – *Honckenya peploides-Elytrigia juncea* foredune community	SD6 *Ammophila arenaria* mobile dune community (a) *Elymis farctus* sub-community
	Community DG6 – *Ammophila arenaria-Pilosella officinarium* dune community	SD7 *Ammophila arenaria-Festuca rubra* semi-fixed dune community (c) *Ononis repens* sub-community
	Community DG7 – *Brachythecium albicans-Trifolium arvense* dune grassland	SD7 *Ammophila arenaria-Festuca rubra* semi-fixed dune community (b) *Hypnum cupressiforme* sub-community - *Sedum anglicum-Aira praecox* variant
	Community DG8 – *Poa humilis-Brachythecium rutabulum* dune grassland	SD8 *Festuca rubra-Galium verum* fixed dune grassland (a) Typical sub-community
	Community DG9 – *Poa humilis-Bromus hordeaceus* ssp. *thominei* dune grassland	SD8 *Festuca rubra-Galium verum* fixed dune grassland (b) *Luzula campestris* sub-community
	Community DG10 – Parched path community	U1 *Festuca ovina-Agrostis capillaris-Rumex acetosella* grassland (c) *Erodium cicutarium-Teesdalia nudicaulis* sub-community
	Community DG11 – *Anthoxanthum odoratum-Arrhenatherum elatius* dune community	SD9 *Ammophila arenaria-Arrhenatherum elatius* dune grassland (a) Typical sub-community
	Community DG12 – *Carex arenaria* dune community	SD11 *Carex arenaria-Cornicularia aculeata* dune community (b) *Festuca ovina* sub-community
	Community DG13 – *Festuca ovina-Sedum anglicum* dune grassland	SD12 *Carex arenaria – Festuca ovina – Agrostis capillaris* dune grassland (a) *Anthoxanthum odoratum* sub-community - *Sedum anglicum-Aira praecox* variant
	Community DG14 - *Festuca ovina-Dicranum scoparium* dune grassland	SD12 *Carex arenaria – Festuca ovina – Agrostis capillaris* dune grassland (a) *Anthoxanthum odoratum* sub-community

	Survey Vegetation-Type	NVC Community
		In mosaic with: SD11 *Carex arenaria-Cornicularia aculeata* dune community (b) *Festuca ovina* sub-community
Marshland Habitats		
Fen meadows	Community FM15 – *Juncus articulatus – Lathyrus pratensis* fen meadow	
	Stand a – *Holcus lanatus – Cynosurus cristatus* vegetation	M22 *Juncus subnodulosus-Cirsium palustre* fen-meadow (b) *Briza media – Trifolium* spp. sub-community With characters of: MG8 *Cynosurus cristatus-Caltha palustris* grassland
	Stand b – *Holcus lanatus – Agrostis stolonifera* vegetation	M22 *Juncus subnodulosus-Cirsium palustre* fen-meadow (b) *Briza media – Trifolium* spp. sub-community
	Stand c – *Holcus lanatus – Juncus effusus* vegetation	M22 *Juncus subnodulosus-Cirsium palustre* fen-meadow (b) *Briza media – Trifolium* spp. sub-community
	Community FM16 – *Juncus subnodulosus – Juncus inflexus* fen meadow	M22 *Juncus subnodulosus-Cirsium palustre* fen-meadow (d) *Iris pseudacorus* sub-community In mosaic with: MG12 *Festuca arundinacea* grassland (a) *Lolium perenne-Holcus lanatus* sub-community
	Community FM17 – *Agrostis stolonifera – Lolium perenne* grassland	MG11 *Festuca rubra-Agrostis stolonifera-Potentilla anserina* grassland (a) *Lolium perenne* sub-community
	Community FM18 – *Juncus effusus – Agrostis stolonifera* rush-pasture	MG10 *Holcus lanatus-Juncus effusus* rush-pasture (a) Typical sub-community In mosaic with: MG11 *Festuca rubra-Agrostis stolonifera-Potentilla anserina* grassland (a) *Lolium perenne* sub-community
Reedbeds	Community RB19 – *Phragmites australis – Calystegia sepium* tall herb fen	S26 *Phragmites australis-Urtica dioica* tall-herb fen
	Community RB20 – *Phragmites australis – Solanum dulcamara* tall herb fen	S26 *Phragmites australis-Urtica dioica* tall-herb fen (d) *Epilobium hirsutum* sub-community

	Survey Vegetation-Type	NVC Community
	Community RB21 – *Phragmites australis – Lemna minor* reedswamp	S4 *Phragmites australis* swamp
		(a) *Phragmites australis* sub-community
	Community RB22 - *Holcus lanatus – Arrhenatherum elatius* vegetation	OV25 *Urtica dioica-Cirsium arvense* community
Wet woodland	Community WW23 – *Alnus glutinosa – Iris pseudacorus* woodland	W5 *Alnus glutinosa-Carex paniculata* woodland
		(a) *Phragmites australis* sub-community
		With areas of:
		W2 *Salix cinerea-Betula pubescens-Phragmites australis* woodland
		(a) *Alnus glutinosa-Filipendula ulmaria* sub-community
	Community WW24 – *Alnus glutinosa – Glechoma hederacea* woodland	W6 *Alnus glutinosa-Urtica dioica* woodland
		(a) Typical sub-community
Grazing marsh dykes	Community DY25 - *Hydrocharis morsus-ranae - Lemna trisulca* aquatic community	A4 *Hydrocharis morsus-ranae-Stratiotes aloides* community
	Community DY26 – *Ceratophyllum submersum* aquatic community	A2 *Lemna minor* community
		(b) *Lemna trisulca* sub-community
		Or
		A3 *Spirodela polyrhiza-Hydrocharis morsus-ranae* community
		Over
		A6 *Ceratophyllum submersum* community
	Community DY27 – *Myriophyllum spicatum – Potamogeton pectinatus* aquatic community	A12 *Potamogeton pectinatus* community
		with
		S21 *Scirpus maritimus* swamp
	Community DY28 – *Chara vulgaris* aquatic community	A11 *Potamogeton pectinatus-Myriophyllum spicatum* community
		(b) *Elodea canadensis* sub-community
	Community DY29 – *Lemna minor* aquatic community	A2 *Lemna minor* community
		(a) Typical sub-community
		With some samples referable to:
		(b) *Lemna trisulca* sub-community
	Community DY30 – *Phragmites australis* emergent community	S4 *Phragmites australis* swamp
		(a) *Phragmites australis* sub-community
Dry Woodlands and Rides		
Dry woodland	Community DW31 – *Pteridium aquilinum-Ceratocapnos claviculata* woodland	

	Survey Vegetation-Type	NVC Community
	Stand A – *Agrostis capillaris-Dryopteris dilatata* community	W10 *Quercus robur-Pteridium aquilinum-Rubus fruticosus* woodland community
		(d) *Holcus lanatus* sub-community
		With characters of:
		W16 *Quercus* spp.-*Betula* spp.-*Deschampsia flexuosa* woodland
		(a) *Quercus robur* sub-community
	Stand B – *Lonicera periclymenum-Dryopteris* filix-mas community	W10 *Quercus robur-Pteridium aquilinum-Rubus fruticosus* woodland community
		(d) *Holcus lanatus* sub-community
	Community DW32 – *Quercus robur-Urtica dioica* woodland	W8 *Fraxinus excelsior-Acer campestre-Mercurialis perennis* woodland
		(a) *Primula vulgaris-Glechoma hederacea* sub-community - dry variant
	Community DW33 – *Ulmus procera* scrub	W21 *Crataegus monogyna-Hedera helix* scrub community
Felled and replanted areas		W23b *Rumex acetosella* sub-community of the *Ulex europaeus-Rubus fruticosus* scrub
		OV27c *Rubus fruticosus* agg.-*Dryopteris dilatata* sub-community of the *Epilobium angustifolium* community
		W25b *Hyacinthoides non-scripta* sub-community of the *Pteridium aquilinum-Rubus fruticosus* underscrub
		U1 *Festuca ovina-Agrostis capillaris-Rumex acetosella* grassland
		(c) *Erodium cicutarium-Teesdalia nudicaulis* sub-community
		(d) *Anthoxanthum odoratum-Lotus corniculatus* sub-community
Ride network	Community RI34 – *Agrostis capillaris – Polytrichum juniperinum* community	U1 *Festuca ovina-Agrostis capillaris-Rumex acetosella* grassland
		(c) *Erodium cicutarium-Teesdalia nudicaulis* sub-community
	Community RI35 – *Agrostis capillaris – Eurhynchium praelongum* community	U4 *Festuca ovina-Agrostis capillaris-Galium saxatile* grassland
		(b) *Holcus lanatus-Trifolium repens* sub-community
	Community RI36 – *Agrostis capillaris – Sagina procumbens* community	U1 *Festuca ovina-Agrostis capillaris-Rumex acetosella* grassland
		(c) *Erodium cicutarium-Teesdalia nudicaulis* sub-community
	Community RI37 – *Pteridium aquilinum – Agrostis capillaris* community	U20 *Pteridium aquilinum-Galium saxatile* community
		(a) *Anthoxanthum odoratum* sub-community
	Community RI38 – *Poa annua – Agrostis capillaris* community	MG7 *Lolium perenne* grassland community
		(e) *Lolium perenne-Poa pratensis* sub-community

Survey Vegetation-Type	NVC Community
Community RI39 – *Poa annua – Taraxacum officinale* agg. community	OV23 *Lolium perenne-Dactylis glomerata* community (c)*Plantago major-Trifolium repens* sub-community

Preliminary Works Area – Made Ground

Within the preliminary works area, shown in Figure 3.2, three distinct communities with quite discreet distributions were identified within the sown grassland fields:

Community YG1 – *Festuca rubra-Veronica arvensis* acid grassland

Community YG2 – *Dactylis glomerata – Medicago lupulina* community

Community YG3 – *Festuca arundinacea-Poa trivialis* tall grassland

Table 3.2 comprises a synoptic table, which emphasises the key floristic characters of these communities. The NVC determinations proposed in the following community accounts are to an extent determined by the seed mixture that created the initial sward in these two fields and the accompanying discussion is therefore more speculative in character than would be the case for a semi-natural sward.

Table 3.2 Synoptic Table for the Young Grasslands on Made Ground*

Community (YG):	1	2	3
Festuca arundinacea	V	V	V
Dactylis glomerata	V	V	V
Brachythecium rutabulum	IV	V	II
Trifolium repens	IV	III	II
Medicago lupulina	III	IV	II
Veronica arvensis	V		
Brachythecium albicans	IV		
Trifolium arvense	IV		
Agrostis capillaries	III		
Taraxacum officinale agg	III		
Festuca ovina	III		
Hypochaeris radicata	III		
Festuca rubra glauca	II		
Cerastium semidecandrum	II		
Vicia lathyroides	II		
Ceratodon purpureus	II		

Community (YG):	1	2	3
Erodium cicutarium	II		
Trifolium glomeratum	II		
Festuca rubra agg.	V	IV	

*Showing the communities where species occur in more than 20 per cent of the samples allocated to each community (for a definition of the frequency ranges see Table 2.2)

Table 3.3 Synoptic Table for the Yound Grasslands on Made Ground

Community (YG):	1	2	3
Lotus corniculatus	V	IV	
Crepis capillaris	III	II	
Plantago lanceolata	III	II	
Eurhynchium praelongum	II	IV	
Poa pratensis	II	IV	
Trifolium dubium		II	
Vicia sativa nigra		II	
Leontodon autumnalis		II	
Poa trivialis		II	V
Agrostis stolonifera		III	IV

Community YG1 – *Festuca rubra-Veronica arvensis* acid grassland

Ten samples were assigned to this community. Some of the character species shown in Table 3.3 Synoptic Table for the Yound Grasslands on Made Ground

also extend into community YG2, and in some cases community YG3, but there is a suite of species which define the essentially dry and infertile nature of the substrate where this kind of grassland occurs. In particular, *Veronica arvensis*, the moss *Brachythecium albicans* and *Trifolium arvense* are constant, and are restricted to this community, sometimes with other associates such as *Festuca rubra* ssp. *glauca*, *Vicia lathyroides* and *Trifolium glomeratum*.

Supporting an average number of 17.2 plant species (range 13-21 species per sample), this is the most species-rich sward in this habitat. The samples are restricted to the marginal and slightly raised parts of the eastern field, particularly beneath the large bund. At the time of survey, these areas were already noticeably parched, and the sward height was lower than in the other communities.

The range of dryland species, rather than their proportions as part of the total sward, indicate that this community can be regarded as an immature example of the *Luzula campestris* sub-community of the *Festuca rubra-Galium verum* fixed dune grassland (SD8b). In common with other young grasslands on sandy soils in Suffolk, the levels of available nutrients are likely to

fall in time, and this will also tend to increase the soil acidity. It is possible that, with continued sheep grazing, the sward would follow a trajectory in its species assemblage towards the *Erodium cicutarium-Teesdalia nudicaulis* sub-community of the *Festuca ovina-Agrostis capillaris-Rumex acetosella* grassland (U1c). To some extent, this pattern is already becoming evident, as shown in the full community tables (Appendix A). A number of acidophilous species (eg *Agrostis capillaris* and *Festuca ovina*) are grouped in one half of the community table, while a somewhat weedier, mesophytic group of species are clustered in the other half (eg *Taraxacum officinale*, *Medicago lupulina*).

According to Rodwell (2000a), this type of dune grassland *can be found on suitable stable dunes and sand plains all around the British coast*. Its occurrence behind the screening mound may, in part, be the product of the substrate source, or of the proximity of suitable seed sources; it is not known whether the distinctive species of dune grassland were introduced. This immature stand is an interesting and valuable example of the kind of vegetation that can develop in such situations, which are uncommon around the British coast and tend to be restricted to disturbed ground in non-agricultural locations.

Community YG2 – *Dactylis glomerata-Medicago lupulina* grassland

Thirteen samples have been grouped in this community. There is considerable overlap with community YG1 in that both swards share a number of constant grasses (*Festuca arundinacea*, *Dactylis glomerata* and *Festuca rubra* agg.), herbs (*Medicago lupulina* and *Lotus corniculatus*) and the moss *Brachythecium rutabulum*. However, this community lacks all but the occasional appearance of the dryland species which characterise community YG1. Instead, a group of mesophytes[7] are present, notably *Trifolium dubium*, *Vicia sativa* ssp. *nigra* and *Leontodon autumnalis*. In addition, two grasses, *Poa trivialis* and *Agrostis stolonifera* are present, which connect this sward with community YG3.

The average number of plant species is 10.3 (range 7-13 species per sample), which is significantly less species rich than community YG1. The community typically occurs alongside community 1 on less drought-prone soil and forms a transition to community YG3.

The presence of *Dactylis glomerata* as a constant with *Medicago lupulina* in this young grassland, particularly as *Brachythecium rutabulum* and *Crepis capillaris* also occur frequently in the community samples, suggests that this type of grassland can be referred to the *Arrhenatherum elatius-Medicago lupulina* sub-community of the *Lolium perenne-Dactylis glomerata* community (OV23d). This diverse assemblage is one typical of re-sown areas, and is common throughout lowland Britain on disturbed areas, particularly those associated with made ground on building sites and in development areas. The species composition is determined by the original species mix sown and the suite of species subsequently able to colonise.

Medicago lupulina tends to be associated with quite calcareous swards and if the grassland were to continue to be sheep grazed, in the long-term it is likely that the grassland would develop initially towards the *Trisetum flavescens* sub-community of the *Lolium perenne-Cynosurus cristatus* grassland (MG6c), with a trajectory towards the more acid *Anthoxanthum* sub-community (MG6b) or the *Anthoxanthum odoratum-Lotus corniculatus* sub-community of the *Festuca-Agrostis-Rumex* grassland (U1d).

[7] A species requiring average levels of soil moisture; intolerant of long periods of drought.

Community YG3 – *Festuca arundinacea* grassland

This 'default' assemblage consists of eight samples, collected from stands away from the high screening mound, which share in the absence of the distinguishing species of the other communities, and in the dominance of *Festuca arundinacea*, which is abundant in all samples. The canopy created by this species allows for few other associates, excepting the grasses *Poa trivialis* and *Agrostis stolonifera*, which often form a sprawling mat on the ground, with clusters of flowering stems in less shaded patches. *Dactylis glomerata* is present in low numbers throughout, forming depauperate tussocks with markedly fewer flowering stems than were present in the other swards. The boundaries of these stands with the other communities are rather diffuse, and the community table (Appendix A) shows one sample (12) taken from what appears to be a transition zone with community 2.

The average number of plant species is 5.3 (range 3-9 species per sample) and this community marks out the most species-poor areas of these grasslands, and is associated with the least drought-prone soils.

The allocation of this kind of grassland within the NVC is somewhat problematic, as all the constituent species are also found growing in other habitats or kinds of grassland. It is reasonable, however, to regard the sward as a planted sward of moist soils, and to assign it to the ubiquitous *Lolium perenne-Poa trivialis* leys (MG7b). This community is very common in floodplain grasslands throughout lowland Britain.

Coastal Habitats

The vegetation of the coastal strip between the foreshore and the screening mound can be divided into two broad habitats: the zone of vegetated shingle up to the dune ridge, and the dune vegetation extending from, and including, the dune ridge and the coastal grasslands on the landward side of the bund. The distribution of the coastal communities is shown in **Figure 3.3**.

Vegetated Shingle

Two distinct communities were identified, which corresponded to their position on the shingle beach:

Strandline assemblage Community

Community VS4 – *Lathyrus japonicus-Crambe maritima* community

Strandline Assemblage Community

The strandline is the area at the top of the beach where the high tide has deposited material from the sea, and a small group of specialist plant species may colonise. Within the survey area, this type of vegetation forms only fragmentary and sparse stands on the seaward side of Community VS4.

The following species were recorded; their comparative frequency (rather than their absolute frequency) is given using the DAFOR scale, as defined in section 2.2.

Table 3.4 Species Composition of the Strandline (using the DAFOR Scale)

Species	Abundance
Honckenya peploides	F
Crambe maritima	O
Beta vulgaris maritima	O
Salsola kali	O
Glaucium flavum	O
Senecio viscosus	R
Atriplex glabriuscula	R
Cakile maritima	R

This group of species within the strandline forms a pioneer community, where individuals are unlikely to persist for long periods due to the fact that they will be regularly overwhelmed by high tides and storm surges, whilst trampling may also restrict growth.

Where the assemblage occurs, the vegetation can be referred to the *Honckenya peploides-Cakile maritima* strandline community (SD2). This community is of high conservation value, and is listed in Annex 1 of the EU 'Habitats' Directive; it is an interest feature of the Minsmere and Walberswick Heaths and Marshes SSSI to the north of the survey area.

Community VS4 – *Lathyrus japonicus-Crambe maritima* community

Five samples were taken of this vegetation, which occurs on the less disturbed, coarse shingle on the landward side of the strandline. In places, this community was particularly well developed, with extensive patches of *Silene uniflora* and *Lathyrus japonicus* featuring amongst sometimes quite thickly scattered *Crambe maritima* and associated species. The substrate varies from coarse shingle to a sand matrix with various smaller shingle elements.

Lathyrus japonicus is often a notable feature of this vegetation, though it is one species that is generally restricted to the shingle substrate, rather than sands, and is thus slightly limited in its distribution within the community. Where it occurs, and this is much the greater part of the stands, the vegetation is unequivocally referrable to the *Lathyrus japonicus* sub-community of the SD1 *Rumex crispus-Glaucium flavum* shingle community. Areas where the substrate is noticeably sandier are also best accommodated within this sub-community, although there is a drift towards the species composition described in community DG5 (see below).

This community is of high conservation value, and is listed in Annex 1 of the EU 'Habitats' Directive; it is an interest feature of the Minsmere and Walberswick Heaths and Marshes SSSI to the north of the survey area.

Dune Grasslands

This suite of swards has been separated into ten communities, covering the vegetation associated with the dune ridge and also the coastal grasslands on the landward side of the bund. The distribution of the constituent samples of each community into distinct and mappable stands is complicated by their sometimes fragmentary nature, and the presence of swards which form a mosaic of distinct communities, often with no clear boundaries.

The communities have been defined as:

Community DG5 – *Honckenya peploides-Elytrigia juncea* foredune community

Community DG6 – *Ammophila arenaria-Pilosella officinarium* dune community

Community DG7 – *Brachythecium albicans-Trifolium arvense* dune grassland

Community DG8 – *Poa humilis-Brachythecium rutabulum* dune grassland

Community DG9 – *Poa humilis-Bromus hordeaceus* ssp. *thominei* dune grassland

Community DG10 – Parched path community

Community DG11 – *Anthoxanthum odoratum-Arrhenatherum elatius* dune community

Community DG12 – *Carex arenaria* dune community

Community DG13 – *Festuca ovina-Sedum anglicum* dune grassland

Community DG14 *Festuca ovina-Dicranum scoparium* dune grassland

A synoptic table has been produced to emphasise the key floristic characters of these communities. (Table 3.5)

Table 3.5 Synoptic Table for Dune Communities*

Communities (DG):	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**
Carex arenaria	V	V	II	II	II	2	III	4		V
Elytrigia juncea	V	V	III	II			V			
Eryngium maritimum	V									
Honkenya peploides	V									
Ononis repens	V	V	III	IV	III		IV		V	
Rumex crispus littoreus	V									
Sonchus arvensis	V	III	III	II	II					
Crambe maritima	IV									
Ammophila arenaria	III	V	I					3		II
Atriplex glabriuscula	III									
Arrhenatherum elatius	II						V	2		
Calystegia soldanella	II	III								
Crithmum maritimum	II									
Festuca rubra rubra	II		III	V	IV	2			II	
Lathyrus japonicus	II									
Senecio viscosus	II									
Holcus lanatus		V					II	2		

Communities (DG):	5	6	7	8	9	10	11	12	13	14
Senecio jacobaea		V	II	V	II					
Crepis capillaris		V	IV	IV						
Galium verum		V	V	III	IV					
Pilosella officinarum		V	V	III	III		II		V	
Vulpia bromoides		V	V	III						
Hypochaeris radicata		IV	III	IV	V		II	2	V	V
Brachythecium rutabulum		IV		V	II					
Catapodium marinum		IV	V							
Festuca arenaria		IV	III	III						
Lotus corniculatus		III	IV	V	III	2				
Poa humilis		III	V	V	V		IV	2	IV	
Aira praecox		II	V						III	
Blackstonia perfoliata		II								
Brachythecium albicans		II	V							
Centaurium erythraea		II								
Ceratodon purpureus		II								
Hypnum cupressiforme		II	V	II	III	2			IV	IV
Plantago lanceolata		II	V	V	IV		III		III	
Taraxacum officinale agg		II	III	V	II					
Vicia sativa nigra		II		III	V				III	
Trifolium arvense			V		II					
Cerastium semidecandrum			IV							
Sedum anglicum			IV		II		II		V	
Syntrichia ruraliformis			III							
Leontodon saxatilis			III		II					
Bromus hordeaceus thominei			III	V	V				II	
Cladonia furcata			III						III	
Erodium cicutarium			III							
Festuca ovina			III		V		II		V	V
Cladonia foliacea			II							
Phleum arenarium			II							
Campylopus introflexus			II							
Cetraria aculeata			II						III	
Cladonia fimbriata			II							
Hypochaeris glabra			II							

Communities (DG):	5	6	7	8	9	10	11	12	13	14
Peltigera canina			II							
Plantago coronopus			II			2				
Geranium molle				IV	II					
Festuca rubra glauca				III						
Luzula campestris				III	II		II		V	III
Dactylis glomerata				III						
Scleropodium purum				III	V					
Veronica arvensis				II						
Cynosurus cristatus				II						
Vicia lathyroides				II	II					
Anthoxanthum odoratum					V		V	3	IV	
Agrostis capillaris					III		III		III	
Rumex acetosella					IV				II	V
Rhinanthus minor					IV				IV	
Dicranum scoparium					II				V	V
Trifolium dubium					II					
Anisantha sterilis					II					
Poa annua						2				
Crassula tillaea						2				
Trifolium subterraneum						2				
Rubus fruticosus agg							II	2		II
Dryopteris dilatata								2		
Polytrichum juniperinum									II	
Cladonia portentosa										II
Cladina arbuscula										II
Erica cinerea										II
Quercus robur sapling										II

* Showing the communities where species occur in more than 20 per cent of the samples allocated to each community (for a definition of the frequency ranges see Table 2.2). Where less than five samples were taken in defining a community, the number of samples are given for species occurring in more than 20 per cent of the samples[8].

[8] Community DG10 – Total of 2 samples; Community DG12 – Total of 4 samples.

Community DG5 – Honckenya peploides-Elytrigia juncea foredune community

Six samples were taken from this stand, which occurs on the seaward side of the dune ridge, where sand aggregates have built up on top of the beach shingle. The sand is often slightly sloping upwards towards the base of the dune ridge, and in places its margin has been eroded by high tides. *Honkenya peploides*, *Ononis repens*, *Elytrigia juncea* and *Carex arenaria* are the most frequent species, each acting to stabilise the sand in this foredune location. In places, *Ammophila arenaria* has begun to establish, as large tufts occupy up to half of some samples; they have not, however, coalesced over the plots. The open but increasingly stabilised stand is the locus for a number of species found only rarely elsewhere in the coastal habitats, including *Eryngium maritimum*, *Crithmum maritimum* and *Calystegia soldanella*.

The average number of plant species is 11.5 (range 5-15 species per sample).

Community DG5 corresponds to the *Elymus farctus*[9] sub-community of the *Ammophila arenaria* mobile dune community (SD6a).

This is an uncommon type of vegetation in Suffolk, as building dunes are themselves rare.

Community DG6 – *Ammophila arenaria-Pilosella officinarium* dune community

Six samples were taken from this stand, which is located on the ridge-top and seaward face of the dune ridge, where *Ammophila arenaria* is the major constituent of the dune faces. *Carex arenaria*, *Elytrigea juncea*, *Festuca arenaria* and *Holcus lanatus* are subordinate constants, and form the matrix within which a variety of ephemerals and dune grassland herbs exploit the gaps between the grass tussocks. The diminutive annuals *Vulpia bromoides*, *Aira praecox*, *Centaurium erythraea* and *Catapodium marinum* are often present, but it is the consistent appearance of *Pilosella officinarium* and *Ononis repens*, amongst other herbs, which indicate that the dune community has partly fixed the sand substrate. Whilst a few dune specialists such as *Calystegia soldanella* and *Eryngium maritimum* are still present, the drift in floristics is towards the grasslands of recently stabilised dunes.

The average number of plant species is 19.5 (range 14-25 species per sample).

Community DG6 is quite typical of semi-fixed dunes in being composed of four groups of species: established dune 'fixers' that are still vigorous; a number of ephemerals taking advantage of high sun levels in gaps in the vegetation; a residual suite of unstabilised dune specialists, and a substantial range of dune grassland species. The frequency of occurrence of *Ononis repens*, in particular, indicates that this vegetation is best referred to the *Ononis repens* sub-community of the *Ammophila arenaria-Festuca rubra* semi-fixed dune community (SD7c).

This community is typical of the partly fixed dune communities that have developed in the few areas of coastal Suffolk with stable dune sands.

Community DG7 – *Brachythecium albicans-Trifolium arvense* dune grassland

Eleven samples were taken from this sward, which is typically low-growing and often dominated by its moss flora or by a particular group of annuals. The mosses *Brachythecium albicans* and *Hypnum cupressiforme* are constant, and are usually accompanied by annuals comprising *Trifolium arvense*, *Vulpia bromoides*, *Aira praecox*, *Catapodium marinum*, *Cerastium diffusum* ssp. *diffusum*, *Crepis capillaris*, *Sedum anglicum* and occasionally *Plantago*

[9] *Elymus farctus* is an earlier scientific name for *Elytrigia juncea*

coronopus and *Phleum arenarium*. This flora is often accompanied by a sprawling mass of the lichen *Cladonia rangiformis*. Amongst these character species, typical dune grassland species are present in somewhat reduced proportions: *Galium verum*, *Plantago lanceolata* and *Poa humilis* are among the constants.

The flora of this community is particularly varied, and includes low numbers of species from several other dune grassland communities.

The average number of plant species is 25.0 (range 18-32 species per sample).

Community DG7 does not readily conform to the published suite of dune grassland types within the NVC. It most closely resembles the Ammophila-Festuca semi-fixed dune community (SD7), particularly as Festuca arenaria and Elytrigia juncea are present. The constant presence of Hypnum cupressiforme suggests that the grassland can be aligned with the sub-community of that species, i.e. SD7b. The large suite of prominent annuals, however, indicates that a second type of vegetation is integral to the overall character of this kind of grassland. Rodwell et al. (2000b) refers to a survey of The Haven at Thorpeness (Hughes 1995) in describing communities of annuals on drought-prone, infertile sandy soils and identifying a Sedum anglicum-Aira praecox community with a similar suite of species and it is considered that this community should be referred to as an SD7b-[Sedum anglicum-Aira praecox] dune grassland.

This vegetation is therefore a particularly distinct type of semi-fixed dune grassland, and is thought to have a very restricted distribution along the coast of Suffolk.

Community DG8 – *Poa humilis-Brachythecium rutabulum* dune grassland

Seven samples were taken from this stand, which represents the most extensive area of fixed dune grassland in the survey area. The grasses *Poa humilis* and *Festuca rubra* ssp. *rubra* are often dominant in this sward, with the herbs *Plantago lanceolata*, *Lotus corniculatus*, *Taraxacum officinale* agg. and *Senecio jacobaea*. The moss *Brachythecium rutabulum* is ubiquitous, and there is a smaller suite of annuals, many of which are no more than occasional. These include *Vicia lathyroides* and *Trifolium glomeratum*. The sward height is taller than the preceding community, and the vegetation is dominated by plants indicating more fertile conditions, but like Community DG9 there are low numbers of many species that are more generally found in other kinds of dune grassland.

The average number of plant species is 20 (range 16-28 species sample).

Community DG8 is the closest example in the survey area to the often somewhat calcareous fixed dune vegetation exemplified by the *Festuca rubra-Galium verum* fixed dune grassland (SD8a), the Typical sub-community, to which it is best referred.

This type of dune grassland is commonly found in dune habitats elsewhere around the British coast, but is much more restricted in Suffolk, where the dune sands are often acidic in character.

Community DG9 – *Poa humilis-Bromus hordeaceus ssp. thominei* dune grassland

Seven samples were taken from this stand where *Poa humilis* and *Hypochaeris radicata* are constant, along with *Festuca ovina* and *Anthoxanthum odoratum*. While the sward height is between 10 and 30 cm, *Ammophila arenaria* is absent and *Carex arenaria* is restricted to a few depauperate specimens. Instead, the sward contains a number of perennial herb associates that are typical of somewhat acid conditions in fixed dune grassland.

Floristically, Community DG9 has a strong affinity with both the *Luzula campestris* sub-community of the *Festuca-Galium* fixed dune grassland (SD8b) and the *Luzula campestris* sub-community of the *Carex arenaria-Festuca ovina-Agrostis capillaris* dune grassland (SD12a). Rodwell (2000a p210) comments on the similarities between these types of vegetation, but asserts that, as here, the mesophytic herbs are more consistently present throughout *Festuca-Galium* swards, and this community therefore equates most closely to an SD8b fixed dune grassland.

This type of dune grassland is commonly found in dune habitats elsewhere around the British coast, and is more representative of the dune grasslands where they occur in Suffolk, as it reflects the predominantly acidic sands found along the coast.

Community DG10 – Parched path community

Two samples were taken from the heavily trampled paths through the dune grasslands. Both samples were notable for containing *Plantago coronopus*, *Crassula tillaea* and *Trifolium subterraneum*. They should not be considered typical of the path vegetation, which are often rather species-poor versions of the surrounding swards, or almost bare of vegetation, but display characters of the kind of drought-prone species assemblages that features within it.

The average number of plant species is 10.0 (range 9-11 species per sample).

The samples correspond most closely to the Erodium cicutarium-Teesdalia nudicaulis sub-community of the *Festuca ovina-Agrostis capillaris-Rumex acetosella* grassland (U1c).

It thus represents an atypical version of the kind of open vegetation that develops on parched ground throughout the Suffolk Sandlings, particularly where the ground is compacted by trampling and kept open by rabbit grazing.

Community DG11 – *Anthoxanthum odoratum-Arrhenatherum elatius* dune community

Five samples were taken from different stands of this type of vegetation, which is distinctive by virtue of the co-existence of its three constants, *Anthoxanthum odoratum*, *Arrhenatherum elatius* and *Elytrigia juncea*. *Ammophila arenaria* and *Carex arenaria* sometimes feature prominently, and this sward is often 20-40 centimetres tall. Ruderal species are present in very low numbers, and there is only a thin scattering of other species, of which *Poa humilis*, *Ononis repens*, *Plantago lanceolata* and *Agrostis capillaris* are frequent associates.

The average number of plant species is 11.6 (range 6-15 species per sample).

The appearance of *Arrhenatherum elatius* as a constant in proportions where it is sometimes co-dominant, is a very distinctive feature of this vegetation. Apart from *Anthoxanthum*, the associated constants are not those that would indicate that the sward has developed on strongly acid sand, though those species are present in low numbers. The closest NVC fit to this community is the *Ammophila arenaria-Arrhenatherum elatius* dune grassland (SD9a).

While *Arrhenatherum* is frequently found on partly stabilised shingle in Suffolk, there are few examples in the county where it has formed such as distinctive stand.

Community DG12 – *Carex arenaria* dune community

Four samples were taken from this stand, which is invariably associated with the loose sands of the dune ridge that are being stabilised by the dense rhizome network of Carex *arenaria*, the overwhelming dominant. *Ammophila arenaria* and *Elytrigia juncea*, although present, are no

more than occasional in occurrence and, with the occasional patch of *Honckenya peploides*, are the sole coastal specialists. There are few associates beneath the low canopy, such as *Hypochaeris radicata*, though tufts of several grass species occupy gaps in the canopy, or overtop it, most notably *Arrhenatherum elatius* and *Anthoxanthum odoratum*. A component of the flora, notably *Rubus fruticosus* agg., *Lonicera periclymenum* and *Dryopteris dilatata* lends a rather scrubby appearance to the vegetation.

The average number of plant species is 7.5 (range 5-10 species per sample).

The role of *Carex arenaria* as the stabiliser of acid sands, and the relative poverty of the associated species in this kind of vegetation, indicates that the stand is referred to the *Festuca ovina* sub-community of the *Carex arenaria* dune community (SD10b).

There are few extensive examples of this vegetation on the Suffolk coast, as the dominant species requires loose sand to create the dense, species-poor stands characteristic of this community.

Community DG13 – *Festuca ovina-Sedum anglicum* dune grassland

Six samples were taken from this stand, which forms part of a mosaic of stabilised dune grasslands on the parched acid sands. The grass component of the sward is dominated, as is common in these swards, by the tussocks of *Festuca ovina*, with contributions from *Luzula campestris*, *Anthoxanthum odoratum* and *Poa humilis*. The attendant herbs are *Pilosella officinarium*, *Hypochaeris radicata* and *Ononis repens*, together with lesser amounts of *Rhinanthus minor* and *Plantago lanceolata*. The annuals *Sedum anglicum*, *Aira praecox* and the diminutive *Bromus hordeaceus* ssp. *thominei*, amongst others, are present in varying quantities in gaps in the herbaceous sward, but the mosses *Dicranum scoparium*, *Hypnum cupressiforme* and *Polytrichum juniperinum* are frequent throughout and the lichens *Cladonia furcata*, *Cetraria aculeata* and *Cladonia portentosa* are also present.

The average number of plant species is 15.0 (range 8-18 species per sample).

The floristic affiliation of this community is with the *Anthoxanthum odoratum* sub-community of the *Carex-Festuca-Agrostis* dune grassland (SD12a). However, the sward lacks contributions from both *Ammophila* and *Carex arenaria*, and the somewhat open character of the grassland provides opportunities for the *Sedum-Aira* annual community to exploits the gaps with the result that this most closely equates to an SD12a-[*Sedum anglicum-Aira praecox*] dune grassland.

As noted for Community DG7, this vegetation is a particularly distinct type of semi-fixed dune grassland, and is thought to have a very restricted distribution along the coast of Suffolk.

Community DG14 - *Festuca ovina-Dicranum scoparium* dune grassland

Nine samples were taken from this largely undisturbed, parched, acid grassland community, located on stabilised sands. The sward structure is determined by the abundant tussocks of *Festuca ovina* intermingled with long-established mats of the rhizomatous *Carex arenaria*. In large parts of the stand, these two species remain co-dominant above a patchy carpet of the mosses *Dicranum scoparium* and *Hypnum cupressiforme*, and scattered individuals of *Rumex acetosella* and *Hypochaeris radicata*. Apart from the marked absence of many dune grassland species constant in the neighbouring grasslands, this vegetation is distinctive in the appearance of scattered scrub and *Rubus fruticosus* agg.,, occasional small sub-shrubs of *Erica cinerea* and *Calluna vulgaris* and bright carpets of the fruticose (shrubby) lichens *Cladonia arbuscula* and *Cladonia portentosa* in lightly trampled and grazed areas.

The average number of plant species is 8.4 (range 6-11 species per sample).

Community DG14 retains the strong floristic links with the *Anthoxanthum odoratum* sub-community of the *Carex-Festuca-Agrostis* dune grassland (SD12a), though the abundance of *Festuca ovina*, the paucity of many of the community constants, and the appearance of patches of fruticose lichens suggests that the stand is developing some of the characteristics of the *Festuca ovina* sub-community of the *Carex arenaria-Cornicularia aculeata* dune community (SD11b). The open lichen-moss areas form patches within the more extensive *Festuca-Carex* sward, and the sward can be regarded as a mosaic of SD12a / SD11b.

Marshland Habitats

Vegetation communities of the marshland habitats are shown in **Figure 3.4**.

Fen Meadows

Two distinct fen meadow communities were identified with variations in floristic composition between fields. Often these can be related to a particular group of species which are more commonly associated with a different community or sub-community. The most extensive type of vegetation is subdivided into three separate stands, as shown in Table 3.6, in order to highlight these variations. A third, minor community has also been distinguished from restricted areas of the meadows, notably on the edge of some fields; these appear to correspond to a slight elevation by dike-sides. One rush-pasture community is also identified.

The communities and stand sub-divisions, are:

Community FM15 – *Juncus articulatus – Lathyrus pratensis* fen meadow

Stand a – *Holcus lanatus – Cynosurus cristatus* vegetation

Stand b – *Holcus lanatus – Agrostis stolonifera* vegetation

Stand c – *Holcus lanatus – Juncus effusus* vegetation

Community FM16 – *Juncus subnodulosus – Juncus inflexus* fen meadow

Community FM17 – *Agrostis stolonifera – Lolium perenne* grassland

Community FM18 – *Juncus effusus – Agrostis stolonifera* rush-pasture

A synoptic table has been produced to emphasise the key floristic characters of these communities (Table 3.6).

Table 3.6 Synoptic Table for the Fen Meadow Communities*

Synoptic table (FM)	15a	15b	15c	16	17	18
Agrostis stolonifera	IV	V	V	V	2	V
Alopecurus pratensis			II			
Anthoxanthum odoratum	IV	II	V	II		
Brachythecium rutabulum	III	II	III			

Synoptic table (FM)	15a	15b	15c	16	17	18
Calliergonella cuspidatum	II			III		
Cardamine pratensis	II	III	IV			
Carex acutiformis				III		
Carex disticha	III	II		III		
Carex flacca				II		
Carex otrubae				II		
Carex panicea	II					
Cerastium fontanum			II			
Cirsium palustre			II			II
Cynosurus cristatus	V		II			
Eleocharis uniglumis				II		
Eurhynchium praelongum						II
Festuca arundinacea	V			V		
Festuca pratensis		II	II	II		
Festuca rubra	V	IV	IV	III		II
Galium palustre			II	II		
Galium uliginosum				III		
Holcus lanatus	V	V	V	IV	2	V
Hydrocotyle vulgaris				IV		
Iris pseudacorus				III		
Juncus articulatus	V	V	V			III
Juncus effusus		III	V	II		V
Juncus gerardii				III		
Juncus inflexus				V		
Juncus subnodulosus				V		
Lathyrus pratensis	III	III	IV			
Lolium perenne			II		2	II
Lotus pedunculatus	IV		V	III		
Lychnis flos-cuculi				II		
Mentha aquatica				III		
Phragmites australis				V		
Plantago lanceolata	III	III	III	IV		
Poa pratensis			II			
Poa trivialis	III	III	III		2	III
Potentilla anserina			III	III		III

Synoptic table (FM)	15a	15b	15c	16	17	18
Ranunculus acris			II			
Ranunculus flammula				II		
Ranunculus repens	V	IV	IV		2	II
Rumex acetosa		IV	IV			IV
Rumex conglomeratus	II		IV			
Rumex crispus						II
Stellaria graminea		II				
Taraxacum officinale agg	IV					
Trifolium pratense	II	III		II		
Trifolium repens					2	
Vicia cracca			III	IV		

* Showing the communities where species occur in more than 20 per cent of the samples allocated to each community (for a definition of the frequency ranges see Table 2.2). Where less than five samples were taken in defining a community, the number of samples are given for species occurring in more than 20 per cent of the samples[10]

Community FM15 – Juncus articulatus – Lathyrus pratensis fen meadow

Stand a – *Holcus lanatus – Cynosurus cristatus* vegetation

Eight samples were taken from this stand. *Juncus articulatus* is uniformally dominant, with a grassy understorey composed of several species, particularly *Holcus lanatus* and *Festuca rubra*. A thin over-canopy of *Festuca arundinacea* flowering stems develops in the late-season ungrazed sward. The ground layer has an infrequent moss flora of *Calliergonalla cuspidata* and the occasional wisp of *Brachythecium rutabulum*. Amongst a variety of herbs, *Lathyrus pratensis*, *Lotus pedunculatus* and *Galium* species are occasionally found sprawling into the canopy, and the ground layer usually contains *Ranunculus repens*, *Taraxacum officinale* agg. and *Plantago lanceolata*.

The average number of plant species is 14.1 (range 11-18 species per sample).

This stand corresponds primarily to the *Briza media – Trifolium* spp. sub-community of the *Juncus subnodulosus-Cirsium palustre* fen-meadow (M22b). However, the constant presence of *Cynosurus cristatus* and *Taraxacum officinale* agg., in particular, suggest affinity with the *Cynosurus cristatus-Caltha palustris* grassland (MG8), which may reflect long-standing pasture management on a substrate influenced by calcareous groundwater. The presence of *Festuca arundinacea*, which is scattered throughout large areas of the SSSI, can also be indicative of moist, calcareous conditions. Furthermore, it is one of the salt-tolerant species in the stand that may constitute a remnant of a period when brackish conditions prevailed.

In summary, the stand can be referred to as M22b (MG8) fen meadow vegetation to reflect the singularities of its floristic composition. The *Juncus-Cirsium* community is particularly

[10] In Community FM17, two samples were taken.

characteristic of the remaining fen meadows in Suffolk, and the suite of stands on the Sizewell Marshes is notable for its variation and species composition (Parmenter 1996).

Stand b – *Holcus lanatus – Agrostis stolonifera* vegetation

Five samples were taken from this stand, where *Juncus articulatus* is often dominant, sometimes accompanied by *J. effusus*. A sub-canopy is occupied by the ubiquitous grasses *Holcus lanatus*, *Agrostis stolonifera* and *Festuca rubra*, often accompanied by scattered individuals and patches of *Ranunculus repens* and *Rumex acetosa*, sometimes with a little *Cardamine pratensis* and *Trifolium pratense*. Few other species are present, though *Lathyrus pratensis* is occasionally found as a sprawler within the canopy, and the moss flora is very sparse, the mosses indicating nutrient-rich conditions.

The average number of species is 12.2 (range 9-16 species per sample), making this stand the least species-rich within the community.

Stand b is of rather simple composition and can be referred to the *Briza media – Trifolium* spp. sub-community of the *Juncus subnodulosus-Cirsium palustre* fen-meadow (M22b) by virtue of the close match afforded by its constant species. The presence of *Juncus effusus*, *Festuca pratensis*, *F. arundinacea*, *Stellaria graminea* and *Carex otrubae* may represent a period of low grazing intensity in past years, and may also be indicative of a past salt incursion.

Stand c – *Holcus lanatus – Juncus effusus* vegetation

Ten samples were taken from this stand, where a mixed rush canopy is produced by *Juncus articulatus* and *J. effusus*. The samples record a constant sprawling element produced by the presence of *Lotus pedunculatus*, *Lathyrus pratensis* and *Vicia cracca*. A thick, grassy sub-canopy is present throughout, dominated by *Holcus lanatus*, *Agrostis stolonifera* and frequently *Festuca rubra*, *Anthoxanthum odoratum* and *Poa trivialis*. Amongst the herbs *Rumex acetosa*, *Ranunculus repens*, *Potentilla anserina* and *Cardamine pratensis* are frequent, often with scattered individuals of *Rumex conglomeratus*. The bryoflora is very sparse and largely composed of *Brachythecium rutabulum*. Other species found in the stand include *Eleocharis palustris*, *Iris pseudacorus* and *Epilobium palustre*.

The average number of species is 19.1 (range 13-30 species per sample), making this stand the most species-rich within the community.

Stand c is the closest match to the *Briza media – Trifolium* spp. sub-community of the *Juncus subnodulosus-Cirsium palustre* fen-meadow (M22b). In common with Stand a, it is particularly grassy beneath the *Juncus* canopy and, in this, it retains some affinity with the *Cynosurus cristatus-Caltha palustris* grassland (MG8).

Community FM16 – *Juncus subnodulosus – Juncus inflexus* fen meadow

Ten samples were taken from this stand, which has several differences in floristic composition from Community FM15. A mixed rush canopy of variable thickness is produced by the ubiquitous presence of *Juncus subnodulosus* and *J. inflexus*. In contrast with the rushes of community FM15, these are particularly associated with calcareous waters. *Phragmites australis*, *Iris pseudacorus* and *Festuca arundinacea* produce a thin supra-canopy, and the sprawlers *Vicia cracca*, *Galium uliginosum* and *Lotus pedunculatus* are frequently present. The sedges *Carex disticha* and *C. acutiformis* are sometimes prominent, and these species collectively present a more colourful and varied physiognomy than community FM15. In

addition, the canopy sometimes gives way to an open field and ground layer, often with *Juncus gerardii* and *Eleocharis uniglumis*.

The field layer is marked by the constancy of *Agrostis stolonifera* and *Plantago lanceolata*, and on the ground, *Hydrocotyle vulgaris*, *Calliergonella cuspidata*, *Potentilla anserina* and *Carex flacca* are often prominent, sometimes with *Triglochin palustris*.

The average number of plant species is 19.7 (range 14-31 species per sample), making this community the most species-rich within the fen meadows.

Community FM16 is characterised by an assemblage of species that clearly indicates this vegetation is representative of the *Juncus-Cirsium* (M22) community. Furthermore, it is distinguished from the *Briza-Trifolium* sub-community of community FM15 by the preponderance of species also found in tall-herb fens, of which *Phragmites*, *Hydrocotyle*, *C. acutiformis* and *Iris* are particularly evident. This places the community within the *Iris pseudacorus* sub-community (M22d).

Interestingly, the more open patches within the stand dominated by *J. gerardii*, and the presence of *Festuca arundinacea*, *Carex otrubae* and other species including *Oenanthe lachenalii*, suggest that the stand can be regarded as a mosaic of the *Juncus-Cirsium* fen-meadow with the *Lolium perenne-Holcus lanatus* sub-community of the *Festuca arundinacea* grassland (MG12a). *F. arundinacea* has been referred to as being a constituent of swards in some of the community FM15 stands, but it is only in this community that salt-tolerant species are not only associates of the main vegetation, but form discrete stands within it.

In summary, the stand can be referred to as a mosaic of M22d fen meadow vegetation with patches of MG12a grassland.

The presence of this vegetation on Sizewell Marshes has been recorded throughout the Vegetation Monitoring Programme (Parmenter 1996), and is an unusual feature of the fen meadow vegetation, and very uncommon in Suffolk, particularly as part of a suite of fen meadow communities.

Community FM17 – *Agrostis stolonifera – Lolium perenne* grassland

Two samples were collected from linear dyke-side vegetation from the Goose Hill marshes. Both samples are from a stand of short-sward grassland and share a number of constants. *Agrostis stolonifera*, *Lolium perenne*, *Ranunculus repens*, *Poa trivialis* and *Trifolium repens* are all abundant in the sward, with *Holcus lanatus* and *Plantago lanceolata* frequent associates.

The average number of plant species is 9.5 (range 8-11 species per sample), making this a species-poor community within the fen meadow vegetation.

Community FM17 is composed of species which are also common in the surrounding stands, but lack the character species of fen-meadow. It is a sward of moist and occasionally inundated conditions, and is best referred to the *Lolium perenne* sub-community of the *Festuca rubra-Agrostis stolonifera-Potentilla anserina* grassland (MG11a), although it is noted that *P. anserina* is an infrequent associate of the stand.

This community is uncommon in Suffolk, and is mainly restricted to the few remaining coastal marshes where modern drainage has not been undertaken.

Community FM18 – *Juncus effusus – Agrostis stolonifera* rush-pasture

Five samples were taken from the Salt Marsh field to the east of Goose Hill. The stock-grazed sward is predominantly composed of thick tussocks of *Juncus effusus*, with some *J. articulatus*, over a variety of grasses and herbs. *Agrostis stolonifera* and *Holcus lanatus* are ubiquitous, both within the tussock-dominated areas and the more open swards between them. The rush tussocks have a limited flora associated with them: *Rumex acetosa* is often found at their base, and *Poa trivialis*, and sometimes *Phleum pratense*, form tall tufts which sprout above the rushes. *Lotus pedunculatus* and *Galium* are occasionally found sprawling amongst the tussocks. In the more open sward, *Agrostis* and *Holcus* are often associated with *Lolium perenne*, *Potentilla anserina* and *Ranunculus repens* in a loose, tufted inundation sward in which *Alopecurus geniculatus*, *Rumex crispus* and *Cirsium palustre* are sometimes found.

The average number of species is 10.2 (range 6-14 species per sample), making this community a relatively species-poor community within the fen meadows.

The overall floristics of this stand refer it to the typical sub-community of the *Holcus lanatus-Juncus effusus* rush-pasture (MG10a). In between the tussocks, however, the sward resembles an inundation community, such as the *Lolium perenne* sub-community of the *Festuca rubra-Agrostis stolonifera-Potentilla anserina* grassland (MG11a). It is likely that the latter has been colonised by rushes, and that the current character of the sward, owing to the preponderance of the rush flora, should be regarded as a rush-pasture. Furthermore, the sward has some characters which suggest that, as reviewed in the sequence of Fen Meadow Vegetation Monitoring Programme reports (Parmenter (1996, 1998, 2000) and Stone (2004a, 2006)), it is on a trajectory towards the target *Juncus-Cirsium* fen-meadow vegetation.

Reedbed Vegetation

Two similar reed-dominated communities are identified with a further two distinct vegetation types sampled from small stands. The distinction between the main stands, communities RB19 and RB20, is partly based on floristics, but the main difference is in species richness. No synoptic table is provided, but the full community tables are given in Appendix A.

The reedbed communities and associated vegetation are:

Community RB19 – *Phragmites australis – Calystegia sepium* tall herb fen

Community RB20 – *Phragmites australis – Solanum dulcamara* tall herb fen

Community RB21 – *Phragmites australis – Lemna minor* reedswamp

Community RB22 - *Holcus lanatus – Arrhenatherum elatius* vegetation

Community RB19 – *Phragmites australis – Calystegia sepium* tall herb fen

Seven samples were taken from this vegetation, which occurs in several places within the reedbeds. *Phragmites australis* is the overwhelming dominant, usually forming a complete canopy, except where tufts of *Carex acutiformis* and the occasional *Typha latifolia* are present. The reed is often festooned with the scrambler *Calystegia sepium* and sometimes with *Lotus pedunculatus*, *Galium aparine* and *Vicia cracca*. The field layer is sparse, but *Urtica dioica*, *Cirsium palustre*, *Poa trivialis*, *Eupatorium cannabinum* and *Iris pseudacorus* are constant, if rather infrequent. The ground layer is very fragmentary, with the occasional *Cardamine pratensis*, *Agrostis stolonifera* and *Lychnis flos-cuculi*. The moss flora is restricted to

Brachythecium rutabulum and *Eurhychium praelongum*, which occasionally mantle the basal reed stems.

The average number of species is 16.0 (range 9-21 species per sample), making this the most species rich of the reedbed communities.

Owing to the abundance of *Phragmites*, Community RB19 is best placed within the *Phragmites australis-Urtica dioica* tall-herb fen (S26), though there is both a clear affinity with *Salix cinerea-Betula pubescens-Phragmites australis* woodland (W2a), to which the scrub cover on the reedbed can be referred, and a very close floristic match to the *Phragmites-Iris* sub-community of the *Epilobium hirsutum* tall herb community (OV26b). There is no close floristic match with any particular sub-community of *Phragmites-Urtica* fen[11], and it is determined that this vegetation is best retained at community level. The floristic similarity with the tall-herb vegetation may suggest that the reedbed is infused with eutrophic waters, either by flooding, or by seasonal drawdown, allowing the naturally eutrophic peat to oxidise.

This community is the most extensive of the reedbed types in lowland Britain, and is composed of predominantly common species. In Suffolk, all reedbeds are priority habitats under the Suffolk Biodiversity Action Plan, but the survey stands are not in themselves uncommon vegetation communities.

Community RB20 – *Phragmites australis – Solanum dulcamara* tall herb fen

Six samples of this vegetation were taken from among the reedbed stands. It is distinguished by the presence of only four constant species: *Phragmites australis*, which is normally the overwhelming dominant, though *Carex acutiformis* may successfully overcome this dominance in small patches, the scrambler *Calystegia sepium* which is as frequent as in community RB19, and the straggler *Solanum dulcamara*, which is ever-present though often as depauperate specimens. Apart from *C. acutiformis*, the grasses *Phalaris arundinacea* and *Poa trivialis* are the only other associates excepting scattered fronds of *Lemna minor*. The remaining species recorded from this vegetation are thinly scattered and occur in small numbers.

The average number of species is 6.8 (range 4-8 species per sample), making this a rather species-poor tall herb fen.

As with Community RB19, this community is clearly placed within the *Phragmites australis-Urtica dioica* tall-herb fen (S26), though it also shares a floristic affinity with *Salix-Betula-Phragmites* woodland (S2a) and the *Epilobium* tall-herb community (OV26b). Nonetheless, the more frequent occurrence of *S. dulcamara*, and the absence of key species from other sub-communities of this type of tall-herb fen, suggest that this vegetation is best referred to the *Epilobium hirsutum* sub-community (S26d).

Community RB21 – *Phragmites australis – Lemna* minor reedswamp

At the time of survey, the depth of water in the fringing reedswamp made access difficult and few samples were taken from this area. This stand was difficult to access safely, and three samples were considered sufficient to characterise its floristics and physiognomy. *Phragmites australis* is the overwhelming dominant, forming a dense canopy; an occasional stem of *Typha latifolia* projects from this layer. The average water depth of the samples was 30 cm at the time

[11] The closest match is with the Oenanthe crocata sub-community, which is exclusively western in distribution.

of survey, and the water surface was carpeted in large patches of *Lemna minor*. There are few individuals of different species beneath the canopy; *Calystegia sepium* is an occasional scrambler, and scattered stems of *Juncus subnodulosus*, *Iris pseudacorus* and *Apium nodiflorum* are also present.

The average number of species is 4.3 (range 3-6 species per sample), making this a species-poor reedswamp.

The comparative lack of associates indicates that this reedswamp should be referred to the *Phragmites australis* sub-community of the *Phragmites australis* swamp (S4a).

This is a common type of reedbed in lowland Britain, and is typical of emergent vegetation colonising a eutrophic waterbody.

Community RB22 - *Holcus lanatus – Arrhenatherum elatius* vegetation

A strip of raised bund forms a small stand, from which two samples were taken. The vegetation is characterised by varying proportions of the grasses *Holcus lanatus* and *Arrhenatherum elatius* growing amongst patches of *Cirsium arvense* and *Urtica dioica*. *Calystegia sepium* often scrambles over these plants. Few other species are present, and the samples recorded the emergents *Phragmites australis* and *Carex riparia*, with the weedy associate *Poa trivialis*, *Galium aparine* and *Rumex crispus*.

The average number of species is 7.5 (range 6-9 species per sample).

Community RB22 has a strong floristic affinity with the *Arrhenatherum elatius* sub-community of the *Phragmites-Urtica* tall-herb fen (S26b). Structurally, however, this kind of vegetation cannot be considered as a reed-bed, and is best accommodated according to its weedy dominants, as a form of the *Urtica dioica-Cirsium arvense* community (OV25).

This is a common kind of vegetation in lowland Britain, and is often associated with fertile, disturbed ground.

Wet Woodlands

Two forms of wet woodland occur within the survey area. The first has developed on the peat marsh amongst the fen meadow and reedbed communities. It clearly has a strong relation with reed and the bulkier sedges, and can be regarded as a successional development from abandoned reedbed. The areas of willow and alder scrub colonising the unmanaged reedbeds can be regarded as young examples of this woodland type. The second form lies on the thinner peats at the margin of the Sizewell Marshes, and extends upslope from the Turf Pits area between the Kenton and Goose Hills. *Alnus glutinosa* is the most common canopy-forming tree species, but nowhere forms an extensive canopy. In the shrub layer, *Salix cinerea* is frequent, and in places on the Marshes, forms areas of intact sub-canopy in the absence of alder.

No synoptic table is provided for these two communities but full community tables are given in Appendix A.

Community WW23 – *Alnus glutinosa – Iris pseudacorus* woodland

Community WW24 – *Alnus glutinosa – Glechoma hederacea* woodland

Community WW23 – *Alnus glutinosa – Iris pseudacorus* woodland

Fourteen samples were recorded from this type of woodland, which occurs solely on what is likely to be deep peat amongst the fen meadow and reedbed communities. *Alnus glutinosa*, *Fraxinus excelsior* and *Quercus robur* are all present in the canopy over most of the stand, but the canopy in some parts of the stand are dominated by *Betula pubescens* and *Populus nigra* agg. The shrub layer is often patchy, and varies from being virtually absent to forming patches of sub-canopy in the absence of canopy species. *Salix cinerea* is the most frequent species, with some *Crataegus monogyna* and other shrub willows. Saplings of *Alnus glutinosa* are frequent, and those of *Fraxinus excelsior, Betula pubescens* and *Quercus robur* were also recorded.

The field and ground layers are most conspicuously characterised by species found in the surrounding wetlands. In particular, *Iris pseudacorus*, *Solanum dulcamara*, *Poa trivialis* and *Urtica dioica* are constant. Common associates are *Phragmites australis*, which is patchily dominant, and the thin straggling stems of *Galium aparine*. *Carex acutiformis*, *Mentha aquatica* and *Lycopus europaeus* are also locally frequent. On the ground, the bryoflora is largely made up of the common mosses *Eurhynchium praelongum* and *Brachythecium rutabulum*. With the exception of the areas where *Phragmites* and *Lycopus* dominate, the field and ground layers are often composed of scattered plants.

Community WW23 is clearly related to the *Salix cinerea-Betula pubescens-Phragmites australis* woodland (W2), and to the *Alnus glutinosa-Carex paniculata* woodland (W5). Where the alder canopy is absent, *Betula pubescens* and *Salix cinerea* form an open canopy over a *Phragmites*-dominated field layer. Here, these parts of the stand most closely resemble the *Alnus glutinosa-Filipendula ulmaria* sub-community of the *Salix-Betula-Phragmites* woodland (W2a). However, much of the stand is clearly most closely affiliated with the *Phragmites australis* sub-community of the *Alnus-Carex* woodland (W5a).

In summary, this woodland can be referred to as W5a woodland. This community has become infrequent in Suffolk river valleys, and is often restricted to peat bodies marking valleyside seepages. It is an immature example of this type of woodland, which is typically associated with wetter ground conditions than that found in Community WW24.

Community WW24 – *Alnus glutinosa – Glechoma hederacea* woodland

Three samples were taken from this small stand, which grades from the Turf Pits area on the margins of the deep peat that characterises the Sizewell Marshes, through areas of shallowing peat to the dry woodland at its western end. The upper part of the stand may be influenced by local seepage from the free-draining rocks of the Norwich Crag and overlying glacial sands and gravels and is clearly somewhat intermediate in its floristic composition between the mildly acid dry woodland that surrounds it, and true valley fen woodland. Planted *Alnus cordata* and *Rhododendron ponticum* are both features of what is a rather modified stand.

Alnus glutinosa is the only constant canopy species and, sharing the canopy cover with *Fraxinus excelsior* in only part of the stand, is patchily dominant. *Salix cinerea* occurs as a patchy shrub layer, but much of the stand has only a thin sub-canopy made up of *Populus tremula* and *Acer pseudoplatanus* saplings.

The field layer represented by the samples shares a number of constants, particularly *Glechoma hederacea*, *Holcus lanatus*, *Dryopteris dilatata* and *Urtica dioica*. On higher ground, these are associated with *Pteridium aquilinum*, *Silene dioica* and *Ceratocapnos claviculata*, while on lower ground *Poa trivialis* is ubiquitous, forming lush carpets containing occasional individuals of *Ranunculus repens* and *Stachys sylvatica*. In the wettest areas *Iris pseudacorus*, *Mentha*

aquatica and *Cirsium palustre* are locally frequent. The bryoflora on the higher ground includes *Mnium hornum*, while *Eurhynchium praelongum* is the sole moss on lower ground.

Community WW24 is an example of a wet woodland formed on the margins of a floodplain and extending upslope in the narrow valley floor. The minimal seepage from very free-draining substrates probably prevents the development of a woodland type more typical of valley sides, and the stand is best accommodated within the Typical sub-community of the *Alnus glutinosa-Urtica dioica* woodland (W6a).

This is amongst the more common types of wet woodland in Suffolk, but is restricted to low-lying valley side and partly drained floodplains. In the driest and the wettest parts of the stand, other woodland types are apparent, but their extent is very local and confined to small topographical features.

Grazing Marshes Dyke Survey

As shown in Figure 3.5, six distinct communities were identified, with often quite discreet distributions through the survey area:

Community DY25 - *Hydrocharis morsus-ranae - Lemna trisulca* aquatic community

Community DY26 – *Ceratophyllum submersum* aquatic community

Community DY27 – *Myriophyllum spicatum – Potamogeton pectinatus* aquatic community

Community DY28 – *Chara vulgaris* aquatic community

Community DY29 – *Lemna minor* aquatic community

Community DY30 – *Phragmites australis* emergent community

A synoptic table has been produced to emphasise the key floristic characters of these communities (Table 3.7). Seven of the 132 samples could not readily be included within the identified communities. Therefore, while these samples are given in the relevant community tables, they are not included in the constancy column, as they lack key character species.

Table 3.7 Synoptic Table for the Aquatic (including Dyke and Swamp) Communities*

Aquatic Communities (DY):	25	26	27	28	29	30
Lemna minor	III	IV			V	
Lemna trisulca	V	V				
Hydrocharis morsus-ranae	V	II				
Cladophora sp.		IV	II	IV		III
Spirogyra sp.	II					
Ceratophyllum submersum		V				
Myriophyllum spicatum			V			
Potamogeton pectinatus			IV			
Chara vulgaris				V		

Aquatic Communities (DY):	25	26	27	28	29	30
Ceratophyllum demersum	II			II		
Myriophyllum verticillatum	III					
Elodea canadensis	III					
Hottonia palustris	III					
Phragmites australis	IV		III	IV	III	V
Bolboschoenus maritimus			III	V		
Berula erecta	IV	V				
Iris pseudacorus	II					
Sparganium erectum	II					
Juncus subnodulosus	II	II				
Mentha aquatica	II	II				
Agrostis stolonifera		III	III			
Schoenoplectus tabernaemontani				III		
Aster tripolium				II		
Juncus articulatus				II		

*Showing the communities where species occur in more than 20 per cent of the samples allocated to each community (for a definition of the frequency ranges see Table 2.2). The species groups are ordered by the floating, submerged or emergent habit of each species.

In the following community descriptions, species-richness refers solely to the average score of the number of aquatic (floating plus submerged) species in each sample; reference is also made to the classification of Wolfe-Murphy *et al*. (1991). Their endgroups[12] are correlated by the authors to the nearest equivalent NVC communities, and are referred to in each community description.

It should be noted that the NVC method requires that the floating, submerged and emergent flora be considered separately in allocating samples, or groups of samples, to the classification. For example, a reed-filled dyke with a floating duckweed carpet and sparse submerged vegetation may be regarded as constituting a S4 *Phragmites* swamp over an A2 *Lemna* community. In another situation, a sparse emergent or floating flora may be subsumed within a community rich in submerged species which, as defined, may include the same emergent or floating species that would otherwise be considered separately if they were more abundant.

Because of the different sample size, no direct comparison should be made with previous surveys in the study area referred to in section 3: the samples were taken with the sole intent of classifying the vegetation within the NVC, and the reference to endgroups is intended as indicative rather than definitive.

[12] This is a term used in statistics to denote a group of samples with similar characteristics.

Community DY25 - *Hydrocharis morsus-ranae - Lemna trisulca* aquatic community

Forty seven samples were assigned to this community, with a further three samples more tentatively included here, though each lacks some character species. The samples are dominated by the presence of *Hydrochaeris morsus-ranae* and *Lemna trisulca*, which form a floating carpet, often with contributions from *Lemna minor* and *Spirodela polyrhiza*. The most frequently associated submerged species are *Elodea canadensis*, *Myriophyllum verticillatum*, *Hottonia palustris* and both *Ceratophyllum demersum* and *C. submersum*. Occasional species include *Chara vulgaris* and *Potamogeton trichoides*.

The average number of floating and submerged aquatic species is 4.7 (range 1-9 species per sample), making this the richest community within the study area for aquatic plant species.

A number of emergent species are frequently encountered, notably *Berula erecta* and *Sparganium erectum*, which often form a low, scattered canopy over the *Hydrochaeris-Lemna* floating carpet. *Oenanthe fistulosa* was also recorded here.

The aquatic vegetation corresponds to Endgroup 1 of the Wolfe-Murphy *et al*. (1991) classification, which they summarise (using NVC codes) as:

Mainly floating carpets of Lemna minor (A2) and / or Hydrochaeris morsus-ranae-Lemna (synonymy Spirodela) polyrhiza (A3) over submerged vegetation dominated by Ceratophyllum demersum (A5), occasionally Elodea canadensis (A15).

They note that the bulk of this vegetation is equivalent to the *Hydrochaeris-Spirodela* community (A3).

Community DY25, in fact, also includes many samples with the submerged species *Myriophyllum verticillatum* and *Hottonia palustris*, for which the *Hydrocharis-Stratiotes* community (A4) is preferential, and that subsumes the species forming a floating carpet.

In summary, the community can therefore be referred to the *Hydrocharis morsus-ranae-Stratiotes aloides* community (A4). According to Rodwell (2000a) this vegetation *is now very local and mostly confined to Broadland*.

Community DY26 – *Ceratophyllum submersum* aquatic community

Six samples were assigned to this community, with a further two samples more tentatively included here, though each lacks some character species. The samples frequently display an often thin floating carpet, largely composed of *Lemna trisulca* and *L. minor*. The distinctive feature of the community, however, is the thick tangle of *Ceratophyllum submersum* lying just below the water surface, usually suspended below dense masses of algae, predominantly *Cladophora* species. In one sample, lime-encrusted strands of the stonewort *Chara vulgaris* var. *vulgaris* was recorded.

The average number of floating and submerged aquatic species is 4.0 (range 3-5 species per sample), making this the second richest community within the study area for aquatic plant species.

Berula erecta is a constant, though occasional companion and stray stolons of *Agrostis stolonifera* are often found trailing over these submerged species.

The community was only recorded from the marsh dykes at Goose Hill, and its presence and condition has been monitored by Suffolk Wildlife Trust, as part of their aquatic dyke system vegetation monitoring programme (Casey *et al*., 1993; Casey, 1998; Hemphill 2006).

The aquatic vegetation corresponds to Endgroups 1 and 3 of the Wolfe-Murphy *et al.* (1991) classification, which they summarise (using NVC codes) as:

Endgroup 1: *Mainly floating carpets of Lemna minor (A2) and / or Hydrochaeris morsus-ranae-Lemna (synonymy Spirodela) polyrhiza (A3) over submerged vegetation dominated by Ceratophyllum demersum (A5), occasionally Elodea canadensis (A15).*

They note that the bulk of this vegetation is equivalent to the *Hydrochaeris-Spirodela* community (A3).

Endgroup 3: *Invariably beds of Ceratophyllum submersum (A6) beneath floating carpets of A2b*.

Community DY26, in fact, displays rather patchy floating carpets not only of A2b, but also A3. The only submerged vegetation distinguished in this group of samples is A6.

In summary, the community can be referred to the *Ceratophyllum submersum* community (A6) beneath floating carpets of either the *Lemna trisulca* sub-community of the *Lemna minor* community (A2b) or the *Spirodela polyrhiza-Hydrocharis morsus-ranae* community (A3).

According to Rodwell (2000a), the *C. submersum* community *is mostly confined to sites on or near the coast of south-eastern England, with scattered localities to the west.*

Community DY27 – *Myriophyllum spicatum – Potamogeton pectinatus* aquatic community

Two stands of this community were distinguished, with a total of 27 samples. In both stands, there are only scattered *Lemna minor* fronds on the water surface and the samples are characterized by the presence of frequent, though not ubiquitous, mats of the submerged plants *Myriophyllum spicatum* and *Potamogeton pectinatus*. The former is rather more common, but it, too, does not occur in all samples assigned to this community.

In stand A, *Enteromorpha* species is often found as submerged masses within the water column, and the aquatic species are usually accompanied by a very thin emergent canopy provided by *Phragmites australis*.

In stand B, *Zannichellia* is an infrequent associate of the dominant aquatic species, and is usually restricted to a few trailing stems. *Bolboschoenus maritimus* and *Agrostis stolonifera* are constant emergents in these samples, with some *Phragmites australis* and *Schoenoplectus tabernaemontani*.

The overall average number of aquatic species is 2.1 (range 0-4 species per sample); stand A is somewhat more species-rich (2.6) while stand B has a mean of 1.6 species; stand A is a more complete representation of the community, as the aquatic species in stand B are less frequent, and often subordinate to the emergent layer.

Both stands occur only in the seaward part of the Sizewell Levels, to the north of the preliminary works area.

The aquatic vegetation corresponds to either Endgroup 6 or 8 of the Wolfe-Murphy *et al.* (1991) classification, which they summarise (using NVC codes) as:

Endgroup 6: Mainly *Potamogeton pectinatus-Myriophyllum spicatum community (A11).*

Endgroup 8: *Potamogeton pectinatus invariably the sole submergent (A12)*

M. spicatum and *P. pectinatus* are both constant in the *Myriophyllum-Potamogeton* community (A11), but both stands defined by the survey samples lack the community associates of this often species-rich pondweed vegetation, which is characteristic of distinctly base-rich waters. It may be that the brackish conditions where the survey stands occur have affected formerly more species-rich dyke vegetation.

The species-poor stands are best located within the *Potamogeton pectinatus* community (A12), which *has a wide distribution through the lowlands of southern Britain* (Rodwell 2000a). *M. spicatum* is rather over-represented, but this vegetation extends into brackish waters and may itself have derived from the *Myriophyllum-Potamogeton* community. In stand B, the constant presence of the emergent *Bolboschoenus maritimus* can be referred to *Scirpus maritimus* swamp (S21).

Community DY28 – *Chara vulgaris* aquatic community

The main area of this infrequent community lies on the southern margin of the brackish part of Sizewell Levels and is recorded by five samples. Two further samples are more tentatively included here, though each lacks some character species and may also have some relation to Community DY26. *Chara vulgaris* var. *vulgaris* is the distinctive species of the submerged flora of these samples, though its presence varies from a thick lime-encrusted mat to scattered fronds. It is often accompanied beneath the surface by algal masses dominated by *Cladophora* species *Ceratophyllum demersum*, *Zannichellia palustris* and *Potamogeton pusillus* are among the associates. The remaining two samples share a number of these species.

The average number of floating and submerged aquatic species is 3.0 (range 2-4 species per sample), making this the third richest community within the study area for aquatic plant species.

The emergent flora is similar to stand B of Community DY27; *Bolboschoenus maritimus* and *Phragmites australis* form an often thin canopy, sometimes with *Schoenoplectus tabernaemontani*; *Aster tripolium* and *Juncus articulatus* are also present.

The aquatic vegetation in this community does not correlate clearly with the endgroups identified by Wolfe-Murphy *et al*. (1991) in their survey of Suffolk and Essex coastal dykes. Within the NVC, the *Potamogeton-Myriophyllum* community (A11) is the focus for stonewort records, and community DY28 is referred to this; the associate species, and the composition of surrounding dyke vegetation, indicate that the vegetation is best placed within the *Elodea canadensis* sub-community (A11b). The presence of several salt-tolerant emergent species suggests that the community is occasionally influenced by salt water.

The community is thus a rather unusual form and, by virtue of the presence of salt-tolerant species, is likely to be largely restricted to brackish habitats in coastal situations. Its conservation value is enhanced by forming part of a transition series of dyke communities on the Levels.

Community DY29 – *Lemna minor* aquatic community

Throughout the survey area, a number of sampled dykes lack the character species of communities DY25-DY28, and 33 samples have been grouped to form a rather diffuse community characterised by the constant and sometime ubiquitous floating carpet usually dominated by *Lemna minor*, though with a number of floating species making an occasional appearance. The submerged associates are infrequent or absent, and the emergent layer, if present, is largely restricted to *Phragmites australis*, *Bolboschoenus maritimus* or, in a few cases, by the taller fen meadow species of the bankside.

The average number of floating and submerged aquatic species is only 1.9 (range 1-4 species per sample), making this one of the poorest communities within the study area for aquatic plant species.

This community is typical of particular peripheral drains and dykes and, sometimes in association with community DY30, defines particular waterbodies either unfavourable for aquatic plant growth, or subject to forms of disturbance or constraint that restrict their development.

The aquatic vegetation predominantly corresponds to Endgroup 4 of the Wolfe-Murphy *et al.* (1991) classification, which they summarise (using NVC codes) as:

Endgroup 4: *Generally species-poor Lemna minor (A2), although often with Lemna trisulca and then referrable to the (A2b) sub-community*.

All but a few of the samples in community DY29 can be directly referred to the Typical sub-community of the *Lemna minor* community (A2a), where the floating carpet can vary from sparse to continuous. This is a common aquatic community throughout lowland Britain. A few samples, by virtue of the presence of *L. trisulca*, may be referred to sub-community (A2b). All samples lack a significant development of a submerged flora, though a few samples contain scattered individuals of species commonly associated with *Potamogeton-Myriophyllum* vegetation (A11).

Community DY30 – *Phragmites australis* emergent community

On the Minsmere Levels, five samples were taken from stretches of dyke where occasional *Lemna* species and spots of *Cladophora* species were the only aquatic plants; *Phragmites australis* was found to be the sole constant and other emergents, including *Rorippa nasturtium-aquaticum*, were always more frequent than either floating carpet or submerged plants.

The average number of floating and submerged aquatic species is only 1. (range 1-2 species per sample), making this the poorest community within the study area for aquatic plant species.

Like the *Lemna minor* aquatic community, samples of this community were located along particular water bodies, and the lack of aquatic vegetation may indicate unfavourable or difficult conditions for their development.

Community DY30 may be referred to the *Phragmites australis* sub-community of the *Phragmites australis* swamp (S4a), which is a common swamp community throughout lowland Britain.

Dry Woodlands and Rides

The woodland habitats of Kenton and Goose Hills can be sub-divided into two classes:

- Dry woodland
- Ride network

The distribution of the vegetation communities identified within these habitats is shown in Figure 3.6.

Dry Woodlands

Three distinct communities were identified, the first with two stands showing discernable differences in species composition, with quite discreet distributions through the survey area:

Community DW31 – *Pteridium aquilinum-Ceratocapnos claviculata* woodland

Stand A– *Agrostis capillaris-Dryopteris dilatata* community

Stand B– *Lonicera periclymenum-Dryopteris filix-mas* community

Community DW32 – *Quercus robur-Urtica dioica* woodland

Community DW33 – *Ulmus procera* scrub

A synoptic table has been produced to emphasise the key floristic characters of these communities (Table 3.8).

Table 3.8 Synoptic Table for the Dry Woodland Communities*

Communities (DW):	**31a**	**31b**	**32**	**33**
Canopy layer				
Pinus nigra laricio	IV	IV	IV	
Betula pubescens	II			
Betula pendula		II		
Quercus robur		II	V	
Acer pseudoplatanus			II	
Castanea sativa			III	
Shrub layer				
Betula pendula sapling	II	III		
Ulex europaeus		II		
Sambucus nigra		III	IV	
Crataegus monogyna		II	IV	
Acer pseudoplatanus sapling		II	III	
Ulmus procera suckers			III	2
Corylus avellana			III	
Field / ground layer				
Ceratocapnos claviculata	V	V	II	
Pteridium aquilinum	V	IV		
Rubus fruticosus agg	IV	IV		
Scleropodium purum	IV	II		
Agrostis capillaris	IV			
Dryopteris dilatata	IV			

Communities (DW):	31a	31b	32	33
Eurhynchium praelongum	III	III	IV	2
Fissidens taxifolius	III			
Holcus lanatus	II	III		2
Hypnum jutlandicum	II	II		
Carex arenaria	II			
Dicranella heteromalla	II			
Galium saxatile	II			
Holcus mollis	II			
Hypnum cupressiforme	II			
Polytrichum formosum	II			
Polytrichum juniperinum	II			
Rumex acetosella	II			
Thuidium tamariscinum	II			
Lonicera periclymenum		IV		
Brachythecium rutabulum		III	II	
Dryopteris filix-mas		III		
Dicranum scoparium		II		
Urtica dioica			V	2
Galium aparine			IV	
Stellaria media			III	2
Anenome nemorosa			III	
Arctium minus agg			III	
Glechoma hederacea			II	2
Silene dioica			II	2
Hedera helix			II	
Acer pseudoplatanus seedling			II	
Arum maculatum			II	
Quercus robur seedling			II	
Chaerophyllum temulum				2
Poa trivialis				2

Showing the communities where species occur in more than 20 per cent of the samples allocated to each community (for a definition of the frequency ranges see Table 2.2). Where less than five samples were taken in defining a community, the number of samples are given for species occurring in more than 20 per cent of the samples.[13]

[13] Community DW33 contains two samples.

Community DW31 – *Pteridium aquilinum-Ceratocapnos claviculata* woodland

Twenty five samples were taken from this community, which ranges over Goose Hill and a large proportion of Kenton Hill. In the main, the community corresponds to the distribution of the plantation conifers, although areas of *Quercus rubra*, *Castanea sativa* and more recent plantations are also included.

Two variants are recognised as stands A and B, though they share a number of species in common. Throughout this community, the field layer is dominated by *Pteridium aquilinum* and *Rubus fruticosus*, with *Holcus lanatus*. The ground layer includes *Ceratocapnos claviculata* and the mosses *Scleropodium purum, Eurhynchium praelongum* and *Hypnum jutlandicum*, the latter often forming a dense ground carpet. Collectively, these species are indicative of dry, mildly acid soil conditions.

Stand A – *Agrostis capillaris-Dryopteris dilatata* community

In addition to the community associates, this stand of thirteen samples has a singularly sparse sub-canopy layer beneath the *Pinus nigra* ssp. *laricio* plantation, consisting almost entirely of scattered *Betula pendula* saplings. The field layer includes a suite of acidophile herbs and mosses. The herb layer, in addition to *Agrostis capillaris* and *Dryopteris dilatata*, frequently contains *Galium saxatile, Holcus mollis, Rumex acetosella* and *Carex arenaria*. These species are also present on the acid dune sands, and indicate that this stand can be regarded as part of the heathland habitat sensu lato, albeit that no ericaceous sub-shrubs were recorded.

Stand B – *Lonicera periclymenum-Dryopteris filix*-mas community

In addition to the community associates mentioned above, this stand of twelve samples has a rather more varied canopy and shrub layer than stand A. *Quercus robur* and *Betula pendula* are occasionally found in the canopy, above shrubs including *Sambucus nigra* and *Corylus avellana*, and saplings of B. *pendula* and *Acer pseudoplatanus*. The field and ground layers are rather less diverse than stand A, and lack the species associated with markedly acid soils. Instead, the flora has a more mesophytic character, with many records for *Lonicera periclymenum*, *Dryopteris filix-mas* and the moss *Brachythecium rutabulum*.

Owing to the dominance of *Pteridium* and *Rubus*, both stands clearly fall into the *Quercus robur-Pteridium aquilinum-Rubus fruticosus* woodland community (W10). This is a common type of woodland on the free-draining soils of Suffolk. In the Suffolk Sandlings, it is often the predominant natural woodland forming on valley slope Crag sands, and on the more fertile sands and gravels.

Stand A can readily be referred to the *Holcus lanatus* sub-community (W10d), but a secondary characterisation of the stand is needed to reflect the associated acidophilous flora. This can best be provided by reference to the *Quercus robur* sub-community of the *Quercus* spp.-*Betula* spp.-*Deschampsia flexuosa* woodland (W16a).

Stand A can therefore be referred to as W10d (W16a). This is now an uncommon woodland type in Suffolk, and is restricted to infertile sands.

Stand B can also readily be referred to the *Holcus lanatus* sub-community (W10d).

The distinction between the stand is important in vegetation terms, as it indicates the potential for stand A to develop heathland characters through management, which is not the case for stand B.

Quercus-Pteridium-Rubus woodland is widely distributed and common over the lowlands of England and Wales; the *Holcus sub-community occurs throughout most of the range but has been most frequently recorded in plantations in the Weald, East Anglia and the Midlands* (Rodwell 2000a).

Community DW32 – *Quercus robur-Urtica dioica* woodland

Six samples were taken from this woodland type, which was confined to Kenton Hill. The canopy is often rather mixed, with *Pinus nigra* ssp. *laricio* often co-dominant with *Quercus robur*, and *Acer pseudoplatanus*, *Castanea sativa* and *Ulmus procera* suckers also evident in some places. The shrub layer is better developed than in community DW31, with *Corylus avellana* joining *Sambucus nigra* and *Crataegus monogyna*. The field and ground layers are dominated by *Urtica dioica*, often with *Galium aparine* and the moss *Eurhynchium praelongum*. A long list of occasionals was also recorded, and it is understood that *Hyacinthoides non-scripta* is present in the western end of Kenton Hills.

Community DW32 can best be accommodated within the *Primula vulgaris-Glechoma hederacea* sub-community of the *Fraxinus excelsior-Acer campestre-Mercurialis perennis* woodland (W8a) as a dry variant of this community. According to Rodwell (2000a), this type of woodland *is widespread over more base-rich soils in lowland Britain*, and the *Primula-Glechoma* sub-community is *especially well-represented in the east Midlands, East Anglia and the Weald*.

Community DW33 – *Ulmus procera* scrub

Two samples were taken of this stand, which forms a linear block on the southern slope of the shallow valley between Kenton and Goose Hills, bisected by a trackway. *Ulmus procera* suckers form a canopy and almost entirely exclude a shrub layer. *Urtica dioica*, *Glechoma hederacea*, *Silene dioica* and *Poa trivialis* form a distinctive field layer over the ubiquitous *Eurhynchium praelongum*. This flora is very characteristic of moist-dry fertile soils on free-draining substrates in the Suffolk Sandlings.

The community can be referred to the *Crataegus monogyna-Hedera helix* scrub community (W21), though its distinctive features were apparently not sampled for the NVC, and no clear association to a particular sub-community is evident. The floristic composition of the stand indicates that it would develop into a form of *Fraxinus-Acer-Mercurialis* woodland (W8) in time.

Crataegus-Hedera scrub (W21) is widely distributed through the British lowlands.

Felled and Replanted Areas

Felled and replanted areas recorded by the survey were typically revegetated by two groups of species. The first group is comprised of those species making a rapid response to the nutrient flush concomitant with vegetation clearance and ground disturbance. These include the typical dominants of the cleared areas: *Rubus fruticosus*, *Pteridium aquilinum* and *Chamerion angustifolium*. These species share aggressive colonisation and patch-spreading habits, and are sufficiently shade-tolerant to survive beneath a scattered canopy at pole stage. Small patches of *Ulex europaeus* and *Cytisus scoparius* were noted, but had not developed into canopy dominants. Other nitrophiles include *Urtica dioica* and *Silene dioica*, which are both locally frequent, and scattered individuals of *Arctium minus* and *Glechoma hederacea*.

The second and more extensive group consists of species commonly associated with dry and somewhat acidic ground, and typically present in the ride network or in surrounding dryland habitats. Principal among these are *Agrostis capillaris*, *Holcus lanatus* and *Rumex acetosella*, which occur frequently in the recently cleared areas, and linger in the patches of more open ground amongst the patch- forming dominants of the first group. These species are often accompanied by the acidophilous grasses *Agrostis vinealis*, *Anthoxanthum odoratum*, and the annuals *Erodium cicutarium* and *Ornithopus perpusillus*.

Unbrowsed vegetation in regenerating areas is typically a mosaic of immature micro-stands of the following NVC communities, depending upon the dominant cover plant in the field layer:

W23b *Rumex acetosella* sub-community of the *Ulex europaeus-Rubus fruticosus* scrub

OV27c *Rubus fruticosus* agg.-*Dryopteris dilatata* sub-community of the *Epilobium angustifolium* community

W25b *Hyacinthoides non-scripta* sub-community of the *Pteridium aquilinum-Rubus fruticosus* underscrub

In gaps between the patches formed by these dominants, the field and ground layer can be kept open by rabbit browsing/grazing. Over the higher ground, particularly to the east, an immature acid grassland can form, which corresponds to the *Festuca ovina-Agrostis capillaris-Rumex acetosella* grassland (U1). Where grasses come to dominate, the *Anthoxanthum odoratum-Lotus corniculatus* sub-community predominates, where therophytes[14] and/or bryophytes remain frequent amongst patchy grass cover, this vegetation corresponds to the *Erodium cicutarium-Teesdalia nudicaulis* sub-community.

In moister areas, *Urtica dioica* and *Juncus effusus* may form local clonal patches, but are these are not extensive.

Ride Vegetation

Six distinct communities were identified, each focussed on a particular position within the ride network:

Community RI34 – *Agrostis capillaris – Polytrichum juniperinum* community

Community RI35 – *Agrostis capillaris – Eurhynchium praelongum* community

Community RI36 – *Agrostis capillaris – Sagina procumbens* community

Community RI37 – *Pteridium aquilinum – Agrostis capillaris* community

Community RI38 – *Poa annua – Agrostis capillaris* community

Community RI39 – *Poa annua – Taraxacum officinale* agg. community

[14] A therophyte is one of the sub-divisions of the Raunkiær system, which categorises plants using "life-form" categories, and was devised by Christen C. Raunkiær. The subdivisions of the Raunkiær system are based on the location of the plant's growth-point (bud) during seasons with adverse conditions (cold or dry seasons). A therophyte is a plant which survives such unfavourable seasons in the form of a seed completing its life-cycle during favourable seasons.

A synoptic table has been produced to emphasise the key floristic characters of these communities (Table 3.9).

Table 3.9 Synoptic Table for the Ride Communities

Communities (RI):	**34**	**35**	**36**	**37**	**38**	**39**
Agrostis capillaris	V	V	V	3	V	
Rumex acetosella	V	III	II	2		
Polytrichum juniperinum	V		II			
Scleropodium purum	III	IV	II	2		
Hypnum jutlandicum	III	II				
Anthoxanthum odoratum	III	IV	II			
Carex arenaria	III		IV			
Holcus lanatus	II	IV	III	2	V	IV
Poa annua	II	IV	V		V	IV
Pteridium aquilinum	II	II		3	II	
Dicranum scoparium	II	II				
Aira praecox	II		IV			
Syntrichia ruraliformis	II					
Hypnum cupressiforme	II					
Campylopus pyriformis	II					
Eurhynchium praelongum		V	III		IV	III
Rhytidiadelphus squarrosus		IV	III			
Cerastium fontanum		II	II			II
Rubus fruticosus agg		II				II
Dicranella heteromalla		II				
Sagina procumbens			V			
Vulpia bromoides			V			
Trifolium repens			III			IV
Plantago major			III			III
Prunella vulgaris			III			II
Aphanes australis			III			

Communities (RI):	34	35	36	37	38	39
Veronica serpyllifolia			III			
Senecio jacobaea			III			
Hypochaeris radicata			III			
Bryum sp.			III			
Filago vulgaris			III			
Lolium perenne			II		V	IV
Bryum argenteum			II			
Bromus hordeaceus hordeaceus			II			
Ornithopus perpusillus			II			
Trifolium glomeratum			II			
Plantago coronopus			II			
Trifolium micranthum			II			
Inula conyza			II			
Vicia sativa nigra			II			
Silene dioica				2		III
Holcus mollis				2		
Ceratocapnos claviculata				2		
Ranunculus repens					II	III
Urtica dioica					II	II
Dactylis glomerata					II	II
Phragmites australis					II	
Poa trivialis						IV
Taraxacum officinale agg						IV
Stellaria media						III
Myosotis arvensis						II
Rumex obtusifolius						II
Glechoma hederacea						II
Lapsana communis						II
Galium aparine						II
Plantago lanceolata						II

Communities (RI):	34	35	36	37	38	39
Geranium robertianum						II

Showing the communities where species occur in more than 20 per cent of the samples allocated to each community (for a definition of the frequency ranges see Table 2.2).[15]

Community RI34 – *Agrostis capillaris – Polytrichum juniperinum* community

Nine samples were taken from this stand, which occurs in open rides on the high ground of Goose Hill. *Agrostis capillaris*, *Polytrichum juniperinum*, *Scleropodium purum* and *Rumex acetosella* are the constants and usually dominant in a short, rather open and parched sward. The occurrence of the stand corresponds to high daylight areas within the plantation where there is moderate trampling. Bryophytes are particularly frequent and diverse in this community, and *Syntrichia ruraliformis*, *Hypnum cupressiforme* and *Campylopus pyriformis* are all frequent. A very thinly scattered lichen flora is also present in some areas of the stand, including *Cladonia foliacea*. The Nationally Scarce herb *Crassula tillaea* is occasionally present in open ground, often found growing with *Carex arenaria*.

The average number of plant species is 13.8 (range 7-18 species per sample).

Community RI34 can be referred to the *Erodium cicutarium-Teesdalia nudicaulis* sub-community of the *Festuca ovina-Agrostis capillaris-Rumex acetosella* grassland (U1c), though it should be noted that the vegetation also has some characteristics of the *Anthoxanthum odoratum* sub-community of the *Carex arenaria-Festuca ovina-Agrostis capillaris* dune grassland (SD12a).

This is a notable community, infrequent in Suffolk, and largely restricted to infertile loose sands.

Community RI35 – *Agrostis capillaris – Eurhynchium praelongum* community

Seventeen samples were taken from this stand, which occurs in somewhat shaded conditions, often in narrow rides and/or in very lightly trampled conditions. This community occurs in the general vicinity of community RI34, but over a wider area. *Agrostis capillaris* and *Scleropodium purum* are still constants, with the perennial grasses *Holcus lanatus* and *Anthoxanthum odoratum*, but the suite of bryophytes is now dominated by *Eurhynchium praelongum* and *Rhytidiadelphus squarrosus*. *Hypnum jutlandicum* and *Dicranella heteromalla* are also associates. *Poa annua* is much more frequent than in community RI34 and occupies the more trampled areas within the stand, sometimes accompanied by other annuals such as *Aphanes australis* and *Vulpia bromoides*.

The average number of plant species is 10.2 (range 6-15 species per sample).

The influence of shade tolerant species that have been able to colonise the moist conditions on the ride provides an unusual floristic composition for a grassland community. It is apparent, however, that the reduction in droughting has shifted the sward away from the *Festuca-Agrostis-Rumex* community (U1) typical of inland acid stands, towards the *Festuca-Agrostis-*

[15] Community RI37 – 3 samples were taken

Galium grassland (U4) more commonly found in areas of higher rainfall and more humid conditions.

Community RI35 is therefore referred to the *Holcus lanatus-Trifolium repens* sub-community of the *Festuca ovina-Agrostis capillaris-Galium saxatile* grassland (U4b), with which it shares many similarities.

The distribution of this community in Suffolk is poorly known, but has been recorded by the author in moist, rather acid but quite fertile sands.

Community RI36 – *Agrostis capillaris – Sagina procumbens* community

This community is defined by five samples taken from stands where a variety of annuals occupy patches of bare ground amongst a low, open sward of *Agrostis capillaris*, often with some *Holcus lanatus* and *Carex arenaria*. Areas of the mosses *Eurhynchium praelongum*, *Rhytidiadelphus squarrosus* and *Bryum* species are also present. The catalogue of annuals is extensive with *Poa annua*, *Vulpia bromoides*, *Aphanes australis* and *Filago vulgaris* being particularly frequent. *Trifolium glomeratum*, *T. scabrum* and *Crassula tillaea* are also present.

The average number of plant species is 21.6 (range 14-26 species per sample).

Community RI36 can be referred to the *Erodium cicutarium-Teesdalia nudicaulis* sub-community of the *Festuca ovina-Agrostis capillaris-Rumex acetosella* grassland (U1c), however, it has many different species to community RI34, and the species present indicate that the substrate, although dry and liable to parching, may be less acid than in that community.

This kind of *Festuca-Agrostis-Rumex* grassland is also more frequently occurring, and is a common feature of less trampled paths and path margins on suitable soils throughout the Suffolk Sandlings.

Community RI37 – *Pteridium aquilinum – Agrostis capillaris* community

This occasional community has few, small stands, that tend to occur on abandoned areas of the wider rides. Three samples were taken of vegetation with abundant *Pteridium aquilinum*, standing over a grassy field layer of *Agrostis capillaris* and *Holcus* species. The herb component is quite varied, with frequent *Rumex acetosella* and *Ceratocapnos claviculata*. The bryoflora is sparse, but *Scleropodium purum* and *Hypnum jutlandicum* are both represented.

The average number of plant species is 9.7 (range 9-11 species per sample).

Community RI37 can be referred to the *Anthoxanthum odoratum* sub-community of the *Pteridium aquilinum-Galium saxatile* community (U20a). The vegetation is affected by colonisation from the surrounding woodland and appears to be developing towards a *Pteridium aquilinum-Rubus fruticosus* underscrub (W25).

The kind of bracken stand is not uncommon in conifer plantation on free-draining soils throughout Suffolk.

Community RI38 – *Poa annua – Agrostis capillaris* community

Six samples were taken of this kind of vegetation, which is somewhat transitional between the acid stands of the higher slopes, and the increasingly nutrient-loving vegetation of the base of slope. *Poa annua*, *Holcus lanatus* and *Agrostis caipillaris* are ubiquitous here, but the

vegetation is characterised by the appearance of *Lolium perenne*. There is an odd assortment of companion species, reflecting the juxtaposition of the upland flora with that of the peat margin.

The average number of plant species is 8.5 (range 7-10 species per sample).

Community RI38 is somewhat transitional between the *Lolium perenne-Poa pratensis* sub-community of the *Lolium perenne* grassland community (MG7e) and a more open, disturbed sward of the *Plantago major-Trifolium repens* sub-community of the *Lolium perenne-Dactylis glomerata* community (OV23c). The high cover of *Agrostis* suggests that the sward is best placed within the former syntaxon, and can be referred to as MG7e, which is of common occurrence in Suffolk.

Community RI39 – *Poa annua – Taraxacum officinale* agg. community
Six samples were taken from this stand which, like community RI38 is located low down on the slopes of the plantation. The flora is rather more diverse than for that community, with *Poa annua, P. trivialis, Lolium perenne, Holcus lanatus* and *Urtica dioica* all abundant in different samples.

The average number of plant species is 12.5 (range 9-18 species per sample).

The uniformity of these samples is not as close as in most other communities, and the companion species are both extensive and from different situations. As for community RI38, this assemblage is somewhat transitional between the *Lolium perenne-Poa pratensis* sub-community of the *Lolium perenne* grassland community (MG7e) and a more open, disturbed sward of the *Plantago major-Trifolium repens* sub-community of the *Lolium perenne-Dactylis glomerata* community (OV23c). The absence of *Agrostis capillaris* and the high cover of *Poa annua* suggest that the sward is best placed within the more ruderal community, and can be referred to as OV23c, a common community of fertile, disturbed situations.

3.2.2 2008 Survey

In the 2008 report, the term ‘stand’ is reserved for an area or areas of homogeneous vegetation. Where more than one area of a similar type of vegetation has been identified, these have been combined to form a single stand. Each stand is normally represented by the species composition and general vegetation characters recorded at a number of representative sample plots.

A total of 347 vegetation samples were taken from the survey areas defined in section 2. Analysis of the data has defined 34 vegetation stands, which are listed in **Error! Reference source not found..** The location of the samples and of the vegetation stands they represent are given in Figures 3.7-3.10.

In certain cases, stands of visually distinct aquatic or fen meadow vegetation are placed within the same NVC community but are retained as distinct areas in the accounts given in sections 3. If one characteristic of a stand is particularly visible – normally the abundance or constant presence of a species - the stand may be named as a distinctive ‘variant’ of a particular sub-community within the NVC.

In this report, the term ‘community’ is reserved for the published NVC vegetation units, and is not used as a synonym for a stand. This convention is employed as a way of distinguishing between the characters of the vegetation found in the survey area, and those of the NVC communities themselves. This means that several types of vegetation identified by the 2007 report as communities are renamed in this report as stands. Where Sizewell Marshes SSSI

samples taken in 2007 are collated with the 2008 data set, they have been re-assigned to the stands to which they have a closest match.

Where several similar stands are identified in particular habitats, a synoptic (summary) table is included in the accounts. Each table presents the summary data for the group of stands, which allows for comparison of their floristic characters.

For each stand, species are listed according to their constancy within the stand as shown in Table 3.10. For example, where a stand is composed of ten samples, the synoptic table would include all species occurring with a constancy of one or more. Where less than five samples were taken in defining a stand, the number of samples is given for species occurring in more than 20 per cent of the samples. This summary (or synoptic) table should be consulted when reading the stand accounts.

Table 3.10 Constancy Categories Used in Vegetation Tables

Constancy	Range (%)	
V	81-100	
IV	61-80	
III	41-60	
II	21-40	
I	1-20	Excluded from the synoptic table

Wherever possible, the stands are described in terms of the NVC, and are titled accordingly. Nonetheless, it should be evident from the stand descriptions, and the detailed stand tables presented in Appendix B. Data Tables for the Plant Communities, that some areas of distinct vegetation recorded by the survey are not accurate reflections of the published communities. In some cases, stands may be singular local representatives of a type of vegetation defined with reference to vegetation elsewhere in Britain. Other stands, such as most of the fen meadow vegetation, are distinct in the field, but are all subsumed in a broadly defined community (or sub-community) within the NVC. A few stands, such as the drier grasslands found on parts of the power station embankment and on the southern valley slopes, are not represented within the NVC; these are given descriptive names, though an attempt is made to align these kinds of vegetation within the broad framework of the NVC.

Vegetation is either mapped as homogeneous blocks, such as the fen meadow stands, or their distribution is illustrated by mapping only the sample locations (where different stands are intermingled (as with the dykes) or occur in only limited parts of the survey area (as is the case with the ride survey)).

Table 3.11 Summary of vegetation stands present within the study area[16]

Habitat	NVC Community		Stand
Dyke vegetation	A4 Hydrocharis morsus ranae-Stratiotes aloides community	Full sun variant	DY1a
		Shade variants	DY1b
		Stonewort variant	DY1c
		Elodea canadensis variant	DY1d
	A2b Lemna minor community, Lemna trisulca sub-community over		DY2
	A6 Ceratophyllum submersum community		
	A2c Lemna minor community, Riccia fluitans-Ricciocarpus sub-community over		DY3
	A16 Callitriche stagnalis community with		
	S23 Other water margin vegetation		
	A2a *Lemna minor* community, Typical sub-community over		DY4
	A16 *Callitriche stagnalis* community with		
	S23 Other water margin vegetation		
	A2a *Lemna minor* community, Typical sub-community over		DY5
	S23 Other water margin vegetation		
	A2a *Lemna minor* community, Typical sub-community with		DY6
	S4a *Phragmites australis* community, *Phragmites australis* sub-community		
	A2a *Lemna minor* community, Typical sub-community		DY7
Fen meadow	M22b *Juncus subnodulosus-Cirsium palustre* fen-meadow, *Briza media-Trifolium* spp. sub-community	Stand a	FM1a
		Stand b	FM1b
		Persicaria amphibia variant	FM1c
		Menyanthes trifoliata variant	FM1d
	M22b *Juncus subnodulosus-Cirsium palustre* fen-meadow, *Briza media-Trifolium* spp. sub-community with affinities to		FM2
	MG8 *Cynosurus cristatus-Caltha palustris* grassland		
	M22b *Juncus subnodulosus-Cirsium palustre* fen-meadow, *Briza media-Trifolium* spp. sub-community with affinities to		FM3a
	MG12a *Festuca arundinacea* grassland, *Lolium perenne-Holcus lanatus* sub-community		FM3b FM3c
	M22d *Juncus subnodulosus-Cirsium palustre* fen-meadow, *Iris pseudacorus* sub-community with affinities to		FM4
	MG12a *Festuca arundinacea* grassland, *Lolium perenne-Holcus lanatus* sub-community		

[16] Note that the table incorporates those stands or groups of samples surveyed in 2007 that fall within the current survey areas in order to provide a full account of the occurrence and character of each surveyed stand. NB the table does not include other types of vegetation surveyed in 2007.

Habitat	NVC Community	Stand
	M22b *Juncus subnodulosus-Cirsium palustre* fen-meadow, *Briza media-Trifolium* spp. sub-community / MG10a *Holcus lanatus-Juncus effusus* grassland, Typical sub-community. Intermediate.	FM5
	MG10a *Holcus lanatus-Juncus effusus* grassland, Typical sub-community	FM6
Valleyslope grasslands	*Holcus lanatus* grassland	VG1
	U1d *Festuca ovina-Agrostis capillaris-Rumex acetosella* grassland, *Anthoxanthum odoratum-Lotus corniculatus* sub-community	VG2
Reedbed	S26 *Phragmites australis-Urtica dioica* fen	RB1
Wet Woodland	W6a *Alnus glutinosa-Urtica dioica* woodland, Typical sub-community	WW1
	W2a *Salix cinerea-Betula pubescens-Phragmites australis* woodland, *Alnus glutinosa-Filipendula ulmaria* sub-community	WW2
	W5a *Alnus glutinosa-Carex paniculata* woodland, *Phragmites australis* sub-community	WW3
	W10d *Quercus robur-Pteridium aquilinum-Rubus fruticosus* woodland, *Holcus lanatus* sub-community	WW4
Ride vegetation	U1c *Festuca ovina-Agrostis capillaris-Rumex acetosella* grassland, *Erodium cicutarium-Teesdalia nudicaulis* sub-community	RI34
	With affinities to	
	SD12a *Carex arenaria-Festuca ovina-Agrostis capillaris* dune grassland, *Anthoxanthum odoratum* sub-community	
	U4b *Festuca ovina-Agrostis capillaris-Galium saxatile* grassland, *Holcus lanatus-Trifolium repens* sub-community	RI35
Coastal embankment	SD8 *Festuca rubra-Galium verum* fixed dune grassland	CE1
	Parched grassland	CE2
	W23 *Ulex europaeus-Rubus fruticosus* scrub	CE3

Aquatic vegetation of the Sizewell Marshes SSSI dykes

The 2007 survey of the dykes within 200m of the Preliminary Works Area (which took in part of the Minsmere Levels to the north), included 11 samples from dykes within Goose Hill Marsh and Goodram's Fen within the Sizewell Marshes SSSI. These were added to the 136 samples taken in 2008 from the fen meadow compartments and accessible areas of Goodram's Fen with an aquatic flora. This has allowed a comprehensive assessment of the aquatic vegetation of Sizewell Marshes SSSI, based on a total of 147 samples.

The aquatic species recorded in these samples have been subdivided into floating (9) and submerged species (16), along with aquatic algae genera (5). The floating plants include one moss (*Drepanocladus fluitans*, solely recorded when detached from the bank and floating on the water surface), a liverwort (*Riccia fluitans*) and an aquatic fern (*Azolla filiculoides*). This category also includes the floating form of *Persicaria amphibia*, but is dominated by *Lemna*

minor, *L. trisulca* and *Hydrocharis morsus-ranae*. Of the submerged aquatic species, *Ceratophyllum demersum*, *Elodea canadensis* and *Callitriche stagnalis* are particularly evident, though several dykes have abundant *Ceratophyllum submersum* and *Chara vulgaris*.

In addition, 12 species were recorded as marginal emergents. These are species found within the waterbody that can form stoloniferous[17] 'rafts' from the bank. Detached fragments of the stolons may also occur within the floating aquatic flora; of these, the aquatic form of *Berula erecta* is particularly common in many dykes. Swamp and fen emergents were also recorded where stems arise within the waterbody. Where prolific, these species are recognized as a separate swamp community, but in most samples species such as *Sparganium erectum* and *Equisetum fluviatile* are subsumed within the aquatic communities of the NVC.

Of the vascular plants, two are Nationally Scarce[18]: *Potamogeton coloratus* and *Myriophyllum verticillatum*. *Ceratophyllum submersum*[19], *Hydrocharis morsus-ranae* and *Hottonia palustris* are uncommon (Preston, Pearman & Dines, 2002) but occur in more than 100 10 km squares and exceed the threshold for this conservation category. Several samples, taken from the dykes surrounding compartments G27, G37 and G3 contain records of another locally scarce species, *Carex diandra*, which occurs on the bankside margin of the waterbodies.

In the following stand descriptions, species-richness refers solely to the average score of the number of aquatic (floating plus submerged) species in each sample. There is no nationally adopted standard for determining species richness of aquatic plant communities. Reference is also made to the classification of Wolfe-Murphy *et al*. (1991); their endgroups[20] are correlated by the authors to the nearest equivalent NVC communities, and are referred to in each stand description. Because of the different sample size, no direct comparison should be made with previous surveys in the study area referred to in Section 2&3: the samples were taken with the sole intent of classifying the vegetation within the NVC, and the reference to endgroups is intended as indicative rather than a definitive definition.

As shown in Figure 3.7 and listed in Table 3.11, seven distinct stands are identified, with often quite discrete distributions through the survey area. They are named in terms of the NVC syntaxa[21] that are closest in character and species composition. One stand is further sub-divided into a number of variants, which describe distinct species compositions or ecological situations. Where appropriate, the dyke stands are described in terms of more than one NVC syntaxon; for example, a group of similar samples may contain a community of floating aquatic species over a submerged or swamp community, often dominated by one species, such as *Ceratophyllum submersum* or *Phragmites australis*.

In broad terms, stands DY1 and DY2 occur within the fen meadow dykes, while the remaining communities are found along the Mains Drains, in heavy shade or on the margins of Sizewell

[17] Stoloniferous – a root-like stem
[18] 'Nationally Scarce' defines those species that have been recorded from 16-100 10 km squares of the UK National Grid; the category is assigned to relevant species in, for example, Stace (1997) and Preston *et al* 2002).
[19] Given as Nationally Scarce by Casey (1998), but removed from this list by 1994 (Stewart, Pearman and Preston 1994).
[20] This is a term used in statistics to denote a group of samples with similar characteristics brought together following the application of a statistical procedure.
[21] In vegetation classification, a syntaxon is a taxonomic unit of the classification of any rank – amongst the communities identified, reference may be made to a community, sub-community or variant of a published community within the NVC.

Marshes. This separation is likely to reflect differing water chemistry, mediated by different light regimes and management occurring within the survey area.

A comparison of each stand is given in Table 3.12 according to the frequency of occurrence of species in each sample group. The species groups are ordered by the floating, submerged, marginal and swamp/fen habit of each species.

Table 3.12 Synoptic table for the aquatic and swamp stands recorded from Sizewell Marshes

Dyke vegetation	DY1a	DY1b	DY1c	DY1d	DY2	DY3	DY4	DY5	DY6	DY7
Floating										
Lemna minor	IV	V		II	V	2	V	V	4	V
Lemna trisulca	V	III	IV	V	IV	2			1	
Hydrocharis morsus-ranae	V	V	V	IV	II				1	
Persicaria amphibia		II								
Riccia fluitans						2				
Submerged										
Utricularia vulgaris	II	III		II						
Ceratophyllum demersum	III	V								
Chara vulgaris			V							
Elodea canadensis				V			II			
Ceratophyllum submersum					V					
Callitriche stagnalis						2	V	II		
Aquatic algae										
Spirogyra sp.	II	II	III	III	III	2	II			
Cladophora sp.						1				
Marginal										
Berula erecta	IV	III	IV	V	IV	2	III	IV	1	
Agrostis stolonifera		III		II	II				1	
Mentha aquatica	II			II	II	2		III		
Rorippa nasturtium-aquaticum				II			III	III		
Alisma plantago-aquatica				II						
Veronica beccabunga						1		II		
Swamp-Fen										
Phragmites australis	IV	III	III	IV	III		III		4	II
Juncus subnodulosus	II		III		II	1				
Iris pseudacorus	II		II					III		II
Rumex hydrolapathum	II		II	II					1	

Dyke vegetation	DY1a	DY1b	DY1c	DY1d	DY2	DY3	DY4	DY5	DY6	DY7
Carex pseudocyperus	II		III	II						
Carex riparia		II		II						
Equisetum fluviatile			II			2				
Sparganium erectum				III		1				
Juncus effusus						2				
Juncus articulatus						2				
Glyceria maxima								II		

Stand DY1 - A4 *Hydrocharis morsus-ranae – Stratiotes aloides* community

The four stands that relate to this NVC community are maintained as separate variants in order to emphasise the distinct differences in species composition and appearance. While each is considered separately, it is emphasized that the stands can be regarded as variants of the same NVC community. As such, an overall statement regarding the limited distribution of the community as a whole is reserved for the end of the stand accounts, and refers to all four stands.

Stand DY1a - A4 *Hydrocharis morsus-ranae – Stratiotes aloides community* – Full sun variant

Twenty-three samples were taken from this stand, which occurs exclusively in full sunlight, particularly in dykes north of Reckham Pits Wood (often in association with Stand DY1c) and south of Rookyard Wood.

The stand is characterised by a constant layer of floating species, usually *Hydrocharis morsus-ranae* subtended by suspended agglomerations of *Lemna trisulca*. The aquatic form of *Berula erecta* occurs throughout the stand, with stolon segments scattered over the surface. Scattered shoots of *Juncus subnodulosus, Rumex hydrolapathum* and *Iris pseudacorus* are common, and shoots of *Phragmites australis* are sometimes sufficiently frequent to give the appearance of swamp patches along several dyke sections.

Submerged aquatic species, while present throughout, rarely attain prominence in this stand. While *Ceratophyllum demersum* may sometimes be abundant, the dyke samples are characterised by contributions from several species, such as *Utricularia vulgaris* and the Nationally Scarce *Myriophyllum verticillatum*. *Callitriche stagnalis* and *Elodea canadensis*, though present, do not form mats as they do in Stands DY1d and DY4.

The average number of floating and submerged aquatic species is 4.0 (range 2-8 species per sample), making this the least species-rich variant of Stand DY1 in terms of its flora, though it compares favourably with the other dyke vegetation communities on this measure.

Stand DY1b - A4 *Hydrocharis morsus-ranae – Stratiotes aloides* community – Shade variants

Thirty four samples were taken from this stand, which occurred where dyke sections were at least partly shaded by alder and other trees and shrubs. Dykes where this vegetation occurs are mainly located within the fen meadow compartments, though some samples were taken from peat areas along the boundary with the power station. The proportion of cover directly above

the sample was measured by eye, and the samples are further divided into light and heavy shade forms. While this stand shows some distinctive features that are a likely response to lower light levels, other factors such as the orientation of the dyke, the amount of tree leaf-litter and the amount of skylight percolating through the canopy may contribute to the differences.

While *Hydrocharis morsus-ranae* and *Lemna trisulca* are present throughout, the floating vegetation layer is frequently dominated by *Lemna minor*. This species frequently forms a thick carpet over the surface, particularly in the heavy shaded form of the stand. *Spirodela polyrhiza* is also present in limited sections, and the occasional frond of *Persicaria amphibia* occurs sporadically.

Many samples recorded a thick tangle of *Ceratophyllum demersum*, sometimes accompanied or replaced by *Utricularia vulgaris.* *C. demersum*, in particular, is widely recognised as being tolerant of some shading, and may also be responding to the additional nutrient store provided by the input of leaf and other detritus into the waterbodies supporting this stand. These species are present in quantity in both shade forms, but are much less frequent under heavy shade conditions, where they are often absent. Associated submerged species are particularly common in the light shade form of the stand, with *Myriophyllum verticillatum, Potamogeton berchtoldii* and *Chara globularis* all present.

The light shade form of the stand also includes plentiful algal masses, with *Spirogyra* spp., *Cladophora* spp. and *Enteromorpha* spp. all being present in quantity. The latter genus is sometimes ubiquitous in particular dyke sections.

The marginal and swamp/fen species are also better represented in the light shade form, with *Berula erecta* and *Phragmites australis* being particularly common. Here, too, extension growths from the bankside flora occupy the margins of the dykes; *Agrostis stolonifera* and *Carex riparia* representing a range of associates in this stand. Of particular note are the occasional, scattered tussocks of *Carex diandra* that occur low down on the bankside.

The average number of floating and submerged aquatic species for the stand is 5.2 (range 1-8 species per sample), making this the most species-rich variant of Stand DY1 in terms of its flora. The light shade form (average 5.6) is significantly more species-rich than the heavy shade form (average 4.4), though it should be stressed that the latter does not include dyke sections where a flora was absent.

Stand DY1c - A4 *Hydrocharis morsus-ranae – Stratiotes aloides* community – Stonewort variant

This stand is represented by 12 samples from dyke sections in the most species-rich areas of fen meadow, north of Reckham Pits Wood and Rookyard Wood. Both are in central areas of the marsh in full sunlight.

In the western area above Reckham Pits Wood, the stand is dominated by the floating vegetation – *Hydrocharis morsus-ranae* and *Lemna trisulca*, with a discontinuous raft of *Berula erecta*. Beneath this canopy, *Chara vulgaris* and *Spirogyra* spp. are constant but never abundant, sometimes accompanied by *Myriophyllum verticillatum*.

In the eastern area, north of Rookyard Wood, the stonewort forms extensive, lime-encrusted swathes, with occasional contributions from the other species. In patches where the floating vegetation does dominate, the stonewort, which is notably light-demanding, is itself reduced to scattered individuals, and the presence of *Ceratophyllum demersum* and *Utricularis vulgaris* suggest the stonewort variant is giving way to other forms of the DY1 stand.

Swamp/fen associates are scattered and diverse: the stand includes both species occurring in the fen meadows, but also the occasional *Oenanthe lachenalii* and *Bolboschoenus maritimus*. These species are an indication that the stand may have some relation with Stand DY28 – *Chara vulgaris* aquatic community, which was recorded from the brackish parts of Sizewell Levels in 2007.

The average number of floating and submerged aquatic species for the stand is 4.6 (range 2-8 species per sample), making this one of the more species-rich variants of Stand DY1 in terms of its flora. This value lies between that given for Stand DY28 (3.0) and the light shade form of Stand DY1b (5.6).

Stand DY1d - A4 Hydrocharis morsus-ranae – Stratiotes aloides community – *Elodea canadensis* variant

This stand occurs in fragmented locations to the northeast of Reckham Pits Wood and along the southern margin of the marshes between Keeper's Cottage and Rosery Cottages. Nine samples were taken from open and partly shaded situations from dykes on the margins of areas supporting other variants of Stand DY1.

The stand is dominated by floating vegetation – *Hydrocharis morsus-ranae* and *Lemna triculca* - with a discontinuous raft of *Berula erecta*. The algal genus *Spirogyra* is also well represented, and blanketweed sometimes forms a thick mat on or near the water surface. *Elodea canadensis* is also constant and is the most common submerged species; it forms thick, ropey tangles along lengths of the dyke sections, giving way periodically to blanketweed or, in one section, to fine strands of *Chara globularis*. Other submerged species are no more than occasional, though *Utricularia vulgaris* and both *Ceratophyllum* species are present.

With the exception of *Berula erecta*, marginals are uncommon, and *Phragmites australis* and *Sparganium erectum* are the most frequent swamp species. In places, both species form patches of marginal swamp stands, but rarely cover the dyke surface.

The average number of floating and submerged aquatic species is 4.2 (range 2-7 species per sample), making this a stand of moderate species-richness within the survey area. It is similar in species composition and character to Stand DY25, encountered in 2007 on the Sizewell Levels to the north of the survey area, though it is less species-rich than that stand.

Evaluation of Stand DY1

The aquatic vegetation of all four above stands representing this type of vegetation all correspond to Endgroup 1 of the Wolfe-Murphy *et al*. (1991) classification, which they summarise (using NVC codes) as:

> Mainly floating carpets of *Lemna minor* (A2) and / or *Hydrochaeris morsus-ranae-Lemna* (synonymy *Spirodela*) *polyrhiza* (A3) over submerged vegetation dominated by *Ceratophyllum demersum* (A5), occasionally *Elodea canadensis* (A15).

Wolfe-Murphy *et al* note that the bulk of this vegetation is equivalent to the *Hydrochaeris-Spirodela* community (A3).

The addition of several species to the vegetation described by Wolfe-Murphy *et al* (1991), particularly *Myriophyllum verticillatum* and *Hottonia palustris*, for which the *Hydrocharis-Stratiotes* community (A4) is preferential, highlights a significant difference from the vegetation they described. Although the variants are distinct and display different species compositions, the

stand as a whole can be referred to the *Hydrocharis morsus-ranae-Stratiotes aloides* community (A4). According to Rodwell (1995) this vegetation "….is now very local and mostly confined to Broadland". Its representation at Sizewell Marshes is particularly notable in Suffolk as the site has a peat substrate, which is not a common feature of the county coastline; in addition, the shingle beach ridge has protected the Marshes from all but occasional saline intrusions. This community represents part of the complex of dyke vegetation noted in the SSSI citation.

Stand DY2 - A2b *Lemna minor* community, *Lemna trisulca* sub-community over A6 *Ceratophyllum submersum* community

A further 11 samples were added during the 2008 survey to the six samples gathered from a discrete area of this stand type (mapped in 2007 as DY26) on Goose Hill Marsh. This type of aquatic vegetation extends from Goose Hill Marsh southwards as far as Grimsey's Wood and into one dyke on Goodram's Fen. Other examples of this type of vegetation were identified from several dykes to the south of Leiston Carr and in scattered locations northeast of Reckham Pits Wood.

The distribution of floating vegetation is markedly variable amongst the dykes where this stand occurs. In some dyke sections, *Lemna minor* forms a dense carpet over the surface and, where the species is present, a mixed assemblage of *Hydrocharis morsus-ranae*, *Lemna trisulca* and occasional *Spirodela polyrhiza* also occurs. *Berula erecta* is a constant companion, though only occasional in number, and stray stolons of *Agrostis stolonifera* are often found trailing among these species.

The distinguishing feature of the stand, however, is *Ceratophyllum submersum*, which forms a thick tangle just below the water surface, usually suspended below dense masses of algae, predominantly *Spirogyra* species. In two samples, lime-encrusted strands of the stonewort *Chara vulgaris* were recorded.

The average number of floating and submerged aquatic species is 3.7 (range 3-7 species per sample), making this vegetation less species-rich than those referred to the A4 *Hydrocharis-Stratiotes* community, though clearly associated with them.

The aquatic vegetation corresponds to Endgroup 3 of the Wolfe-Murphy *et al*. (1991) classification, which they summarise (using NVC codes) as:

> Endgroup 3: Invariably beds of *Ceratophyllum submersum (A6)* beneath floating carpets *of A2b*.

In summary, the stand can be referred to the *Ceratophyllum submersum* community (A6) beneath floating carpets of *Lemna trisulca* sub-community of the *Lemna minor* community (A2b). According to Rodwell (1995), the *C. submersum* community "… is mostly confined to sites on or near the coast of south-eastern England, with scattered localities to the west". The *Lemna trisulca* vegetation is also centred on the southeast of lowland Britain. This community represents part of the complex of dyke vegetation noted in the SSSI citation.

Stand DY3 - A2c *Lemna minor* community, *Riccia fluitans-Ricciocarpus natans* sub-community over A16 *Callitriche stagnalis* community with S23 Other water margin vegetation

This minor stand is of limited extent, and is recorded from two dykes on the fringes of Compartment G63 by Lover's Lane. It resembles Stand DY4 in many respects, but has a more developed floating plant flora including masses of *Riccia fluitans* suspended near the surface of

the water column. In the recent Flora of Norfolk, the distribution of this aquatic liverwort is described as 'widely scattered' (Stevenson, R in Beckett & Bull 1999) and has been recorded from only 9 10 km-squares in that county. In Suffolk, its distribution is uncertain, though it has been recorded in 2008 from Docwra's Ditch near Coastguard Cottages, Dunwich by the author.

The submerged flora is limited to *Callitriche stagnalis* and the stand also includes a patchily developed marginal flora, sometimes dominated by *Berula erecta*, with *Veronica beccabunga* and *Mentha aquatica* associated.

The average number of floating and submerged aquatic species in the two samples referred to this stand is 3.9 (range 5-6 species per sample), making this vegetation less species-rich than those referred to the A4 *Hydrocharis-Stratiotes* community.

The aquatic vegetation broadly corresponds to Endgroup 2 of the Wolfe-Murphy *et al*. (1991) classification, which they summarise (using NVC codes) as:

> Endgroup 2: Includes mixtures of *Lemna minor* (typically A2a) and the *Callitriche stagnalis* (A16) but with associated brackish species, notably *Ranunculus baudotii* (A21).

Clearly, the stand lacks evidence for brackish influences.

In summary, this small stand can be referred to the *Riccia fluitans-Ricciocarpus natans* sub-community of the *Lemna minor* community (A2c), over the *Callitriche stagnalis* community (A16) with Other water margin vegetation (S23). According to Rodwell (1995), the *Riccia-Ricciocarpus* sub-community is south-eastern in its distribution, and the limited occurrence of the character species (at least in East Anglia) suggests that this is an uncommon community. Both the A16 and S23 communities are widespread and common in lowland Britain.

Stand DY4 - A2a *Lemna minor* community, Typical sub-community over A16 *Callitriche stagnalis* community with S23 Other water margin vegetation

Eleven samples were taken of this stand, which largely occurs along sections of the main drains, often in association with Stand DY5, and is recorded from all dykes surrounding compartment G59 towards the west of the survey area. It resembles Stand DY3 in many respects, but lacks *Riccia fluitans* amongst the floating flora. Here, *Lemna minor* is ubiquitous and forms patchy dense carpets along many sections. A scattered marginal flora is also often present, with *Berula erecta, Rorippa nasturtium-aquaticum* and sometimes spreads of *Catabrosa aquatica*, though this species appears to be less frequently occurring in some of the dykes and drains (personal observation); this may, in part, be a temporary consequence of recent dyke management. Swamp species are infrequent, with scattered *Phragmites australis* and *Iris pseudacorus*.

The submerged flora consists largely of *Callitriche* species. Identification of this genus remains uncertain in the absence of fruiting material: it is likely that *Callitriche stagnalis, C. obtusangula* and *C. platycarpa* are all represented, though most plant material was referred to *C. stagnalis*. *Elodea canadensis* is also present, particularly along the Leiston Drain, and there are scattered records of *Ceratophyllum demersum* and *Potamogeton berchtoldii*.

The average number of floating and submerged aquatic species in the two samples referred to this stand is 3.6 (range 2-6 species per sample), making this vegetation less species-rich than those referred to the A4 *Hydrocharis-Stratiotes* community.

As with Stand DY3, the aquatic vegetation broadly corresponds to Endgroup 2 of the Wolfe-Murphy *et al*. (1991) classification, which they summarise (using NVC codes) as:

> Endgroup 2: Includes mixtures of *Lemna minor* (typically A2a) and the *Callitriche stagnalis* (A16) but with associated brackish species, notably *Ranunculus baudotii* (A21).

Clearly, the stand lacks evidence for brackish influences.

In summary, this stand can be referred to the Typical sub-community of the *Lemna minor* community (A2a), over the *Callitriche stagnalis* community (A16) with Other water margin vegetation (S23). According to Rodwell (1995), all these communities are amongst the most common in lowland Britain, and are associated with standing water to moderately flowing waters, often of moderate to high fertility.

Stand DY5 - A2a *Lemna minor* community, Typical sub-community over S23 Other water margin vegetation

Ten samples were taken of this stand, which largely occurs along sections of the Main Drains, often in association with Stand DY4, as well as in standing waters often in shade in some dyke sections near the southern Main Drain beneath Reckham Pits Wood. There is a small outlier in a single dyke section near Round Covert.

Aquatic vegetation is largely represented by patches of *Lemna minor*, which seldom attain extensive proportions and are more typically found in the most slow-flowing sections of the Main Drains, often in the lee of coarse woody debris and amongst the stilt roots of bankside shrubs and trees. *Callitriche stagnalis* also occurs occasionally, emphasising the close relation of this vegetation with Stand DY4. Swamp/fen species are also present, with *Iris pseudacorus* and *Glyceria maxima* often present.

Much of the character of these stands lies in the often vigorous growths of marginal vegetation. *Berula erecta*, *Mentha aquatica* and *Rorippa nasturtium-aquaticum* all occur as lush, thick beds extending across the water surface, often in association with *Veronica beccabunga* and *Agrostis stolonifera*.

The average number of floating and submerged aquatic species is only 1.7 (range 1-5 species per sample), making this the poorest stand within the study area for aquatic plant species.

The aquatic vegetation predominantly corresponds to Endgroup 4 of the Wolfe-Murphy *et al*. (1991) classification, which they summarise (using NVC codes) as:

> Endgroup 4: Generally species-poor *Lemna minor* (A2), although often with *Lemna trisulca* and then referrable to the (A2b) sub-community.

All samples in this stand can be directly referred to the Typical sub-community of the *Lemna minor* community (A2a), where the floating carpet can vary from sparse to continuous. This is a common aquatic community throughout lowland Britain. Similarly, the S23 Other water margin vegetation is common and typical of ditches and slow-flowing streams.

Stand DY6 - A2a *Lemna minor* community, Typical sub-community with S4a *Phragmites australis* community, *Phragmites australis* sub-community

This minor stand has been recorded from the dykes surrounding the reedbed south of Grimsey's Wood, and along the southern Main Drain where it passes beside Goodram's Fen. In both

cases, dense growth of reed produces strong shade over the water surface, and it is likely that the aquatic vegetation is affected by low light levels.

The four samples referred to this stand have a simple structure with an often complete and dense carpet of *Lemna minor* over the water surface, and advancing stands of pure *Phragmites australis* extending from the channel margins. Two unassigned samples from the marginal marsh dyke in compartment G52 are also included here – these dyke sections contain reedswamp without the *Lemna minor* layer and one sample has recorded an area of the pondweed *Potamogeton pectinatus*.

The average number of floating and submerged aquatic species is only 1.8 (range 1-3 species per sample), making this one of the poorest communities within the study area for aquatic plant species.

The aquatic vegetation predominantly corresponds to Endgroup 4 of the Wolfe-Murphy *et al.* (1991) classification, which they summarise (using NVC codes) as:

> Endgroup 4: Generally species-poor *Lemna minor* (A2), although often with *Lemna trisulca* and then referrable to the (A2b) sub-community.

All samples in this stand can be directly referred to the Typical sub-community of the *Lemna minor* community (A2a), where the floating carpet can vary from sparse to continuous. This is a common aquatic community throughout lowland Britain. Similarly, the S4a *Phragmites australis* swamp, although less widespread, can be typical of disturbed peatlands and has low conservation value for its limited flora.

Stand DY7 – S2a *Lemna minor* aquatic community

Throughout the survey area, a number of sampled dykes lack the character species of the other communities. A group of 23 samples (including five samples from 2007) have been brought together to form a rather diffuse stand that often occurs in dyke sections amongst other aquatic vegetation. The stand is characterised by the constant and sometimes ubiquitous floating carpet usually dominated by *Lemna minor*, though with a number of floating species making an occasional appearance. The submerged associates are infrequent or absent, and the emergent layer, if present, is largely restricted to *Phragmites australis*, *Glyceria maxima* or, in a few cases, by the taller fen meadow species of the bankside.

The average number of floating and submerged aquatic species is only 1.8 (range 1-4 species per sample), making this one of the poorest communities within the study area for aquatic plant species.

This stand is typical of particular peripheral drains and dykes and, sometimes in association with stand DY6, defines waterbodies that are either unfavourable for aquatic plant growth, or subject to forms of disturbance or constraint that restrict the development of aquatic vegetation.

The aquatic vegetation predominantly corresponds to Endgroup 4 of the Wolfe-Murphy *et al.* (1991) classification, which they summarise (using NVC codes) as:

> Endgroup 4: Generally species-poor *Lemna minor* (A2), although often with *Lemna trisulca* and then referrable to the (A2b) sub-community.

All but a few of the samples in stand DY7 can be directly referred to the Typical sub-community of the *Lemna minor* community (A2a), where the floating carpet can vary from sparse to continuous. This is a common aquatic community throughout lowland Britain. A few

samples, by virtue of the presence of *L. trisulca*, may be referred to the *L. trisulca* sub-community (A2b), which is more frequently found in the southeast. Almost all samples lack a significant development of a submerged flora.

Sizewell Marshes SSSI fen meadows, reedbeds and wet woodland

Fen meadows

Fen meadow compartments within Sizewell Marshes are extensive, but exclude Goodram's Fen and the two reedbed compartments, G25 and M7. The communities identified in the compartments covered by the 2007 survey (G17-23 and G26-27) have been grouped with the vegetation types identified in this report and mapped, in Figure 3.8, according to the NVC communities to which they have been referred.

While none of the recorded species are recognized as Nationally Scarce, many of the plants are uncommon in Suffolk and listed by Suffolk Biological Records Centre (SBRC)[22] (http://www.users.globalnet.co.uk/~sbrc/Fens&Marshes.htm); they are frequently restricted to semi-natural wetland habitats. In this category can be included *Anagallis tenella, Cirsium dissectum, Pedicularis palustris, Valeriana dioica, Carex echinata* and *C. pulicaris*. Of equal note are the limited numbers of *Isolepis cernua* that occur on trampled ground within several compartments.

As shown in Figure 3.8, six distinct stands are identified, with often quite discrete distributions within the Marshes. They are listed below in terms of the nearest NVC community. Two stands are further divided into a number of homogeneous sub-stands and variants[23], which describe distinct species compositions.

Most fen meadow stands are referred to the *Briza media-Trifolium* spp. sub-community of the *Juncus subnodulosus-Cirsium palustre* fen-meadow community (M22b). However, the species composition and species-richness of the stands varies markedly. The distribution and nature of these variations is strongly suggestive of differing locations, management histories or hydro-chemical conditions. For this reason, some stands are described as distinct entities showing differing aspects of one NVC sub-community (as in FM1), or are described with reference to a secondary NVC syntaxon. For example, FM4, while clearly related to the *Iris pseudacorus* sub-community of the *Juncus-Cirsium* fen-meadow (M22d), also contains patches and gradients referrable to the *Lolium perenne-Holcus lanatus* sub-community of the *Festuca arundinacea* grassland (MG12a). At Sizewell Marshes, the necessity to refer to secondary vegetation features in naming the stands can often be explained with reference to its grazing history, or to the influence of occasional brackish incursions on species composition.

According to Rodwell (1991) M22 *Juncus-Cirsium* fen-meadow is most commonly encountered in East Anglia, and Rodwell *et a*l (2007, Figure 30) show a distribution restricted to areas with calcareous groundwater, particularly in the Breckland, the Waveney Valley, and within the small coastal valleys bisecting the Sandlings in east Suffolk.

[22] This reference refers to the lists of 'Really Useful Species' produced by the Records Centre to describe the plants that have a restricted county distribution centred on particular semi-natural habitats, such as fens and marshes. By default, the plants tend to be uncommon in the county.

[23] If one characteristic of a stand is particularly visible – normally the abundance or constant presence of a species - the stand may be named as a distinctive 'variant' of a particular sub-community within the NVC.

The remaining stands occur towards the margin of the Marshes, and are either referred to as an intermediate between M22 *Juncus-Cirsium* and the *Holcus lanatus-Juncus effusus* rush-pasture, or can be regarded as representative of the latter community. In each case, the composition of the stands reflects the reduced influence of soil water during the growing season.

In general terms, Stand FM1, in its several versions, occupies the deeper peats away from the valley margins, and includes zones of vegetation containing many of the less common species found within the Marshes. To the south, the margins of the fen meadows are occupied by distinct bands of communities where *Juncus subnodulosus* is replaced by the more common rushes *Juncus inflexus* and *J. effusus*. On the northern side of Grimsey's Wood, the rush-dominated stands are often simpler in character and tend to be dominated by *Juncus articulatus* and be poorer in species. Lastly, on the southern and western extremities of the Marshes, the vegetation is more closely aligned to rush pasture, and many of the fen species are absent.

A comparison of each stand is presented in Table 3.13 according to the frequency of occurrence of species in each sample group.

Table 3.13 Synoptic table for the fen meadow communities recorded from Sizewell Marshes in 2008*.

	FM1a	FM1b	FM1c	FM1d	FM2	FM3a	FM3b	FM3c	FM4	FM5	FM6
Juncus articulatus	V	V	IV	4	V	IV	V	4	III	V	II
Holcus lanatus	V	III	V	4	V	IV	V	2	V	V	V
Festuca rubra	V	V	IV	4	IV	IV	IV		IV	II	
Plantago lanceolata	V	V	V	3	IV	IV	III		III	III	
Anthoxanthum odoratum	V	II	V	3	IV	II	III		III		
Ranunculus acris	V	V	III	2	III	III	III		III		
Calliergonella cuspidatum	V	V	III	4	II	III	V	1	III		
Carex nigra	V	V	III	4	II	IV	III		III		
Carex panicea	V	V	II	4		III	III				
Juncus subnodulosus	V		V	2		V			V		
Agrostis stolonifera	IV	V	III	4	V	IV	V	3	IV	IV	V
Ranunculus repens	IV	III	V	1	IV	II	III	2	IV	V	V
Trifolium pratense	IV	V	V	3	III	III	III		IV	V	II
Cynosurus cristatus	IV	V	III	1	II		II		II		
Carex disticha	IV	V	IV	4	IV	V	V	2	IV		
Phragmites australis	IV					II	II		II		
Dactylorhiza fuchsii	IV	III	III	2							
Anagallis tenella	IV	II				II					
Valeriana dioica	IV			1							
Briza media	IV	II		2							
Lotus pedunculatus	III	III	V	3	V	IV	V		V	IV	

	FM1a	FM1b	FM1c	FM1d	FM2	FM3a	FM3b	FM3c	FM4	FM5	FM6
Trifolium repens	III	V	III	2	II	III	III		II	III	IV
Taraxacum officinale agg	III	IV	III	1	II					III	II
Cardamine pratensis	III	V	V	2	III	III	II		II	III	
Galium uliginosum	III		II								
Succisa pratensis	III	III		1							
Cerastium fontanum	II		IV	3			II		II	V	II
Brachythecium rutabulum	II	II	IV		III	III	II		III	III	
Festuca pratensis	II		IV	1	II	II			II		
Equisetum fluviatile	II			4	II	II	III	4	III		
Juncus inflexus	II	II	II			V	V	1			
Cirsium palustre	II										
Ranunculus flammula	II	III	II	1		III	III	3			
Festuca arundinacea	II	II	II	2		V	IV		III		
Rhinanthus minor	II			3							
Lychnis flos-cuculi	II		II	3		II					
Carex flacca	II			3							
Mentha aquatica	II					III	II	1	II		
Rhytidiadelphus squarrosus		III		2							
Potentilla anserina		II	IV		II	III	V		II	V	II
Rumex acetosa		II	IV	2	III		II		II	IV	
Cratoneuron filicinum		II		1							
Potentilla erecta		II									
Prunella vulgaris		II									
Danthonia decumbens		II									
Persicaria amphibia			V			III	II	2	II		
Poa trivialis			IV	3					III	V	V
Equisetum palustre			IV	1			II		III		II
Vicia cracca			III	3		II	II		IV		
Carex hirta			II				II			III	IV
Stellaria graminea			II							III	
Lathyrus pratensis			II	2	II				II		
Eleocharis palustris			II								
Galium palustre				4		IV	II	2	III		
Menyanthes trifoliata				4							
Iris pseudacorus				3				1	IV		
Dactylorhiza praetermissa				2					II		

	FM1a	FM1b	FM1c	FM1d	FM2	FM3a	FM3b	FM3c	FM4	FM5	FM6
Glyceria fluitans				1			II	1			
Amblystegium riparium				1							
Climacium dendroides				1							
Juncus effusus					IV	II	III	2			II
Rumex conglomeratus					II			3	II	II	III
Hydrocotyle vulgaris						II					
Triglochin palustris						II		1			
Isolepis setacea							II				
Eleocharis uniglumis								2			
Oenanthe lachenalii								2			
Drepanocladus cossonii								2			
Carex otrubae								1			
Epilobium palustre								1			
Epilobium parviflorum								1			
Hippurus vulgaris								1			
Carex acutiformis									II		
Lolium perenne										V	V
Equisetum arvense										II	
Alopecurus geniculatus											II
Cirsium arvense											II

* Showing the communities where species occur in more than 20 per cent of the samples allocated to each stand

Stand FM1a - M22b *Juncus subnodulosus-Cirsium palustre* fen-meadow, *Briza media-Trifolium* spp. sub-community – Stand A

This stand is largely confined to three fields in the central area of the floodplain, compartments G37, G38 and G39. The block of fields is surrounded on three sides by a woodland belt formed within the double dyke network, and is separated by species-rich internal dykes. An outlier has also been recorded from Compartment M12 (samples 43 and 44). The stand is one of the group dominated by *Juncus subnodulosus*, with *Juncus articulatus* patchily co-dominant, in this case occasionally accompanied by *Juncus inflexus* and *J. effusus*. A suite of grasses and sedges form an often continuous understorey, and the stand is notable for containing large areas where the rushes give way to a short sward characterised by the presence of *Anagallis tenella*.

In addition to the rushes, *Carex nigra, C. panicea, C. disticha* all occur frequently, often with *Carex flacca* and the grasses *Festuca rubra, Holcus lanatus, Anthoxanthum odoratum* and, rather less commonly, other species such as *Cynosurus cristatus* and *Briza media*. *Phragmites australis* and *Festuca arundinacea* are no more than occasional, and the potential height of

these species may produce a very thin and patchy supra-canopy[24] late in the growing season if unmanaged.

Of the forbs[25], *Plantago lanceolata* and *Ranunculus acris* are ubiquitous, often accompanied by *Trifolium pratense, Ranunculus repens* and *Dactylorhiza fuchsii*. *Valeriana dioica* and *Succisa pratensis* are also present through much of the stand and, with *Anagallis tenella*, signal the species-richness of this form of fen meadow. A considerable number of associates are scattered within the vegetation, of which *Rhinanthus minor, Hydrocotyle vulgaris, Eriophorum angustifolium, Menyanthes trifoliata, Dactylorhiza praetermissa* and *Carex pulicaris* are notable for the site in being 'Really Useful Species'[26] but also in having a limited distribution within the fen meadow habitat at Sizewell Marshes.

The bryophyte layer is marked by the frequency of *Calliergonella cuspidata*, which forms thick carpets of wefts[27] over extensive areas, and is rarely absent. *Brachythecium rutabulum, Cratoneuron filicinum* and *Rhytidiadelphus squarrosus* are also present.

The average number of species is 25.3 (range 19-30 species per sample) making this one of the more species rich stands on the Marshes. With Stand FM1b, it forms a largely discrete area marked by the presence of the group of species (such as *Anagallis tenella* and *Succisa pratensis*) most commonly associated with nutrient poor fen.

Stand FM1a, with FM1b, is closely associated with the *Briza media-Trifolium* spp. sub-community of the *Juncus subnodulosus-Cirsium palustre* fen-meadow community (M22b) and both stands are well-developed examples of this NVC syntaxon. The singular separation of the stands is based on the abundance of *Juncus subnodulosus* and *Valeriana dioica* in this stand, which may indicate a somewhat greater influence of calcareous groundwater in the root-zone. Notwithstanding, the vegetation, particularly with its suite of associated species, is seldom as well-developed in Suffolk, and can be regarded as being particularly uncommon in the county with a very restricted distribution.

Stand FM1b - M22b *Juncus subnodulosus-Cirsium palustre* fen-meadow, *Briza media-Trifolium* spp. sub-community – Stand B

This stand is located in a single area to the southwest of the main area of Stand FM1a, with which it has many similarities. It occupies much of Field G38, where it abuts Stand FM1a and contains a similar group of uncommon species with additional plants not recorded elsewhere in the survey area. The stand extends into the corner of Field G58, though it is less well developed here and may be transitional to Stand FM2. The largest area of this vegetation, however, is found over much of Field G40, where it displays a distinctive physiognomy and species composition.

[24] A supra-canopy is a secondary canopy forming above the general height of the sward; it is composed of the tall stems of late-flowering grasses and forbs, and lends a temporary impression of height.

[25] Non-woody plants other than grasses, sedges or rushes, bryophytes, ferns and fern allies.

[26] SBRC (http://www.users.globalnet.co.uk/~sbrc/Fens&Marshes.htm)

[27] A weft is one of ten life forms typical for mosses – annual, cushion, short turf, tall turf, dendroid, fan, mat, pendant, tail and weft. They are noted to suggest adaptive evolution with wefts being at the extreme of high humidity and low irradiation (Smith, 1982).

Like Stand FM1a, this is typically short vegetation, dominated by the sedges *Carex disticha, C. nigra* and *C. panicea*. Amongst the sedges, the moss *Calliergonella cuspidata* is often abundant, frequently accompanied by *Rhytidiadelphus squarrosus*. While *Juncus articulatus* is abundant in patches, rushes are nowhere dominant, and *Juncus subnodulosus* is noticeably absent. Patches of low ground in the stand support a group of species also found in Stand FM1a. These include *Cardamine pratensis, Plantago lanceolata* and *Trifolium repens*, as well as the uncommon *Succisa pratensis, Briza media* and *Anagallis tenella*.

The distinctive character of Stand FM1b that distinguishes it from other stands on Sizewell Marshes is the occasional presence of a suite of species frequently associated with nutrient-poor fen, and not recorded from Stand FM1a. In particular, the grasses *Danthonia decumbens* and *Agrostis canina*, and the forbs *Pedicularis palustris* and *Cirsium dissectum*, in addition to the uncommon species found in both stands, separate Stands FM1b and FM1a from the remaining areas of fen meadow.

The average number of species is 24.1 (range 17-29 species per sample) making this one of the more species rich stands on the Marshes. With Stand FM1a, it forms a largely discrete area marked by the presence of the group of species most commonly associated with nutrient-poor fen.

Stand FM1b, with FM1a, is closely associated with the *Briza media-Trifolium* spp. sub-community of the *Juncus subnodulosus-Cirsium palustre* fen-meadow community (M22b). Both stands are well-developed examples of this NVC syntaxon. The group of distinctive species in stand FM1b, such as *Potentilla erecta, Prunella vulgaris* and *Danthonia decumbens*, are typical of low-fertility situations, but may represent a less calcareous area of the Marshes than that occupied by Stand FM1a, as indicated by their typical tolerance for acidity (Hill *et al*, 2004). The two stands together may represent variations in hydro-chemical conditions in this area of Sizewell Marshes – a feature of notable importance in understanding the eco-hydrology of fen-meadow vegetation. Notwithstanding, the vegetation, particularly with its suite of associated species, is seldom as well-developed in Suffolk, and can be regarded as particularly uncommon with a very restricted distribution.

Stand FM1c - M22b *Juncus subnodulosus-Cirsium palustre* fen-meadow, *Briza media-Trifolium* spp. sub-community – *Persicaria amphibia* variant

This large block of vegetation extends up the increasingly narrow floodplain westwards from compartments G33 and M12. The floristic composition of this stand is broadly similar to Stands FM1a, FM3a and FM4, though it lacks many of the uncommon species recorded from Stand FM1a, and the group of reedfen species defining Stand FM4 occurs no more than occasionally. The large suite of constants is dominated by the rushes *Juncus subnodulosus* and *J. articulatus*, however, and few other species have a high cover in any sample. Of these, it is *Carex disticha*, rather than *C. nigra*, that is the most common sedge, while *Holcus lanatus, Agrostis stolonifera* and *Festuca rubra* are the only grasses that are sward-forming beneath the rush canopy. Nonetheless other grass species can be common, notably *Anthoxanthum odoratum, Poa trivialis* and *Festuca pratensis*. Amongst the forbs, *Plantago lanceolata, Lotus pedunculatus, Ranunculus repens, Trifolium pratense* and *Cardamine pratensis* are typical, and *Brachythecium rutabulum* and *Calliergonella cuspidata* are both frequent at low cover.

The distinguishing species in this stand are *Persicaria amphibia* (terrestrial form), *Carex hirta* and *Stellaria graminea*. These species lend a rather weedy character to the vegetation, and their frequency suggests that large parts of the stand can be characterised by disturbance and that

there are periods during the growing season when the watertable fluctuates markedly within the root zone.

The average number of species is 25.4 (range 20-35 species per sample) making this one of the more species rich stands on the Marshes. It also includes many of the most species-rich fen-meadow samples from Sizewell Marshes. Its location south of the Kenton Hills represents an extension of the species-rich forms of fen meadow westwards into the more confined valley floor. At its eastward margin, the stand abuts areas of the wettest fen-meadow stands (FM4 and FM1d), while to the west it gives way to much drier vegetation, transitional to MG10 *Holcus-Juncus* rush-pasture. It therefore represents the vegetation situated in the centre of an east-west gradient of reducing soil wetness.

The species composition of Stand FM1c contains a group of species, represented by *Persicaria amphibia*, that suggests a less stable watertable than is typical of the *Briza media-Trifolium* spp. sub-community of the *Juncus subnodulosus-Cirsium palustre* fen-meadow community (M22b). However, the bulk of the vegetation accords well with this community.

Stand FM1d - M22b *Juncus subnodulosus-Cirsium palustre* fen-meadow, *Briza media-Trifolium* spp. sub-community – *Menyanthes trifoliata* variant

This stand is restricted to low-lying areas within compartments G34 and G35 with unsampled fragments of this kind of vegetation also noted to be present in compartments G37 and G39.

This distinctive vegetation is a short sward dominated by *Menyanthes trifoliata*, which forms a thick carpet restricting the development of other species. Nonetheless, a distinctive range of constants from Stands FM1a, FM3a and FM4 are typically present, with the rush *Juncus articulatus*, sometimes accompanied by *J. subnodulosus*; the full complement of sedges: *Carex disticha, C. nigra, C. panicea* and *C. flacca*; a suite of grasses dominated by *Holcus lanatus* and *Festuca rubra* with *Agrostis stolonifera* and *Anthoxanthum odoratum*; and a wide range of forbs including *Equisetum fluviatile, Galium palustre* and *Lotus pedunculatus*. Many of the less common species found in Stands FM1a and 1b are also present, such as *Valeriana dioica, Rhinanthus minor* and *Succisa pratensis*. The bryophyte layer is also similar to Stand FM1a, and also includes occasional *Climacium dendroides*.

The average number of species is 27.8 (range 20-35 species per sample) making the patches of this vegetation the most species-rich in Sizewell Marshes,

This vegetation occurs within Stand FM4 (and also in FM1a) where it is restricted to shallow hollows and the stand can be regarded as a local variant falling within the compass of the *Briza media-Trifolium* spp. sub-community of the *Juncus subnodulosus-Cirsium palustre* fen-meadow community (M22b). Bogbean has a restricted distribution in Suffolk, and the majority of records are from river valleys. This variant of M22 *Juncus-Cirsium* fen-meadow can therefore be regarded as particularly uncommon in the county.

Stand FM2 - M22d *Juncus subnodulosus-Cirsium palustre* fen-meadow, *Iris pseudacorus* sub-community with affinities to MG8 *Cynosurus cristatus-Caltha palustris* grassland

This stand is widely found along the southern margin of the floodplain from Reckham Pits Wood to beyond Rosery Cottages on the extremity of the survey area. It was recorded from Fields G35 and G58, where it clearly lies on higher ground than the abutting fen-meadow stands, as well as in Fields G39, G56, G64, G66 and G51, where it forms marginal rush-pasture on the edges of the valley floor. The stand is also common in the Goose Hill fields to the north,

where it was recorded in various forms from Fields G20, G21 and G24 in this survey and as FM15 in the other Goose Hill fields (compartments G17, G18, G19, G22 and G23) in 2007.

The rushes *Juncus articulatus* and *J. effusus* are commonly dominant, and *J. inflexus* and *J. subnodulosus* are no more than occasional. Of the sedges, *Carex disticha* is commonly abundant and *C. nigra* occasionally prominent. Despite the often overwhelming dominance of the rushes and sedges, *Holcus lanatus* and *Agrostis stolonifera* can also proliferate, and both species are abundant throughout the stand; *Festuca rubra* and *Anthoxanthum odoratum* are also common. Of the forbs, *Lotus pedunculatus, Plantago lanceolata* and *Ranunculus repens* are the most frequently occurring. Bird's-foot trefoil (*Lotus*) sometimes smothers the surrounding vegetation, particularly in Field G51.

Although many other species were recorded from this stand, and less common species such as *Dactylorhiza fuchsii, Eriophorum angustifolium* and *Ranunculus flammula* occur occasionally, the stand has few low-growing areas where sedges form the main canopy, and large areas are dominated by *Juncus articulatus*.

The average number of species is 15.1 (range 8-22 species per sample) making the stand one of the least species-rich fen meadow types in Sizewell Marshes.

The stand can broadly be referred to the *Briza media-Trifolium* spp. sub-community of the *Juncus subnodulosus-Cirsium palustre* fen-meadow community (M22b). However, the absence of many of the distinctive species and the rather patchy mosaic of rush-dominated areas amongst a grassier sward, suggest that the stand may also be referred to a development from floodplain grassland. In this, the *Cynosurus cristatus-Caltha palustris* grassland community (MG8) may best describe some of the floristic features present in the stand. In some fields, notably compartment G24, the occurrence of species such as *Eriophorum angustifolium*, albeit as occasional, scattered individuals, may indicate a more developed form of the *Briza-Trifolium* sub-community. Similarly, the rather rudimentary vegetation in compartment G51 near Rosery Cottages is rather closer to rank *Holcus-Juncus* rush-pasture (MG10).

This variability within the stand may correlate with proximity to the valley footslope. The passing similarity to the floristics of MG8 *Cynosurus-Caltha* grassland may reflect the influence of groundwater seepage or localised inundation, key factors in the distribution of this "scarce and locally distributed community of lowland flood pastures and spring-heads through the English lowlands, East Anglia and the Pennine valley sides with scattered localities in Scotland …" (Rodwell et al 2007).

Stand FM3 - M22b *Juncus subnodulosus-Cirsium palustre* fen-meadow*, Briza media-Trifolium* spp. sub-community with affinity to MG12a *Festuca arundinacea* grassland, *Lolium perenne-Holcus lanatus* sub-community

Three distinct forms of this vegetation were identified from a restricted, but quite extensive, area of the Marshes, to the east and southeast of compartment G39. This area, though clearly related to the adjacent stand FM1a, has a distinct character produced by the abundance of *Juncus inflexus* over large areas in association with *Festuca arundinacea* and *Potentilla anserina*. These species may indicate rather more fertile, calcareous conditions (Hill *et al*, 2004) than those suggested for Stand FM1, with topsoils that may remain waterlogged for long periods during the growing season.

The three stands are maintained as separate units in order to emphasize the distinct differences in species composition and appearance. While each is considered separately, it is emphasized

that the stands can be regarded as variants of the same NVC community. As such, an overall statement regarding the limited distribution of the community as a whole is reserved for the end of the stand accounts.

Stand FM3a M22b *Juncus subnodulosus-Cirsium palustre* fen-meadow, *Briza media-Trifolium* spp. sub-community with affinities to MG12a Festuca arundinacea grassland, *Lolium perenne-Holcus lanatus* sub-community

This vegetation is partly located along the eastern boundary of compartment G39 (Stand FM1a) forming a sinuous strip through Fields G49, M9, G41-3 and G45. It was also recorded as a small area along the northern fringe of Field G38, amongst Stand FM1a vegetation. The stand often forms the edge of the survey area in this part of Sizewell Marshes, though Stand FM3b is sometimes interposed.

The stand is dominated by *Juncus subnodulosus* and shares many constant species with Stand FM1a, notably *Juncus articulatus, Carex nigra, C. panicea* and *C. disticha*. It also has a similar grouping of common grasses - *Festuca rubra, Holcus lanatus* and *Agrostis stolonifera* – but *Briza media* and *Cynosurus cristatus* are absent. While *Plantago lanceolata, Ranuncus acris* and *Trifolium pratense* remain common, and *Anagallis tenella* is also present, many of the less common forbs recorded in Stands FM1a and 1b are absent.

The stands also differ as this vegetation is composed of substantially more frequent *Juncus inflexus* and *Festuca arundinacea*, with *Galium palustre, Lotus pedunculatus* and *Potentilla anserina* amongst a group of species tolerant of periods of inundation during the growing season, including *Triglochin palustris* and the terrestrial form of *Persicaria amphibia*. Part of the stand character is described by the presence of *Juncus gerardii* (saltmarsh rush) in discrete areas of low-lying land. Saltmarsh rush is often accompanied by *Eleocharis uniglumis, Carex otrubae* and *Oenanthe lachenalii*, further developing the distinctive appearance of the sward. However, this vegetation occurs only sporadically and in small patches within the general sward, and was not sampled separately.

The bryophyte layer is rather patchy, with scattered strands of *Calliergonella cuspidata* and *Brachythecium rutabulum*.

Several field entrances are mantled in open swards of *Juncus bufonius* and *Isolepis setacea*, with occasional *Sagina procumbens, Veronica scutellata* and *Isolepis cernua*. The latter species has been a feature of such small, disturbed areas of this stand throughout the Fen Meadow Vegetation Monitoring Programme (Stone 2003-2008).

The average number of species is 19.1 (range 12-24 species per sample) making this stand of moderate species-richness amongst the fen-meadow stands.

The species composition of much of the sward is clearly allied to the adjacent Stand FM1a, though the very shallow depressions picked out by the key species *Potentilla anserina* and *Juncus gerardii* are distinctive features. The latter species, in particular, indicates a brackish influence within the root zone, and the preponderance of *Carex disticha* and *Festuca arundinacea* over much of the stand suggests that large areas of the stand remain wet during the growing season. While the stand clearly falls within the compass of the *Briza media-Trifolium* spp. sub-community of the *Juncus subnodulosus-Cirsium palustre* fen-meadow community (M22b), many species are also commonly found within the *Lolium perenne-Holcus lanatus* sub-community of *Festuca arundinacea* grassland (MG12a).

Stand FM3b - M22b *Juncus subnodulosus-Cirsium palustre* fen-meadow, *Briza media-Trifolium* spp. sub-community with affinities to MG12a *Festuca arundinacea* grassland, *Lolium perenne-Holcus lanatus* sub-community

This stand is found in association with Stand FM3a on the margins of the central channel of the floodplain, principally in compartments G50, G65 and G44. While the species composition is similar, this vegetation occurs further away from the central areas of fen-meadow defined by Stands FM1a and 1b.

It is distinguished from Stand FM3a by the marked absence of *Juncus subnodulosus*, and by the replacement of some wetland species by plants more commonly associated with periods during the growing season when the watertable drops below the rooting zone.

In common with Stand FM3a, large areas are dominated by the rushes *Juncus articulatus* and *J. inflexus*, with *J. effusus* a common associate. The sedges *Carex disticha* and *C. nigra* are also frequently abundant, with constant *C. panicea*, but the stand also contains *C. hirta*, a species indicative of summer drawdown. The grasses *Holcus lanatus*, *Agrostis stolonifera*, *Festuca rubra* and *F. arundinacea* are predominant, though the presence of *Cynosurus cristatus* helps to separate this vegetation from Stand FM3a.

The forbs of both stands are very similar in composition, with *Lotus pedunculatus* and *Potentilla anserina* being particularly common in this stand, while *Galium palustre* is no more than occasional and *Anagallis tenella* is absent. *Isolepis setacea* is also present here, where it is commonly found on trampled ground in Field G44. The distinct brackish patches found in Stand FM3a are absent, and the ground surface, though still prone to seasonal waterlogging, is less clearly subject to inundation.

The average number of species is 18.8 (range 14-25 species per sample) making this stand of moderate species-richness amongst the fen-meadow stands.

Stand FM3c - M22b *Juncus subnodulosus-Cirsium palustre* fen-meadow, *Briza media-Trifolium* spp. sub-community with affinity to MG12a *Festuca arundinacea* grassland, *Lolium perenne-Holcus lanatus* sub-community

This small stand occurs in two areas of the central part of the floodplain (within compartments G42 and G39). Each area is defined by the abundance of the horsetail *Equisetum fluviatile*, which can dominate the vegetation in hollows and on the margins of dykes. In compartment G39, the stand has developed in the wettest area of *Juncus articulatus*-dominated rush-pasture and associates with the horsetail and rush are few: *Juncus effusus*, *Holcus lanatus* and *Ranunculus repens* are constant, with some *Agrostis stolonifera* and *Carex otrubae*.

The second area occurs in an inundation hollow within compartment G42 amongst vegetation assigned to Stand FM4. Here, *E. fluviatile* grows as a swamp dominant with *Eleocharis uniglumis* and the mosses *Drepanocladus cossonii* and *Calliergonella cuspidata*. *Agrostis stolonifera* is ubiquitous and, with species such as *Persicaria amphibia* and *Oenanthe lachenalii*, indicates that the hollow remains inundated for long periods during the growing season but periodically dries out. This vegetation has been notable in recent years (Stone 2008) for supporting a population of the terrestrial form of *Hippurus vulgaris*, though the species was inconspicuous at the time of this survey.

The average number of species is 11.3 (range 8-15 species per sample) making examples of this vegetation amongst the least species-rich of the fen-meadow stands.

Over the area covered by the three variants of Stand FM3, the species composition of much of the sward is clearly allied to the adjacent Stand FM1a, though the very shallow depressions picked out by the key species *Potentilla anserina* and *Juncus gerardii* are distinctive features. The latter species, in particular, indicates a brackish influence within the root zone, and the preponderance of *Carex disticha* and *Festuca arundinacea* over much of stands FM3a and 3b suggest that large areas remain wet during the growing season. While the group of stands clearly fall within the compass of the *Briza media-Trifolium* spp. sub-community of the *Juncus subnodulosus-Cirsium palustre* fen-meadow community (M22b), many species of FM3a and 3b are also commonly found within the *Lolium perenne-Holcus lanatus* sub-community of *Festuca arundinacea* grassland (MG12a). The small patches of *Equisetum fluviatile* swamp occurring in wet hollows, separated as FM3c, are readily subsumed within M22b.

According to Rodwell (1991) M22 *Juncus-Cirsium* fen-meadow is most commonly encountered in East Anglia, and Rodwell *et al* (2007, Figure 30) show a distribution restricted to areas with calcareous groundwater, particularly in the Breckland, the Waveney Valley, and within the small coastal valleys bisecting the Sandlings in east Suffolk.

Rodwell (1992) locates MG12 *Festuca arundinacea* grassland exclusively in coastal estuaries and salt-marshes around the British coast, and its presence in fen-meadow vegetation at Sizewell Marshes may be a distinctive but infrequent feature of this habitat along the Suffolk coast, where occasional saline incursions influence the character of the vegetation.

Stand FM4 - M22d *Juncus subnodulosus-Cirsium palustre* fen-meadow, *Iris pseudacorus* sub-community with affinity to MG12a Festuca arundinacea grassland, *Lolium perenne-Holcus lanatus* sub-community

The areas of vegetation comprising this stand lie in the central part of the floodplain, mainly to the northwest of Stand FM1a. There are three discrete areas, the larger abutting the reedbeds of fields G25 and M7, and occupying areas of fields M12 and G32-35, and the smaller stands extending into fields G28, 30 and 47 from the dyke, and occupying part of Field G42. In each case, it would appear that the stand is occupying areas of low-lying land. In the larger area, shallow hollows are occupied by the *Menyanthes trifoliata* swards of Stand FM1d.

The stand bears a clear resemblance to Stand FM16, surveyed in 2007, which was recorded over compartments G26 and G27.

In common with Stand FM1, *Juncus subnodulosus* and *J. articulatus* are common and often co-dominant rushes, while *Carex disticha, Holcus lanatus, Festuca rubra* and *Agrostis stolonifera* are the most common grasses and sedges. *Lotus pedunculatus, Trifolium pratense* and *Ranunculus repens* are all constant forbs, and this stand supports many of the flood-tolerant species of Stand FM3a, while lacking many less common species recorded in Stand FM1a. *Juncus gerardii* patches are present in localised areas within compartment G42, suggesting that this part of the stand experiences similar hydrological conditions to Stand FM3a.

However, the distinctive feature of this vegetation is the small suite of species, typified by *Iris pseudacorus, Vicia cracca, Equisetum fluviatile* and *Carex acutiformis*, which also occur in reedfen. Flag iris (*Iris pseudacorus*), in particular, is ubiquitous throughout the stand, and the rhizomatous *Carex acutiformis*, where it occurs, is frequently dominant, particularly along dyke margins.

The bryophyte layer is rather patchy, with scattered strands of *Calliergonella cuspidata* and *Brachythecium rutabulum.*

The average number of species is 22.9 (range 12-29 species per sample) making this stand one of the more species-rich types of fen-meadow, though samples indicate that the dominance of one of the character species leads to species impoverishment; this is particularly evident in *Carex acutiformis* patches, where there are commonly few associates.

The location of the stand amongst the FM1 stands confirms that the vegetation can readily be assigned to the *Juncus subnodulosus-Cirsium palustre* fen-meadow community (M22). However, the distinctive and colourful drapes of *Vicia cracca* over *Iris pseudacorus* and the rush canopy mark a shift in species composition towards the *Iris pseudacorus* sub-community (M22d), which is known to be concentrated in the East Anglian topogenous mires and is one of the less commonly encountered sub-communities of this kind of fen meadow. It is rather more frequently encountered in association with reedfen and wet woodland. In Suffolk, it tends to occur as small stands in wet hollows, and is uncommon with limited distribution in peatland areas.

Stand FM5 - M22b *Juncus subnodulosus-Cirsium palustre* fen-meadow, *Briza media-Trifolium* spp. sub-community / MG10a *Holcus lanatus-Juncus effusus* grassland, typical sub-community. Intermediate.

This stand is located in the western section of the floodplain towards Leiston. Fields G61 and G63, where this vegetation occurs, are distinctly drier than those on the eastern side, and it is likely that summer drawdown of the watertable produces periods of droughting in the root zone. Nonetheless, the presence of large numbers of *Potentilla anserina, Lotus pedunculatus* and *Carex hirta* are indicative of moist ground conditions during much of the growing season. Indeed, the stand is dominated by *Juncus articulatus*, usually growing with abundant *Poa trivialis*, and these species form an often dense canopy over *Holcus lanatus, Lolium perenne* and a number of forbs. Amongst these, *Trifolium pratense, Cerastium fontanum, Ranunculus repens* and *Rumex acetosa* are constant associates.

The stand lacks a bryophyte layer, with *Brachythecium rutabulum* and the occasional strand of *Kindbergia praelonga*[28] providing only thin ground cover.

The average number of species is 15.0 (range 10-19 species per sample) making this stand one of the least species-rich types of fen-meadow at Sizewell Marshes.

This vegetation is intermediate in species composition between fen-meadow and rush pasture. While it shares some characters of Stand FM1c to the east and FM6 to the west, it is sufficiently distinct to be separated from them and regarded as intermediate between the *Briza media-Trifolium* spp. sub-community of the *Juncus subnodulosus-Cirsium palustre* fen-meadow community (M22b) and the typical sub-community of *Holcus lanatus-Juncus effusus* rush-pasture (MG10a). *Holcus-Juncus* rush-pasture is a common form of rush-dominated vegetation in degraded pastures on drained peat and mineral substrates, and is a relatively frequent community in suitable locations throughout Suffolk.

Stand FM6 – MG10a *Holcus lanatus-Juncus effusus* grassland, typical sub-community

Many fields are marked by a distinct low bund along dykes margins, or include the toeslopes of the southern valley side. The sometimes diffuse areas of vegetation sampled on this slightly raised ground are grouped together in this stand, which extends from Field G63 at the western end of the survey area, around Rackham Pits Wood, and as far as Field G52 near Rosery

[28] This species was formerly known as *Eurhynchium praelongum*

Cottages. While the ground in some areas may be sufficiently moist to support occasional tussocks of *Juncus articulatus*, or patches of *Glyceria declinata*, the stand is characterised by a small groups of species, consisting of the grasses *Holcus lanatus*, *Poa trivialis*, *Lolium perenne* and *Agrostis stolonifera*, the sedge *Carex hirta*, and the forbs *Ranunculus repens* and *Trifolium repens*.

This stand also subsumes two samples recorded in 2007 from a low dyke-side bund in Goose Hill Marsh (Stand FM17).

The sward is usually low and tightly knit, and many areas show signs of rabbit grazing. As the soils are predominantly composed of a sandy substrate, cattle-trampling along this drier ground tends to accentuate the 'lawn'-like character of the sward. The raised position of the stand means that it is also subject to trampling by site visitors and is used as a routeway by vehicles and stock. In some parts, the stand abuts patches of scrub, usually blackthorn, that are used as sheltered lays by the cattle.

The boundary of the sward with the neighbouring rush-pasture and fen-meadow tends to be abrupt where the stand occurs on bunded materials. However, where the stand occurs on toeslopes, as in Field G47 and G34, the vegetation may merge into rush-dominated vegetation quite slowly as the depth of surface peat thickens into the floodplain. In these situations, the peat may remain shallow far into the floodplain, and the diffuse boundary may be marked by the local presence of *Juncus effusus* in addition to the typical flora of the neighbouring stands.

The average number of species is 11.0 (range 6-15 species per sample) making this stand the least species-rich type of sward at Sizewell Marshes.

Although no rush species is more than occasional, the bulk of the sward components are constants of the typical sub-community of *Holcus lanatus-Juncus effusus* rush-pasture (MG10a), to which the whole stand is referred. Some small areas, particularly on the more trampled parts of dyke-side bunds, could be allocated to the *Lolium perenne* sub-community of the *Festuca rubra-Agrostis stolonifera-Potentilla anserina* grassland (MG11a), although it is noted that *P. anserina* is an infrequent associate in these areas. *Holcus-Juncus* rush-pasture is a common form of rush-dominated vegetation in degraded pastures on drained peat and mineral substrates, and is a relatively frequent community in suitable locations throughout Suffolk.

Valley slope grasslands

As an adjunct to the survey of the fen meadows, two valley slope fields were also assessed during the fieldwork.

The first field – compartment G52 – was also surveyed in 1993, when it was referred to an MG7 *Lolium perenne-Trifolium repens* ley. Since that time, the species composition has changed considerably, and a rather homogeneous *Lolium perenne*-dominated sward has been replaced by *Holcus lanatus*, with mixtures of *Agrostis stolonifera*, *Festuca rubra* and *Agrostis capillaris* revealing a distinct soil moisture gradient across the slope.

A similar variation in soil moisture conditions was recorded in the second field, not surveyed in 1993, which occupies the valley slopes to the northwest of compartment G58. Here, *Holcus lanatus* and *Agrostis capillaris* are dominant over much of the sward, which is very dry and locally droughty except along the footslope.

As shown in Figure 3.8 the two grassland stands occupy the whole of the two fields, though further sampling would no doubt show some division in each between the dry and moist areas

on the slopes. Stand VG1 (compartment G52) is referred to as a *Holcus lanatus* grassland, as its species composition does not bear relation to the published NVC communities. Stand VG2 supports a suite of species commonly found in the *Anthoxanthum odoratum-Lotus corniculatus* sub-community of the *Festuca ovina-Agrostis capillaris-Rumex acetosella* grassland (U1d).

A comparison of each stand is presented in Table 3.14.

Table 3.14 Synoptic table for the valleyslope grasslands communities recorded from the margin of Sizewell Marshes*.

	VG1	VG2
Holcus lanatus	V	V
Cerastium fontanum	IV	V
Agrostis capillaris	III	V
Agrostis stolonifera	IV	
Festuca rubra	IV	
Bromus hordeaceus hordeaceus	III	
Cirsium arvense	III	
Urtica dioica	III	
Veronica chamaedrys	III	
Senecio jacobaea		V
Hypochaeris radicata		V
Plantago lanceolata		V
Trifolium repens		V
Brachythecium albicans		IV
Dactylis glomerata		IV
Ornithopus perpusillus		IV
Vulpia bromoides		IV
Rumex acetosella		III
Trifolium dubium		III
Aira caryophyllea		II
Aira praecox		II
Crepis capillaris		II
Filago vulgaris		II
Spergularia rubra		II
Trifolium glomeratum		II

* Showing the communities where species occur in more than 20 per cent of the samples allocated to each stand

Stand VG1 – *Holcus lanatus* grassland

This rather diffuse stand is dominated by the character species, *Holcus lanatus*. On the lower slopes, *Agrostis stolonifera* is co-dominant with *Urtica dioica* being the primary associate. This tall herb forms extensive patches, particularly in areas of rabbit disturbance, and the grassland sometimes gives way to the *Urtica dioica-Cirsium arvense* community (OV25). In drier areas, notably upslope, *Agrostis capillaris* accompanies the other grasses and, together with *Festuca rubra*, these species form a simple short sward favoured by rabbits. In some areas, where grazing is pronounced, the unpalatable *Veronica chamaedrys* is frequent. In other, more open patches, the annual grass *Bromus hordeaceus* proliferates.

There are few other associates, and the average number of species per sample is 7.0 (range 6-9), which is poor for many grazed grasslands.

This vegetation was not successfully matched with the NVC. The lack of species and the under-developed character of the sward give this grassland little conservation value for its flora, and the type of vegetation is most likely to be found on fertile, freely drained soils, typically in situations of recent arable reversion.

This area lies within the Sizewell Marshes SSSI although it does not support a habitat feature for which the site has been designated. In comparison with the vegetation recorded in 1993, the stand has changed considerably in character and now reveals the different degrees of soil wetness within the field. This development can be regarded as an increase in conservation value and, in time, further species should colonise the drought-prone drier slopes or the diffuse transition on the footslope with the fen meadow margin.

Stand VG2 - U1d Festuca ovina-*Agrostis capillaris-Rumex acetosella* grassland, *Anthoxanthum odoratum-Lotus corniculatus* sub-community

The drought prone slopes of this field have developed into young grassland with a number of constant species, including *Holcus lanatus* and *Agrostis capillaris* as the dominant grasses. Several forbs, notably *Hypochaeris radicata*, were recorded from all samples, which revealed a long list of associate species. In particular, the stand is characterised by the presence of a suite of species typically recorded from moderately acid parched grassland, typical of the upper layers of Red Crag, or of silty sands and gravels. In particular, *Ornithopus perpusillus*, *Trifolium glomeratum* and *Rumex acetosella* are frequent with the moss *Brachythecium albicans*. Gaps in the sward are frequently occupied by annual grasses – *Vulpia bromoides* and the two *Aira* species.

The average number of species is 16.0 (range 12-19 species per sample).

With reference to the NVC, this young grassland is floristically closest to the *Anthoxanthum odoratum-Lotus corniculatus* sub-community of the *Festuca ovina-Agrostis capillaris-Rumex acetosella* grassland (U1d). The community "occurs widely over suitable substrates throughout the warm and dry lowlands of England and Wales" (Rodwell 1992); the *Anthoxanthum-Lotus* sub-community is centred on East Anglia and marks "a shift on to less parched soils and ones which are perhaps less impoverished".

If allowed to mature as a managed sward, it may prove to be a successful reversion from arable to dry sandy grassland. As such, it is a valuable development within the Sandlings in demonstrating the potential for creating dry grasslands on crag valley slopes. It is noted, however, that *Senecio jacobaea* (listed as a Noxious Weed in the Weeds Act 1959) was present in low numbers in each sample and has the potential to seed more extensively into the sward.

The grassland also retains some characteristics of less mature ruderal vegetation, and could quickly revert to more open, weedy rough grassland if under-managed.

Lying outwith the SSSI, stand VG2 is considered to be of only local nature conservation value

Reedbeds

Two reedbeds was surveyed as part of the survey. Stand RB1 is located in compartments G25 and M7 and, as demonstrated by the 1993 survey, areas of the vegetation may have developed from rush pasture. The stand has similarities with the stands of reed-dominated vegetation found in Goodram's Fen, surveyed in 2007 as RB19 and RB20. Stand RB2 is reed-dominated vegetation separating the dune grasslands north of the embankment from the 'Saltmarsh' fen meadows on the eastern side of Goose Hill.

Stand RB1 - S26 *Phragmites australis-Urtica dioica* tall-herb fen

Ten samples of the reedbed revealed considerable variation in the species composition and structure of the vegetation. The west of the stand contains areas where *Arrhenatherum elatius* is common and may patchily be the dominant species. Further east, *Juncus articulatus*, accompanied by *Agrostis stolonifera*, replaces *Arrhenatherum* as a large tussock-forming dominant. Much of the eastern part of the reedbed, however, is reed-dominated, with a number of fen associates including *Galium palustre*, *Carex acutiformis* and *Calystegia sepium*. Even in this area, though, reed is sometimes overtopped by *Phalaris arundinacea* in patches, though this tall grass does not share the overwhelming dominance of reed.

The distribution of these variations within the reedbed, which are mirrored in the woodland to the north of compartment G25, indicates that the footslope of the hillside extends deep into Sizewell Marshes in this area, and is only covered in a thin layer of peat. This is borne out by the increase in peat wetness in the eastern part of the stand and the change in the character of the vegetation. Nonetheless, the patchy canopy of *Phragmites australis* extends across the reedbed, accompanied by *Urtica dioica*, and the whole reedbed can be regarded as a single stand. With reference to the NVC, the Stand can be placed within the *Phragmites australis-Urtica dioica* tall herb fen (S26). This is a common form of reedbed in lowland Britain, and is particularly associated with fertile situations.

The average number of species is 13.1, making this stand one of the more species-rich tall herb fens, comparing favourably with stands recorded from Goodram's Fen.

Stand RB2 - S26 Phragmites australis-Urtica dioica tall-herb fen

This species-poor reedbed occupies the surficial peats along the inland margins of the shingle ridge north of the embankment. The soil has been much disturbed in the past, with hollows, shallow drains and low embankments creating a patchwork of uneven ground. Phragmites australis is the overwhelming dominant over much of the reedbed, and is accompanied by nettle Urtica dioica and bramble Rubus fruticosus agg. in the drier areas, and pond sedge Carex riparia in the wetter areas. Scattered sallow scrub and birch trees are both present on the edges of the stand, and the northern margin gives way abruptly to dry scrub marking the margins of the dune grassland.

The reedbed vegetation is species-poor, and no samples are included in the report.

Wet woodlands

This part of the Sizewell Marshes vegetation survey is a further, partial development of the woodland blocks surveyed in 2007. Three areas were included in the 2008 fieldwork; compartment G48 and the western half of Grimsey's Wood (both of which lie within Sizewell Marshes SSSI) together with Leiston Carr, which lies outwith Sizewell Marshes SSSI but within the CWS. Each wood has a different species composition, and is located in different situations within and on the margins of Sizewell Marshes.

Leiston Carr, like the Turf Pits woodland to the northeast, lies on thin peats at the margin of the marsh. Mature *Alnus glutinosa* is the most common canopy-forming tree species, but nowhere forms an extensive canopy. In the shrub layer, *Salix cinerea* is frequent and, in places, forms areas of intact sub-canopy in the absence of alder. The young carr woodland developing on Compartment G48 has yet to develop a mature canopy, and young sallow, alder and some birch have formed a scrubby thicket over remnants over the tall herb fen that preceded it. The western half of Grimsey's Wood is a mature block of valley floor wet woodland with a mixed canopy and a tall herb fen field layer that abruptly gives way on its western margin to a moist oak-birch woodland.

Stand WW1 - W6a *Alnus glutinosa-Urtica dioica* woodland, Typical sub-community

This stand is comparable to Stand WW24 – *Alnus glutinosa-Glechoma hederacea* woodland, surveyed in 2007.

Stand WW1 forms the lower part of Leiston Carr and occupies a narrow band alongside the Leiston Drain. The upper part of the stand may be influenced by local seepage from the free-draining Norwich Crag and overlying glacial sands and gravels and is clearly somewhat intermediate in its floristic composition between the mildly acid dry woodland that surrounds it, and true valley fen woodland.

Alnus glutinosa is the only constant canopy species and, sharing the canopy cover with *Betula pubescens* in limited areas of the stand, is patchily dominant. *Salix cinerea* occurs as an occasional shrub layer, but much of the stand has only a thin sub-canopy made up of *Populus tremula* and *Acer pseudoplatanus* saplings with the occasional hazel. *Rhododendron ponticum* also occurs in some quantity along the upslope margin, but rarely penetrates far under the alder canopy.

The field layer represented by the samples shares a number of constants, particularly *Urtica dioica, Dryopteris dilatata, Poa trivialis* and *Juncus effusus*. In wetter ground, small patches of *Iris pseudacorus* and *Phragmites australis* occur. The bryoflora on the higher ground includes *Mnium hornum*, while *Kindbergia praelonga* is the sole moss on lower ground.

Stand WW1 is an example of wet woodland that has developed on the margins of the floodplain, but includes elements of both the dry woodland on its upslope side, and patches of true floodplain wet woodland in the lower hollows. The minimal seepage from very free-draining substrates upslope probably prevents the development of a woodland type more typical of valley sides, and the stand is best accommodated within the Typical sub-community of the *Alnus glutinosa-Urtica dioica* woodland (W6a).

Alnus-Urtica woodland is a widespread but local community throughout the lowlands, often on the remnants of undrained flood-plains and eutrophicated mires (Rodwell, 1991). It is amongst the more common types of wet woodland in Suffolk, but is restricted to low-lying valley sides

and partly drained floodplains. In the driest and the wettest parts of the stand, other woodland types are apparent, but their extent is very local and confined to small topographical features.

Stand WW2 - W2a *Salix cinerea-Betula pubescens-Phragmites australis* woodland, *Alnus glutinosa-Filipendula ulmaria* sub-community

This young woodland can more properly be regarded as mixed sallow scrub, as large areas of the developing canopy are composed of overstood *Salix cinerea*, with young uncut stems of *Alnus glutinosa* and *Betula pubescens*, with some *Fraxinus excelsior*.

There is no intact sub-canopy, though areas of the central and southern parts of the stand are clearly younger and the canopy here still permits free growth of the tall herb fen that preceded it. In these areas, the field layer is dominated by frequent *Phragmites australis, Angelica sylvestris* and sprawls of *Galium palustre* and *Lotus pedunculatus*. *Iris pseudacorus, Urtica dioica* and *Cirsium palustre* are locally frequent, with a wide range of associates occasionally occurring amidst a thin ground layer of *Agrostis stolonifera* with infrequent wefts of the moss *Brachythecium rutabulum*.

Elsewhere, the field layer is very thin, though of the same general species composition.

Stand WW2 is an example of carr woodland that has developed on only periodically saturated peat. It can be referred to the *Alnus glutinosa-Filipendula ulmaria* sub-community of the *Salix cinerea-Betula pubescens-Phragmites australis* woodland (W2a). This type of woodland is particularly distinctive of East Anglian floodplain, though fragments occur throughout lowland Britain. While this type of woodland is not uncommon in Suffolk, in the Sandlings it is restricted to small pockets of valley-floor wetland, where it has often developed from abandoned grazed areas and may quickly mature into alder woodland. It is not always considered a desirable community where it has replaced more floristically-rich tall-herb fens and fen meadows.

Stand WW3 - W5a *Alnus glutinosa-Carex paniculata* woodland, *Phragmites australis* sub community

This stand is an extension of Stand WW23 – *Alnus glutinosa – Iris pseudacorus* woodland, surveyed in 2007. However, in contrast with the immature shrub-dominated areas found in Stand WW23, this stand is wholly affiliated with the *Phragmites australis* sub-community of the *Alnus-Carex* woodland (W5a).

Five samples were recorded from this type of woodland in 2008, which occurs solely on what is likely to be deep peat amongst the fen meadow and reedbed communities. *Alnus glutinosa*, *Fraxinus excelsior* and *Quercus robur* are all present in the canopy over most of the stand, although in some parts the canopy is dominated by *Betula pubescens* and *Populus nigra* agg. The shrub layer is often patchy, and varies from being virtually absent to forming patches of sub-canopy in the absence of canopy species. *Salix cinerea* is the most frequent species, with some other shrub willows and *Crataegus monogyna*. Saplings of *Alnus glutinosa* are frequent, and those of *Fraxinus excelsior, Betula pubescens* and *Quercus robur* were also recorded.

The field and ground layers are most conspicuously characterised by species found in the surrounding wetlands. In particular, *Iris pseudacorus*, *Eupatorium cannabinum*, *Poa trivialis* and *Urtica dioica* are constant. Common associates are *Phragmites australis*, which is patchily dominant, and the thin straggling stems of *Galium aparine*. *Carex acutiformis*, *Mentha aquatica* and *Lycopus europaeus* are also locally frequent. On the ground, the bryoflora is largely made up of the common mosses *Kindbergia praelonga* and *Brachythecium rutabulum*.

With the exception of the areas where thick stands of *Iris pseudacorus* dominate, the field and ground layers are composed of scattered plants.

This is the most commonly occurring form of this type of woodland, which is "a fairly local, though quite widespread, community throughout the English lowlands" (Rodwell1991). The sub-community has become infrequent in Suffolk river valleys, and is often restricted to peat bodies marking valleyside seepages. It is an immature example of this type of woodland, which is typically associated with wetter ground conditions than that found in Stand WW1.

Stand WW4 - W10d *Quercus robur-Pteridium aquilinum-Rubus fruticosus* woodland, *Holcus lanatus* sub-community

The western fringe of Grimseys Wood is made up of moist oak-birch woodland that is clearly on the margins of the valley floor, in an area of very thin peat over sand. One over-turned root-plate shows the appearance of sand at a depth of only c.5 cm, beneath a thin layer of dry peat. Two samples were taken from this area, which emphasise the gap in age structure between the scatter of mature *Quercus robur, Fraxinus excelsior, Betula pubescens* and *B. pendula*, and the thin shrub layer composed of saplings and young trees of *Quercus, Fraxinus* and *Alnus glutinosa*, and widely scattered *Salix caprea* and *Corylus avellana*. Climbing stems of *Lonicera periclymenum* are patchily frequent on the trunks of some trees.

The field layer is dominated by a sward of *Holcus lanatus*, with occasional patches of *Urtica dioica, Juncus effusus* and *Molinia caerulea*, with *Dryopteris dilatata, Rumex sanguineus* and *Geranium robertianum*. Scattered in small hollows are little clumps of *Iris pseudacorus* with *Phragmites australis* and occasional *Solanum dulcamara*. This flora, however, is restricted to these wetter areas, and can be regarded as outliers of the adjacent W5 *Alnus-Carex* woodland.

Along the margins of this stand, the presence of clumps of *Molinia caerulea* and *Juncus effusus* form no more than a transition from wet woodland to a drier habitat. Much of this woodland stand can be referred to a moist form of the *Holcus lanatus* sub-community of the W10 *Quercus robur-Pteridium aquilinum-Rubus fruticosus* woodland. The community is "widely distributed and common over the lowlands of England and Wales" (Rodwell 1991), and the *Holcus lanatus* sub-community is most frequently recorded in southeast England. This type of woodland is common on the valley slopes and many plateaux of the Sandlings, though it is only locally found on the margins of wetlands, where it tends to occur in narrow transitional zones on the valley footslope.

Goose Hill and Kenton Hills Woodland Rides Survey

The function of this survey was to supplement the group of samples taken from the parched, acid sections of the ride network on Goose Hill and the Kenton Hills, and to further delineate this area of vegetation. The survey focused only upon the area where the highest potential for heathland restoration was identified during the 2007 survey (Stands RI34 and RI35).

An additional six samples were taken within Stand RI34, a short grassland sward, with *Agrostis capillaris* and *Polytrichum juniperinum* constant, which occurs in the most parched and somewhat trampled areas in the centre of rides in a limited area of Kenton Hills and over a more extensive part of Goose Hill. In both areas, the vegetation was recorded from the higher ground, where the presence of drought-tolerant annuals, pioneer mosses and elements of the nearby acid sand dune flora have combined to form an open grassland very similar to that found in heathland areas.

The remaining 13 samples were taken within Stand RI35, with *Agrostis capillaris* and *Kindbergia praelonga* constant. This mossy sward is found in the shadier rides where drought-tolerant annuals are mostly absent, and the sward is dominated by the character moss, and other species including *Rhytidiadelphus squarrosus* and *Scleropodium purum*. This stand was initially regarded as a homogeneous unit, but the additional samples revealed a division between a group of species associated with dry, acid and very infertile conditions, and a second group more commonly associated with recently stabilised, moderately fertile and only mildly acid soils.

The distribution of samples from these different vegetation stands has allowed an effective boundary to be drawn around the samples assigned to the supplemented Stand RI34 and around the variant of Stand RI35 associated with more strongly acid and less fertile conditions. The location of all woodland ride samples from both surveys is given in Figure 3.9.

The following accounts for these communities supersede those included in the 2007 survey, from which they are largely derived.

Stand RI34 – *Agrostis capillaris – Polytrichum juniperinum* community

Fifteen samples were taken from this stand, which occurs in open rides on the high ground of Goose Hill and in limited areas of the Kenton Hills. *Agrostis capillaris, Polytrichum juniperinum, Scleropodium purum, Anthoxanthum odoratum* and *Rumex acetosella* are the constants and frequently dominant in a short, rather open and parched sward. The occurrence of the stand corresponds to high areas of strong sunlight within the plantation where there is moderate trampling. Bryophytes are particularly frequent and diverse in this community, and *Syntrichia ruraliformis, Hypnum cupressiforme* and *Campylopus pyriformis* are all common. A very thinly scattered lichen flora is also present in some areas of the stand, including *Cladonia foliacea*. The Nationally Scarce herb *Crassula tillaea* is occasionally present in open ground, often found growing with *Carex arenaria*.

The average number of plant species is 13.0 (range 7-18 species per sample).

Stand RI34 can be referred to the *Erodium cicutarium-Teesdalia nudicaulis* sub-community of the *Festuca ovina-Agrostis capillaris-Rumex acetosella* grassland (U1c), though it should be noted that the vegetation also has some characteristics of the *Anthoxanthum odoratum* sub-community of the *Carex arenaria-Festuca ovina-Agrostis capillaris* dune grassland (SD12a). *Festuca-Agrostis-Rumex* grassland "occurs widely over suitable substrates throughout the warm and dry lowlands of England and Wales" (Rodwell 1992), though it is centred on East Anglia; the *Erodium-Teesdalia* sub-community typically occurs on parched, base-poor ground, and is uncommon outside of the East Anglian Breckland region. *Carex-Festuca-Agrostis* dune grassland occurs mainly on the east coast of Britain, and is notable for occurring inland on loose infertile sands. Stand RI34 is thus a notable community in Suffolk, and is largely restricted to Breckland and the Sandlings, where it is often found along rides in conifer forests that receive full sunlight in sheltered situations.

Stand RI35 – *Agrostis capillaris – Kindbergia praelonga* community[29]

Thirty samples were taken from this stand, which occurs in somewhat shaded conditions, often in narrow rides and/or in very lightly trampled conditions. This vegetation occurs in the general vicinity of Stand RI34, but over a wider area. *Agrostis capillaris* and *Scleropodium purum* are still constants, with the perennial grasses *Holcus lanatus* and *Anthoxanthum odoratum*, but the suite of bryophytes is now dominated by *Kindbergia praelonga* and *Rhytidiadelphus squarrosus*. *Hypnum jutlandicum* and *Dicranella heteromalla* are also associates. *Poa annua* is much more frequent than in Stand RI34 and occupies the more trampled areas within the stand.

Two variants of this stand are now recognised.

Variant A shares all of its constant species with Variant B, but both *Pteridium aquilinum* and *Rubus fruticosus* agg. are much more common. The variant has a list of associates frequently found in dry, acid and infertile conditions, including the mosses *Hypnum jutlandicum, Dicranella heteromalla* and *Dicranum scoparium*. *Holcus mollis* and *Aira praecox* are also occasional associates.

The average number of plant species in variant A is 9.5.

Variant B shares all its constant species with Variant A, but *Cerastium fontanum, Stellaria pallida* and *Hypochaeris radicata* occur more commonly here. In addition, the variant has a long list of associate species restricted to it, including *Senecio jacobaea, Stellaria media, Carex arenaria* and *Dactylis glomerata*.

The average number of plant species is 12.1.

The influence of shade tolerant species that have been able to colonise the moist conditions on the ride provides an unusual floristic composition for a grassland community. It is apparent, however, that the reduction in droughting has shifted the sward away from the *Festuca-Agrostis-Rumex* community (U1) typical of inland acid stands, towards the *Festuca-Agrostis-Galium* grassland (U4) more commonly found in areas of higher rainfall and more humid conditions.

Stand RI35 is therefore referred to the *Holcus lanatus-Trifolium repens* sub-community of the *Festuca ovina-Agrostis capillaris-Galium saxatile* grassland (U4b), with which it shares many similarities. The species composition of the two variants suggests that Variant A should be considered with reference to the *Anthoxanthum odoratum* sub-community of the *Pteridium aquilinum-Galium saxatile* community (U20a), while Variant B has some similarities with acid, fixed sand dune, particularly the *Anthoxanthum odoratum* sub-community of the *Carex arenaria-Festuca ovina-Agrostis capillaris* dune grassland (SD12a).

Festuca-Agrostis-Galium grasslands (U4) are common throughout large areas of the British uplands, and the *Holcus-Trifolium* sub-community extends this type of vegetation into the lowlands on moist, often fertile sands that are drought-free. The *Pteridium-Galium* community (U20) is virtually ubiquitous on suitable soils throughout the British Isles, and the grassy *Anthoxanthum* sub-community is typically found in open areas of oak-birch woodland in the lowlands. *Carex-Festuca-Agrostis* dune grassland occurs mainly on the east coast of Britain, and is notable for occurring inland on loose infertile sands.

[29] The name of this stand is altered from that given in the 2007 report, to take account of the new scientific name accorded to members of the former *Eurhynchium* genus.

The distribution of this community in Suffolk is poorly known, but it has been recorded by the author in moist, rather acid but quite fertile sands on low floodplain terraces in the River Waveney and partially shaded sections of forest rides in the Sandlings conifer forests.

Coastal embankment habitats survey

An initial survey of the vegetation mantling the coastal bunds in 2007 indicated that the communities were not sufficiently mature to be well represented within the NVC framework. The 2008 survey sought to provide sufficient information on the character of the constituent stands to make an effective record of this vegetation.

It was determined that all young plantations could not be related to the NVC. In part, this was due to the diverse nature of the tree planting stock, but it was also evident that extensive areas had been sown with a meadow mix. Notwithstanding, samples were taken of the embankment slope on the coastal side and along the narrow corridor of trampled grassland on the top of the embankment. In addition, patches of gorse scrub were also sampled, though these were often very small and the samples tend to reflect a proportion of 'edge species'. Open areas on the made slopes near the northern side of the power station were also sampled as a third community. This vegetation was a form of rabbit-grazed parched grassland, with many semi-natural characters.

As shown in Figure 3.10, three communities are identified and represented by sample location.

Stand CE1 – SD8 *Festuca rubra-Galium verum* fixed dune grassland

Thirteen samples of this stand were taken from locations on the coastal side of the embankment, along the open grassland on the top of the embankment, and in the plantation areas within glades and rides. While a number of the recorded species may have originated as a sown mixture, the samples demonstrate a unity of species composition over large areas of the grassland. *Festuca rubra* is ubiquitous throughout, and is frequently the dominant sward-forming grass, forming a litter-rich mat over extensive areas. *Poa pratensis, Anthoxanthum odoratum* and *Holcus lanatus* are also locally abundant and these grasses are accompanied by *Plantago lanceolata* and *Vicia sativa*. Other constants include *Hypochaeris radicata* and *Elytrigia repens*. The distribution of the vegetation is patchy in some parts of the coastal side and top of the embankment, and the more open areas can be colonised by sheets of a diminutive form of *Bromus hordeaceus*.

The range of associated herbs is extensive and the samples recorded common *Vicia hirsuta, Senecio jacobaea* and *Leucanthemum vulgare*. Few forbs have spread to form extensive patches, though legumes such as *Medicago lupulina* and *Trifolium dubium* are locally abundant in small areas. Few bryophytes are present; with *Brachythecium rutabulum* being the only species found carpeting the ground.

The average number of plant species is 14.8 species and the range within the samples is 12-18 species.

The group of samples taken can be referred to the *Festuca rubra-Galium verum* fixed dune grassland community (SD8). This community is typical of shelly dunes that have been stabilised by grazed grassland; it occurs in suitable locations around the British coast. Its presence in this immature form on the coastal embankment is largely due to the slightly calcareous character of the substrate, though its species composition may reflect the composition of the seed mixes that were probably sown to stabilise the surface of the embankment. In Suffolk, extensive areas of

this type of vegetation are uncommon, as the sands in most coastal situations are too acidic, and the embankment provides a long-term location for an unmanaged form of this community.

Although it is possible that this stand could be considered for CWS status under the 'Rarity' criterium (and similar habitats could fall under the Specific Habitat Criterium 4.2.1 'Unimproved/semi-improved, dry acid grassland or dry but non acid grassland associated with crag/sand and gravels in Suffolk) it is relatively small, fragmented, immature and likely to be transitory in nature.

Stand CE2 – Parched grassland

Ten samples of this rabbit grazed community were taken from a number of locations were it has developed. The vegetation is restricted to high sunlight areas of the made slopes on the northern side of the power station. Sward heights are typically just several centimetres and the grassland is maintained by rabbit grazing and by the strongly droughting substrate, which appears to have derived from crag sands.

The moss *Brachythecium rutabulum* is frequently dominant, forming a close carpet over the ground surface. *Carex arenaria, Holcus lanatus* and *Dactylis glomerata* form the constant sward constituents with sprawls of *Lotus corniculatus* and rosettes of *Leontodon hispidus*. The grasses *Vulpia bromoides, Festuca rubra* and *Poa pratensis* are also sward-forming in several areas, though the grassland is usually open with high bryophyte cover or patches of bare ground, which are colonised by a wide range of annual associates, including *Catapodium marinum, Centaureum erythraea, Trifolium striatum* and a number of diminutive acrocarpous mosses, such as *Pohlia nutans* and *Tortula ruralis ruraliformis*.

The average number of species in the samples is 16.8 (range: 12-21 species).

The sampled areas are seldom contiguous and this stand forms patches over an extensive area. The suite of grasses, annual forbs and mosses are indicative of extremely parched grassland, but the crag sands have imparted sufficient alkalinity to the young soil to make the vegetation impossible to classify within the NVC[30]. Within a coastal context, the community is very uncommon and is perhaps more likely to be encountered on exposed concrete surfaces, as on the Dunwich Cliffs (personal observation) or the floors of inland crag quarries (eg. Stone 2004b), than on natural ground.

Although it is possible that this stand could be considered for CWS status under the 'Rarity' criterium (and similar habitats could fall under the Specific Habitat Criterium 4.2.1 'Unimproved/semi-improved, dry acid grassland or dry but non acid grassland associated with crag/sand and gravels in Suffolk) it is relatively small, fragmented, immature and likely to be transitory in nature.

Stand CE3 - W23 *Ulex europaeus-Rubus fruticosus* scrub

Five samples were taken from the scattered patches of gorse scrub along the embankment. While gorse was dominant in each, the samples largely recorded grassland species that had become associated with scrub. *Prunus spinosa* and *Rubus fruticosus* agg. were both constant companions and the samples can be referred to the *Ulex europaeus-Rubus fruticosus* scrub, though the stand as a whole cannot be readily assigned to a particular sub-community. W23 is a

[30] In European phytosociology, this vegetation would probably be classified as an immature form of open, dry grassland belonging to the Thero-Airion alliance.

common community in both a local and national context, with a widespread distribution on marginal land throughout.

4. References

ADAS (2006) Sizewell Integrated Land Management Plan. British Energy Group Plc

ADAS / SWT. (2005-2007). Annual Management Plan Reviews. British Energy Group Plc

Anon. (1994). Biodiversity: the UK action plan. HMSO, London.

Anon. (1995). Biodiversity: the UK Steering Group report. Two Volumes. HMSO, London.

Avery, B.W. (1990). Soils of the British Isles. CAB International, Wallingford.

Beckett, G & Bull, A. (1999). A flora of Norfolk. Privately published.

Bioscan UK Limited. (1992). Sizewell 'C': 1992 Specific Studies. Unpublished report to Nuclear Electric plc.

Blockeel, T.L. & Long, D.G. (1998) A check-list and census catalogue of British and Irish bryophytes. Cardiff: British Bryological Society.

British Energy Plc. (2007). Biodiversity Action Plan. British Energy plc.

Casey D (1998) A botanical survey of the Sizewell Belts grazing marshes dyke system. Unpublished report for Suffolk Wildlife Trust.

Casey D., Kay S., Miller A., Wright M., Harding M & West, R. (1993). An Ecological Survey Of Sizewell Belts. Unpublished Suffolk Wildlife Trust Report to Nuclear Electric.

Doarks, C & Leach, S. (1990). A classification of grazing marsh dyke vegetation in Broadland. NCC England Field Unit Report (Project No.76). Unpublished report to Nature Conservancy Council.

Dobson, F.S. (2005). Lichens. An illustrated guide to the British and Irish Species. The Richmond Publishing Co. Ltd., Slough.

Doody, P & Randall, R. (2003). Guidance for the Management of Coastal Vegetated Shingle. Contract No. MAR 05-03-002. English Nature, Peterborough.
Entec UK Ltd. (2008). Sizewell national vegetation classification report 2007. Report to British Energy Group PLC.

Hemphill P (2006) Botanical survey of the Sizewell Belts grazing marshes dyke system. Unpublished report for Suffolk Wildlife Trust.

Hill, M.O., Preston, C.D. and Roy, D.B. (2004) PlantAtt - Attributes of British and Irish plants: Status, size, life history, geography and habitats. Centre for Ecology and Hydrology, Huntingdon.

Hughes, S. (1995). The Haven, Thorpeness: NVC Survey 1995. Unpublished report to the Suffolk Wildlife Trust, Ashbocking

Jensch, A. and Beyschlag, W. (2003) Vegetation ecology of dry acidic grasslands in the lowland areas of central Europe. Flora 198, 3-25.

John, D. M., Whitton, B. A & Brook, A. J. [Eds]. (2002) The freshwater algal flora of the British Isles - an identification guide to freshwater and terrestrial algae. Cambridge University Press, Cambridge.

Parmenter, J. (2001). Sizewell Belts SSSI Woodland Survey, June 2001. Unpublished report for Suffolk Wildlife Trust and Nuclear Electric.

Parmenter, J.M. (1996-2001). Sizewell Belts SSSI. Annual reports on the fen meadow vegetation monitoring programme. Unpublished reports to the Suffolk Wildlife Trust and Nuclear Electric.

Paton, J.A. (1999). The liverwort flora of the British Isles. Harley Books, Colchester.

Preston, C.D., Pearman, D.A & Dines, T.D [Eds]. (2002). New Atlas of the British and Irish flora. Oxford University Press: Oxford.

Purvis, O.W., Coppins B.J., Hawsworth, D.L., James, P.W. and Moore D.M. (1992). The lichen flora of Great Britain and Ireland. London. British Natural History Museum.

Rodwell J.S. [Ed.] (1995) British plant communities. Volume 4. Aquatic communities, swamp and tall-herb fens. Cambridge University Press, Cambridge

Rodwell J.S. [Ed] (1992) *British* Plant Communities Volume 3. Grasslands and montane communities. Cambridge University Press.

Rodwell, J.S. [Ed.] (1991a) British plant communities. Volume 1. Woodlands and scrub. Cambridge University Press, Cambridge

Rodwell, J.S. [Ed.] (1991b) British plant communities. Volume 2. Mires and heaths. Cambridge University Press, Cambridge

Rodwell, J.S. [Ed.]. (2000a). British plant communities. Volume 5. Maritime communities and vegetation of open habitats. Cambridge University Press, Cambridge

Rodwell, J.S., Dring J.C., Averis, A.B.G., Proctor, M.C.F., Malloch, A.J.C., Schaminée, J.N.J & Dargie, T.C.D. (2000b). Review of coverage of the National Vegetation Classification, JNCC Report, No. 302

Rodwell, J.S., Morgan, V., Jefferson, R.G & Moss, D. (2007). The European context of British lowland grassland. JNCC Report No. 394. Joint Nature Conservation Committee, Peterborough.

Smith, A.J.E. (2004). The moss flora of Britain and Ireland. Cambridge. Cambridge University Press.

Sneddon, P & Randall, R.E. (1993). Coastal vegetated shingle structures of Great Britain: main report. Joint Nature Conservation Committee, Peterborough.

Sneddon, P & Randall, R.E. (1994) Coastal vegetated shingle structures of Great Britain: Appendix 3. Shingle sites in England. Joint Nature Conservation Committee, Peterborough.

Stace, C. (1997). New Flora of the British Isles. Second edition. Cambridge University Press, Cambridge.

Stewart A, Pearman DA & Preston CD (1994) Scarce plants in Britain. Joint Nature Conservation Committee, Peterborough.

Stone, J.M. (2004a). Sizewell Belts SSSI. Report on the fen meadow vegetation monitoring programme. Unpublished report to the Suffolk Wildlife Trust and Nuclear Electric.

Stone JM (2004b) *National Vegetation Classification Survey of Sutton Crag Pit SSSI*. Unpublished report to English Nature, Suffolk Team.

Stone, J.M. (2003). Sizewell Beach vegetation survey. Unpublished report to the Suffolk Wildlife Trust and Nuclear Electric.

Stone, J.M. (2003-2008). Sizewell Belts SSSI. Annual reports on the fen meadow vegetation monitoring programme. Unpublished reports to the Suffolk Wildlife Trust and British Energy.

Stone, J.M. (2006). Sizewell Belts SSSI. Report on the fen meadow vegetation monitoring programme. Unpublished report to the Suffolk Wildlife Trust and British Energy.

Suffolk County Council. Suffolk biodiversity action plan. Accessed on 28th October, 2008 at http://www.suffolk.gov.uk/Environment/Biodiversity/BiodiversityActionPlans.htm

Walmsey, C.A. (1986). Restoration of Plant Species in Newly Landscaped Coastal Sites at Sizewell. First Year Interim Report for the 1st August 1985 to 31st July 1986. Unpublished report to the Central Electricity Generating Board.

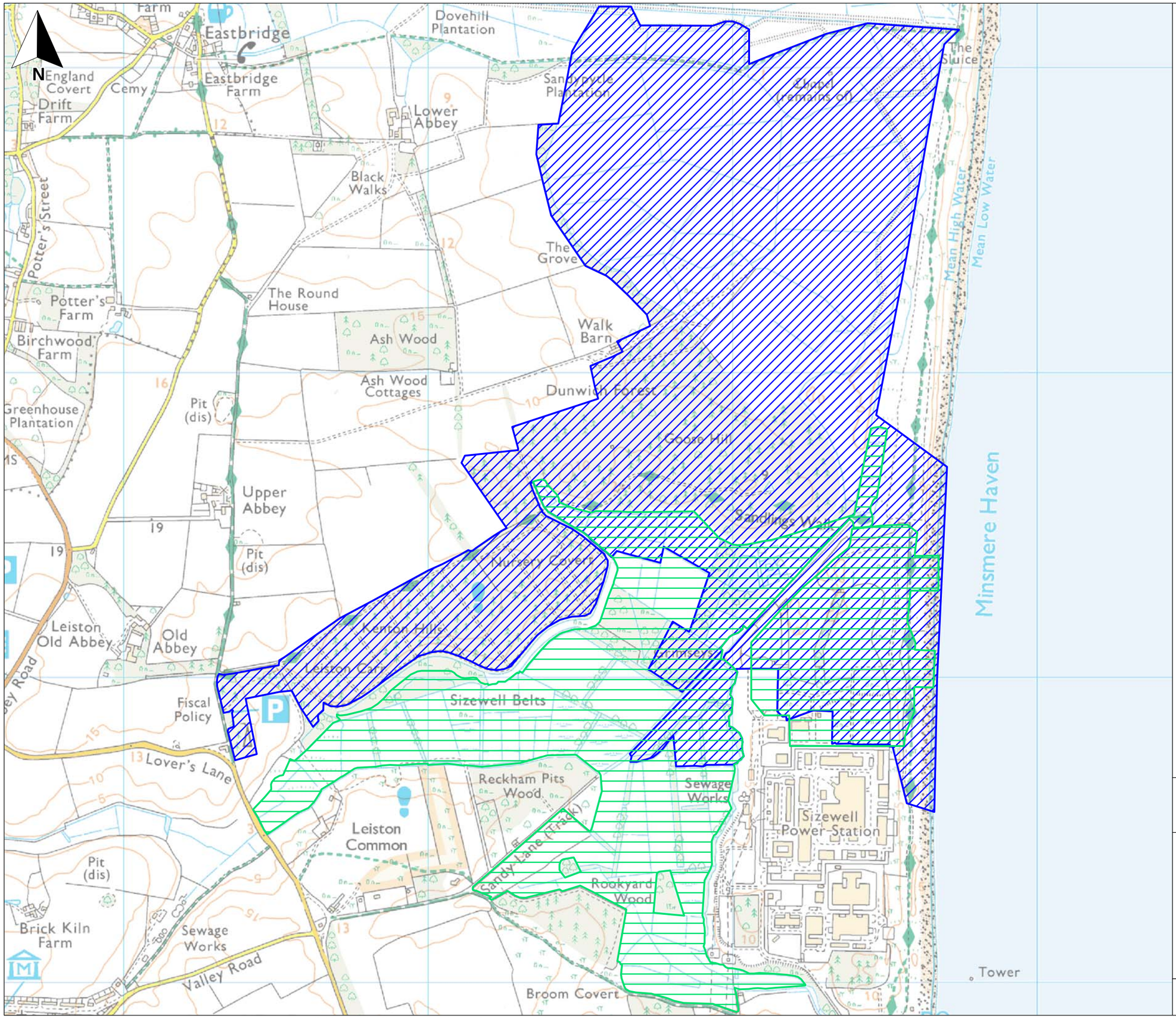
Walmsley, C.A & Davy, A.J. (1997a). Germination Characteristics of Shingle Beach Species, Effects of Seed Ageing and their Implications for Vegetation Restoration. Journal of Applied Ecology, Vol. 34, No. 1. pp. 131-142.

Walmsley, C.A & Davy, A.J. (1997b). The Restoration of Coastal Shingle Vegetation: Effects of Substrate Composition on the Establishment of Seedlings. Journal of Applied Ecology, Vol. 34, No. 1. pp. 143-153.

Walmsley, C.A & Davy, A.J. (1997c). The Restoration of Coastal Shingle Vegetation: Effects of Substrate on the Establishment of Container Grown Plants. *Journal of Applied Ecology*, Vol. 34, No. 1. pp. 154-165.

Wilson, P. & King, M. Eds. (2000). Fields of vision: a future for Britain's arable plants. Plantlife, London.

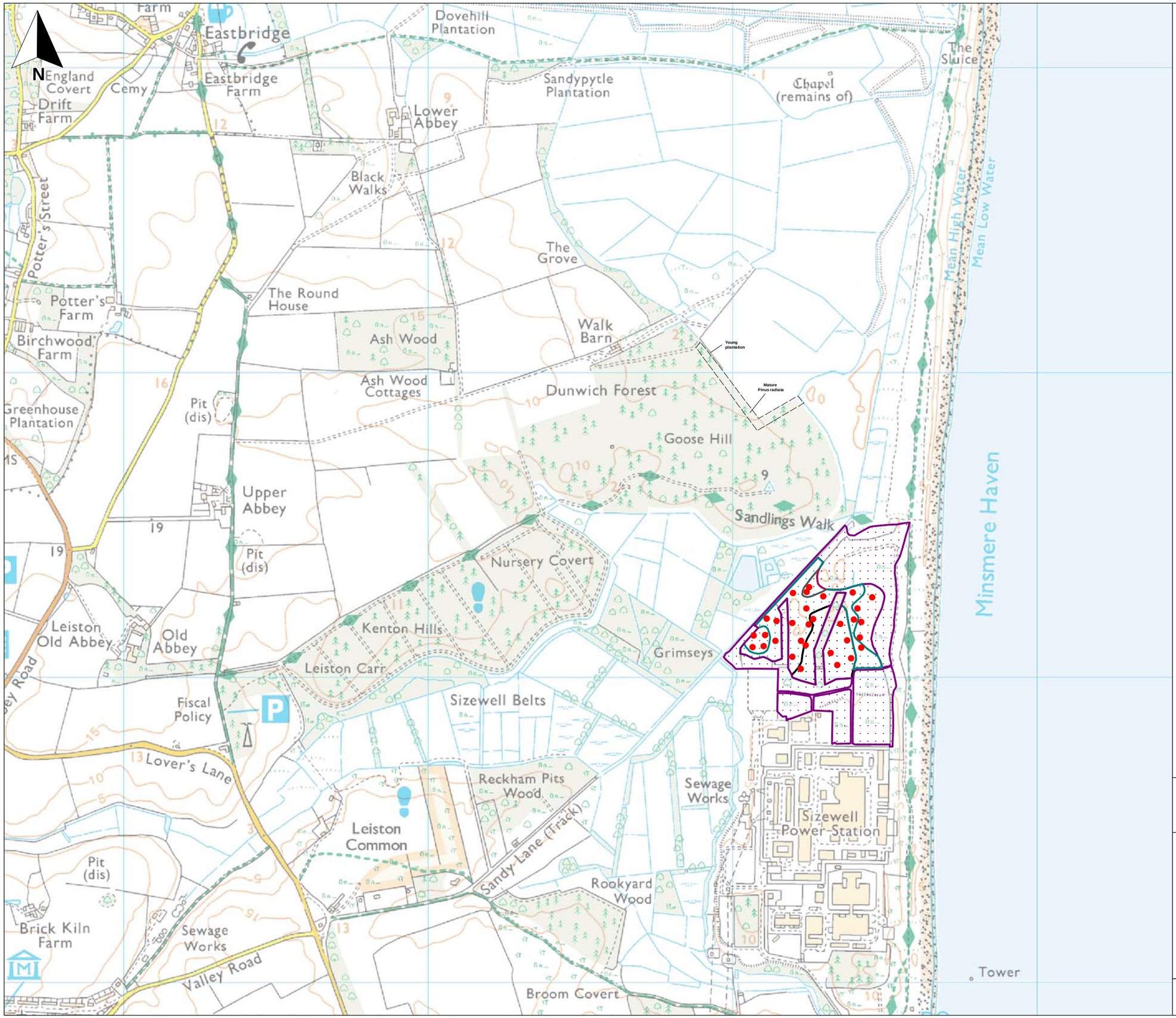
Wolfe-Murphy, A.S., Leach, S.J & Doarks, C. (1991). A botanical survey of grazing marsh ditch systems on the Suffolk and Essex coasts. Nature Conservancy Council.



Sizewell NVC Survey Report 2007 - 2008

Figure 1.1
Site plan showing survey areas

June 2012
28130-A432.wor tugwc



Key

- Community YG1
- Community YG2
- Community YG3
- Young woodland
- Quadrat locations

0 m 500 m

Scale 1:12000 @ A3

Sizewell NVC Survey Report 2007 - 2008

Figure 3.2
Communities on made ground within Preliminary Works Area, 2007

June 2012
28130-A434.wor tugwc

N

The Round House

The Grove

Walk Barn

Ash Wood

Ash Wood Cottages

Dunwich Forest

Pit (dis)

Goose Hill

Upper Abbey

Sandlings Walk

Pit (dis)

Nursery Covert

Kenton Hills

Old Abbey

Grimseys

Leiston Carr

Sizewell Belts

Fiscal Policy

Lover's Lane

Reckham Pits Wood

Sewage Works

Sizewell Power Station

Leiston Common

Sandy Lane (Track)

Rookyard Wood

Sewage Works

Valley Road

Broom Covert

Tower

PC

Sizewell

LEISTON CP

Minsmere Haven

Mean High W

Mean Low

Key

- Community VS4
- Community DG5
- Community DG6
- Community DG7
- Community DG8
- Community DG9
- Community DG10
- Community DG11
- Community DG12
- Community DG13
- Community DG14

0 m 500 m

Scale 1:10000 @ A3

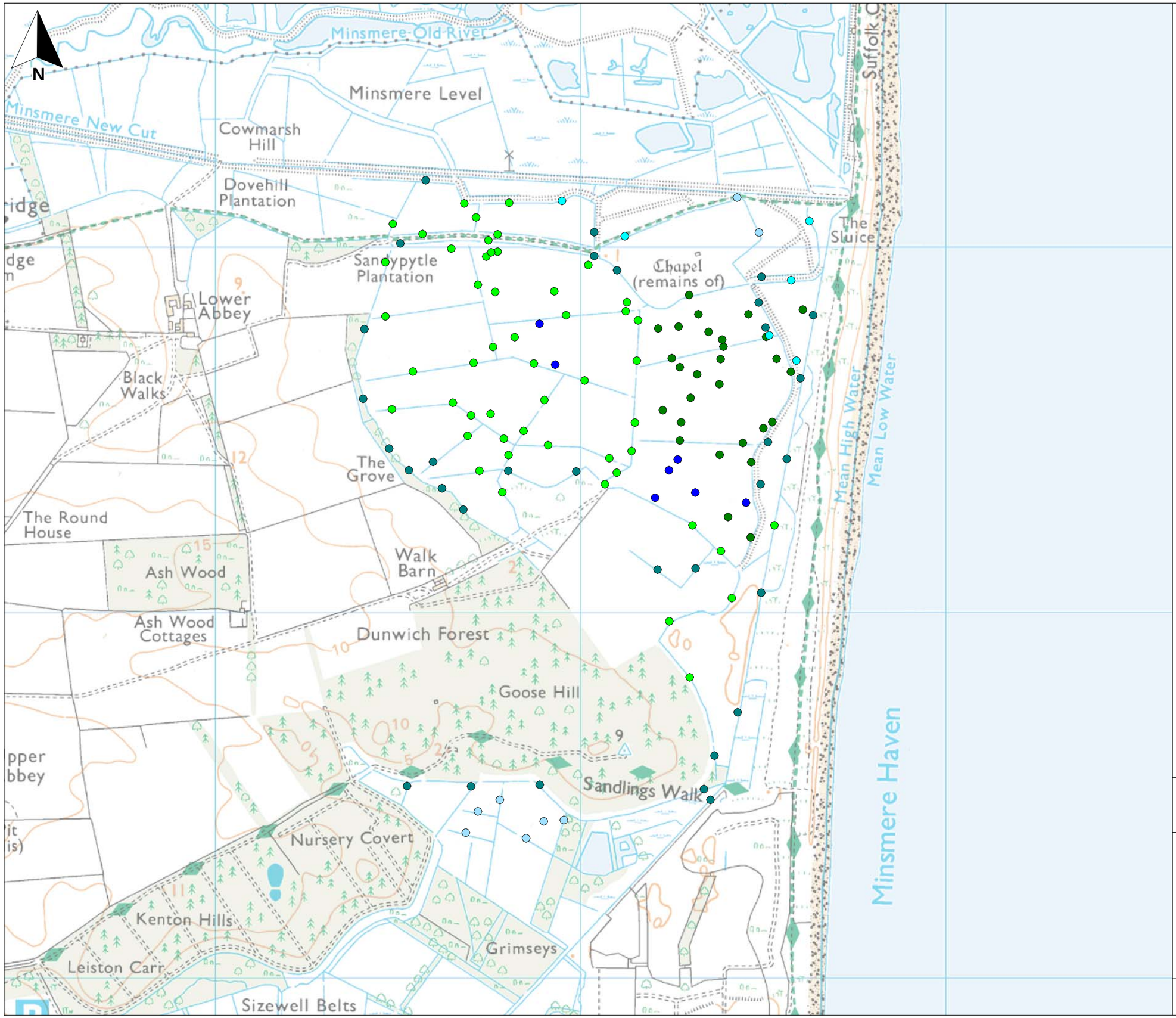
EDF

Sizewell NVC Survey Report 2007 - 2008

Figure 3.3
Coastal habitat communities, 2007

June 2012
28130-A435.wor tugwc

amec



Key

- Community DY25
- Community DY26
- Community DY27
- Community DY28
- Community DY29
- Community DY30

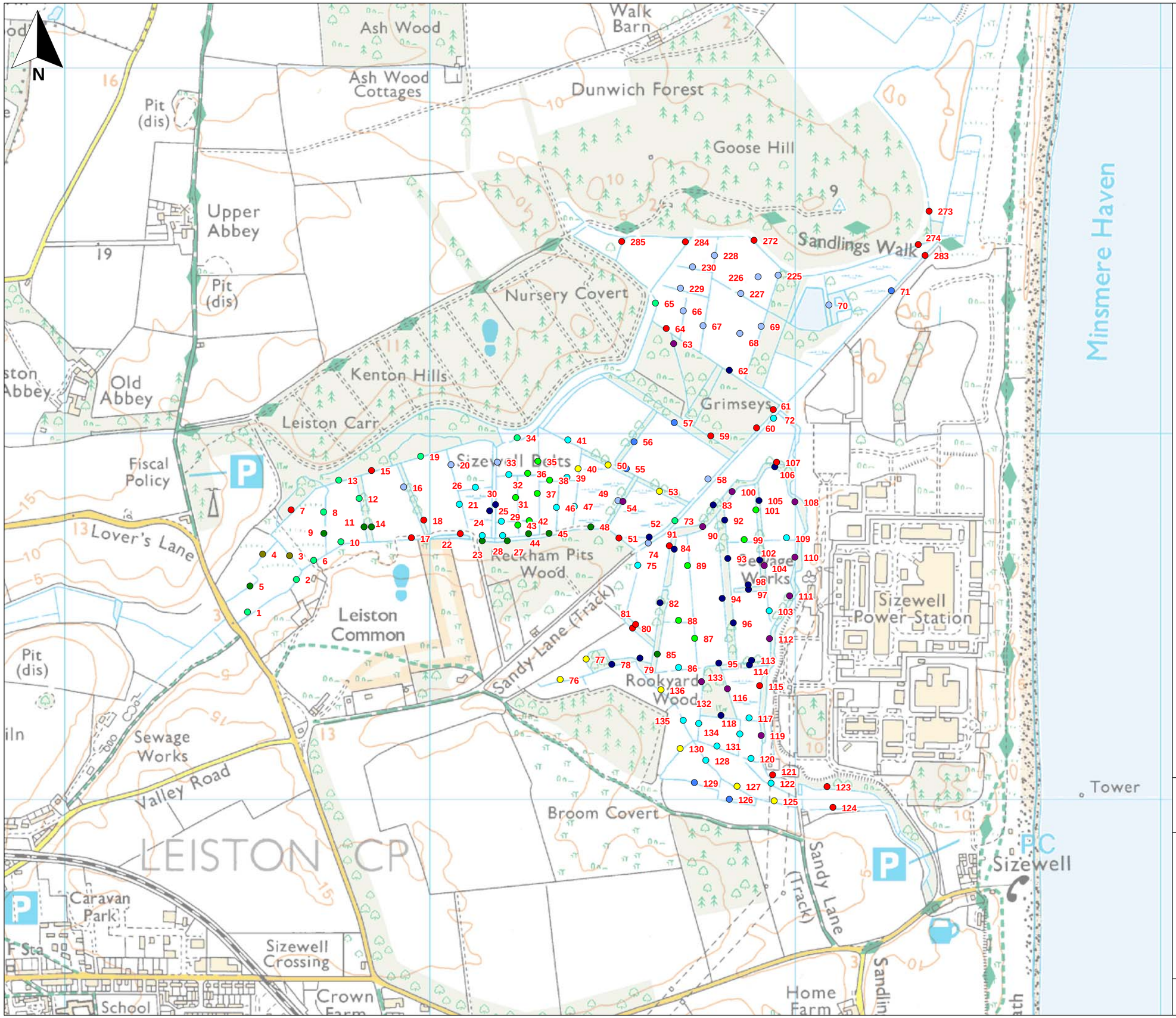
0 m 500 m

Scale 1:10000 @ A3

Sizewell NVC Survey Report 2007 - 2008

Figure 3.5
Grazing marsh dyke communities, 2007

June 2012
28130-A437.wor tugwc



Key

- A4 - Full sun variant (DY1a)
- A4 - Light shade variant (DY1bi)
- A4 - Heavy shade variant (DY1bii)
- A4 - stonewort variant (DY1c)
- A4 - Elodea candensis variant (DY1d)
- A2b over A6
- A2c over A16 with S23 (DY3)
- A2a over A16 with S23 (DY4)
- A2a over S23 (DY5)
- A2a with S4a (DY6)
- A2a (DY7)

0 m 500 m

Scale 1:10000 @ A3

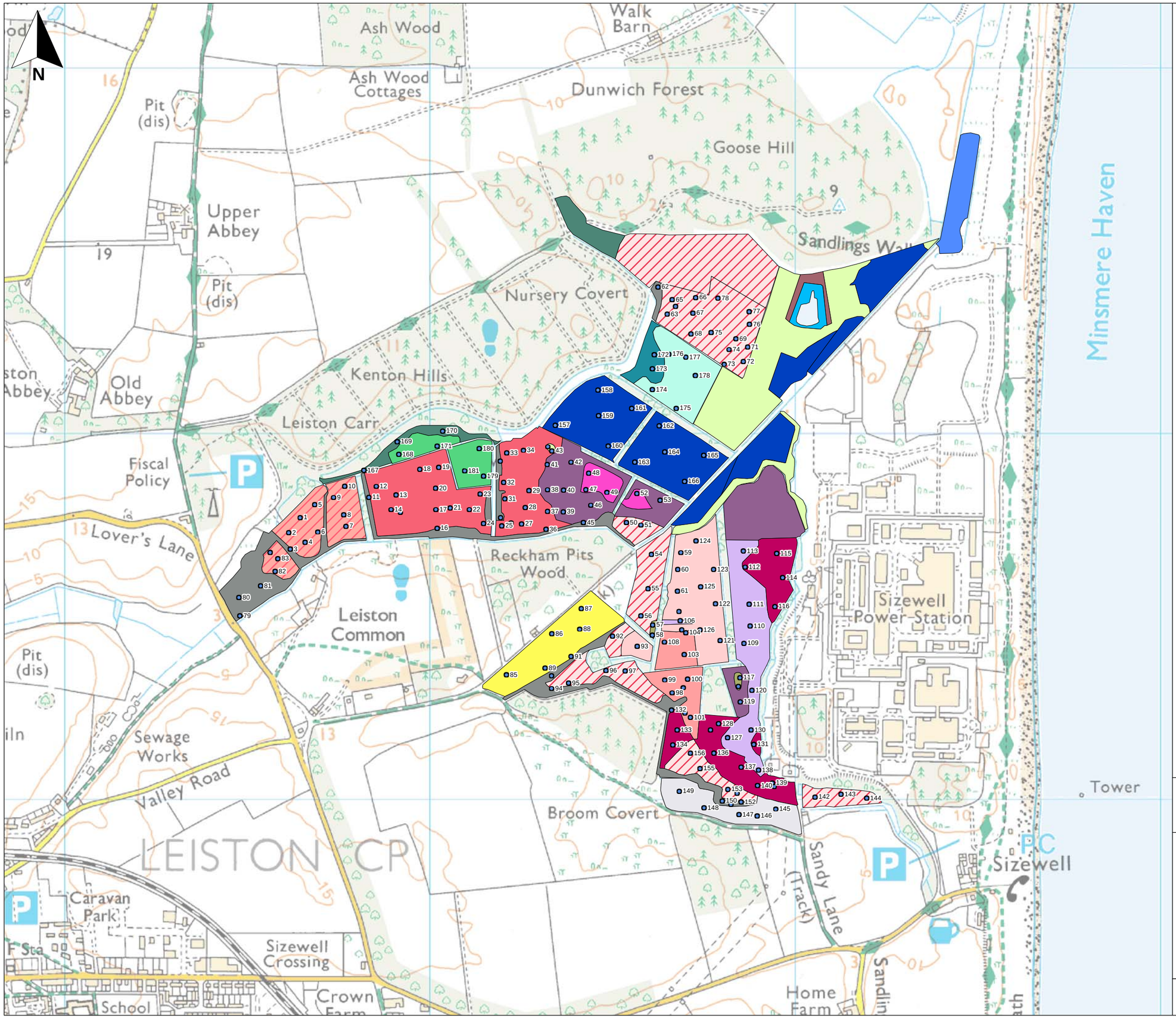
EDF

Sizewell NVC Survey Report 2007 - 2008

Figure 3.7
Sizewell marshes dyke vegetation, 2008

June 2012
28130-A439.wor tugwc

amec



Key

- M22b (FM1a)
- M22b (FM1b)
- M22b - Persicaria amphibia variant (FM1c)
- M22b - Menyanthes trifoliata variant (FM1d)
- M22b (MG8) FM2
- M22b (MG12a) (FM3a)
- M22b (MG12a) (FM3b)
- M22b (MG12a) (FM3c)
- M22d (MG12a) FM4
- M22b / MG10a (FM5)
- MG10a (FM6)
- Holcus lanatus grassland (VG1)
- U1d (VG2)
- S26 RB1
- S26 [RB2) (2007)]
- S4a [RB21) (2007)]
- OV25 [RB22) (2007)]
- W6a WW1
- W2a (WW2)
- W5a (WW3)
- W5a [WW23) (2007)]
- W10d (WW4)
- Location of 2008 samples

0 m 500 m

Scale 1:10000 @ A3

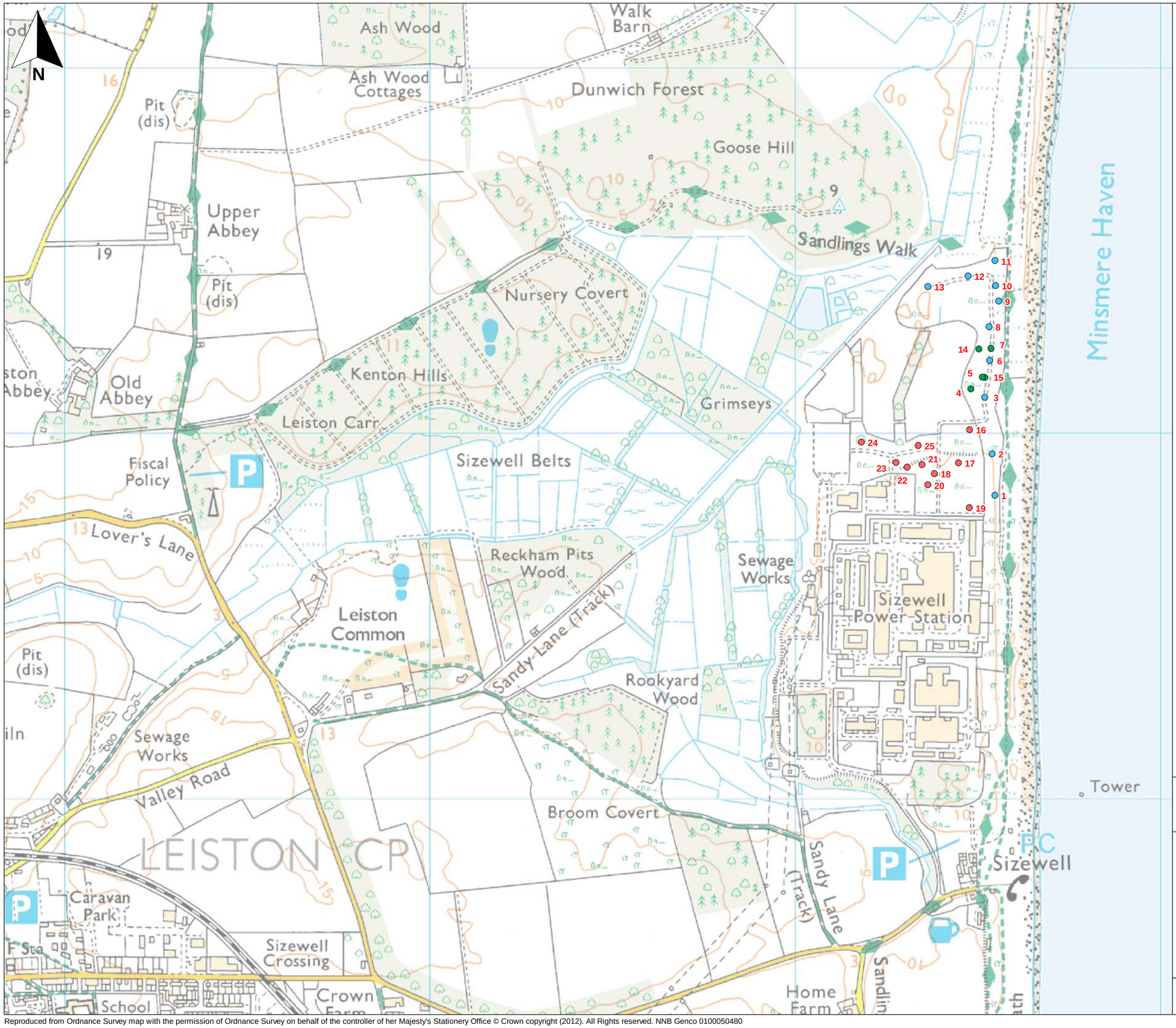
EDF

Sizewell NVC Survey Report 2007 - 2008

Figure 3.8
Sizewell Marshes - fen meadows, 2008

June 2012
28130-A440.wor tugwc

amec



Key

- SD8 (CE1)
- Parched grassland (CE2)
- W23 (CE3)

0 m — 500 m

Scale 1:10000 @ A3

Sizewell NVC Survey Report 2007 - 2008

Figure 3.9
Sizewell coastal embankment habitats stand distribution, 2008

June 2012
28130-A441.wor tugwc

N

Lower Abbey
Black Walks
The Grove
The Round House
Ash Wood
Ash Wood Cottages
Walk Barn
Dunwich Forest
Goose Hill
Pit (dis)
Upper Abbey
Pit (dis)
Nursery Covert
Saltings Walk
Mean High Water
Mean Low Water
Minsmere Haven
Old Abbey
Leiston Hills
Leiston Carr
Grimseys
Fiscal Policy
Sizewell Belts
Lover's Lane
Reckham Pits Wood
Sewage Works
Sizewell Power Station
Leiston Common
Sandy Lane (Track)
Rookyard Wood
Pit (dis)
Sewage

Key

- U1c (SD12a) - Community R134
- U4b (SD20a) - Community R135a
- U4b (SD12a) - Community R135b
- U1c - Community R136
- U20a - Community R137
- MG7e - Community R138
- OV23c - Community R139
- Areas of high suitability for potential heathland restoration
- Areas of moderate suitability for potential heathland restoration

0 m 500 m

Scale 1:10000 @ A3

EDF

Sizewell NVC Survey Report 2007 - 2008

Figure 3.10
Woodland rides, 2008

June 2012
28130-A442.wor tugwc

amec

Appendix A
2007 Data Tables for the Plant Communities

73 Pages

June 2012
Doc Reg No. 28130RR363i1

Young Grasslands

Community YG1 ***Festuca rubra - Veronica arvensis*** **grassland**

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**		
Festuca rubra agg.	5	6	5	5	5	3	7	4	6	5	V	(3-7)
Festuca arundinacea	4	3	6	5	7	6	4	7	3	7	V	(3-7)
Dactylis glomerata	6		3	2	5	4	7	7	8	7	V	(2-8)
Lotus corniculatus	4	3	1	1	4	2	7	6		1	V	(1-7)
Veronica arvensis	3		1	1	3	3	3	3	3	2	V	(1-3)
Brachythecium rutabulum	4	5	6		5	4		5	6	7	IV	(4-7)
Trifolium repens	6		5		2	5	4	4	7	4	IV	(2-7)
Brachythecium albicans		6	5	10	5	1	9	4	1		IV	(1-10)
Trifolium arvense		4	3	1	1		1	1		1	IV	(1-4)
Crepis capillaris	2	1		1		1	2	3	3	1	IV	(1-3)
Agrostis capillaris	4	3	3	3		2					III	(2-4)
Festuca ovina	2	5	2	1		4					III	(1-5)
Medicago lupulina					1	2	1	4		4	III	(1-4)
Plantago lanceolata		3		2	1		3	1			III	(1-3)
Hypochaeris radicata						1	2	2	3	1	III	(1-3)
Taraxacum officinale agg.					1		1	2	2	1	III	(1-2)
Poa pratensis	3				2	3				4	II	(2-4)
Cerastium semidecandrum			2	3	2	2					II	(2-3)
Eurhynchium praelongum	2		7		4			1			II	(1-7)
Festuca rubra glauca				5		2	1		2		II	(1-5)
Vicia lathyroides			3		1			2		1	II	(1-3)
Ceratodon purpureus	2	4				2					II	(2-4)
Erodium cicutarium		3		1			2				II	(1-2)
Trifolium glomeratum		1		1		1					II	(1)
Bromus hordeaceus hordeaceus				5			4				I	(4-5)

Community YG1 (continued)	***Festuca rubra - Veronica arvensis* grassland**											
Bryum sp.			4		4						I	(4)
Leontodon saxatilis		4	3								I	(3-4)
Agrostis stolonifera		3			2						I	(2-3)
Bellis perennis							1			2	I	(1-2)
Sonchus arvensis			1			1					I	(1)
Leontodon autumnalis				1					1		I	(1)
Scleropodium purum		4									I	(4)
Trifolium dubium	2										I	(2)
Inula conyza				2							I	(2)
Syntrichia ruraliformis			2								I	(2)
Rumex acetosella		1									I	(1)
Peltigera canina	1										I	(1)
Vulpia myuros				1							I	(1)
Senecio jacobaea									1		I	(1)
Sonchus asper				1							I	(1)
Filago minima						1					I	(1)
Hypochaeris glabra				1							I	(1)
Lolium perenne								1			I	(1)
Vicia sativa nigra						1					I	(1)
Sward height (cm)	11	2	17	12	14	15	9	12	10	20		
Vegetation cover (%)	80	50	50	40	70	80	90	85	90	90		
Bryophyte cover (%)	10	0	60	100	0	5	0	0	0	0		
Litter cover (%)	5	15	10	1	5	1	2	10	1	15		
Bare ground (%)	30	20	10	0	15	45	5	20	30	30		
No. of species	15	17	18	21	18	21	17	17	13	15	Av.	17.2

Community YG2 ***Dactylis glomerata - Medicago lupulina* grassland**

	11	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**		
Festuca arundinacea	6	7	9	8	9	10	8	9	8	5	8	7	7	V	(5-10)
Dactylis glomerata	6	4	6	6	5	5	5	3	4	4	7	7	7	V	(3-7)
Brachythecium rutabulum	5	5	5	6	4	4	8	5	6	2	8	6	5	V	(2-8)
Medicago lupulina				1	1	1	4	2	3	6	2	4	1	IV	(1-6)
Lotus corniculatus	2						4	1	2	2	4	5	7	IV	(1-7)
Festuca rubra agg.	5	1		4	5				4	4		2	6	IV	(1-6)
Eurhynchium praelongum		2		6	5	1	1		4		2	1		IV	(1-6)
Trifolium repens	9	8		5						7	3	6	7	III	(3-9)
Agrostis stolonifera		4	1				3		3		4	3	2	III	(1-4)
Poa pratensis	4	3		2		2	1	1	2	4				III	(1-4)
Crepis capillaris	1		1	1	1						1	1	2	III	(1-2)
Poa trivialis			5			6					3	4		II	(3-6)
Vicia sativa nigra	2		1			2							1	II	(1-2)
Leontodon autumnalis			1		2		1	1						II	(1-2)
Plantago lanceolata			2	2									2	II	(2)
Trifolium dubium	1				1		1							II	(1)
Veronica arvensis				2									2	I	(2)
Anthoxanthum odoratum		1								4				I	(1-4)
Agrostis capillaris	2		1											I	(1-2)
Equisetum arvense		5												I	(5)
Bellis perennis											3			I	(3)
Taraxacum officinale agg.													2	I	(2)
Lolium perenne	2													I	(2)
Cirsium arvense			2											I	(2)
Brachythecium albicans									1					I	(1)
Senecio sylvaticus					1									I	(1)
Ophrys apifera				1										I	(1)

Community YG2 (continued) **Dactylis glomerata - Medicago lupulina grassland**

	11	12	13	14	15	16	17	18	19	20	21	22	23		
Sward height (cm)	22	17	34	32	42	31	26	31	29	17	18	22	11		
Vegetation cover (%)	100	90	95	75	85	95	90	85	80	100	80	85	100		
Bryophyte cover (%)	0	15	0	0	20	5	80	10	0	2	70	0	0		
Litter cover (%)	10	15	70	55	50	60	15	65	30	5	30	30	5		
Bare ground (%)	25	50	1	0	5	5	0	0	10	50	0	20	10		
No. of species	12	10	11	12	10	8	10	7	10	9	11	11	13	Av.	10.3

Community YG3 ***Festuca arundinacea - Poa trivialis*** **grassland**

	24	**25**	**26**	**27**	**28**	**29**	**30**	**31**		
Festuca arundinacea	9	9	10	10	9	10	9	8	V	(8-10)
Poa trivialis	3	4	6	8	7	5	4	6	V	(3-8)
Dactylis glomerata	3	5	2		4	3	6	3	V	(2-6)
Agrostis stolonifera		3	7	4	8	6		5	IV	(3-8)
Brachythecium rutabulum		4			4			1	II	(1-4)
Trifolium repens		1			1	2			II	(1-2)
Medicago lupulina		1	1					1	II	(1)
Lotus corniculatus					1				I	(1)
Crepis capillaris					1				I	(1)
Trifolium dubium					1				I	(1)
Holcus lanatus								1	I	(1)
Sward height (cm)	35	38	33	41	32	42	38	29		
Vegetation cover (%)	85	90	95	95	95	95	85	95		
Bryophyte cover (%)	0	5	0	0	5	0	0	2		
Litter cover (%)	70	70	50	40	60	20	65	20		
Bare ground (%)	5	10	20	30	10	60	15	40		
No. of species	3	7	5	3	9	5	3	7	No.	5.3

Coastal vegetation

Vegetated shingle

Community VS4 ***Lathyrus japonicus-Crambe maritima*** **community**

	32	**33**	**34**	**35**	**36**		
Lathyrus japonicus	5		6	4	7	IV	(4-7)
Crambe maritima	2	5		1	3	IV	(1-5)
Rumex crispus littoreus	1	3		3	3	IV	(1-3)
Silene uniflora	2	4	2			III	(2-4)
Elytrigia juncea		3		2	1	III	(1-3)
Honkenya peploides		4	1			II	(1-4)
Ammophila arenaria					3	I	(3)
Beta maritima				2		I	(2)
Leymus arenarius					1	I	(1)
Atriplex glabriuscula					1	I	(1)
Sward height (cm)	4	10	5	4	6		
Herb cover (%)	20	25	30	10	50		
Bryophyte/lichen cover (%)	0	0	0	0	0		
Litter cover (%)	1	0	0	0	3		
Bare ground (%)	85	80	75	90	50		
No. of species	4	5	3	5	7	Av.	4.8

Dune Grasslands

Community DG5 ***Honckenya peploides-Elytrigia juncea* foredune community**

	37	**38**	**39**	**40**	**41**	**42**		
Elytrigia juncea	6	3	2	4	3	4	V	(2-6)
Honkenya peploides	6	7	1	4	5	6	V	(1-7)
Carex arenaria	2	3	1	2	3	2	V	(1-3)
Ononis repens	2	1		4	4	4	V	(1-4)
Sonchus arvensis	1	2		2	2	1	V	(1-2)
Rumex crispus littoreus	1	2		2	1	1	V	(1-2)
Eryngium maritimum	1	1		1	1	1	V	(1)
Crambe maritima	1	4			1	1	IV	(1-4)
Ammophila arenaria		3	7	7			III	(3-7)
Atriplex glabriuscula		2		2		1	III	(1-2)
Arrhenatherum elatius					2	2	II	(2)
Lathyrus japonicus	2	2					II	(2)
Calystegia soldanella			2	2			II	(2)
Crithmum maritimum		1			4		II	(1-4)
Festuca rubra rubra				1		1	II	(1)
Senecio viscosus					1	1	II	(1)
Hypochaeris radicata	2						I	(2)
Leymus arenarius		2					I	(2)
Anisantha sterilis						2	I	(2)
Senecio jacobaea				1			I	(1)
Holcus lanatus						1	I	(1)
Leontodon saxatilis				1			I	(1)
Atriplex laciniata	1						I	(1)
Beta maritima		1					I	(1)
Sonchus asper						1	I	(1)

Community DG5 (continued) ***Honckenya peploides-Elytrigia juncea* foredune community**

	37	**38**	**39**	**40**	**41**	**42**		
Sward height (cm)	24	5	40	35	25	28		
Herb cover (%)	50	50	45	50	30	35		
Bryophyte/Cryptogam cover (%)	0	0	0	0	0	0		
Litter cover (%)	2	1	2	2	0	1		
Bare ground (%)	55	60	70	65	75	70		
No. of species	11	14	5	13	11	15	Av.	11.5

Community DG6 ***Ammophila arenaria-Pilosella officinarium*** **dune community**

	43	**44**	**45**	**46**	**47**	**48**		
Ammophila arenaria	7	5	8	9	7	8	V	(5-9)
Pilosella officinarum	7	6	2	5	5	4	V	(2-7)
Carex arenaria	3	2	4	3	3	3	V	(2-4)
Senecio jacobaea	1	1	1	1	2	3	V	(1-3)
Elytrigia juncea	2		7	3	4	3	V	(2-7)
Holcus lanatus	3	4	4	4	2		V	(2-4)
Ononis repens		3	3	4	3	2	V	(2-4)
Vulpia bromoides	3	3		2	3	4	V	(2-4)
Galium verum	4	3		1	4	3	V	(1-4)
Crepis capillaris	3	3	2	1	2		V	(1-3)
Brachythecium rutabulum			4	5	4	2	IV	(2-5)
Catapodium marinum	2	2			3	3	IV	(2-3)
Festuca arenaria	6	3			2	1	IV	(1-6)
Hypochaeris radicata	2	1		2		3	IV	(1-3)
Sonchus arvensis	2				3	3	III	(2-3)
Calystegia soldanella	1		4	4			III	(1-4)
Lotus corniculatus	3	4				1	III	(1-4)
Poa humilis		1			2	2	III	(1-2)
Taraxacum officinale agg.	3	3					II	(3)
Aira praecox	3	2					II	(2-3)
Vicia sativa nigra			2			2	II	(2)
Hypnum cupressiforme		4				1	II	(1-4)
Ceratodon purpureus					1	2	II	(1-2)
Brachythecium albicans		2				1	II	(1-2)
Centaurium erythraea	2	1					II	(1-2)
Plantago lanceolata		1	1				II	(1)
Blackstonia perfoliata					1	1	II	(1)
Homalothecium lutescens		4					I	(4)
Leontodon hispidus					3		I	(3)

Community DG6 (continue) ***Ammophila arenaria-Pilosella officinarium* dune community**

	43	**44**	**45**	**46**	**47**	**48**		
Racomitrium canescens		3					I	(3)
Senecio viscosus	2						I	(2)
Trifolium arvense		2					I	(2)
Phleum arenarium					2		I	(2)
Festuca rubra glauca			2				I	(2)
Eryngium maritimum			1				I	(1)
Lathyrus japonicus						1	I	(1)
Anthoxanthum odoratum						1	I	(1)
Luzula campestris						1	I	(1)
Galium saxatile				1			I	(1)
Trifolium repens		1					I	(1)
Veronica arvensis						1	I	(1)
Syntrichia ruraliformis	1						I	(1)
Cladonia foliacea		1					I	(1)
Medicago polymorpha						1	I	(1)
Sward height (cm)	65	12	45	70	50	40		
Herb cover (%)	65	80	95	90	75	85		
Bryophyte/lichen cover (%)	1	20	5	15	5	2		
Litter cover (%)	40	5	60	60	40	40		
Bare ground (%)	30	35	5	0	20	30		
No. of species	20	25	14	14	19	25	Av.	19.5

Community DG7 ***Brachythecium albicans-Trifolium arvense*** **dune grassland**

	49	**50**	**51**	**52**	**53**	**54**	**55**	**56**	**57**	**58**	**59**		
Brachythecium albicans	5	5	3	5	4	2	6	8	1	7	7	V	(1-8)
Trifolium arvense		3	2	3	6	3	4	4	4	2	2	V	(2-6)
Galium verum	2	3	3	3	4	2	4	2	2	4		V	(2-4)
Hypnum cupressiforme	4	6	7	4	7	2	4	2	2	1		V	(1-7)
Vulpia bromoides		3		4	5	3	7	5	5	5	3	V	(3-7)
Aira praecox	3		4	3	3	2		2	3	3	4	V	(2-4)
Catapodium marinum	3	2	3	3		3	2		4	3	3	V	(2-4)
Plantago lanceolata	6	5	5	3	5	3	7	3		1		V	(1-7)
Pilosella officinarum	2	2	1		5	3	2	5	5	6		V	(1-6)
Poa humilis	2		1	2	2	3	2	5	5	4		V	(1-5)
Lotus corniculatus	6	4	4		3		4	4	6	3		IV	(3-6)
Cerastium diffusum diffusum	3	3	3	1	1		3		2	3		IV	(1-3)
Crepis capillaris	1		2		2		2	1	3	3	1	IV	(1-3)
Sedum anglicum	4	1	1	2	3	1		2				IV	(1-4)
Cladonia rangiformis		6	4	3	6	9			3			III	(3-9)
Festuca rubra rubra	3	3	2					2	4	7		III	(2-7)
Festuca arenaria	2	4		2			3			3	2	III	(2-4)
Elytrigia juncea		2		2			3		3	3	3	III	(2-3)
Ononis repens						3	2	3	3	3	1	III	(1-3)
Hypochaeris radicata	2	2				1		2		3	3	III	(1-3)
Bromus hordeaceus thominei	1	3	3					1		2	2	III	(1-3)
Festuca ovina	1		1	1		2		3			2	III	(1-3)
Taraxacum officinale agg.			1	2		2		2		1	1	III	(1-2)
Erodium cicutarium	1		1	1		1	2	1				III	(1-2)
Syntrichia ruraliformis			4			3	2	3		2		III	(2-4)
Leontodon saxatilis	2	1			2				2	3		III	(1-3)
Sonchus arvensis		1	1	1				1			1	III	(1)
Cetraria aculeata			2	2	2	5						II	(2-5)
Phleum arenarium	2	2		3		3						II	(2-3)
Hypochaeris glabra						2		1	5		3	II	(1-5)

Community DG7(continued) ***Brachythecium albicans-Trifolium arvense* dune grassland**

	49	50	51	52	53	54	55	56	57	58	59		
Senecio jacobaea						2	1	2		1		II	(1-2)
Peltigera canina	1	1		1			1					II	(1)
Carex arenaria									2	2	4	II	(2-4)
Plantago coronopus	2	2	2									II	(2)
Campylopus introflexus								1	2	2		II	(1-2)
Cladonia fimbriata				1	2						1	II	(1-2)
Cladonia foliacea			1			2		1				II	(1-2)
Polytrichum juniperinum					4						5	I	(4-5)
Trifolium scabrum			5	2								I	(2-5)
Luzula campestris									3	2		I	(2-3)
Evernia prunastri		2				2						I	(2)
Ceratodon purpureus								1			4	I	(1-4)
Campanula rotundifolia		1	3									I	(1-3)
Vicia sativa nigra							1			2		I	(1-2)
Jasione montana		1				2						I	(1-2)
Ammophila arenaria							1				1	I	(1)
Rumex acetosella						1					1	I	(1)
Brachythecium rutabulum									6			I	(6)
Cladonia squamosa				5								I	(5)
Polytrichum piliferum								4				I	(4)
Trifolium dubium										3		I	(3)
Honkenya peploides						2						I	(2)
Agrostis capillaris											2	I	(2)
Poa annua						2						I	(2)
Festuca rubra glauca						2						I	(2)
Elytrigia repens									2			I	(2)
Eryngium maritimum		1										I	(1)
Holcus lanatus										1		I	(1)
Vicia hirsuta							1					I	(1)
Cerastium fontanum								1				I	(1)
Galium saxatile										1		I	(1)
Trifolium repens										1		I	(1)

Community DG7(continued) ***Brachythecium albicans-Trifolium arvense* dune grassland**

	49	**50**	**51**	**52**	**53**	**54**	**55**	**56**	**57**	**58**	**59**		
Cladonia pyxidata				1								I	(1)
Hieracium umbellatum			1									I	(1)
Lupinus arboreus							1					I	(1)
Trifolium micranthum										1		I	(1)
Sward height (cm)	2	2	1	3	4	1	6	2	4	12	10		
Herb cover (%)	50	35	40	40	70	30	75	40	95	90	35		
Bryophyte/lichen cover (%)	60	80	65	40	60	80	35	60	30	45	60		
Litter cover (%)	1	5	5	15	5	1	2	1	5	5	5		
Bare ground (%)	30	2	10	10	5	10	25	5	15	20	20		
No of species	22	26	27	25	18	29	23	28	23	32	22	Av.	25.0

Community DG8 ***Poa humilis-Brachythecium rutabulum*** **dune grassland**

	60	**61**	**62**	**63**	**64**	**65**	**66**		
Brachythecium rutabulum	5	8	8	7	4	4	5	V	(4-8)
Poa humilis	8	5	6	5	6	7	3	V	(3-8)
Lotus corniculatus	2	5	4	3	2	4	5	V	(2-5)
Plantago lanceolata	5	5	5	2	1	4	6	V	(1-6)
Taraxacum officinale agg.	1	1	1	2	2	2	1	V	(1-2)
Festuca rubra rubra		7	6	6	7	3	5	V	(3-7)
Bromus hordeaceus thominei		3	2	3	2	4	2	V	(2-4)
Crepis capillaris	1	5	2	3	1	1		V	(1-5)
Senecio jacobaea	1	1		1	1	2	1	V	(1-2)
Ononis repens	2	1	5	3			1	IV	(1-5)
Hypochaeris radicata		3	3	1	1	2		IV	(1-3)
Geranium molle		1	1	1		2	1	IV	(1-2)
Pilosella officinarum	2	4	5	9				III	(2-9)
Vulpia bromoides		2		5		5	6	III	(2-6)
Galium verum	4	4	2	5				III	(2-5)
Festuca rubra glauca		2	2	2			2	III	(2)
Vicia sativa nigra	1	1	1		2			III	(1-2)
Scleropodium purum	6		5	4				III	(4-6)
Festuca arenaria	6		1	2				III	(1-6)
Luzula campestris	1		2			1		III	(1-2)
Dactylis glomerata		1		1	2			III	(1-2)
Cynosurus cristatus			3				5	II	(3-5)
Carex arenaria	4		3					II	(3-4)
Elytrigia juncea		4		2				II	(2-4)
Hypnum cupressiforme	4			2				II	(2-4)
Veronica arvensis	1			3				II	(1-3)
Sonchus arvensis					1	2		II	(1-2)
Vicia lathyroides				1			1	II	(1)

Community DG8 (continued) ***Poa humilis-Brachythecium rutabulum* dune grassland**

	60	**61**	**62**	**63**	**64**	**65**	**66**		
Holcus lanatus					6			I	(6)
Polytrichum juniperinum	5							I	(5)
Trifolium repens							5	I	(5)
Brachythecium albicans				4				I	(4)
Leontodon saxatilis						3		I	(3)
Achillea millefolium			3					I	(3)
Cerastium semidecandrum				3				I	(3)
Eurhynchium praelongum		3						I	(3)
Anthoxanthum odoratum			2					I	(2)
Trifolium dubium							2	I	(2)
Catapodium marinum				2				I	(2)
Vicia hirsuta				2				I	(2)
Trifolium campestre				2				I	(2)
Hypochaeris glabra	2							I	(2)
Leucanthemum vulgare						2		I	(2)
Trifolium glomeratum							2	I	(2)
Rumex acetosella					1			I	(1)
Rhinanthus minor						1		I	(1)
Leontodon autumnalis							1	I	(1)
Tragopogon pratensis					1			I	(1)
Sward height (cm)	12	20	14	10	32	18	6		
Herb cover (%)	80	90	90	85	100	75	85		
Bryophyte/lichen cover (%)	60	60	70	60	5	5	15		
Litter cover (%)	30	40	10	5	55	50	5		
Bare ground (%)	0	5	1	10	10	10	35		
No. of species	19	20	22	28	16	17	18	Av.	20.0

Community DG9 ***Poa humilis-Bromus hordeaceus* ssp. *thominei* dune grassland**

	67	**68**	**69**	**70**	**71**	**72**	**73**		
Poa humilis	5	6	3	4	4	5	2	V	(2-6)
Bromus hordeaceus thominei	3	4	5	3	2	3	3	V	(2-5)
Hypochaeris radicata	2	3	2	2	2	4	4	V	(2-4)
Vicia sativa nigra	2	1	2	2	3	2	1	V	(1-3)
Scleropodium purum	5	8	4	9	8	7		V	(4-9)
Anthoxanthum odoratum	8		2	7	4	3	4	V	(2-8)
Festuca filiformis	7	4	8	3	8	1		V	(1-8)
Plantago lanceolata	5	6	5	6	6			IV	(5-6)
Festuca rubra rubra		6	4	3		4	7	IV	(3-7)
Galium verum	4	3	5	3	4			IV	(3-5)
Rumex acetosella	2	2	3			4	3	IV	(2-4)
Rhinanthus minor	3	1		5	6		2	IV	(1-6)
Hypnum cupressiforme		2	7			2	5	III	(2-7)
Pilosella officinarum	5	4	4					III	(4-5)
Agrostis capillaris			2			8	8	III	(2-8)
Ononis repens	4	2	4					III	(2-4)
Lotus corniculatus					1	5	5	III	(1-5)
Sedum anglicum		4	4					II	(4)
Brachythecium rutabulum	2						4	II	(2-4)
Carex arenaria				3	2			II	(2-3)
Luzula campestris			2		2			II	(2)
Sonchus arvensis						2	1	II	(1-2)
Anisantha sterilis				2		1		II	(1-2)
Leontodon saxatilis			1		2			II	(1-2)
Vicia lathyroides			2	1				II	(1-2)
Trifolium arvense			2				1	II	(1-2)
Trifolium dubium	1						2	II	(1-2)
Senecio jacobaea				1			1	II	(1)
Dicranum scoparium		1			1			II	(1)
Taraxacum officinale agg.	1	1						II	(1)

Community DG9 (continued) ***Poa humilis-Bromus hordeaceus* ssp. *thominei* dune grassland**

	67	**68**	**69**	**70**	**71**	**72**	**73**		
Geranium molle		1					1	II	(1)
Aira praecox			3					I	(3)
Catapodium marinum			2					I	(2)
Vicia hirsuta				2				I	(2)
Erophila verna			2					I	(2)
Leontodon autumnalis		1						I	(1)
Cerastium fontanum							1	I	(1)
Koeleria macrantha			1					I	(1)
Linaria vulgaris					1			I	(1)
Sward height (cm)	19	17	11	22	16	26	23		
Herb cover (%)	100	95	80	85	95	90	95		
Bryophyte/lichen cover (%)	20	60	70	90	70	40	30		
Litter cover (%)	50	30	15	40	10	50	40		
Bare ground (%)	10	5	0	0	5	0	5		
No. of species	16	19	24	16	16	14	18	Av.	17.6

Community DG10 Parched path community

	74	75		
Plantago coronopus	6	5		2
Carex arenaria	3	6		2
Crassula tillaea	3	3		2
Festuca rubra rubra	2	3		2
Lotus corniculatus	3	2		2
Poa annua	2	2		2
Trifolium subterraneum	1	2		2
Hypnum cupressiforme	1	1		2
Ceratodon purpureus	2			1
Galium saxatile		1		1
Sagina apetala		1		1
Weissia controversa		1		1
Sward height (cm)	1	1		
Herb cover (%)	40	50		
Bryophyte/lichen cover (%)	1	0		
Litter cover (%)	0	0		
Bare ground (%)	70	60		
No. of species	9	11	Av.	10.0

Community DG11 ***Anthoxanthum odoratum-Arrhenatherum elatius*** **dune community**

	76	**77**	**78**	**79**	**80**		
Anthoxanthum odoratum	5	4	6	5	7	V	(4-7)
Arrhenatherum elatius	7	3	4	4	7	V	(3-7)
Elytrigia juncea	5	2	7	4	3	V	(2-7)
Poa humilis		3	3	3	3	IV	(3)
Ononis repens		2	4	2	3	IV	(2-4)
Carex arenaria		2		8	5	III	(2-8)
Agrostis capillaris		2		4	2	III	(2-4)
Plantago lanceolata			2	2	3	III	(2-3)
Festuca ovina		4	4			II	(4)
Holcus lanatus				3	5	II	(3-5)
Luzula campestris		2	2			II	(2)
Hypochaeris radicata	1	3				II	(1-3)
Rubus fruticosus agg.	1			2		II	(1-2)
Pilosella officinarum			2		1	II	(1-2)
Sedum anglicum		1	1			II	(1)
Ammophila arenaria	8					I	(8)
Honkenya peploides					4	I	(4)
Scleropodium purum		4				I	(4)
Rumex acetosella		4				I	(4)
Dicranum scoparium		4				I	(4)
Elytrigia atherica				4		I	(4)
Festuca rubra		3				I	(3)
Stellaria graminea					3	I	(3)
Lotus corniculatus			2			I	(2)
Achillea millefolium			2			I	(2)
Sonchus arvensis					1	I	(1)
Vicia lathyroides					1	I	(1)
Sward height (cm)	60	32	47	55	28		

Community DG11 (continued) ***Anthoxanthum odoratum-Arrhenatherum elatius* dune community**

	76	**77**	**78**	**79**	**80**		
Herb cover (%)	100	100	100	90	95		
Bryophyte/lichen cover (%)	0	30	0	0	0		
Litter cover (%)	65	50	50	70	60		
Bare ground (%)	5	5	20	5	10		
No. of species	6	15	12	11	14	Av.	11.6

Community DG12 ***Carex arenaria* dune community**

	81	**82**	**83**	**84**		
Carex arenaria	10	10	10	9	4	
Anthoxanthum odoratum	3	3	2		3	
Ammophila arenaria	1	1		2	3	
Arrhenatherum elatius	2	2			2	
Poa humilis	2	2			2	
Hypochaeris radicata	1	2			2	
Holcus lanatus		1	2		2	
Rubus fruticosus agg.			1	2	2	
Dryopteris dilatata		1		2	2	
Honkenya peploides	4				1	
Festuca ovina				4	1	
Lonicera periclymenum		4			1	
Agrostis capillaris		3			1	
Elytrigia juncea	2				1	
Stellaria graminea			1		1	
Sward height (cm)	39	35	38	55		
Herb cover (%)	100	100	100	100		
Bryophyte/lichen cover (%)	0	0	0	0		
Litter cover (%)	30	70	60	70		
Bare ground (%)	50	10	20	20		
No. of species	8	10	5	5	Av.	7.5

Community DG13 ***Festuca filiformis-Sedum anglicum*** **dune grassland**

	85	**86**	**87**	**88**	**89**	**90**		
Festuca filiformis	5	5	9	9	9	8	V	(5-9)
Sedum anglicum	2	1	3	2	1	3	V	(1-3)
Dicranum scoparium	5	6	6		5	5	V	(5-6)
Pilosella officinarum	5	5	4		4	3	V	(3-5)
Hypochaeris radicata	2	4	3		4	5	V	(2-5)
Ononis repens	3	1	3		2	4	V	(1-4)
Luzula campestris	3	2	2	1		2	V	(1-3)
Anthoxanthum odoratum	3	4			5	6	IV	(3-6)
Hypnum cupressiforme	2		2	9		3	IV	(2-9)
Poa humilis			3	2	2	4	IV	(2-4)
Rhinanthus minor	1		3	4		3	IV	(1-4)
Cetraria aculeata	2	4	3				III	(2-4)
Agrostis capillaris	3		3	2			III	(2-3)
Aira praecox	3	3	2				III	(2-3)
Cladonia furcata	8	8		1			III	(1-8)
Plantago lanceolata	1		4	5			III	(1-5)
Vicia sativa nigra		1	1			2	III	(1-2)
Polytrichum juniperinum	4	5					II	(4-5)
Bromus hordeaceus thominei			3			3	II	(3)
Festuca rubra rubra	1	4					II	(1-4)
Rumex acetosella				1		2	II	(1-2)
Trifolium arvense				5			I	(5)
Cladonia portentosa			4				I	(4)
Campylopus introflexus	4						I	(4)
Polytrichum piliferum		4					I	(4)
Vicia lathyroides		2					I	(2)
Galium verum				2			I	(2)
Phleum arenarium		2					I	(2)
Senecio jacobaea				1			I	(1)

Community DG13 (continued) ***Festuca filiformis-Sedum anglicum* dune grassland**

	85	**86**	**87**	**88**	**89**	**90**		
Trifolium dubium						1	I	(1)
Plantago coronopus				1			I	(1)
Crepis capillaris			1				I	(1)
Sward height (cm)	5	1	9	14	23	17		
Herb cover (%)	50	45	90	90	90	100		
Bryophyte/lichen cover (%)	90	95	30	80	20	50		
Litter cover (%)	0	1	50	5	30	40		
Bare ground (%)	1	0	0	0	30	0		
No. of species	18	17	18	14	8	15	Av.	15.0

Community DG14 ***Festuca filiformis-Dicranum scoparium*** **dune grassland**

	91	**92**	**93**	**94**	**95**	**96**	**97**	**98**	**99**		
Festuca filiformis	9	7	8	9	9	5	8	7	8	V	(5-9)
Dicranum scoparium	9	7	4	6	5	7	5	6	8	V	(4-9)
Carex arenaria	5	5	8	6	6	4	6	5	3	V	(3-8)
Rumex acetosella	3	3	2	4	1	4	2	3	5	V	(1-5)
Hypochaeris radicata	2		1	3	1	5	2	4	4	V	(1-5)
Hypnum cupressiforme	2	6	1	5			1		1	IV	(1-6)
Luzula campestris					2	3	3	3	2	III	(2-3)
Cladina arbuscula				5		9		8		II	(5-9)
Cladonia portentosa	2								2	II	(2)
Erica cinerea		5						1		II	(1-5)
Rubus fruticosus agg.			2				1			II	(1-2)
Ammophila arenaria			1				1			II	(1)
Quercus robur sapling		1	1							II	(1)
Calluna vulgaris			4							I	(4)
Anthoxanthum odoratum									3	I	(3)
Agrostis capillaris									3	I	(3)
Elytrigia juncea							2			I	(2)
Dryopteris dilatata			1							I	(1)
Pilosella officinarum								1		I	(1)
Galium verum									1	I	(1)
Ceratodon purpureus		1								I	(1)
Senecio sylvaticus							1			I	(1)
Sward height (cm)	28	18	28	23	27	6	20	11	8		
Herb cover (%)	90	90	90	100	100	40	95	60	50		
Bryophyte/lichen cover (%)	90	60	10	45	35	95	20	80	70		
Litter cover (%)	60	30	70	50	60	5	60	5	2		
Bare ground (%)	0	10	5	5	15	0	5	2	10		
No. of species	7	8	11	7	6	7	11	8	11	Av.	8.4

Marshland

Fen meadow

Community FM15 ***Juncus articulatus – Lathyrus pratensis*** **fen meadow**
Stand A – ***Holcus lanatus – Cynosurus cristatus*** **vegetation**

	100	**101**	**102**	**103**	**104**	**105**	**106**	**107**		
Juncus articulatus	8	7	7	8	8	8	8	8	V	(7-8)
Holcus lanatus	7	8	5	5	4	4	5	6	V	(4-7)
Cynosurus cristatus	2	3	4	4	4	5	3	3	V	(2-5)
Festuca rubra		4	6	7	5	5	4	3	V	(3-7)
Festuca arundinacea		2	4	2	3	3	3	1	V	(1-4)
Ranunculus repens		2		2	3	3	2	2	IV	(2-3)
Anthoxanthum odoratum	2	3	3	5		4		1	IV	(1-5)
Taraxacum officinale agg.	1	2	2	1	2	2			IV	(1-2)
Agrostis stolonifera	5	5	5				5	4	IV	(4-5)
Lotus pedunculatus	2	2			1	3	1		IV	(1-3)
Carex disticha			5	5			3	4	III	(3-5)
Lathyrus pratensis	2	2		2				2	III	(2)
Poa trivialis			4	3		3		3	III	(3-4)
Plantago lanceolata			2	1	2	3			III	(1-3)
Brachythecium rutabulum		1	1	1			1		III	(1)
Carex panicea				4	6	3			II	(3-6)
Cardamine pratensis				1		2		1	II	(1-2)
Trifolium pratense	1			2	1				II	(1-2)
Rumex conglomeratus	1	1					1		II	(1)
Calliergonella cuspidatum					3	5			II	(3-5)
Potentilla anserina				3					I	(3)
Galium uliginosum			3						I	(3)

Community FM15 (continued) ***Juncus articulatus – Lathyrus pratensis*** **fen meadow**
Stand A – ***Holcus lanatus – Cynosurus cristatus*** **vegetation**

	100	**101**	**102**	**103**	**104**	**105**	**106**	**107**		
Veronica beccabunga					3				I	(3)
Carex flacca						3			I	(3)
Deschampsia cespitosa			2						I	(2)
Festuca pratensis								2	I	(2)
Galium palustre						1			I	(1)
Cerastium fontanum				1					I	(1)
Ranunculus flammula						1			I	(1)
Lychnis flos-cuculi						1			I	(1)
Phleum pratense			1						I	(1)
Rumex acetosa	1								I	(1)
Trifolium repens							1		I	(1)
Sward height (cm)	30	15	40	50	50	40	50	50		
Herb cover (%)	100	95	100	95	100	100	100	95		
Bryophyte cover (%)	0	1	1	2	10	15	1	0		
Litter cover (%)	70	70	50	50	50	60	50	40		
Bare ground (%)	10	0	20	5	15	0	15	20		
No. of species	11	13	15	18	13	18	12	13	Av.	14.1

Community FM15 ***Juncus articulatus – Lathyrus pratensis*** **fen meadow**
Stand B – ***Holcus lanatus – Agrostis stolonifera*** **vegetation**

	108	**109**	**110**	**111**	**112**		
Juncus articulatus	8	6	6	7	7	V	(6-8)
Holcus lanatus	5	4	7	7	6	V	(4-7)
Agrostis stolonifera	5	6	4	4	5	V	(4-6)
Festuca rubra	4	2	4	3		IV	(2-4)
Ranunculus repens		2	3	2	1	IV	(1-3)
Rumex acetosa	3	2	1		1	IV	(1-3)
Juncus effusus		4		3	5	III	(3-5)
Poa trivialis	4	4	3			III	(3-4)
Lathyrus pratensis	2		4		2	III	(2-4)
Cardamine pratensis	3	1	3			III	(1-3)
Plantago lanceolata	1	1	1			III	(1)
Trifolium pratense		1	1	1		III	(1)
Anthoxanthum odoratum	3				2	II	(2-3)
Carex disticha	1				4	II	(1-4)
Festuca pratensis	1	4				II	(1-4
Brachythecium rutabulum		3	1			II	(1-3)
Stellaria graminea			3	1		II	(1-3)
Festuca arundinacea	2					I	(2)
Carex otrubae		2				I	(2)
Dactylis glomerata		2				I	(2)
Taraxacum officinale agg.				1		I	(1)
Rumex conglomeratus		1				I	(1)
Eurhynchium praelongum	1					I	(1)
Sward height (cm)	15	10	10	10	30		
Herb cover (%)	95	95	90	95	95		

Community FM15 (continued) ***Juncus articulatus – Lathyrus pratensis*** **fen meadow**
Stand B – ***Holcus lanatus – Agrostis stolonifera*** **vegetation**

	108	**109**	**110**	**111**	**112**		
Bryophyte cover (%)	1	5	1	0	0		
Litter cover (%)	70	50	50	60	65		
Bare ground (%)	0	5	5	5	5		
No. of species	14	16	13	9	9	Av.	12.2

Community FM15 ***Juncus articulatus – Lathyrus pratensis* fen meadow**
Stand C – *Holcus lanatus – Juncus effusus* vegetation

	113	114	115	116	117	118	119	120	121	122		
Juncus articulatus	5	9	8	10	7	10	9	10	8	7	V	(5-10)
Holcus lanatus	5	5	6	6	6	5	6	6	7	7	V	(5-7)
Agrostis stolonifera	8	5	6	3	5	3	5	5	4	7	V	(3-8)
Lotus pedunculatus	1	2	2	4	3	3	3	3	2	3	V	(1-4)
Juncus effusus	6	6	4	4	9	4	4		4	4	V	(4-9)
Anthoxanthum odoratum		1	2	6	3	5	4	3	5	3	V	(1-6)
Rumex acetosa			3	4	3	3	3	3	4	3	IV	(3-4)
Lathyrus pratensis			2	2	3	1	3	1	2	2	IV	(1-3)
Rumex conglomeratus	1		2	2	2		1	2	1	2	IV	(1-2)
Festuca rubra			3	2		6	6	5	7	6	IV	(2-7)
Ranunculus repens	3	3	3	3			2		2	2	IV	(2-3)
Cardamine pratensis	1	3	3			3		2	3	1	IV	(1-3)
Poa trivialis			2	5	3	3	3	4			III	(2-5)
Potentilla anserina			2	3	2		4	2	4		III	(2-4)
Brachythecium rutabulum			4			2	2	3	3	2	III	(2-4)
Vicia cracca			1	2	3	3	2	1			III	(1-3)
Plantago lanceolata			2	2		2	3		1		III	(1-3)
Alopecurus pratensis		2	3			1				1	II	(1-3)
Galium palustre	2	2	2	1							II	(1-2)
Ranunculus acris							2	2	3		II	(2-3)
Cynosurus cristatus						1	2		4		II	(1-4)
Cirsium palustre			3			2	1				II	(1-3)
Lolium perenne		2	3		1						II	(1-3)
Cerastium fontanum			3	1			1				II	(1-3)
Festuca pratensis				1		1			2		II	(1-2)
Poa pratensis		1					1		2		II	(1-2)
Alopecurus geniculatus	4		4								I	(4)
Eurhynchium praelongum				3		3					I	(3)

Community FM15 (continued) ***Juncus articulatus – Lathyrus pratensis*** **fen meadow**
Stand C – ***Holcus lanatus – Juncus effusus*** **vegetation**

	113	**114**	**115**	**116**	**117**	**118**	**119**	**120**	**121**	**122**		
Carex disticha		3					3				I	(3)
Festuca arundinacea			2				3				I	(2-3)
Stellaria palustris			2	2							I	(2)
Trifolium pratense							2		2		I	(2)
Iris pseudacorus			1		2						I	(1-2)
Trifolium repens			2						1		I	(1-2)
Taraxacum officinale agg.							2		1		I	(1-2)
Epilobium parviflorum		1					1				I	(1)
Eleocharis palustris	3										I	(3)
Phalaris arundinacea		3									I	(3)
Carex hirta										3	I	(3)
Carex nigra							2				I	(2)
Rhinanthus minor							2				I	(2)
Lemna minor	2										I	(2)
Calliergonella cuspidatum							1				I	(1)
Epilobium palustre							1				I	(1)
Juncus conglomeratus	1										I	(1)
Polytrichum formosum			1								I	(1)
Sward height (cm)	80	110	70	70	70	90	90	100	85	75		
Herb cover (%)	90	100	95	100	100	100	100	100	100	100		
Bryophyte/lichen cover (%)	0	0	5	8	0	4	3	3	3	2		
Litter cover (%)	60	30	40	50	50	40	35	45	50	55		
Bare ground (%)	70	40	0	10	10	20	25	20	15	40		
Water depth (cm)	14	4	0	0	0	0	0	0	0	5		
No. of species	13	15	28	20	14	19	30	15	22	15	Av.	19.1

Community FM16 **Juncus subnodulosus – Juncus inflexus fen meadow**

	123	124	125	126	127	128	129	130	131	132		
Juncus subnodulosus	8	7	6	7	7	4	4	9	5	7	V	(4-9)
Agrostis stolonifera	4	2	4	4	5	9	9	5	5	2	V	(2-9)
Juncus inflexus	2	5	4	4	7	6	4	2	2	2	V	(2-7)
Phragmites australis	6	3	3	5	2	3	4	4	4		V	(2-6)
Festuca arundinacea	3	3	3	3		3	1	1	1	2	V	(1-3)
Plantago lanceolata		1	3	2		3	2	3	3	1	IV	(1-3)
Hydrocotyle vulgaris	3			3		1	4	5	4	5	IV	(1-5)
Holcus lanatus		2	4	2			1	3	3	4	IV	(1-4)
Vicia cracca		1	2	1		1		1	2	1	IV	(1-2)
Calliergonella cuspidatum	2	2	8			4	5			5	III	(2-8)
Carex disticha		7	5		7		5		2	3	III	(2-7)
Carex acutiformis		5		6	5	1		1		7	III	(1-7)
Lotus pedunculatus		2	3	3				2	3	5	III	(2-5)
Potentilla anserina			2	4		1		2	2	5	III	(1-5)
Mentha aquatica	2	3		3			1	3	3		III	(1-3)
Galium uliginosum	2	2	2	2	2					2	III	(2)
Juncus gerardii	4		3			2	5		8		III	(2-8)
Festuca rubra			6			7	4		4	2	III	(2-7)
Iris pseudacorus	1			1	2			3		2	III	(1-3)
Eleocharis uniglumis	2				4	3	4				II	(2-4)
Juncus effusus					4		2		4	2	II	(2-4)
Carex flacca		3	2				3		1		II	(1-3)
Ranunculus flammula		1	1	2						2	II	(1-2)
Carex otrubae	1			1			1		1		II	(1)
Lychnis flos-cuculi		1	1	1				1			II	(1)
Trifolium pratense			3	1					3		II	(1-3)
Anthoxanthum odoratum			3					1	3		II	(1-3)
Galium palustre		1	3		2						II	(1-3)
Festuca pratensis						2		2	1		II	(1-2)

Community FM16 (continued) ***Juncus subnodulosus – Juncus inflexus* fen meadow**

	123	124	125	126	127	128	129	130	131	132		
Equisetum fluviatile			3		4						I	(3-4)
Poa trivialis		3	3								I	(3)
Juncus articulatus			4							2	I	(2-4)
Carex nigra					4					2	I	(2-4)
Eleocharis palustris		3			2						I	(2-3)
Triglochin palustris						3	2				I	(2-3)
Ranunculus repens			2					2			I	(2)
Lythrum salicaria								1	1		I	(1)
Carex panicea			4								I	(4)
Amblystegium riparium			3								I	(3)
Trifolium repens						2					I	(2)
Ranunculus acris			2								I	(2)
Schoenoplectus tabernaemontani		2									I	(2)
Cirriphyllum piliferum			2								I	(2)
Calystegia sepium								2			I	(2)
Cerastium fontanum			1								I	(1)
Epilobium palustre										1	I	(1)
Oenanthe lachenalii	1										I	(1)
Anagallis tenella			1								I	(1)
Sward height (cm)	80	80	70	75	80	40	40	60	35	75		
Herb cover (%)	85	95	100	80	80	95	95	100	95	100		
Bryophyte/lichen cover (%)	2	2	60	0	0	5	10	0	0	20		
Litter cover (%)	20	30	70	60	40	20	15	60	20	50		
Bare ground (%)	30	25	0	20	50	20	30	10	50	20		
Water depth (cm)	16	18	0	15	22	4	11	8	2	4		
No. of species	14	21	31	19	14	17	18	20	22	21	Av.	19.7

Community FM17 ***Agrostis stolonifera – Lolium perenne*** **grassland**

	133	**134**		
Agrostis stolonifera	8	7	2	
Lolium perenne	4	7	2	
Ranunculus repens	5	6	2	
Poa trivialis	4	5	2	
Trifolium repens	6	2	2	
Holcus lanatus	2	4	2	
Dactylis glomerata	3		1	
Festuca pratensis	2		1	
Agrostis capillaris		2	1	
Plantago lanceolata		1	1	
Taraxacum officinale agg.		1	1	
Eurhynchium praelongum		1	1	
Plantago major		1	1	
Sward height (cm)	5	4		
Herb cover (%)	90	85		
Bryophyte cover (%)	0	1		
Litter cover (%)	15	25		
Bare ground (%)	10	15		
No. of species	8	11	Av.	9.5

Community FM18 ***Juncus effusus – Agrostis stolonifera*** **rush-pasture**

	135	**136**	**137**	**138**	**139**		
Juncus effusus	9	7	10	5	10	V	(5-10)
Agrostis stolonifera	3	6	5	8	6	V	(3-8)
Holcus lanatus	4	2	4	4	3	V	(2-4)
Rumex acetosa	1		1	1	2	IV	(1-2)
Potentilla anserina		5		3	2	III	(2-5)
Poa trivialis	3		2		3	III	(2-3)
Juncus articulatus		4		5	1	III	(1-5)
Lolium perenne		4		5		II	(4-5)
Ranunculus repens		2		5		II	(2-5)
Eurhynchium praelongum	4				2	II	(2-4)
Festuca rubra		2		4		II	(2-4)
Rumex crispus		1		1		II	(1)
Cirsium palustre		1		1		II	(1)
Phleum pratense	4					I	(4)
Lotus pedunculatus	2					I	(2)
Alopecurus geniculatus				2		I	(2)
Rumex conglomeratus			2			I	(2)
Galium palustre					1	I	(1)
Ranunculus flammula				1		I	(1)
Cerastium fontanum		1				I	(1)
Phalaris arundinacea					1	I	(1)
Ranunculus acris		1				I	(1)
Taraxacum officinale agg.				1		I	(1)
Trifolium pratense		1				I	(1)
Vegetation height (cm)	50	45	55	35	50		
Vegetation cover (%)	95	90	100	85	100		
Bryophyte cover (%)	5	0	0	0	2		

Community FM18 (continued) ***Juncus effusus – Agrostis stolonifera*** **rush-pasture**

	135	**136**	**137**	**138**	**139**		
Litter cover (%)	15	10	20	5	20		
Bare ground (%)	20	25	15	30	15		
Water depth (cm)	0	1	1	2	0		
No. of species	8	13	6	14	10	Av.	10.2

Reedbed vegetation

Community RB19 **Phragmites australis – Calystegia sepium tall herb fen**

	140	141	142	143	144	145	146		
Phragmites australis	8	9	10	9	9	10	10	V	(8-10)
Calystegia sepium	6	5	4	5	5	4	3	V	(3-6)
Urtica dioica	3	3	1	3	1	1	1	V	(1-3)
Cirsium palustre	3	2	1	1	2	1	2	V	(1-3)
Poa trivialis	3		3	8	4	1	2	V	(1-8)
Lotus pedunculatus	3	3	1	3	3	1		V	(1-3)
Eupatorium cannabinum	3		2	4		3	3	IV	(2-4)
Galium aparine	3		2	3	3	1		IV	(1-3)
Iris pseudacorus	1		1	2	3	2		IV	(1-3)
Galium palustre	4	3				2	3	III	(2-4)
Equisetum palustre	4		4	1	2			III	(1-4)
Angelica sylvestris	4		1		2	1		III	(1-4)
Juncus effusus	3	1	1	1				III	(1-3)
Solanum dulcamara	2					4	4	III	(2-4)
Lycopus europaeus	2	2			3			III	(2-3)
Eurhynchium praelongum	4	4						II	(4)
Holcus lanatus				3	5			II	(3-5)
Phalaris arundinacea	3	4						II	(3-4)
Rubus fruticosus agg	4	3						II	(3-4)
Scrophularia aquatica			3	3				II	(3)
Carex acutiformis			4	2				II	(2-4)
Lemna minor						3	2	II	(2-3)
Vicia cracca	3			1				II	(1-3)
Cardamine pratensis	2				1			II	(1-2)
Typha latifolia			1	2				II	(1-2)

Community RB19(continued) ***Phragmites australis – Calystegia sepium*** **tall herb fen**

	140	**141**	**142**	**143**	**144**	**145**	**146**		
Arrhenatherum elatius						5		I	(5)
Juncus articulatus	3							I	(3)
Sparganium erectum					3			I	(3)
Mentha aquatica						3		I	(3)
Agrostis stolonifera					3			I	(3)
Apium nodiflorum						2		I	(2)
Brachythecium rutabulum			2					I	(2)
Lychnis flos-cuculi						2		I	(2)
Ranunculus repens				2				I	(2)
Valeriana officinalis		2						I	(2)
Alnus glutinosa sapling				1				I	(1)
Cirsium arvense				1				I	(1)
Epilobium hirsutum						1		I	(1)
Epilobium tetragonum		1						I	(1)
Sonchus arvensis				1				I	(1)
Sward height (cm)	170	180	210	160	130	250	250		
Vegetation cover (%)	100	100	100	100	100	100	100		
Bryophyte cover (%)	5	4	2	0	0	0	0		
Litter cover (%)	85	80	60	60	90	80	90		
Bare ground (%)	5	20	0	0	10	5	0		
Open water (%)	5	0	20	0	0	60	80		
Water depth (cm)	2	0	2	0	2	20	15		
No. of species	21	13	16	20	15	18	9	Av.	16.0

Community RB20 ***Phragmites australis – Solanum dulcamara*** **tall herb fen**

	147	**148**	**149**	**150**	**151**	**152**		
Phragmites australis	10	10	10	10	10	8	V	(8-10)
Calystegia sepium	4	4	5	3	5	6	V	(3-6)
Solanum dulcamara		2	2	2	2	3	V	(2-3)
Galium aparine	4	1			2		III	(1-4)
Urtica dioica	3			2	1		III	(1-3)
Phalaris arundinacea	3	3					II	(3)
Carex acutiformis					2	8	II	(2-8)
Poa trivialis	3	2					II	(2-3)
Lemna minor			1	3			II	(1-3)
Iris pseudacorus			2				I	(2)
Lycopus europaeus			2				I	(2)
Typha latifolia			2				I	(2)
Mentha aquatica					2		I	(2)
Cirsium arvense	2						I	(2)
Rumex conglomeratus		2					I	(2)
Equisetum palustre				1			I	(1)
Carex riparia	1						I	(1)
Lythrum salicaria				1			I	(1)
Ranunculus sceleratus		1					I	(1)
Sward height (cm)	170	200	210	220	180	160		
Vegetation cover (%)	100	95	100	100	100	100		
Bryophyte cover (%)	0	0	0	0	0	0		
Litter cover (%)	90	30	40	20	45	65		
Bare ground (%)	5	40	30	60	20	10		
Open water (%)	5	100	100	100	100	80		
Water depth (cm)	2	9	6	8	6	5		
No. of species	8	8	7	7	7	4	Av.	6.8

Community RB21 ***Phragmites australis – Lemna minor*** **reedswamp**

	153	**154**	**155**	
Phragmites australis	10	10	10	3
Lemna minor	8	8	8	3
Juncus subnodulosus	3		3	2
Typha latifolia	2	1		2
Calystegia sepium	1			1
Iris pseudacorus	1			1
Apium nodiflorum			1	1
Sward height (cm)	250	250	250	
Vegetation cover (%)	100	100	100	
Bryophyte cover (%)	0	0	0	
Litter cover (%)	90	90	90	
Bare ground (%)	0	0	0	
Open water (%)	100	100	100	
Water depth (cm)	20	30	40	
No. of species	6	3	4	4.3

Community RB22 ***Holcus lanatus – Arrhenatherum elatius* vegetation**

	156	**157**		
Holcus lanatus	8	7		2
Arrhenatherum elatius	4	7		2
Cirsium arvense	5	6		2
Calystegia sepium	4	5		2
Urtica dioica	6	3		2
Phragmites australis		3		1
Poa trivialis	3			1
Galium aparine	3			1
Carex riparia	3			1
Rumex crispus	2			1
Sward height (cm)	80	60		
Vegetation cover (%)	100	100		
Bryophyte cover (%)	0	0		
Litter cover (%)	90	100		
Bare ground (%)	0	0		
Open water (%)	0	0		
Water depth (cm)	0	0		
No. of species	9	6	Av.	7.5

Wet woodlands

Community WW23 ***Alnus glutinosa – Iris pseudacorus*** **woodland**

	158	159	160	161	162	163	164	165	166	167	168	169	170	171		
Alnus glutinosa	7	2	3	8	7	8	7	8	6				8	3	IV	(2-8)
Fraxinus excelsior	2	7	7		2		2	1	4					5	III	(1-7)
Quercus robur		2	2		1			1			4		3	2	III	(1-4)
Betula pubescens	5			1	2		2				8	7			III	(1-8)
Populus nigra agg.										6		8			I	(6-8)
Salix fragilis	2							1							I	(1-2)
Salix alba										3					I	(3)
Salix cinerea	5		2	2		1	3	1		5					III	(1-5)
Alnus glutinosa sapling		3			3		2		7				5	7	III	(2-7)
Crataegus monogyna		3	1		1		1					1		3	III	(1-3)
Rosa canina agg	2	2	2									2	1		II	(1-2)
Fraxinus excelsior sapling	2	3	4											6	II	(2-6)
Salix caprea									4			4	2		II	(2-4)
Betula pubescens sapling											3	1			I	(1-3)
Salix triandra													4		I	(4)
Salix caprea													2		I	(2)
Quercus robur sapling			1												I	(1)
Iris pseudacorus	3	3	4	5	3	4	4	2	6	3			5	4	V	(3-6)
Lemna minor	3	3	4	2	4	1	3	1	4					4	IV	(1-4)
Solanum dulcamara	2	2	5	3	1	1	1		3				3	3	IV	(1-5)
Poa trivialis	5	5	3			1		2	4		4	2	5		IV	(1-5)
Urtica dioica	4	2	2	2	1			1			3		2	1	IV	(1-4)
Phragmites australis				2	3	1	5		3	9	8	7			III	(1-9)
Eurhynchium praelongum	2					2	2		4	4	3	4	3		III	(2-4)
Galium aparine	4	2			2		1		3			1	2	2	III	(1-4)
Ranunculus sceleratus	2	1	4		3			1						2	III	(1-4)
Cardamine pratensis	2	2	1	1						1				1	III	(1-2)

Community WW23 (continued) ***Alnus glutinosa – Iris pseudacorus*** **woodland**

	158	159	160	161	162	163	164	165	166	167	168	169	170	171		
Mentha aquatica					2			1	4	4				4	II	(1-4)
Carex acutiformis			2	4	3		2	3							II	(2-4)
Ribes nigrum		5	3				2						2	2	II	(2-5)
Cirsium palustre		2		2	1						2		1		II	(1-2)
Holcus lanatus										5	7	7	5		II	(5-7)
Lycopus europaeus									6	4			6	5	II	(4-6)
Juncus effusus		2									2	6	3		II	(2-6)
Eupatorium cannabinum			2	2				2						5	II	(2-5)
Galium palustre	1	3								3				2	II	(1-3)
Phalaris arundinacea		1				4	1				3				II	(1-4)
Ranunculus repens	1	1		2									4		II	(1-4)
Epilobium hirsutum	2	1	1	2											II	(1-2)
Callitriche sp.	2			1	2		1								II	(1-2)
Brachythecium rutabulum											2	3		4	II	(2-4)
Rumex sanguineus									3				3	2	II	(2-3)
Rubus fruticosus agg.											2	1	3		II	(1-3)
Apium nodiflorum							1	2						3	II	(1-3)
Scutellaria galericulata			3							1				1	II	(1-3)
Lonicera periclymenum			2									1	2		II	(1-2)
Angelica sylvestris					2	1				2					II	(1-2)
Calystegia sepium										6	4				I	(4-6)
Ribes rubrum	4	3													I	(3-4)
Agrostis stolonifera											3	3			I	(3)
Geranium robertianum		2									3				I	(2-3)
Arrhenatherum elatius											2	3			I	(2-3)
Thuidium tamariscinum	2	2													I	(2)
Glyceria fluitans						1					4				I	(1-4)
Alnus glutinosa seedling		2						1							I	(1-2)
Lysimachia vulgaris							1	1							I	(1)
Calamagrostis canescens														5	I	(5)
Filipendula ulmaria														3	I	(3)
Equisetum palustre										2					I	(2)
Berula erecta			2												I	(2)

Community WW23 (continued) ***Alnus glutinosa – Iris pseudacorus*** **woodland**

	158	159	160	161	162	163	164	165	166	167	168	169	170	171		
Lotus pedunculatus												2			I	(2)
Juncus subnodulosus										2					I	(2)
Vicia cracca												2			I	(2)
Brachythecium velutinum	2														I	(2)
Crataegus monogyna seedling	2														I	(2)
Rorippa nasturtium- aquaticum	2														I	(2)
Carex pseudocyperus		1													I	(1)
Dryopteris dilatata											1				I	(1)
Fraxinus excelsior seedling	1														I	(1)
Rumex obtusifolius	1														I	(1)
Salix cinerea seedling				1											I	(1)
Stachys palustris		1													I	(1)
Canopy height (m)	35	25	30	15	15	10	10	10	25	30	35	35	20	25		
Canopy cover (%)	70	55	55	70	50	70	50	70	80	100	100	100	95	80		
Sward height (cm)	30	45	60	75	70	60	65	60	100	200	150	150	130	120		
Bryophyte cover (%)	<5	<5	<5	0	0	<5	<5	0	5	4	5	5	2	4		
Litter cover (%)	5	10	10	10	15	5	10	5	20	70	70	80	30	25		
Bare ground (%)	40	20	30	10	10	10	15	10	30	10	5	5	30	0		
Open water (%)	35	10	15	5	10	20	5	30	30	5	0	0	10	50		
Water depth (cm)	20	10	5	<5	5	10	5	15	10	2	0	0	5	40		
No. of species	27	28	22	16	18	11	18	16	14	16	19	19	22	24	Av.	19.3

Community WW24 ***Alnus glutinosa – Glechoma hederacea*** **woodland**

	172	**173**	**174**	
Alnus glutinosa	4	7	8	3
Fraxinus excelsior		7	5	2
Alnus cordata	9			1
Quercus robur			4	1
Populus tremula		4		1
Acer pseudoplatanus			1	1
Ulmus procera suckers			1	1
Salix cinerea	4	1	5	3
Rhododendron ponticum	4		5	2
Acer pseudoplatanus sapling	4			1
Fagus sylvatica sapling	1			1
Glechoma hederacea	4	4	5	3
Holcus lanatus	5	4	2	3
Mnium hornum	5	5	1	3
Dryopteris dilatata	6	2	2	3
Urtica dioica	2	2	5	3
Fraxinus excelsior seedling	1	2	3	3
Juncus effusus	1	1	1	3
Lonicera periclymenum	1	1	1	3
Geranium robertianum	1	1	1	3
Poa trivialis		8	9	2
Eurhynchium praelongum	6		4	2
Pteridium aquilinum	6		1	2
Ranunculus repens		6	1	2
Cirsium palustre		4	2	2
Silene dioica	4		1	2
Galium aparine	2		2	2
Mentha aquatica		3	1	2
Iris pseudacorus		2	1	2
Stachys sylvatica		2	1	2

Community WW24 (continued) ***Alnus glutinosa – Glechoma hederacea*** **woodland**

	172	**173**	**174**		
Acer pseudoplatanus seedling	1		1		2
Angelica sylvestris		1	1		2
Ceratocapnos claviculata	4				1
Rubus fruticosus agg	3				1
Valeriana officinalis		2			1
Hedera helix	1				1
Ilex aquifolium seedling	1				1
Solanum dulcamara		1			1
Cardamine pratensis		1			1
Anthoxanthum odoratum		1			1
Brachypodium sylvaticum		1			1
Carex sylvatica			1		1
Canopy height (m)	11	20	20		
Canopy cover (%)	90	90	90		
Sward height (cm)	8	10	10		
Bryophyte cover (%)	40	25	10		
Litter cover (%)	15	10	15		
Bare ground (%)	25	30	20		
Open water (%)	0	5	0		
Water depth (cm)	0	2	0		
No. of species	24	25	29	Av.	26.0

Grazing marsh dykes

Community DY25 ***Hydrocharis morsus-ranae - Lemna trisulca*** **aquatic community**

	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221		222	223	224
Hydrocharis morsus-ranae	7	7	5	6	6	7	8	8	8	8	5	6	8	9	7	5	8	7	7	5	3	8	8	4	8	5	5	5		6	6	6	5	6		4	10	4	8	8	6	4	7	3		5	4	V	(3-10)	4	4	
Lemna trisulca	5	6	7	6	5	5	2	4	4	7	5	4	7	5	3	5	7	3	6	8	3	7		2	3	3	7	8	7	4	2	7		5		6		6	4	8		9	4	8	6		4	V	(2-9)		1	
Lemna minor		5	4	4			7	6		3		2			2	1		4	3	5	2		9	9		3			7							8	2	3				2				1	III	(1-9)			
Spirodela polyrhiza						6												4						2		3											3										I	(2-6)			
Elodea canadensis	7		4		7			2	4		8	7			4	6					6			1	5					2	5		7					9	6		4		2				5	III	(1-9)			
Myriophyllum verticillatum	4			6	6				4		6	7	6	5	3		4		7	5	5				7													5			3	4	3	10			III	(3-10)			7
Hottonia palustris		5				5		1	1			4	4		1	3	3	1			3	4						8	3	6		5		5				1				2				III	(1-8)			
Spirogyra sp.					3				2	3	4	3	6	6			4				9	6								6	5		7													II	(2-9)	2	4	5
Ceratophyllum demersum	6	4		4		6							4						2		2															5	8				5						II	(2-8)			
Cladophora sp.							4												5		2															2		5	2	4		2		2				I	(2-5)			
Ceratophyllum submersum	6											5	6																				5														I	(5-6)			
Myriophyllum spicatum							2						4																						9												I	(2-9)			
Chara vulgaris																								7														3										I	(3-7)		6	
Potamogeton trichoides												5												3																								I	(3-5)			
Hippurus vulgaris															2																								1									I	(1-2)		3	
Callitriche stagnalis																																			8												I	(8)			
Potamogeton natans																																														6	I	(6)			
Potamogeton pectinatus																																										5					I	(5)			
Callitriche platycarpa																																			3												I	(3)		3	
Enteromorpha sp.								3																																							I	(3)			
Amblystegium sp.																																	2															I	(2)	3	4	
Potamogeton pusillus																																			1												I	(1)			

Community DY25 (continued) ***Hydrocharis morsus-ranae - Lemna trisulca*** **aquatic community**

	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221		222	223	224
Phragmites australis	4	4	4	4	3		5	6	6	5			4				4	7	4	5	2	4	5	7	4	8	7	6	8		3	2	4	7		4		1	6	3	5	6	3	4	3	5		IV	(1-8)			2
Berula erecta	3	4	6	4	5	4	5	2	5	3	2			4	2	1	3	4			1	2		1		5	4	2	1	2						2		3	2	2	2		2	1		1	IV	(1-6)			
Sparganium erectum			4	3			3				4	2	2			5	2				1	3			4					2	2				1	4		2		1		1				II	(1-5)	5	3	6
Mentha aquatica	4		4	3	3				1	2			2				3				1	3						2		2	1	2		2												II	(1-4)			
Juncus subnodulosus				4				4		4		4		3		3					4	3						3		6		6			4								1				II	(1-6)			
Iris pseudacorus	1			3		2	1	2	2					3							1	2						1																		II	(1-3)			
Rumex hydrolapathum	3			3				1		2										1	1						1	1						2												I	(1-3)			
Equisetum fluviatile								2		2		1			5										3			2				1		1												I	(1-5)			
Carex riparia						4						3						3								4			3																	I	(3-4)			
Rorippa nasturtium-aquaticum					4						3																			4										1						I	(1-4)			
Schoenoplectus tabernaemontani								3				4							2	1																											I	(1-4)	5		
Galium palustre										2											2		3							3																I	(2-3)			
Oenanthe fistulosa	3												1				2																													I	(1-3)		3	
Alisma plantago-aquatica			2													3														1																I	(1-3)	3	3	
Juncus effusus							3																																1								I	(1-3)			
Bolboschoenus maritimus																													2																	I	(2)	4	6	5
Typha latifolia																			1																											I	(1)			
Agrostis stolonifera																																				1										I	(1)			
Equisetum palustre																																						1								I	(1)			
No. of aquatic species	5	5	5	5	5	5	3	5	6	6	6	7	6	4	7	7	5	5	6	4	9	6	2	5	4	4	2	3	3	5	6	3	5	3	1	8	4	6	6	4	3	5	5	5	2	2	4	Av.	4.7	4	8	2

Community DY26 ***Ceratophyllum submersum* aquatic community**

	225	226	227	228	229	230			231	232
Lemna trisulca	3	4		3	2	4	V		3	
Lemna minor	10	8		3	3		IV			
Hydrocharis morsus-ranae	2	2					II			
Spirodela polyrhiza	4						I			
Ceratophyllum submersum	6	10	8	10	10	10	V		4	4
Cladophora sp.		8	8	9	7	4	IV			
Chara vulgaris			3				I			
Berula erecta	4	2	1	2	1	1	V			
Agrostis stolonifera	2			1	1		III			
Mentha aquatica			2			2	II			
Juncus subnodulosus					2	1	II			
Phragmites australis			3				I		4	4
No. of species	5	5	3	4	4	3	Av.	4.0	2	1

Community DY27 ***Myriophyllum spicatum – Potamogeton pectinatus*** **aquatic community**

	Stand A															**Stand B**															
	233	**234**	**235**	**236**	**237**	**238**	**239**	**240**	**241**	**242**	**243**	**244**	**245**			**246**	**247**	**248**	**249**	**250**	**251**	**252**	**253**	**254**	**255**	**256**	**257**	**258**	**259**		
Lemna minor	2			1						1				I	(1-2)																
Myriophyllum spicatum	6	6	9	7	10	10	8	10	8	10	10	10	10	V	(6-10)	8	9		9		10	8	4		6	8	2		1	IV	(1-10)
Potamogeton pectinatus	4	4	6	9			8	7	4		2	1	4	IV	(1-9)	6	7	6	3	6		4	6	10						III	(3-10)
Enteromorpha sp.	4	6	5	2			5	4			1	6		IV	(1-6)							1		2						I	(1-2)
Zannichellia palustris																			2		2				2					II	(2)
Bolboschoenus maritimus																4	1	10	3	8	3	1	2	2	3	1	3	4	3	V	(1-10)
Agrostis stolonifera	2						1			1				II	(1-2)	3	2		1	2	2	3		1	2	1	2		2	IV	(1-3)
Phragmites australis	3	1	5	1			2	3	3	3		1	2	IV	(1-5)					4			7		1					II	(1-7)
Schoenoplectus tabernaemontani																	5					2		5						II	(2-5)
Aster tripolium																												1		I	(1)
No. of species	4	3	3	4	1	1	3	3	2	2	3	3	2	Av.	2.6	2	2	1	3	1	2	3	2	2	2	1	1	0	1	Av.	1.6

Community DY28 ***Chara vulgaris* aquatic community**

	260	261	262	263	264			265	266
Chara vulgaris	9	8	3	2	2	V	(2-9)	8	5
Cladophora sp.	2	1	6	5		IV	(1-6)		
Ceratophyllum demersum		1	4			II	(1-4)		
Potamogeton pectinatus					5	I	(5)		
Zannichellia palustris					3	I	(3)		
Hippurus vulgaris		2				I	(2)		
Potamogeton pusillus					2	I	(2)		
Spirogyra sp.								3	
Bolboschoenus maritimus	3	3	5	6	9	V	(3-9)		
Phragmites australis	8	2		2	3	IV	(2-8)	5	
Schoenoplectus tabernaemontani		3	2	4		III	(2-4)	1	3
Aster tripolium			2	1		II	(1-2)		
Juncus articulatus	1	2				II	(1-2)	5	8
Juncus subnodulosus	2					I	(2)		
Iris pseudacorus	1					I	(1)		
Alisma plantago- aquatica	1					I	(1)		
Mentha aquatica								1	
Triglochin maritima									
No. of aquatic species	2	4	3	2	4	Av.	3.0	2	1

Community DY29 ***Lemna minor* aquatic community**

	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299		
Lemna minor	9	7	9	2	10	9	5	8	9	10	10	5	4	3	5	7	10	10	10	9	2	1	10	10	10	10				3	10	10	10	V	(1-10)
Lemna minuta							9														3	4					10	6						I	(3-10)
Spirodela polyrhiza	3	5	4												2															3				I	(2-5)
Azolla filiculoides						5		8																					10					I	(5-10)
Lemna trisulca										1																2							6	I	(1-6)
Hydrocharis morsus-ranae														4																				I	(4)
Spirogyra sp.															8	4														4				I	(4-8)
Callitriche platycarpa																			2	6														I	(2-6)
Cladophora sp.				2																	1													I	(1-2)
Callitriche stagnalis												2																		1				I	(1-2)
Potamogeton berchtoldii																	2			1														I	(1-2)
Ceratophyllum submersum				2																														I	(2)
Enteromorpha sp.													2																					I	(2)
Potamogeton pectinatus																			1															I	(1)
Zannichellia palustris																			1															I	(1)
Phragmites australis	4	9	6	1	6	3	6	2	9	7	9	5	5	7	3												10	10	3					III	(1-10)
Carex riparia	3	4									3					3													2					I	(2-4)
Bolboschoenus maritimus																														6	9	9	8	I	(6-9)
Rorippa nasturtium-aquaticum						3					3				7			2																	I	(2-7)
Iris pseudacorus														1	2	3										3								I	(1-3)
Sparganium erectum	5														5	8																		I	(5-8)

Community DY29 **_Lemna minor_ aquatic community**

	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299		
Juncus subnodulosus														4	4	5																		I	(4-5)
Galium palustre														1	4	6																		I	(1-6)
Rumex hydrolapathum														3	3	3																		I	(3)
Mentha aquatica														3	3																			I	(3)
Urtica dioica																											3	2						I	(2-3)
Equisetum fluviatile															1	2																		I	(1-2)
Agrostis stolonifera																					1	1												I	(1)
Schoenoplectus tabernaemontani																														6				I	(6)
Berula erecta															4																			I	(4)
Apium nodiflorum																										2								I	(2)
Myosotis laxa caespitosa						2																												I	(2)
Equisetum palustre																											1							I	(1)
Glyceria fluitans																		1																I	(1)
No. of aquatic species	2	2	2	3	1	2	2	2	1	2	1	2	2	2	3	2	2	1	4	3	3	2	1	1	1	2	1	1	1	4	1	1	2	Av.	1.9

Community DY30 ***Phragmites australis* emergent community**

	300	301	302	303	304	305	306		
Lemna minuta	2							I	(1)
Cladophora sp.	2	2	1	2				III	(1-2)
Phragmites australis	6	3	7	4	4	5	10	V	(3-10)
Rorippa nasturtium-aquaticum					10			I	(10)
Bolboschoenus maritimus			3					I	(3)
Berula erecta					3			I	(3)
Carex riparia						2		I	(2)
No. of aquatic species	2	1	1	1	0	0	0	Av.	0.7

Dry woodlands

Community DW31 ***Pteridium aquilinum-Ceratocapnos claviculata*** **woodland**
Stand A – ***Agrostis capillaris-Dryopteris dilatata*** **community**

	307	308	309	310	311	312	313	314	315	316	317	318	319		
Canopy layer															
Pinus nigra laricio		9	9	9	9	9		10	9	9	9			IV	(9-10)
Betula pubescens			1		1				4	1	1			II	(1-4)
Quercus rubra												10	8	I	(8-10)
Castanea sativa	6						5							I	(5-6)
Pinus sylvestris									1				5	I	(1-5)
Quercus robur							5							I	(5)
Betula pendula												1		I	(1)
Shrub layer															
Betula pendula sapling			1		1				1					II	(1)
Ulex europaeus							6		2					I	(2-6)
Sambucus nigra						1								I	(1)
Acer pseudoplatanus sapling						1								I	(1)
Quercus rubra sapling													1	I	(1)
Ilex aquifolium shrub										1				I	(1)
Field/ground layers															
Pteridium aquilinum		9	8	10	9	4	8	9	4		10	2	2	V	(2-10)
Ceratocapnos claviculata		5	3	5	5	7	1	3	4	4	4	2		V	(1-7)
Rubus fruticosus agg	7	2	1	3		7	8	2	1		1	3		IV	(1-8)
Dryopteris dilatata		3	5		4	3		4	7	7	2	2		IV	(2-7)
Agrostis capillaris	6	1		1	1	1	1			3		1	1	IV	(1-6)
Scleropodium purum	5	6	6		2		5	2	4	4				IV	(2-6)
Eurhynchium praelongum		5	5	4	7			10	2	8				III	(2-10)
Fissidens taxifolius		2		2	1			2	4	2				III	(1-4)
Carex arenaria	3	1		3					2	2				II	(1-3)
Hypnum jutlandicum		7	4						5	5				II	(4-7)
Holcus mollis					2		4					8	8	II	(2-8)
Rumex acetosella	5					1	3		2					II	(1-5)
Holcus lanatus	2	3		1		2								II	(1-3)

Community DW31 (continued) ***Pteridium aquilinum-Ceratocapnos claviculata* woodland**
Stand A – *Agrostis capillaris-Dryopteris dilatata* community

	307	308	309	310	311	312	313	314	315	316	317	318	319		
Galium saxatile	3	1					1			2				II	(1-3)
Dicranella heteromalla		1										4	3	II	(1-4)
Thuidium tamariscinum		4	2						2					II	(2-4)
Hypnum cupressiforme		2										3	2	II	(2-3)
Polytrichum formosum	4	1		2										II	(1-4)
Polytrichum juniperinum	4			2									1	II	(1-4)
Rhytidiadelphus squarrosus	4	3												I	(3-4)
Lonicera periclymenum	1				1									I	(1)
Ulex europaeus seedling						1						1		I	(1)
Anthoxanthum odoratum	3													I	(3)
Campylopus flexuosus	3													I	(3)
Lophocolea heterophylla	2													I	(2)
Dryopteris filix-mas	1													I	(1)
Pinus sylvatica seedling													1	I	(1)
Quercus robur seedling								1						I	(1)
Pinus nigra laricio seedling											1			I	(1)
Canopy (m)	3	17	20	22	21	20	3	19	22	21	20	21	22		
Canopy cover (%)	35	90	90	85	90	85	40	95	85	90	90	95	95		
No. of species	15	18	11	11	12	11	11	9	16	12	7	11	10	Av.	11.8

Community DW31 ***Pteridium aquilinum-Ceratocapnos claviculata* woodland**
Stand B – L*onicera periclymenum-Dryopteris filix-mas* community

	320	321	322	323	324	325	326	327	328	329	330	331		
Canopy layer														
Pinus nigra laricio	8	8	8	8	8	8			8		8		IV	(8)
Betula pendula							5			8	1	1	II	(1-8)
Quercus robur							1	3				4	II	(1-4)
Castanea sativa								7				4	I	(4-7)
Quercus rubra												8	I	(8)
Quercus cerris								7					I	(7)
Pinus sylvestris			4										I	(4)
Prunus avium												4	I	(4)
Fagus sylvatica												3	I	(3)
Fraxinus excelsior										3			I	(3)
Acer pseudoplatanus							1						I	(1)
Shrub layer														
Betula pendula sapling			2	1	1	4			3	4	1		III	(1-4)
Sambucus nigra	3	1	2	1	4								III	(1-4)
Ulex europaeus							6	1				1	II	(1-6)
Crataegus monogyna		2		1			1						II	(1-2)
Acer pseudoplatanus sapling	1	1						1					II	(1)
Corylus avellana							6	2					I	(2-6)
Ilex aquifolium shrub		2						2					I	(2)
Quercus robur sapling				3							1		I	(1-3)
Ulmus procera suckers	4												I	(4)
Acer campestre sapling								2					I	(2)
Alnus glutinosa sapling										1			I	(1)
Cytisus scoparius							1						I	(1)
Fagus sylvatica sapling								1					I	(1)
Rhododendron ponticum			1										I	(1)
Field/ground layers														
Ceratocapnos claviculata		4	6	6	6	5	4	1	3	2	1	3	V	(1-6)
Rubus fruticosus agg.	4	5	5	5	5	1	8				1	3	IV	(1-8)
Pteridium aquilinum		9	7			8	6		10	10	8	4	IV	(4-10)
Lonicera periclymenum		3	1	2	2	2		3	1		3		IV	(1-3)
Eurhynchium praelongum			7	7	6	7	5	4	3				III	(3-7)

Community DW31 (continued) ***Pteridium aquilinum-Ceratocapnos claviculata* woodland**
Stand B – *Lonicera periclymenum-Dryopteris filix-mas* community

	320	321	322	323	324	325	326	327	328	329	330	331		
Dryopteris filix-mas	4		1	4	5	1	1						III	(1-5)
Brachythecium rutabulum			3	3	4	3						3	III	(3-4)
Holcus lanatus	3			3	1	1	4						III	(1-4)
Scleropodium purum						2	4					3	II	(2-4)
Hypnum jutlandicum	2			3				3					II	(2-3)
Dicranum scoparium	3										2	2	II	(2-3)
Urtica dioica	4				2								I	(2-4)
Rumex acetosella		3									2		I	(2-3)
Polytrichum formosum		1										1	I	(1)
Rhytidiadelphus squarrosus							6						I	(6)
Chamerion angustifolium	5												I	(5)
Anthoxanthum odoratum							4						I	(4)
Hypnum cupressiforme											4		I	(4)
Lophocolea heterophylla				4									I	(4)
Agrostis capillaris	3												I	(3)
Claytonia perfoliata	3												I	(3)
Poa trivialis												3	I	(3)
Polytrichum juniperinum											3		I	(3)
Digitalis purpurea	2												I	(2)
Dryopteris dilatata										2			I	(2)
Senecio jacobaea		2											I	(2)
Silene dioica			2										I	
Ulex europaeus seedling											2		I	(1)
Betula pendula seedling								1					I	(1)
Bryonia dioica	1												I	(1)
Carex arenaria	1												I	(1)
Cirsium arvense			1										I	(1)
Galium aparine					1								I	(1)
Glechoma hederacea											1		I	(1)
Stellaria media	1												I	(1)

Community DW31 (continued) ***Pteridium aquilinum-Ceratocapnos claviculata* woodland**
Stand B – *Lonicera periclymenum-Dryopteris filix-mas* community

	320	**321**	**322**	**323**	**324**	**325**	**326**	**327**	**328**	**329**	**330**	**331**		
Canopy (m)	30	25	35	30	30	30	15	9	35	20	30	8		
Canopy cover (%)	75	75	80	75	75	75	30	90	75	75	75	90		
Litter cover (%)	70	70	45	60	50	30	20	80	90	90	65	60		
Bryophyte cover (%)	1	1	30	40	30	50	50	2	2	0	10	10		
No. of species	17	12	14	13	12	11	16	14	6	7	14	15	Av.	12.6

Community DW32 ***Quercus robur-Urtica dioica* woodland**

Community 33 **Ulmus procera scrub**

	Community 2						Community 3			
	332	**333**	**334**	**335**	**336**	**337**			**338**	**339**
Canopy layer										
Quercus robur	4	5	4	3	3	6	V	(3-6)		
Pinus nigra laricio			1	7	7	7	IV	(1-7)		
Castanea sativa		1			7	1	III	(1-7)		
Acer pseudoplatanus	7		8				II	(7-8)		
Prunus avium	5						I	(5)		
Sorbus aucuparia					4		I	(4)		
Alnus cordata			4				I	(4)		
Quercus cerris					3		I	(3)		
Betula pendula					2		I	(2)		
Acer campestre					2		I	(2)		
Tilia cordata	2						I	(2)		
Shrub layer										
Sambucus nigra	2	3		2		3	IV	(2-3)		
Crataegus monogyna	3			1	3	3	IV	(1-3)		
Ulmus procera suckers		7	6	7			III	(6-7)	10	10
Acer pseudoplatanus sapling	5	5	5				III	(5)		
Corylus avellana				3	4	6	III	(3-6)		
Prunus avium					7		I	(7)		
Ligustrum vulgare	4						I	(4)		
Quercus robur sapling						3	I	(3)		
Rhododendron ponticum		2					I	(2)		
Prunus spinosa				1			I	(1)		
Ulmus glabra		1					I	(1)		
Prunus lusitanica sapling										1
Field/ground layers										
Urtica dioica	7	8	5	3	7	5	V	(3-8)	5	4
Eurhynchium praelongum	4		3		7	3	IV	(3-7)	9	10

Community 33 (continued) **Ulmus procera scrub**

	Community 2						Community 3			
	332	**333**	**334**	**335**	**336**	**337**			**338**	**339**
Galium aparine	3	3			1	2	IV	(1-3)	2	
Arctium minus agg.	2	3	2				III	(2-3)		
Anenome nemorosa			2	3		2	III	(2-3)		
Stellaria media	3		1		1		III	(1-3)	3	1
Glechoma hederacea	5	5					II	(5)	6	3
Acer pseudoplatanus seedling	3		5				II	(3-5)		
Brachythecium rutabulum	4				3		II	(3-4)		
Hedera helix		3	3				II	(3)		
Silene dioica	5		1				II	(1-5)	5	4
Ceratocapnos claviculata					1	2	II	(1-2)	2	
Quercus robur seedling				1		2	II	(1-2)		
Arum maculatum		1				1	II	(1)		
Holcus lanatus					3		I	(3)	2	2
Rubus fruticosus agg.						3	I	(3)		2
Pteridium aquilinum					3		I	(3)		1
Scleropodium purum					3		I	(3)		
Lonicera periclymenum					2		I	(2)		
Hypnum cupressiforme			2				I	(2)		
Anthoxanthum odoratum					2		I	(2)		
Claytonia perfoliata						2	I	(2)		
Sambucus nigra sapling						2	I	(2)		
Sonchus asper						2	I	(2)		
Rumex acetosella					1		I	(1)		
Circaea lutetiana						1	I	(1)		
Geranium robertianum			1				I	(1)		
Poa trivialis									6	3
Chaerophyllum temulum									2	3
Fissidens taxifolius										4
Dryopteris dilatata									3	
Hyacinthoides non-scripta									3	

Community 33 (continued) **Ulmus procera scrub**

	Community 2						Community 3			
	332	**333**	**334**	**335**	**336**	**337**			**338**	**339**
Geum urbanum									3	
Dryopteris filix-mas										1
Canopy (m)	15	25	35	25	15	30			9	12
Canopy cover (%)									95	100
Litter cover (%)	50	50	40	65	65	50				
Bryophyte cover (%)	10	0	2	0	35	0				
No. of species	17	13	16	10	22	19	Av.	16.2	14	14

Ride vegetation

Community RI34 ***Agrostis capillaris – Polytrichum juniperinum* community**

	340	**341**	**342**	**343**	**344**	**345**	**346**	**347**	**348**		
Agrostis capillaris	5	5	6	7	5	8	7	7	7	V	(5-8)
Polytrichum juniperinum	8	8	8	6	6	5	5	3	2	V	(2-8)
Rumex acetosella	5	5	6	5	5	3	2	5	2	V	(2-6)
Scleropodium purum		2	3		1	4		4	2	IV	(1-4)
Hypnum jutlandicum		4			2	4		4	5	III	(2-5)
Carex arenaria	2		2		3		3	2		III	(2-3)
Anthoxanthum odoratum		1	3	2				3	2	III	(1-3)
Campylopus pyriformis	4	4		7	2					III	(2-7)
Holcus lanatus			3	2		4			2	III	(2-4)
Poa annua	3	1	3						2	III	(1-3)
Aira praecox	3	1		3				1		III	(1-3)
Hypnum cupressiforme		2		1	1				3	III	(1-3)
Pteridium aquilinum		3				1		1	1	III	(1-3)
Dicranum scoparium		1			7			6		II	(1-7)
Syntrichia ruraliformis		4		3	1					II	(1-4)
Eurhynchium praelongum						3			8	II	(3-8)
Galium saxatile			3						3	II	(3)
Cladonia foliacea				2	3					II	(2-3)
Vulpia bromoides	1								3	II	(1-3)
Crassula tillaea			1				3			II	(1-3)
Cladonia furcata				3	1					II	(1-3)
Festuca ovina					1			3		II	(1-3)
Sagina procumbens			2	1						II	(1-2)
Hypochaeris radicata		1		1						II	(21)

Community RI34 (continued) ***Agrostis capillaris – Polytrichum juniperinum* community**

	340	**341**	**342**	**343**	**344**	**345**	**346**	**347**	**348**		
Rhytidiadelphus squarrosus									4	I	(4)
Rubus fruticosus agg.						4				I	(4)
Luzula campestris									3	I	(3)
Spergularia rubra							3			I	(3)
Ptilidium ciliare									3	I	(3)
Bryum sp.			2							I	(2)
Aphanes australis	2									I	(2)
Ornithopus perpusillus			2							I	(2)
Cladonia coniocraea					2					I	(2)
Dicranella heteromalla								2		I	(2)
Holcus mollis		2								I	(2)
Poa pratensis			2							I	(2)
Cerastium fontanum									1	I	(1)
Cladonia impexa					1					I	(1)
Pinus nigra seedling				1						I	(1)
Brachythecium albicans							1			I	(1)
Ulex europaeus						1				I	(1)
Dryopteris dilatata									1	I	(1)
Sward height (cm)	2	4	4	3	1	2	4	2	4		
Vegetation cover (%)	40	25	50	45	35	70	45	65	55		
Bryophyte/lichen cover (%)	60	80	60	60	80	50	20	50	90		
Plant litter cover (%)	1	3	2	3	3	10	10	5	15		
Bare ground (%)	25	15	30	20	15	10	30	10	20		
No. of species	9	15	14	14	15	10	7	12	18	Av.	13.8

Community RI35 **Agrostis capillaris – Eurhynchium praelongum community**

	349	350	351	352	353	354	355	356	357	358	359	360	361	362	363	364	365		
Agrostis capillaris	9	10	8	9	9	9	7	8	6	4	8	7	8	8	9	7	8	V	(4-10)
Eurhynchium praelongum	6	2	9	4	7	4	5	2	3	1	4	6	3	7	9		5	V	(1-9)
Rhytidiadelphus squarrosus	5	8	3			2	3		6		7	5	4	4	4	8	8	IV	(2-8)
Holcus lanatus	3	2		1		4	2		3	4	3	2	3	3		3	1	IV	(1-4)
Anthoxanthum odoratum	2	3		2	5	2	3		6		4	3	4		3	4		IV	(2-6)
Scleropodium purum	3		3	8	5	4	2		6			6		2	4		2	IV	(2-8)
Poa annua	3		2			2	5	4		7	5	5	4		2	3		IV	(2-7)
Rumex acetosella				3		3		2	4				1	2	5	4	6	III	(1-6)
Hypnum jutlandicum		2	6			8					2			4				II	(2-8)
Dicranella heteromalla	4	1	2	2		1												II	(1-4)
Cerastium fontanum							3	1	2					3	1			II	(1-3)
Pteridium aquilinum	1			1	1				3						2			II	(1-3)
Dicranum scoparium			1								3		2	1				II	(1-3)
Rubus fruticosus agg							1						1		1	2		II	(1-2)
Luzula campestris			2						5							3		I	(2-5)

Community RI35 (continued) ***Agrostis capillaris – Eurhynchium praelongum*** **community**

	349	350	351	352	353	354	355	356	357	358	359	360	361	362	363	364	365		
Holcus mollis	2											4			2			I	(2-4)
Ptilidium ciliare	2	3			2													I	(2-3)
Aphanes australis							3	3									1	I	(1-3)
Sagina procumbens							3	2						1				I	(1-3)
Galium saxatile			3	1				1										I	(1-3)
Betula pendula seedling									1				1	1				I	(1)
Carex arenaria										3							3	I	(3)
Vulpia bromoides								3									1	I	(1-3)
Ornithopus perpusillus									3						1			I	(1-3)
Glechoma hederacea							1		3									I	(1-3)
Poa pratensis							3											I	(3)
Trifolium repens								3										I	(3)
Hypnum cupressiforme						2												I	(2)
Aira praecox			1															I	(1)
Lophocolea bidentata											1								
Pinus nigra seedling									1									I	(1)
Senecio jacobaea																	1	I	(1)
Lolium perenne										1								I	(1)

Community RI35 (continued) ***Agrostis capillaris – Eurhynchium praelongum*** **community**

	349	**350**	**351**	**352**	**353**	**354**	**355**	**356**	**357**	**358**	**359**	**360**	**361**	**362**	**363**	**364**	**365**		
Taraxacum officinale agg										1								I	(1)
Geranium molle								1										I	(1)
Stellaria media							1											I	(1)
Rumex obtusifolius							1											I	(1)
Urtica dioica										1								I	(1)
Sward height (cm)	8	3	3	11	9	9	1	1	5	5	5	6	5	1	4	5	4		
Vegetation cover (%)	85	90	80	90	80	90	70	80	80	50	80	80	80	50	95	70	75		
Bryophyte/lichen cover (%)	85	80	90	80	80	95	40	0	50	1	60	60	20	50	95	70	70		
Plant litter cover (%)	2	30	10	20	5	20	2	5	10	3	20	3	15	5	5	10	5		
Bare ground (%)	10	40	6	10	0	5	5	15	5	50	5	25	10	5	0	10	10		
No. of species	11	8	11	9	6	11	15	11	14	8	8	8	10	11	12	8	10	Av.	10.1

Community RI36 ***Agrostis capillaris – Sagina procumbens* community**

	366	367	368	369	370		
Vulpia bromoides	3	4	4	5	4	V	(3-5)
Agrostis capillaris	3	2	7	6	7	V	(2-7)
Poa annua	2	6	3	2	4	V	(2-6)
Sagina procumbens	3	4	2	1	2	V	(1-4)
Aira praecox	3	3	3	3		IV	(3)
Carex arenaria		1	2	1	3	IV	(1-3)
Veronica serpyllifolia	3	5		3		III	(3-5)
Bryum sp.	9			2	2	III	(2-9)
Eurhynchium praelongum		5	2	8		III	(2-8)
Rhytidiadelphus squarrosus		2	2		7	III	(2-7)
Prunella vulgaris	4	3		2		III	(2-4)
Holcus lanatus	2	2		4		III	(2-4)
Aphanes australis		2		3	2	III	(2-3)
Filago vulgaris	2	2	2			III	(2)
Plantago major	2	2		1		III	(1-2)
Trifolium repens	1	2			1	III	(1-2)
Hypochaeris radicata	1	1	1			III	(1)
Senecio jacobaea			1	1	1	III	(1)
Trifolium glomeratum	3	3				II	(3)
Rumex acetosella			2		3	II	(2-3)
Scleropodium purum		2		2		II	(2)
Plantago coronopus			4		1	II	(1-4)
Ornithopus perpusillus		1	3			II	(1-3)
Anthoxanthum odoratum		1			3	II	(1-3)
Trifolium micranthum	3			1		II	(1-3)
Polytrichum juniperinum			2	1		II	(1-2)
Bryum argenteum			2		1	II	(1-2)
Inula conyza	1		1			II	(1)
Bromus hordeaceus hordeaceus	1			1		II	(1)

Community RI36 (continued) ***Agrostis capillaris – Sagina procumbens*** **community**

	366	367	368	369	370		
Vicia sativa nigra		1		1		II	(1)
Cerastium fontanum	1			1		II	(1)
Lolium perenne			1	1		II	(1)
Trifolium scabrum	3					I	(3)
Crassula tillaea		3				I	(3)
Populus canescens seedling			3			I	(3)
Campylopus pyriformis		2				I	(2)
Trifolium dubium			2			I	(2)
Plantago lanceolata			2			I	(2)
Dactylis glomerata			2			I	(2)
Juncus bufonius		2				I	(2)
Cerastium semidecandrum	1					I	(1)
Luzula campestris			1			I	(1)
Crepis capillaris			1			I	(1)
Hypnum cupressiforme			1			I	(1)
Veronica arvensis			1			I	(1)
Veronica officinalis		1				I	(1)
Taraxacum officinale agg.				1		I	(1)
Juncus effusus		1				I	(1)
Sward height (cm)	1	1	7	7	2		
Vegetation cover (%)	40	70	75	50	70		
Bryophyte/lichen cover (%)	90	20	4	50	60		
Plant litter cover (%)	2	3	5	1	5		
Bare ground (%)	5	25	50	40	20		
No. of species	20	26	26	22	14	Av.	21.6

Community RI37 ***Pteridium aquilinum – Agrostis capillaris* community**

	371	**372**	**373**		
Pteridium aquilinum	10	10	10	3	
Agrostis capillaris	8	7	5	3	
Holcus mollis	5	7		2	
Holcus lanatus	3		8	2	
Rumex acetosella	6	2		2	
Ceratocapnos claviculata		2	6	2	
Scleropodium purum	3	2		2	
Silene dioica	1		2	2	
Eurhynchium praelongum			4	1	
Rhytidiadelphus squarrosus	4			1	
Hypnum jutlandicum		4		1	
Rubus fruticosus agg.			4	1	
Glechoma hederacea			4	1	
Stellaria graminea	3			1	
Galium saxatile			2	1	
Lonicera periclymenum		2		1	
Aira praecox		1		1	
Populus canescens seedling	1			1	
Quercus robur seedling	1			1	
Sward height (cm)	130	140	140		
Vegetation cover (%)	100	95	100		
Bryophyte/lichen cover (%)	10	5	5		
Plant litter cover (%)	30	40	50		
Bare ground (%)	40	10	0		
No. of species	11	9	9	Av.	9.7

Community RI38 ***Poa annua – Agrostis capillaris* community**

	374	**375**	**376**	**377**	**378**	**379**		
Poa annua	3	8	6	8	8	7	V	(3-8)
Agrostis capillaris	8	6	7	3	4	7	V	(3-8)
Lolium perenne		2	5	4	4	2	V	(2-5)
Holcus lanatus	3		2	4	2	2	V	(2-4)
Eurhynchium praelongum			4	3	2	1	IV	(1-4)
Dactylis glomerata					2	4	II	(2-4)
Ranunculus repens		1		3			II	(1-3)
Pteridium aquilinum	2		1				II	(1-2)
Phragmites australis	2					1	II	(1-2)
Urtica dioica					1	1	II	(1)
Poa trivialis						6	I	(6)
Festuca rubra					4		I	(4)
Plantago major		3					I	(3)
Pohlia nutans	3						I	(3)
Aphanes australis		2					I	(2)
Veronica serpyllifolia		2					I	(2)
Sagina procumbens		1					I	(1)
Trifolium repens		1					I	(1)
Stellaria media				1			I	(1)
Rumex obtusifolius				1			I	(1)
Prunella vulgaris		1					I	(1)
Plantago lanceolata						1	I	(1)
Cynosurus cristatus	1						I	(1)
Cardamine pratensis			1				I	(1)
Sward height (cm)	2	2	5	10	8	7		
Vegetation cover (%)	80	85	80	85	80	80		
Bryophyte/lichen cover (%)	10	0	5	10	2	1		

Community RI38 ***Poa annua – Agrostis capillaris* community**

	374	**375**	**376**	**377**	**378**	**379**		
Plant litter cover (%)	30	2	20	40	15	40		
Bare ground (%)	20	20	10	10	30	20		
No. of species	8	10	7	8	8	10	Av.	8.5

Community RI39 ***Poa annua – Taraxacum officinale* agg. community**

	380	381	382	383	384	385	386	387		
Poa annua	5	6	7	8	5		4		IV	(4-8)
Poa trivialis	5	6			6	4	8	6	IV	(4-8)
Lolium perenne	3	3	7	5	6		4		IV	(3-7)
Holcus lanatus		3		4	2	3	4	6	IV	(2-6)
Taraxacum officinale agg	1		1	2	2		2	2	IV	(1-2)
Trifolium repens	2		1	3	4		4		IV	(1-4)
Ranunculus repens		3	3	3			3		III	(3)
Eurhynchium praelongum	4	2		2				4	III	(2-4)
Plantago major	3	2			4		2		III	(2-4)
Silene dioica		1	1			5		3	III	(1-5)
Stellaria media	3		1	1				2	III	(1-3)
Urtica dioica		1				7		2	II	(1-7)
Myosotis arvensis		1				2		3	II	(1-3)
Cerastium fontanum		2					1	2	II	(1-2)
Rumex obtusifolius			1				1	2	II	(1-2)
Dactylis glomerata					4	1			II	(1-4)
Prunella vulgaris		3		1					II	(1-3)
Rubus fruticosus agg						3		1	II	(1-3)
Glechoma hederacea			1	2					II	(1-2)
Lapsana communis						2		1	II	(1-2)
Galium aparine						1		2	II	(1-2)
Plantago lanceolata				1			1		II	(1)
Geranium robertianum						1		1	II	(1)
Agrostis capillaris								5	I	(5)
Potentilla reptans				4					I	(4)
Agrostis stolonifera								4	I	(4)
Brachythecium rutabulum		4							I	(4)
Potentilla anserina							4		I	(4)
Pteridium aquilinum						3			I	(3)

Community RI39 (continued) ***Poa annua – Taraxacum officinale agg.*** **community**

	380	**381**	**382**	**383**	**384**	**385**	**386**	**387**		
Veronica serpyllifolia		3							I	(3)
Geranium molle								3	I	(3)
Cynosurus cristatus	2								I	(2)
Bryum argenteum	2								I	(2)
Bromus hordeaceus hordeaceus		2							I	(2)
Geum urbanum		2							I	(2)
Sagina procumbens				1					I	(1)
Ptilidium ciliare				1					I	(1)
Syntrichia ruraliformis		1							I	(1)
Arctium minus agg		1							I	(1)
Myosotis sylvatica								1	I	(1)
Sward height (cm)	4	10	1	11	12	20	12	10		
Vegetation cover (%)	40	80	65	80	85	70	70	85		
Bryophyte/lichen cover (%)	5	7	0	3	0	0	0	15		
Plant litter cover (%)	2	10	5	1	5	50	5	20		
Bare ground (%)	70	30	25	25	30	25	30	10		
No. of species	10	18	9	14	8	11	12	18	Av.	12.5

Appendix B
2008 Data Tables for the Plant Communities

38 Pages

June 2012
Doc Reg No. 28130RR363i1

DY1a **A4 *Hydrocharis morsus-ranae* - *Stratiotes aloides* community - full sun variant**
sometimes accompanied by S4 *Phragmites australis* community

Sample number	21	24	26	28	29	32	39	41	46	47	72	75	86	103	109	117	118	120	122	128	131	134	135		
Floating																									
Lemna trisulca	5	4	4	7	4	4	7	3	6	6			10	8	5	5	5	4	6	9	7	2	7	V	(2-10)
Hydrocharis morsus-ranae		3		2	6	6	9	5	9	7		10	3	6	3	3	4	2	8	8	3	6	10	V	(2-10)
Lemna minor	3	3	3	7	4						4	6		9	9	3	3	2		3	3	10		IV	(2-10)
Persicaria amphibia						1															2			I	(1-2)
Spirodela polyrhiza														3										I	(3)
Drepanocladus fluitans													3											I	(3)
Submerged																									
Ceratophyllum demersum	8		9			3					2			1	9		2	8	1		6			III	(1-9)
Utricularia vulgaris	5		4										1				2		8					II	(1-8)
Myriophyllum verticillatum						8													2					I	(2-8)
Myriophyllum spicatum									1															I	(1)
Callitriche stagnalis			1																					I	(1)
Hottonia palustris									1															I	(1)
Elodea canadensis											1													I	(1)
Aquatic algae																									
Spirogyra sp.							4		3	2						8		2	3		8			II	(2-8)
Cladophora sp.					8																2			I	(2-8)
Oscillatoria spp.			3																					I	(3)
Enteromorpha sp.																					2			I	(2)
Marginal																									
Berula erecta	3	5		4	3	3	5	5	3	6			8	2		3	3	1	1	3	1	1	3	IV	(1-8)
Mentha aquatica	2					2		2									1			1			1	II	(1-2)
Agrostis stolonifera		5											2				1							I	(1-5)
Alisma plantago-aquatica									2				1								1			I	(1-2)
Swamp-fen																									
Phragmites australis		3	3	4		3	3	4	1	3		4			6	3			2	9		10	10	IV	(1-10)
Juncus subnodulosus	3	8										1	2	2			1		2		1			II	(1-8)
Rumex hydrolapathum	2			1	2		1						1			1				1			1	II	(1-2)
Iris pseudacorus	1	2	4	5		2	3																	II	(1-5)
Carex pseudocyperus		3											1	1			1				1			II	(1-3)
Sparganium erectum		1										5			1					1				I	(1-5)
Eleocharis palustris		3				3																		I	(3)
Oenanthe lachenalii							1		2															I	(1-2)
Galium palustre		4																						I	(4)
Typha latifolia																			3					I	(3)
Carex riparia										2														I	(2)
Shade (%)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
No. of aquatic species	4	3	6	3	4	5	3	2	5	3	3	2	4	5	4	4	5	5	6	3	8	3	2		Av. 4.0

DY1b **A4 *Hypocharis morsus-ranae - Stratiotes aloides* community - shade variants**
[Separated into light and heavy shade forms]

	Light shade																					Heavy shade														
Sample number	25	30	52	62	78	79	82	83	84	92	93	94	95	96	97	98	102	105	106	113	114	132	54	63	90	100	104	108	110	111	112	116	119	133		
Floating																																				
Lemna minor	2	3	9	5	4	8	10	6	10	3	4	4	6	2	10	3	2	7	8	8	6	4	5	7	8	10	9	8	6	8	9	7	8	7	V	(2-10)
Hydrocharis morsus-ranae	6	5	4		3	3	4	5		2	4	6	2	3	3		4	3	4	4	3	5	3		4	3		4	1	2	2	1		2	V	(1-6)
Lemna trisulca	6	5					2	3	1		2			3	4	3	3	6		7	4	3				1			2			2	3	4	III	(1-7)
Persicaria amphibia		1											2		2				1			1			1								2		II	(1-2)
Spirodela polyrhiza			4	3											3												5								I	(3-5)
Submerged																																				
Ceratophyllum demersum	8	8	8	2			8	9	7			8	9		8	1	9	7	4	10	1	10	8		7	1	1	3	1	3	5	9	4	9	V	(1-10)
Utricularia vulgaris						9	3			7	1	3	7				3	2	7		5	2			4	2		2				8		3	III	(1-9)
Elodea canadensis								1	3											1					1	1					1			I	(1-3)
Potamogeton berchtoldii									1			2													2	1					1			I	(1-2)
Myriophyllum aquaticum																3			2																I	(2-3)
Myriophyllum verticillatum							2									1																			I	(1-2)
Chara vulgaris																	5																		I	(5)
Callitriche obtusangula																															2				I	(2)
Chara globularis																2																			I	(2)
Ceratophyllum submersum				2																															I	(2)
Myriophyllum spicatum									1																										I	(1)
Aquatic algae																																				
Spirogyra sp.						2		2		6	1	2		7					8		2	4										2			II	(1-8)
Enteromorpha sp.					10			3		2	5			7																					I	(2-10)
Cladophora sp.								1								7	4	2																	I	(1-7)
Oscillatoria sp.		3																																	I	(3)
Microspora sp.	3																																		I	(3)
Marginal																																				
Berula erecta		4			2	1		7	6	1	1	3		3	1					2	2	2										1		III	(1-7)
Agrostis stolonifera						1		1		1		1										2		3		1		1	2	1	1	1	1	1	III	(1-3)
Mentha aquatica						1						1									1	1													I	(1)
Rorippa nasturtium-aquaticum					4	2															1														I	(1-4)
Lycopus europaeus					1	1																		2											I	(1-2)
Catabrosa aquatica					4																			2											I	(2-4)
Alisma plantago-aquatica												1																							I	(1)
Swamp-fen																																				
Phragmites australis	5	4	3		3	4	1			3	2	2			3	8	2	5			3	2			2			1							III	(1-8)
Carex riparia							4	3	3		2						3	2							3		1								II	(1-4)
Equisetum fluviatile							1					1					2			1												2	2		I	(1-2)
Juncus subnodulosus														3		2					3											1		1	I	(1-3)
Galium palustre													1								1	2										1		1	I	(1-2)
Typha latifolia	3						2	3									1																		I	(1-3)
Carex diandra							1	2					1															1							I	(1-2)
Rumex hydrolapathum					1	1			1											1															I	(1)
Iris pseudacorus				1					3															9											I	(1-9)
Sparganium erectum					1															3											1				I	(1-3)
Carex pseudocyperus									1						1																				I	(1)
Lythrum salicaria						1															1														I	(1)
Solanum dulcamara																								4											I	(4)
Eupatorium cannabinum																								1											I	(1)
Shade (%)	40	20	40	35	25	40	25	25	25	5	15	25	45	40	35	45	25	10	35	35	40	35	70	60	60	80	60	80	90	80	60	60	80	60		
No. of aquatic species	5	6	4	4	3	4	6	8	6	5	6	6	5	5	6	7	7	6	7	5	6	7	3	1	7	7	3	4	4	3	6	6	4	5		Av. 5.2

DY1c **A4 *Hydrocharis morsus-ranae* - *Stratiotes aloides* community - Stonewort variant**

Sample numbers	31	35	36	37	38	42	43	87	88	89	99	101		
Floating														
Hydrocharis morsus-ranae	6	5	6	5	6	5	6	3	2	3	1	2	V	(1-6)
Lemna trisulca	5	7	7	8	8	3	8	9			1		IV	(1-9)
Potamogeton coloratus						2						3	I	(2-3)
Persicaria amphibia	1		2										I	(1-2)
Drepanocladus fluitans								4					I	(4)
Lemna minor	2												I	(2)
Submerged														
Chara vulgaris	6	2	3	2	1	5	1	1	10	10	10	9	V	(1-10)
Myriophyllum verticillatum		4	7										I	(4-7)
Ceratophyllum demersum	3							4					I	(3-4)
Utricularia vulgaris								5				2	I	(2-5)
Hottonia palustris	1											1	I	(1)
Potamogeton berchtoldii		4											I	(4)
Aquatic algae														
Spirogyra sp.	5	3		5	6		3						III	(3-6)
Cladophora sp.												4	I	(4)
Oscillatoria spp.							3						I	(3)
Marginal														
Berula erecta	4	2	2	4	5	6	3	7					IV	(2-7)
Juncus bulbosus/kochii			5										I	(5)
Mentha aquatica						3							I	(3)
Drepanocladus aduncus						3							I	(3)
Caltha palustris				2									I	(2)
Alisma plantago-aquatica										1			I	(1)
Swamp-fen														
Phragmites australis		3		3	3				3	3	3	4	III	(3-4)
Juncus subnodulosus				3	2	4		3	2	2			III	(2-4)
Carex pseudocyperus		2				2	2	1	1				III	(1-2)
Rumex hydrolapathum	1		1	2						1			II	(1-2)
Iris pseudacorus			2	1	3								II	(1-3)
Equisetum fluviatile			1			1				1			II	(1)
Typha latifolia								2		5			I	(2-5)
Sparganium erectum			1		2								I	(1-2)
Eleocharis palustris						3							I	(3)
Bolboschoenus maritimus												3	I	(3)
Carex riparia												2	I	(2)
Carex diandra										1			I	(1)
Oenanthe lachenalii			1										I	(1)
Galium palustre								1					I	(1)
Shade (%)	0	0	0	0	0	0	0	0	0	0	0	0		
No. of aquatic species	8	6	5	4	4	4	5	6	2	2	3	6		Av. 4.6

DY1d **A4 *Hydrocharis morsus-ranae* - *Stratiotes aloides* community**

***Elodea canadensis* variant**

Sample number	40	50	53	76	77	125	127	130	136		
Floating											
Lemna trisulca	6	4	3	3	3		7	3	5	V	(3-7)
Hydrocharis morsus-ranae	8	4	6			10	6	6	2	IV	(2-10)
Lemna minor		5			3					II	(3-5)
Submerged											
Elodea canadensis	3	5	6	7	9	10	2	8	3	V	(2-10)
Utricularia vulgaris				3	2					II	(2-3)
Chara globularis									8	I	(8)
Ceratophyllum submersum									3	I	(3)
Ceratophyllum demersum			2							I	(2)
Callitriche obtusangula					2					I	(2)
Potamogeton pectinatus									2	I	(2)
Potamogeton berchtoldii					1					I	(1)
Aquatic algae											
Spirogyra sp.				7	10		8	10		III	(7-10)
Marginal											
Berula erecta	2	2	4	1	2	2	5	3	3	V	(1-5)
Agrostis stolonifera				2			2	1		II	(1-2)
Mentha aquatica				1	1			1		II	(1)
Rorippa nasturtium-aquaticum				2	5					II	(2-5)
Alisma plantago-aquatica				1				1		II	(1)
Veronica beccabunga				2						I	(2)
Swamp-fen											
Phragmites australis	8	1	3			6	4	2	1	IV	(1-8)
Sparganium erectum				3		2	1	2		III	(1-3)
Rumex hydrolapathum	1					1		2		II	(1-2)
Carex riparia	4	1								II	(1-4)
Carex pseudocyperus	3				1					II	(1-3)
Typha latifolia				4						I	(4)
Carex nigra								3		I	(3)
Equisetum fluviatile								2		I	(2)
Iris pseudacorus		2								I	(2)
Eleocharis palustris								2		I	(2)
Juncus effusus									1	I	(1)
Equisetum palustre						1				I	(1)
Shade (%)	0	20	20	0	20	0	0	0	5		
No. of aquatic species	3	4	4	4	7	2	4	4	6	Av. 4.2	

DY2 **A2 *Lemna minor* community, *Lemna trisulca* sub-community - over**
A6 *Ceratophyllum submersum*community
[Including samples tabulated in 2007 report]

	2007 samples						2008 samples												
Sample number	225	226	227	228	229	230	16	20	33	49	58	66	67	68	69	70	74		
Floating																			
Lemna minor	10	8		3	3		4	5	8	8	10	6	4		8	5	10	V	(3-10)
Lemna trisulca	3	4		3	2	4	4		5			4	2		4	2		IV	(2-5)
Hydrocharis morsus-ranae	2	2							2	3					3	5		II	(205)
Spirodela polyrhiza	4														3			I	(3-4)
Submerged																			
Ceratophyllum submersum	6	10	8	10	10	10	7	9	8	8	7	5	10	9	8	6	6	V	(5-10)
Chara vulgaris			3											2				I	(2-3)
Potamogeton berchtoldii																	5	I	(5)
Ceratophyllum demersum							3											I	(3)
Elodea canadensis																	3	I	(3)
Aquatic algae																			
Spirogyra sp.		8	8	9	7	4							4	6		1		III	(1-9)
Marginal																			
Berula erecta	4	2	1	2	1	1	4		4			1		2	3		2	IV	(1-4)
Mentha aquatica			2			2		2	3					1				II	(1-3)
Agrostis stolonifera	2			1	1							1			1			II	(1-2)
Swamp-fen																			
Phragmites australis			3				4	3			4		2	3		5	4	III	(2-5)
Juncus subnodulosus					2	1	3					2						II	(1-3)
Iris pseudacorus							2		4	2								I	(2-4)
Galium palustre												1	1					I	(1)
Rumex hydrolapathum												1	1					I	(1)
Carex pseudocyperus							1									1		I	(1)
Equisetum fluviatile									4									I	(4)
Sparganium erectum								1										I	(1)
Shade (%)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
No. of aquatic species	5	5	3	4	4	3	4	2	4	3	2	3	4	3	5	5	4		Av. 3.7

DY3 and DY4 **A2 *Lemna minor* community, Typical sub-community (or Riccia fluitans-Ricciocarpus sub-community) over A16 *Callitriche stagnalis* community, *Callitriche* spp. sub-community often accompanied by S23 Other water margin vegetation**

Sample number	1	2	6	8	10	12	13	19	34	65	73			3	4	
Floating																
Lemna minor	7	5	6	5	5	9	5	9	7	6	10	V	(5-10)	3	4	2
Lemna trisulca											1	I	(1)	3	2	2
Riccia fluitans														4	9	2
Submerged																
Callitriche stagnalis	5	4	6	4	2	2	4	6	6	7	9	V	(2-9)	4	1	2
Elodea canadensis								7	4	1	4	II	(1-7)			
Callitriche obtusangula					6		3					I	(3-6)			
Ceratophyllum demersum									4		3	I	(3-4)			
Potamogeton berchtoldii											1	I	(1)			
Callitriche platycarpa										2		I	(2)			
Aquatic algae																
Spirogyra sp.	4	4			3		6					II	(3-6)	3	2	2
Microspora spp.				4			3					I	(3-4)			
Cladophora sp.	4											I	(4)		4	1
Marginal																
Berula erecta			3		3	1	4	2		2		III	(1-4)	8	1	2
Rorippa nasturtium-aquaticum	4	2	3		2					7		III	(2-7)			
Catabrosa aquatica										2	3	I	(2-3)			
Myosotis scorpioides								2		1		I	(1-2)			
Agrostis stolonifera											2	I	(2)			
Drepanocladus aduncus						1						I	(1)			
Veronica beccabunga		2										I	(2)	3		1
Mentha aquatica														3	1	2
Swamp-fen																
Phragmites australis			3				2	4		2	3	III	(2-4)			
Iris pseudacorus							3		2			I	(2-3)			
Sparganium erectum					5							I	(5)		2	1
Equisetum fluviatile						2						I	(2)	5	1	2
Juncus effusus									2			I	(2)	4	4	2
Carex pseudocyperus										1		I	(1)			
Juncus articulatus														4	3	2
Juncus subnodulosus														4		1
Shade (%)	0	0	0	0	10	20	40	30	50	20	20			0	0	
No. of aquatic species	4	3	2	3	4	2	5	3	4	4	6		Av. 3.6	5	6	Av. 5.5

DY5 **A2 *Lemna minor* community - Typical sub-community, over**

S23 Other water margin vegetation

Sample number	5	9	11	14	23	27	44	45	48	85		
Floating												
Lemna minor	4	3	6	6	3	7	8	5	7	5	V	(3-8)
Lemna trisulca	1										I	(1)
Submerged												
Callitriche stagnalis			4	4	3						II	(3-4)
Elodea canadensis				1							I	(1)
Aquatic algae												
Spirogyra sp.				3							I	(3)
Microspora sp.				4							I	(4)
Marginal												
Berula erecta	9	10	6	4	8	8			4	1	IV	(1-10)
Rorippa nasturtium-aquaticum				5	7			10	8	9	III	(5-10)
Mentha aquatica	1	2	3	3			2				III	(1-3)
Veronica beccabunga	4	3	4	4							II	(3-4)
Agrostis stolonifera							6			2	I	(2-6)
Swamp-fen												
Iris pseudacorus		2		3			6	3	2		III	(2-6)
Glyceria maxima						5		3	4		II	(3-5)
Sparganium erectum			3				3				I	(3)
Phragmites australis			7							2	I	(2-7)
Juncus effusus	3	2									I	(2-3)
Equisetum fluviatile		2									I	(2)
Juncus subnodulosus										2	I	(2)
Galium palustre										1	I	(1)
Typha latifolia				2							I	(2)
Carex diandra										1	I	(1)
Rumex hydrolapathum							2				I	(2)
Shade (%)	10	0	40	20	50	70	20	40	30	50		
No. of aquatic species	2	1	2	5	2	1	1	1	1	1		Av. 1.7

DY6 **A2 *Lemna minor* community, Typical sub-community with**

S4 *Phragmites australis* community, *Phragmites australis* sub-community

[Also atypical samples, including S12 *Potamogeton pectinatus* community]

Sample number	55	56	57	79			126	129	
Floating									
Lemna minor	10	10	10	7	4	(7-10)			
Hydrocharis morsus-ranae				1	1	(1)			
Lemna trisulca				1	1	(1)			
Submerged									
Potamogeton pectinatus								8	1
Aquatic algae									
Marginal									
Berula erecta		2			1	(2)			
Agrostis stolonifera				1	1	(1)		1	1
Rorippa nasturtium-aquaticum								2	1
Mentha aquatica								1	1
Swamp-fen									
Phragmites australis	4	5	5	6	4	(4-6)	10	7	2
Rumex hydrolapathum				1	1	(1)			
Equisetum fluviatile							3		1
Carex riparia							1		1
Sparganium erectum								1	1
Shade (%)	60	50	60	20			0	0	
No. of aquatic species	1	1	1	3		Av. 1.8	0	1	

DY7 **A2 *Lemna minor* community, Typical sub-community**
[Including samples tabulated in 2007 report]

	2007 samples					2008 samples																			
Sample number	272	274	283	284	285	7	15	17	18	22	51	59	60	61	64	80	81	91	107	115	121	123	124		
Floating																									
Lemna minor	9	8	10	10	10	10	5	4	6	10	8	5	7	7	9	10	10	5	7	10	3	10	10	V	(3-10)
Hydrocharis morsus-ranae																				1	1			I	(1)
Lemna trisulca									3			2								3				I	(2-3)
Spirodela polyrhiza															4									I	(4)
Azolla filiculoides	5	8																						I	(5-8)
Submerged																									
Elodea canadensis																	1							I	(1)
Potamogeton berchtoldii			2							4									2					I	(2-4)
Myriophyllum aquaticum																			8					I	(8)
Potamogeton pectinatus					1																			I	(1)
Callitriche platycarpa					2																			I	(2)
Zannichellia palustris					1																			I	(1)
Aquatic algae																									
Spirogyra sp.							7																	I	(7)
Oscillatoria spp.									7															I	(7)
Marginal																									
Berula erecta							4		3					2										I	(2-4)
Agrostis stolonifera															1									I	(1)
Mentha aquatica																							1	I	(1)
Rorippa nasturtium-aquaticum	3			2																				I	(2-3)
Myosotis scorpioides																							1	I	(1)
Drepanocladus aduncus								2																I	(2)
Juncus kochii										7														I	(7)
Swamp-fen																									
Phragmites australis	3	2					5					3				4	3	3			1			II	(1-5)
Iris pseudacorus						2			2			2			1			1				2		II	(1-2)
Equisetum fluviatile																1				1	2			I	(1-2)
Sparganium erectum											4						4		4	1				I	(1-4)
Carex pseudocyperus									2									2						I	(2)
Glyceria maxima											8													I	(8)
Carex nigra																		1						I	(1)
Glyceria fluitans				1																				I	(1)
Shade (%)	0	80	60	0	60	50	60	20	70	40	80	70	90	90	70	70	60	80	60	50	70	90	70		
No. of aquatic species	2	2	2	1	4	1	2	1	3	2	1	2	1	1	2	1	2	1	3	3	2	1	1		Av. 1.8

FM1a **M22b *Juncus subnodulosus-Cirsium palustre* fen-meadow, *Briza media-Trifolium* spp. sub-community**

Sample number	43	44	59	60	61	105	107	121	122	123	124	125	126		
Juncus subnodulosus	5	4	1	5	2	10	10	2	10	10	7	10	9	V	(1-10)
Plantago lanceolata	3	3	3	3	2	2	1	3	3	3	2	3	3	V	(1-3)
Carex nigra	6	5	3		6	4	5	5	4	2	8	4	7	V	(2-8)
Festuca rubra	5	5	4	3	2	5		4	5	4	4	6	5	V	(2-6)
Juncus articulatus		3	9	4	5	2	3	7	2	3	3	1	2	V	(1-9)
Holcus lanatus	1	1	2	2	2		1	2	2	3	3	3	2	V	(1-3)
Ranunculus acris		1	2	3	3	2	3	2	3	1	1	2	1	V	(1-3)
Anthoxanthum odoratum	2	1	1	2	1	1	1	3	2		2	1	2	V	(1-3)
Calliergonella cuspidatum	5	1	5	9	9	9	10	10	7		7		6	V	(1-10)
Carex panicea	3	2	1	3	3	4	3	2			2	2	3	V	(1-4)
Agrostis stolonifera	2	5		3	2	5	3	1		3	3		4	IV	(1-5)
Trifolium pratense	1	2		1	1	2	2	3	2		2		3	IV	(1-3)
Anagallis tenella	4	1		6	5	2	3	1	1				3	IV	(1-6)
Briza media				3	1	3	2	1	3		2	3	2	IV	(1-3)
Cynosurus cristatus	3	1	1	1	1	2		2			3		1	IV	(1-3)
Carex disticha	5		6		3		5	6	5	4			3	IV	(1-6)
Valeriana dioica						3	3	2	3	2	3	4	1	IV	(1-4)
Phragmites australis	1	2		1				1	3	3	2	3		IV	(1-3)
Ranunculus repens	2	2				1	2			2	1	2	1	IV	(1-2)
Dactylorhiza fuchsii	1	1	1	1	1		1		2				1	IV	(1-2)
Lotus pedunculatus	1	2	1		1			1	1		4			III	(1-4)
Cardamine pratensis	2	2	3	2	1	2		2						III	(1-3)
Taraxacum officinale agg				2		1	1	2	3			2	2	III	(1-3)
Galium uliginosum	1	1		1		1		2			1		1	III	(1-2)
Succisa pratensis			2	4	2	2			3			1		III	(1-4)
Trifolium repens	2	3		1				2			1		2	III	(1-3)
Festuca arundinacea									2	1	3	3	1	II	(1-3)
Lychnis flos-cuculi	1	3		2	1			3						II	(1-3)
Cirsium palustre	1	1	2							1		1		II	(1-2)
Ranunculus flammula			1			1	1			2		1		II	(1-2)
Carex flacca	5	7		4	5									II	(4-7)
Brachythecium rutabulum	4	2	2			4								II	(2-4)
Juncus inflexus			4	2	4			2						II	(2-4)
Mentha aquatica					2		4			4		2		II	(2-4)
Festuca pratensis						2			1	1			2	II	(1-2)
Cerastium fontanum	1			1				1			1			II	(1)
Equisetum fluviatile					1		3			1				II	(1-3)
Rhinanthus minor				1		3	1							II	(1-3)
Hydrocotyle vulgaris					5	4								I	(4-5)
Cratoneuron filicinum	4	4												I	(4)
Eleocharis uniglumis				2			2							I	(2)
Galium palustre						2				2				I	(2)
Rumex acetosa	2	2												I	(2)
Rhytidiadelphus squarrosus			1	4										I	(1-4)
Isolepis setacea					1			3						I	(1-3)
Potentilla anserina				1				2						I	(1-2)
Eriophorum angustifolium					1	1								I	(1)
Juncus effusus	1		1											I	(1)
Quercus robur seedling			1					1						I	(1)
Vicia cracca	1								1					I	(1)
Menyanthes trifoliata					5									I	(5)
Carex pulicaris						1								I	(1)
Dactylorhiza praetermissa					1									I	(1)
Hypericum tetrapterum							1							I	(1)
Ophioglossum vulgatum		1												I	(1)
Poa pratensis		1												I	(1)
Potentilla erecta				1										I	(1)
Prunella vulgaris							1							I	(1)
Sward height (cm)	10	7	65	8	6	60	60	45	55	70	60	60	55		
Plant cover (%)	90	95	100	100	90	100	100	100	100	100	100	100	100		
Bryophyte cover (%)	20	10	20	95	90	90	90	100	40	0	40	0	30		
Litter cover (%)	45	20	20	10	5	10	5	5	30	70	30	70	40		

Bare ground (%)	10	45	30	5	5	0	0	0	0	0	0	0	0
Water depth (cm)	0	0	0	0	0	0	0	0	0	0	0	0	0
No. of species	29	29	23	30	30	28	25	29	22	19	22	19	24

Av. 25.3

FM1b **M22b *Juncus subnodulosus-Corsium palustre* fen meadow**
***Briza media-Trifolium* spp. sub-community**

Sample number	93	98	99	100	101	102	103	104	108	135		
Calliergonella cuspidatum	4	9	8	6	6	6	8	9	10	5	V	(4-10)
Agrostis stolonifera	4	7	5	6	8	5	3	3	2	10	V	(2-10)
Juncus articulatus	8	7	6	3	2	5	3	4	3	7	V	(2-8)
Carex disticha	6	5	5	7	4	3	2	2	4	3	V	(2-7)
Cardamine pratensis	3	4	2	3	3	3	3	2	1	4	V	(1-4)
Plantago lanceolata	3	1	2	2	2	2	3	3	2	1	V	(1-3)
Carex nigra	3	3	7	5	7	6	8	8	8		V	(3-8)
Festuca rubra	6	4		3	4	4	2	3	5	3	V	(2-6)
Ranunculus acris	2	3		2	2	3	3	2	2	2	V	(2-3)
Carex panicea	1	7	5	7	5	6	5	6	6		V	(1-7)
Trifolium repens	1		2	3	3	3	2	2	1	6	V	(1-6)
Cynosurus cristatus		3	2	3	1	3	2	2	1	3	V	(1-3)
Trifolium pratense	4		3	2	3	3	2	1		3	IV	(1-4)
Taraxacum officinale agg	3		1	3	2	3	3		1		IV	(1-3)
Rhytidiadelphus squarrosus	2		5	3		4	3		2		III	(2-5)
Lotus pedunculatus	2		5	1	2			1		3	III	(1-5)
Ranunculus repens	5	2			1	2				2	III	(1-5)
Holcus lanatus		3	2			1	1			3	III	(1-3)
Succisa pratensis				1	2		2	2	1		III	(1-2)
Dactylorhiza fuchsii				1		1	1	1	1		III	(1)
Ranunculus flammula		1	1		1		1	1			III	(1)
Rumex acetosa	2	3	2			2					II	(2-3)
Brachythecium rutabulum	2				2	3				1	II	(1-3)
Prunella vulgaris					1	2	3	2			II	(1-3)
Briza media				2	1		1	3			II	(1-3)
Juncus inflexus		2		3	1			1			II	(1-3)
Potentilla erecta				1			2	1	3		II	(1-3)
Anagallis tenella							3	3	3		II	(3)
Potentilla anserina	4		3			2					II	(2-4)
Cratoneuron filicinum	3	2			3						II	(2-3)
Danthonia decumbens							1	1	3		II	(1-3)
Festuca arundinacea		2		1						2	II	(1-2)
Anthoxanthum odoratum				1			1		1		II	(1)
Carex echinata								3	3		I	(3)
Valeriana dioica								2	4		I	(2-4)
Agrostis canina			3	2							I	(2-3)
Carex hirta		3					1				I	(1-3)
Carex pulicaris								2	1		I	(1-2)
Galium uliginosum	2				1						I	(1-2)
Cerastium fontanum	1	1									I	(1)
Cirsium dissectum			1		1						I	(1)
Juncus effusus	1						1				I	(1)
Triglochin palustris				1	1						I	(1)
Isolepis setacea		3									I	(3)
Phragmites australis									3		I	(3)
Carex viridula brachyrrhyncha									2		I	(2)
Eleocharis uniglumis				2							I	(2)
Eriophorum angustifolium								2			I	(2)
Festuca pratensis				2							I	(2)
Bellis perennis								1			I	(1)
Equisetum fluviatile	1										I	(1)
Glyceria fluitans										1	I	(1)
Mentha aquatica								1			I	(1)
Pedicularis palustris									1		I	(1)
Quercus robur seedling									1		I	(1)
Vicia cracca							1				I	(1)
Sward height (cm)	14	9	13	8	7	14	12	14	15	8		
Plant cover (%)	100	90	95	95	95	90	100	95	100	100		
Bryophyte cover (%)	6	85	90	30	30	35	70	85	90	20		
Litter cover (%)	60	0	0	5	5	10	5	5	5	30		

Bare ground (%)	10	10	5	40	40	35	5	0	0	20	
Water depth (cm)	0	0	0	0	0	0	0	0	0	0	
No. of species	24	21	20	27	26	22	28	29	27	17	Av. 24.1

FM1c **M22b *Juncus subnodulosus-Cirsium palustre* fen meadow**

***Briza media-Trifolium* spp. sub-community - *Persicaria amphibia* variant**

Sample number	12	13	14	15	17	18	19	20	21	22	23	24	25	26	27	28	29	31	32	33	34	37		
Juncus subnodulosus	8	7	5	3	7	6	6	7	8	10	9	4	6	5	5	10	10	8	8	6	6	4	V	(3-10)
Holcus lanatus	4	4	4	6	3	5	3	4	4	4	5	4	5	8	6	5	4	3	4	6	6	5	V	(3-8)
Plantago lanceolata	1	1	2	3	2	4	4	3	3	3	4	4	1	3	3	3	1	3	3	3	2	4	V	(1-4)
Lotus pedunculatus	4	5	5	3	3	4	3		3	5	4	3	4	4	3	2	4	3	2	3	3	3	V	(2-5)
Ranunculus repens	3	3	4	5	3	3	5	5	3	3	3	3	4	3	3	2	2	3		2	4	4	V	(2-5)
Trifolium pratense	2		1	4	2	2	2	2	3	2	4	2	2	4	3	3	4	2	2	2	1	3	V	(1-4)
Anthoxanthum odoratum	3	3	3	4	2	3	3	2	3	1	2	4		1	2	2		2	3	3	3	3	V	(1-4)
Persicaria amphiibia	2	2	1	1	3			2	4	4	4	4	4	3	3	3	4	3	2	3	2		V	(1-4)
Cardamine pratensis	2	3	3	2	3	5	4	3	2	2			2	3		1	2	2	3	2		3	V	(1-5)
Carex disticha		3	3	2				2	5	5	5	6		5	5	4	5	6	6	7	4	6	IV	(2-7)
Brachythecium rutabulum	2	2		2	3	1		1		5	4	2	2	3	2	2	2			4	2	3	IV	(1-5)
Festuca rubra		5			2	2	2	3	2	7	7	8			4	6	2	3	3		7	6	IV	(2-8)
Poa trivialis	3	4	2	4	3	3	2	3	3	4	3	4		5		3	2	2					IV	(2-5)
Festuca pratensis	3	2		1				1	1	2	3	2	3	3	2	2		1	2		1	2	IV	(1-3)
Juncus articulatus	7	8	9	7	8	7	8	6	5			8		3	5		2	5				4	IV	(2-9)
Rumex acetosa				2		2	1		2		3	4	3	3	2	2	2		2	3	3	3	IV	(1-4)
Potentilla anserina	2	4	3	3	3	3	1	1	2	1				1	1	2		3	1				IV	(1-4)
Equisetum palustre				1	1				2	2	3	3	2	1	1	1	1	3	3	1		2	IV	(1-3)
Cerastium fontanum	1	1		1	1	2	1			2	3	1				1		1	2	1	1	1	IV	(1-3)
Calliergonella cuspidatum	5			1	4	6	8	2	5	1							2	8	10	4		2	III	(1-10)
Carex nigra	4	2	2		1		3		3	3	2						1	4	6			4	III	(1-6)
Taraxacum officinale agg		1	2	2	3		2	1		2	3	3	1					1			1		III	(1-3)
Cynosurus cristatus	2	1	1	2	1	2	2	1	3			2						1				3	III	(1-3)
Ranunculus acris					1	1	2			1	2					2	2	2	1	2	3	2	III	(1-3)
Agrostis stolonifera			3		3			6		3	2		6	5	6	2	5					6	III	(2-6)
Dactylorhiza fuchsii		1	1	1						1	2	2				1	1		2		1	1	III	(1-2)
Trifolium repens	3			2	3		2	2			2							1	3			2	III	(1-3)
Vicia cracca						1				1	3			1		1	2	1	2			2	III	(1-3)
Carex hirta			1	2	3				2			1	3	3	3								II	(1-3)
Stellaria graminea		1	1			1						1	1		1					1	2		II	(1-2)
Lathyrus pratensis										3			2		1	3				1	3	2	II	(1-3)
Galium uliginosum							1			1						1		1	2	2		2	II	(1-2)
Ranunculus flammula	1		1				2			1						1	1	1					II	(1-2)
Festuca arundinacea												1		2	2	1	2		1				II	(1-2)
Lychnis flos-cuculi						1	2											1	2	1		2	II	(1-2)
Carex panicea						4	5	3								1		5					II	(1-5)
Eleocharis palustris	2		3	4								2					1						II	(1-4)
Juncus inflexus				1									4	2			1	2					II	(1-4)

Carex acutiformis												3		2	3			4					I	(2-4)
Equisetum fluviatile																	3	1	2	3			I	(1-3)
Poa pratensis					1				1			1	1										I	(1)
Arrhenatherum elatius																2	2				2		I	(2)
Galium palustre																	1	2	1				I	(1-2)
Rumex conglomeratus												1			1		1						I	(1)
Rhytidiadelphus squarrosus	4					4																	I	(4)
Phragmites australis																2					5		I	(2-5)
Eleocharis uniglumis					3			1															I	(1-3)
Cirsium palustre																		1		2			I	(1-2)
Phleum bertolonii						1			1														I	(1)
Potentilla erecta																			1	1			I	(1)
Valeriana dioica																		6					I	(6)
Juncus effusus																				4			I	(4)
Mentha aquatica																	3						I	(3)
Glyceria declinata													2										I	(2)
Hypericum tetrapterum																				2			I	(2)
Iris pseudacorus		2																					I	(2)
Vicia hirsuta				2																			I	(2)
Scleropodium purum						1																	I	(1)
Angelica sylvestris																1							I	(1)
Bryum sp.								1															I	(1)
Centaurea nigra																				1			I	(1)
Dactylorhiza praetermissa																		1					I	(1)
Fraxinus excelsior seedling		1																					I	(1)
Luzula multiflora																			1				I	(1)
Glyceria fluitans																	1						I	(1)
Lolium perenne								1															I	(1)
Prunella vulgaris																			1				I	(1)
Quercus robur seedling										1													I	(1)
Succisa pratensis																						1	I	(1)

Sward height (cm)	55	55	45	40	35	30	35	20	30	75	70	40	20	12	12	75	75	55	45	40	55	35	
Plant cover (%)	100	100	100	100	100	95	95	95	100	100	100	100	85	95	90	100	100	100	100	90	95	95	
Bryophyte cover (%)	15	2	0	2	5	20	70	2	20	25	5	2	2	3	3	2	3	60	95	10	2	3	
Litter cover (%)	40	30	50	40	15	10	10	15	20	60	55	40	20	30	50	20	20	10	10	70	75	65	
Bare ground (%)	10	40	20	30	55	40	30	55	40	0	10	30	65	40	30	50	50	40	5	5	0	10	
Water depth (cm)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

No. of species	22	23	22	27	26	25	24	24	23	28	23	27	20	23	23	30	31	35	29	26	21	28	Av. 25.4

FM1d **M22b *Juncus subnodulosus-Cirsium palustre* fen meadow**
***Briza media-Trifolium* spp. sub-community - *Menyanthes trifoliata* variant**

	47	48	49	52		
Menyanthes trifoliata	9	8	9	6	4	(6-9)
Juncus articulatus	5	9	7	8	4	(5-9)
Carex disticha	9	5	6	6	4	(5-9)
Calliergonella cuspidatum	4	5	9	5	4	(4-9)
Festuca rubra	4	4	5	6	4	(4-6)
Agrostis stolonifera	4	2	6	3	4	(2-6)
Galium palustre	6	2	2	2	4	(2-6)
Carex nigra	2	4	5	3	4	(2-5)
Equisetum fluviatile	5	3	3	2	4	(2-5)
Holcus lanatus	2	2	2	3	4	(2-3)
Carex panicea	2	3	3	1	4	(1-3)
Rhinanthus minor	3	3	2		3	(2-3)
Lotus pedunculatus	3	2		2	3	(2-3)
Poa trivialis	3		2	2	3	(2-3)
Anthoxanthum odoratum		2	2	2	3	(2)
Plantago lanceolata		1	1	3	3	(1-3)
Carex flacca		1	2	2	3	(1-2)
Trifolium pratense		1	2	2	3	(1-2)
Lychnis flos-cuculi	1		2	1	3	(1-2)
Cerastium fontanum		1	1	1	3	(1)
Iris pseudacorus	1	1	1		3	(1)
Vicia cracca		1	1	1	3	(1)
Juncus subnodulosus		2		4	2	(2-4)
Briza media			2	2	2	(2)
Lathyrus pratensis		2	2		2	(2)
Rhytidiadelphus squarrosus			2	1	2	(1-2)
Trifolium repens			1	2	2	(1-2)
Cardamine pratensis			1	2	2	(1-2)
Dactylorhiza praetermissa			1	2	2	(1-2)
Ranunculus acris			1	2	2	(1-2)
Dactylorhiza fuchsii		1		1	2	(1)
Festuca arundinacea	1			1	2	(1)
Rumex acetosa			1	1	2	(1)
Climacium dendroides			3		1	(3)
Glyceria fluitans	3				1	(3)
Succisa pratensis				3	1	(3)
Cynosurus cristatus			2		1	(2)
Festuca pratensis			2		1	(2)
Ranunculus flammula	2				1	(2)
Ranunculus repens				2	1	(2)
Taraxacum officinale agg				2	1	(2)
Valeriana dioica				2	1	(2)
Amblystegium riparium	1				1	(1)
Cratoneuron filicinum				1	1	(1)
Equisetum palustre		1			1	(1)
Sward height (cm)	35	30	40	40		
Plant cover (%)	100	95	95	100		
Bryophyte cover (%)	5	80	15	15		
Litter cover (%)	20	25	25	40		
Bare ground (%)	50	20	40	30		
Water depth (cm)	0	0	2	0		
No. of species	20	32	35	24	Av. 27.8	

FM2 **M22b *Juncus subnodulosus-Cirsium palustre* fen-meadow, *Briza media-Trifolium* spp. sub-community with reference to MG8 *Cynosurus cristatus-Caltha palustris* grassland**

	50	51	54	55	56	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	91	92	95	96	97	##	##	##	##	##	##	##		
Agrostis stolonifera	5	3	2	3	3	2	6	5	3	2	2	3	7		6	4	3	3	4	3	4	5	5	6	7	4	8	8	5	5	5	3	2	V	(2-8)
Juncus articulatus	9	7	9	9	10	10	10	7	10	9	10	10	2		5	2	10	10	5	10	10	9	9	7	10	10	4	7		6	7	7	4	V	(2-10)
Lotus pedunculatus		1	4	5	4	6	5	2	7	4	2	6	1	2	1		6	4	5	4	3	4	5	4	2	3	8	10	2	1	5	4	4	V	(1-10)
Holcus lanatus	6	4	4	5	4	4	7	4	3	4	2	3		4	2	8	3	3		3	5	4	6	5	4	3	4	4	8	2	1	2	1	V	(1-8)
Juncus effusus	4	6	6	5	4				1		1			9	8	8	1	1	2		1		2	4			6	4	5	2	2	4	4	IV	(1-9)
Festuca rubra		3				4	3	8	6	6		7	2	3		3	5	4			5			5	4	4	6	3		2		5	2	IV	(2-8)
Anthoxanthum odoratum	2	2	2	3	2	3	3	2	2	2	3	3	2				1	4		2				1	3	3					1	1		IV	(1-4)
Plantago lanceolata	2	1				2	3	3	2	4	3	3	4			1	2	3	2	3	2			1			1				1	2	2	IV	(1-4)
Ranunculus repens	3	2		1	2	1	2	2	2		1					2						2	2	4	3	2	1		3	2	1	2	2	IV	(1-4)
Carex disticha	2	3	5		4		4	7		7		2	3				4	3	4			5		6	3	5				10	9	10	10	IV	(2-10)
Trifolium pratense		2	1		1	1		4		1			4				3		1	4	1	1		2	1							2	1	III	(1-4)
Rumex acetosa	2	1	2		1		3				1					3		3		3	3	3		3	3		3				2	2		III	(1-3)
Brachythecium rutabulum						4	3	2		3		3		4	2			1			2	4		2		2		1			3		2	III	(1-4)
Cardamine pratensis	2	1			1		2		1	1			2					1	1		1	3		3	3			1			2			III	(1-3)
Ranunculus acris	1	2		1	2					2			2								1	3		3	3		1			1		1	1	III	(1-3)
Festuca pratensis							2	2	2	2	1	2								2	2	3		3		1				1	1			II	(1-3)
Taraxacum officinale agg		1					2	3	1	3		2	1				3	1			1						1					2	1	II	(1-3)
Trifolium repens	2	3				3		1		2			6						5			4		3	2									II	(106)
Potentilla anserina					2													2					5		3	3				5	4	4	3	II	(2-5)
Carex nigra						2		1			1		8				6		8												2	1		II	(1-8)
Equisetum fluviatile					3	1	3																				1			3	3	1	2	II	(1-3)
Rumex conglomeratus	1	1	1								1				2	3		1					1											II	(1-3)
Cynosurus cristatus	2	1			1	2		1		2							2			1														II	(1-2)
Calliergonella cuspidatum										4		2	10	4			8		10	4														II	(2-10)
Lathyrus pratensis									1	2	1	3					3			2	2													II	(1-3)
Ranunculus flammula					1	2									1		1						1		2									I	(1-2)
Vicia cracca											1	2					1	1		1					1									I	(1-2)
Cerastium fontanum	1												1			1													1		1	1		I	(1)
Festuca arundinacea			2		2														1							3	2							I	(1-3)
Iris pseudacorus	4		1											1	1	1																		I	(1-4)
Lolium perenne						1			4													3			2									I	(1-4)
Carex hirta																						2	2		2	2								I	(2)
Cirsium palustre													1			2								1	1									I	(1-2)
Eriophorum angustifolium															5		4		3															I	(3-5)
Eurhynchium praelongum								5						2	4																			I	(2-5)
Galium uliginosum													2						2		2													I	(2)
Persicaria amphibia																											4		8	1				I	(1-8)
Galium palustre															2				1														2	I	(1-2)
Glyceria fluitans	5	4																																I	(4-5)
Alopecurus geniculatus	2	1																																I	(1-2)

Epilobium parviflorum																													2			1	I	(1-2)
Carex riparia														4																			I	(4)
Equisetum palustre			3																														I	(3)
Mentha aquatica																																3	I	(3)
Phalaris arundinacea																												3					I	(3)
Bryum sp.																													2				I	(2)
Dactylorhiza fuchsii																																2	I	(2)
Festulolium loliaceum																													2				I	(2)
Juncus bufonius																													2				I	(2)
Poa trivialis		2																															I	(2)
Stellaria palustris																													2				I	(2)
Alopecurus pratensis				1																													I	(1)
Betula pubescens seedling															1																		I	(1)
Calystegia sepium			1																														I	(1)
Carex ovalis										1																							I	(1)
Carex panicea																															1		I	(1)
Deschampsia cespitosa				1																													I	(1)
Epilobium palustre																		1															I	(1)
Juncus inflexus																										1							I	(1)
Juncus subnodulosus		1																															I	(1)
Phragmites australis																1																	I	(1)
Quercus robur seedling												1																					I	(1)
Urtica dioica																												1					I	(1)

Sward height (cm)	35	50	##	90	75	45	40	15	50	40	65	60	3	95	85	80	55	60	7	55	50	10	11	12	24	28	##	##	##	55	45	40	45
Plant cover (%)	95	90	##	##	##	##	##	##	##	##	##	##	80	90	90	90	##	##	85	##	##	##	##	95	##	##	##	##	##	##	##	##	##
Bryophyte cover (%)	0	0	0	0	0	5	3	20	0	6	0	4	90	10	5	0	60	1	90	5	2	5	0	2	0	2	0	1	0	1	3	0	2
Litter cover (%)	55	30	70	70	70	10	15	15	15	20	40	40	5	70	55	20	5	20	5	40	20	40	70	50	60	50	70	50	60	10	10	20	50
Bare ground (%)	20	50	0	0	0	55	50	35	55	45	30	30	0	0	20	60	5	50	0	30	50	25	0	25	10	20	0	20	10	60	60	50	20
Water depth (cm)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

No. of species	18	22	14	10	17	16	15	17	14	19	14	15	17	9	13	13	18	17	15	13	16	15	10	18	19	14	14	8	9	18	17	15	19	Av. 15.1

FM3a **M22b *Juncus subnodulosus-Cirsium palustre* fen-meadow *Briza media-Trifolium* spp. sub-community, with reference to MG12a *Festuca arundinacea* grassland, *Lolium perenne-Holcus lanatus* sub-community**

	106	109	110	111	113	120	127	130	138		
Juncus subnodulosus	2	2	2	4	1	5	2	1	7	V	(1-7)
Carex disticha		9	6	7	4	4	9	2	3	V	(2-9)
Festuca arundinacea		3	2	2	2	2	3	2	3	V	(2-3)
Juncus inflexus	3	2	4	6	4	1	4		2	V	(1-6)
Agrostis stolonifera	9	5	4	5	8		3		8	IV	(3-9)
Lotus pedunculatus	7	3	3	4		8		2	5	IV	(2-8)
Festuca rubra	5	5	2			5	4	3	2	IV	(2-5)
Holcus lanatus	5	2		2	1	4	2		3	IV	(1-5)
Carex nigra		3	8	8	4	4		7		IV	(3-8)
Juncus articulatus		2	3	4		8	3	5		IV	(2-8)
Galium palustre		3	3	3		2	1		3	IV	(1-3)
Plantago lanceolata	2			1	2	3		2	1	IV	(1-3)
Calliergonella cuspidatum		9	10	10			4	9		III	(4-10)
Potentilla anserina			2			3	3	2	3	III	(2-3)
Trifolium pratense	6			1			3	1	1	III	(1-6)
Mentha aquatica			3	3				3	6	III	(3-6)
Brachythecium rutabulum	4				2	3	2			III	(2-4)
Carex panicea			3	2		1		5		III	(1-5)
Persicaria maculosa	2	1					5	3		III	(1-5)
Ranunculus acris	3			2			1	2		III	(1-3)
Ranunculus flammula		1	2	2				2		III	(1-2)
Trifolium repens			1	1			2	1		III	(1-2)
Cardamine pratensis			1				1	1	1	III	(1)
Equisetum fluviatile							3	3	3	II	(3)
Ranunculus repens	4					1			2	II	(1-4)
Lychnis flos-cuculi		1		1				1		II	(1)
Juncus gerardii		5	4							II	(4-5)
Hydrocotyle vulgaris		3			3					II	(3)
Phragmites australis	3				3					II	(3)
Anthoxanthum odoratum	2								2	II	(2)
Anagallis tenella			3	1						II	(1-3)
Juncus effusus							1		2	II	(1-2)
Vicia cracca	2						1			II	(1-2)
Festuca pratensis						1	1			II	(1)
Triglochin palustris			1					1		II	(1)
Rumex acetosa	4									I	(4)
Taraxacum officinale agg	3									I	(3)
Dactylorhiza fuchsii								2		I	(2)
Equisetum palustre						2				I	(2)
Poa trivialis							2			I	(2)
Cerastium fontanum							1			I	(1)
Epilobium parviflorum			1							I	(1)
Glyceria fluitans			1							I	(1)
Myosotis laxa caespitosa			1							I	(1)
Oenanthe lachenalii					1					I	(1)
Rumex conglomeratus									1	I	(1)
Rumex crispus							1			I	(1)
Vicia hirsuta	1									I	(1)
Sward height (cm)	70	60	55	65	75	60	75	30	70		
Plant cover (%)	100	100	90	100	100	100	100	85	100		
Bryophyte cover (%)	4	90	100	100	2	3	10	100	0		
Litter cover (%)	70	5	5	5	60	70	20	0	60		
Bare ground (%)	0	0	0	0	10	0	40	0	10		
Water depth (cm)	0	0	0	0	0	0	0	0	0		
No. of species	18	17	23	20	12	17	24	22	19		Av. 19.1

FM3b **M22b *Juncus subnodulosus-Cirsium palustre* fen meadow**
***Briza media-Trifolium* spp. sub-community, with reference to**
MG12a *Festuca arundinacea* grassland, *Lolium perenne-Holcus lanatus* sub-community

Sample number	112	114	115	116	128	129	131	133	134	136	137	139	140	141		
Agrostis stolonifera	8	8	7	8	2	2	3	5	8	9	9	8	7	8	V	(2-9)
Juncus articulatus	3	2	5	7	6	7	7	5	4	4	4	4	6	4	V	(2-7)
Juncus inflexus	6	5	6	3	4	4		9	9	5	4	2	4	4	V	(2-9)
Carex disticha		8	7	8	7	7	3	3	3	4	2	2	3	3	V	(2-8)
Potentilla anserina	2		3	2	3	4	2	2	3	3	2	6	3		V	(2-6)
Lotus pedunculatus	3	2	3	5	4	3	3			4	2	4	2	2	V	(2-5)
Calliergonella cuspidatum	2	6	4	7	9	4	9	4		4	7		4	1	V	(1-9)
Holcus lanatus		2	2	4	2	3	2	1	2		2	5	2	3	V	(1-5)
Festuca rubra		2		3	2	2	3		2	4	2		3	6	IV	(2-6)
Festuca arundinacea	3		2	3	3	2	1	3		2	1	3			IV	(1-3)
Carex nigra	5	4			7	4	8	2					7	5	III	(2-8)
Carex panicea		1		1	2		3			3	2		3	2	III	(1-5)
Trifolium repens						3	1		1	3	3		2	3	III	(1-3)
Plantago lanceolata	3	2	2	2						1		1	1		III	(1-3)
Ranunculus acris					1		1	1	1	2	3			2	III	(1-3)
Anthoxanthum odoratum	1			2				1	1		2	1	2		III	(1-2)
Equisetum fluviatile					1	1	4			2	2	3			III	(1-4)
Ranunculus repens		2		1				1			2	4		1	III	(1-4)
Ranunculus flammula		1		1			1	1			2		3		III	(1-3)
Trifolium pratense				2	2				2	2			1	2	III	(1-2)
Juncus effusus					2	4				1	4	5		5	II	(1-5)
Galium palustre		2		3			2	2					1		II	(1-3)
Brachythecium rutabulum			2			1				2			2	2	II	(1-2)
Cardamine pratensis				2						2			2	3	II	(2-3)
Mentha aquatica		2	2				4				1				II	(1-4)
Persicaria maculosa					2	2	4								II	(2-4)
Rumex acetosa									1			3		2	II	(1-3)
Cynosurus cristatus					1	2				2					II	(1-2)
Equisetum palustre					2	2						1			II	(1-2)
Isolepis setacea											1		2	2	II	(1-2)
Cerastium fontanum											2		1	1	II	(1-2)
Glyceria fluitans									1			1	2		II	(1-2)
Phragmites australis		1	1	2											II	(1-2)
Carex hirta									1	1				1	II	(1)
Vicia cracca	1		1	1											II	(1)
Hydrocotyle vulgaris	3	3													I	(3)
Alnus glutinosa sapling			4	1											I	(1-4)
Triglochin palustris							1			2					I	(1-2)
Taraxacum officinale agg	1													1	I	(1)
Eleocharis uniglumis											2				I	(2)
Epilobium parviflorum											2				I	(2)
Caltha palustris													1		I	(1)
Calystegia sepium	1														I	(1)
Cirsium palustre		1													I	(1)
Dactylorhiza fuchsii							1								I	(1)
Epilobium palustre													1		I	(1)
Juncus bufonius													1		I	(1)
Lychnis flos-cuculi		1													I	(1)
Plantago major											1				I	(1)
Rumex conglomeratus												1			I	(1)
Sward height (cm)	80	50	85	35	45	45	40	65	65	13	65	75	70	70		
Plant cover (%)	100	100	100	95	90	100	85	100	100	100	95	100	95	95		
Bryophyte cover (%)	2	30	5	55	80	10	100	5	0	5	40	0	5	2		
Litter cover (%)	60	20	50	0	10	40	0	20	30	20	10	30	10	15		
Bare ground (%)	10	20	20	20	0	20	0	45	40	45	20	40	55	60		
Water depth (cm)	0	0	0	4	0	0	0	0	0	0	0	0	0	0		
No. of species	14	19	15	21	19	18	20	14	14	21	24	17	25	22		Av. 18.8

FM3c **M22b *Juncus subnodulosus-Cirsium palustre* fen-meadow**

***Briza media-Trifolium* spp. sub-community, with reference to**

MG12a *Festuca arundinacea* grassland, *Lolium perenne-Holcus lanatus* sub-community

	57	58	117	118		
Equisetum fluviatile	10	10	8	8	4	(8-10)
Juncus articulatus	9	9	4	2	4	(2-9)
Agrostis stolonifera		5	8	8	3	(5-8)
Rumex conglomeratus	2	1	1		3	(1-2)
Ranunculus flammula	1		1	1	3	(1)
Drepanocladus cossonii			7	5	2	(5-7)
Holcus lanatus	4	4			2	(4)
Eleocharis uniglumis			4	4	2	(4)
Juncus effusus	4	4			2	(4)
Carex disticha		4	3		2	(3-4)
Oenanthe lachenalii			3	3	2	(3)
Ranunculus repens	3	3			2	(3)
Galium palustre			3	2	2	(2-3)
Persicaria maculosa			2	3	2	(2-3)
Calliergonella cuspidatum			5		1	(5)
Hippurus vulgaris				3	1	(3)
Carex otrubae	2				1	(2)
Epilobium palustre	2				1	(2)
Triglochin palustris			2		1	(2)
Epilobium parviflorum	1				1	(1)
Glyceria fluitans				1	1	(1)
Iris pseudacorus	1				1	(1)
Juncus inflexus			1		1	(1)
Mentha aquatica			1		1	(1)
Sward height (cm)	85	80	35	45		
Plant cover (%)	100	100	95	90		
Bryophyte cover (%)	0	0	45	20		
Litter cover (%)	65	70	5	60		
Bare ground (%)	5	0	25	0		
Water depth (cm)	0	0	4	2		
No. of species	11	8	15	11		Av. 11.3

FM4 **M22d Juncus subnodulosus-Cirsium palustre community, Iris pseudacorus sub-community with reference to MG12a Festuca arundinacea grassland, Lolium perenne-Holcus lanatus sub-community**

	30	35	38	39	40	41	42	46	53	119		
Juncus subnodulosus	8	5	8	7	9	10	10	4	7	2	V	(2-10)
Lotus pedunculatus	3	8	4	3	6	5	3	2	4	3	V	(2-8)
Holcus lanatus	4	6	3	4	3	4	3	2	2	2	V	(2-6)
Iris pseudacorus	3	7	3		2	2	3	1	1		IV	(1-7)
Vicia cracca		2	2	1	2	3	1	3	2		IV	(1-3)
Carex disticha			7	6		7	4	6	6	5	IV	(4-7)
Festuca rubra			4	6	5	4	7	4	2		IV	(2-7)
Agrostis stolonifera		2	2	6	3		3	5		6	IV	(2-6)
Trifolium pratense	2		1	1	1	2	2	2			IV	(1-2)
Ranunculus repens	1		2	1	1	1	1		2		IV	(1-2)
Equisetum fluviatile		6	4			5	4	3		3	III	(3-6)
Juncus articulatus			8	2			1	7	4	5	III	(1-8)
Galium palustre			4	2	2	2		2		2	III	(2-4)
Poa trivialis	3			2	3	2	2		3		III	(2-3)
Carex nigra			1	2	4	3		2		5	III	(1-5)
Calliergonella cuspidatum			2	2	4	1		2		5	III	(1-5)
Festuca arundinacea				2	2	3	1		2	2	III	(1-3)
Plantago lanceolata			1	2	3	1	2		1		III	(1-3)
Brachythecium rutabulum			1	2	1	3	1	1			III	(1-3)
Anthoxanthum odoratum	2				1		1	3	2		III	(1-3)
Equisetum palustre	2			2	1	1		1			III	(1-2)
Ranunculus acris				1	2		1	2	1		III	(1-2)
Carex acutiformis	7			7				6	8		II	(6-8)
Mentha aquatica		3				2			2	5	II	(2-5)
Persicaria maculosa	3		3					1		2	II	(1-3)
Lathyrus pratensis		1			3		3	1			II	(1-3)
Potentilla anserina			2			1	3			2	II	(1-3)
Festuca pratensis			1		1		2	3			II	(1-3)
Rumex acetosa				1		1	3	1			II	(1-3)
Cerastium fontanum	1			2			2	1			II	(1-2)
Dactylorhiza praetermissa			1	1	2	1					II	(1-2)
Trifolium repens			1	1		1	1				II	(1)
Cynosurus cristatus				3	1			2			II	(1-3)
Phragmites australis							3		1	2	II	(1-3)
Cardamine pratensis					1	1		3			II	(1-3)
Rumex conglomeratus	1	3				1					II	(1-3)
Arrhenatherum elatius		4					3				I	(3-4)
Eleocharis palustris	3		3								I	(3)
Juncus effusus	1	4									I	(1-4)
Juncus inflexus							1			2	I	(1-2)
Ranunculus flammula								1		2	I	(1-2)
Carex panicea					1					1	I	(1)
Epilobium parviflorum			1			1					I	(1)
Galium uliginosum			1	1							I	(1)
Lychnis flos-cuculi						1				1	I	(1)
Lysimachia vulgaris					5						I	(5)
Caltha palustris			3								I	(3)
Eleocharis uniglumis										3	I	(3)
Juncus gerardii										3	I	(3)
Hydrocotyle vulgaris										2	I	(2)
Cirsium palustre						1					I	(1)
Cratoneuron filicinum								1			I	(1)
Dactylorhiza fuchsii				1							I	(1)
Oenanthe lachenalii										1	I	(1)
Poa pratensis								1			I	(1)
Rhinanthus minor				1							I	(1)
Taraxacum officinale agg					1						I	(1)
Sward height (cm)	110	120	75	70	75	70	65	90	110	60		
Plant cover (%)	100	95	100	100	100	100	100	90	100	100		

Bryophyte cover (%)	0	0	2	3	5	3	1	2	0	20	
Litter cover (%)	70	35	40	50	60	40	70	35	10	50	
Bare ground (%)	0	40	30	20	5	30	0	45	60	0	
Water depth (cm)	0	0	0	0	0	0	0	0	0	0	
No. of species	15	12	26	28	27	28	27	29	17	20	Av. 22.9

FM5 **M22b *Juncus subnodulosus-Cirsium palustre* fen-meadow,**

Briza media-Trifolium spp. sub-community intermediate with

MG10a *Holcus lanatus-Juncus effusus* rush-pasture, Typical sub-community

	1	2	4	5	7	8	9	10	82	83	84		
Juncus articulatus	10	9	9	10	8	8	8	10	4	7	8	V	(4-10)
Poa trivialis	8	9	9	3	8	9	3	3	8	8	7	V	(3-9)
Holcus lanatus	5	6	4	3	6	4	3	6	6	4	5	V	(3-6)
Trifolium pratense	2	1	3	1	4	4		4	6	6	5	V	(1-6)
Lolium perenne	3	3	3	2	6	2		2	3	2	1	V	(1-6)
Cerastium fontanum	1	2	1	1	2	1		1	2	2	1	V	(1-2)
Potentilla anserina	6	5	5	4		2	1	4		4	5	V	(1-6)
Ranunculus repens	3	2	3	3	3	5	1	4			1	V	(1-4)
Agrostis stolonifera	3	3	2		3	2			7	5	6	IV	(2-7)
Lotus pedunculatus	1	4	3			3		3		5	6	IV	(1-6)
Rumex acetosa	2	4	3	3	3	3		2				IV	(2-4)
Stellaria graminea	2	1		1		1		1	1			III	(1-2)
Trifolium repens		3			5	3			5		3	III	(3-5)
Carex hirta		3		1	4	3			4			III	(1-4)
Brachythecium rutabulum	3	3		2		1		1				III	(1-3)
Cardamine pratensis	2		1	2		2		3				III	(1-3)
Taraxacum officinale agg	1		1	1					3	1		III	(1-3)
Plantago lanceolata	1		1					1	1		1	III	(1)
Festuca rubra			2						3	6	6	II	(2-6)
Equisetum arvense			2	2	2							II	(2)
Rumex conglomeratus		2	2	2								II	(2)
Juncus effusus							7		1			I	(1-7)
Alopecurus geniculatus			1				2					I	(1-2)
Rumex crispus									1	1		I	(1)
Ranunculus flammula							6					I	(6)
Glyceria declinata							4					I	(4)
Equisetum palustre									2			I	(2)
Persicaria maculosa				2								I	(2)
Arrhenatherum elatius	1											I	(1)
Bromus hordeaceus hordeaceus					1							I	(1)
Cirsium palustre				1								I	(1)
Eurhynchium praelongum							1					I	(1)
Festulolium loliaceum		1										I	(1)
Lythrum salicaria				1								I	(1)
Sward height (cm)	75	45	40	70	15	30	80	55	45	40	45		
Plant cover (%)	100	95	100	100	100	100	90	100	100	100	100		
Bryophyte cover (%)	3	3	0	2	0	1	1	1	0	0	0		
Litter cover (%)	20	10	10	10	20	20	10	15	30	40	40		
Bare ground (%)	50	60	60	60	50	50	65	55	40	30	30		
Water depth (cm)	0	0	0	0	0	0	0	0	0	0	0		
No. of species	17	17	18	19	13	16	10	14	16	12	13	Av. 15.0	

FM6 **MG10a *Holcus lanatus-Juncus effusus* rush-pasture, Typical sub-community**

	2007		2008																	
Sample number	133	134	3	6	11	16	36	45	62	79	80	81	90	94	132	150	151	152		
Ranunculus repens	5	6	6	3	5	3	4	4	6	6	6	4	4	6	2	3	2	3	V	(2-6)
Agrostis stolonifera	8	7	4	7	8	3	4	5		8	7	7	9	9	8	5	5	7	V	(3-9)
Holcus lanatus	2	4	4	5	4	5	3	1	3	9	7	8	6		4	5	6	7	V	(1-9)
Poa trivialis	4	5	8	7	4	6	4	2	4		3	4	7	6	8	2		2	V	(2-8)
Lolium perenne	4	7	4	6	4	8		8	9	3	3	3	4	5		3		3	V	(3-9)
Carex hirta			4	3	3	3			2	3	5	4	3	3	3	8	8	2	IV	(2-8)
Trifolium repens	6	2	3	6	1	8			7		8	3	2	4	6	8	8		IV	(1-8)
Rumex conglomeratus			1		2	2		1	3	1	2	1	1						III	(1-3)
Cerastium fontanum			1	1	1	1				1		1		1					II	(1)
Juncus articulatus						1		3	2			1		3	2				II	(1-3)
Cirsium arvense									2	2	2				2	2			II	(2)
Equisetum palustre											3					4	5	4	II	(3-5)
Potentilla anserina						3								1	3			7	II	(1-7)
Juncus effusus					4		1					1	2						II	(1-4)
Trifolium pratense									1	1	4	2							II	(1-4)
Alopecurus geniculatus					3		2	3										1	II	(1-3)
Taraxacum officinale agg		1						1	2			2							II	(1-2)
Glyceria declinata							5	3					2						I	(2-5)
Festuca rubra											2	4		4					I	(2-4)
Rumex crispus											2	1						4	I	(1-4)
Rumex acetosa								1						3	3				I	(1-3)
Dactylis glomerata	3						1	2											I	(1-3)
Brachythecium rutabulum							3	1						1					I	(1-3)
Plantago lanceolata		1				1			2										I	(1-2)
Iris pseudacorus					2				2										I	(2)
Plantago major		1											1						I	(1)
Cardamine pratensis														3					I	(3)
Equisetum arvense			3																I	(3)
Juncus inflexus															3				I	(3)
Phalaris arundinacea					3														I	(3)
Agrostis capillaris		2																	I	(2)
Festuca pratensis	2																		I	(2)
Anthoxanthum odoratum															1				I	(1)
Equisetum fluviatile																		1	I	(1)
Eurhynchium praelongum		1																	I	(1)
Hypericum tetrapterum					1														I	(1)

Ranunculus acris														1					I	(1)

Sward height (cm)	65	65	6	5	6	5	6	5	8	4	3	6	6	4	4	30	30	30	
Plant cover (%)	100	100	90	90	90	100	50	90	90	95	95	100	95	95	100	100	100	100	
Bryophyte cover (%)	5	0	0	0	0	0	2	1	0	0	0	0	0	1	0	0	0	0	
Litter cover (%)	20	30	10	15	30	20	5	10	5	35	35	50	30	10	30	15	10	10	
Bare ground (%)	45	40	70	65	40	50	60	70	80	40	40	20	40	60	40	55	60	60	
Water depth (cm)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

No. of species	8	11	10	8	14	12	9	13	13	9	13	15	11	14	12	9	6	11	Av. 11.0

VG1 Parched grassland

	145	146	147	148	149		
Holcus lanatus	7	8	9	10	9	V	(7-9)
Agrostis stolonifera	4	5	8		5	IV	(4-8)
Festuca rubra	4	6		4	4	IV	(4-6)
Cerastium fontanum	3	1		1	1	IV	(1-3)
Agrostis capillaris	7		4	4		III	(4-7)
Urtica dioica		4	3		4	III	(3-4)
Veronica chamaedrys			4	3	4	III	(3-4)
Bromus hordeaceus hordeaceus	3	3	2			III	(2-3)
Cirsium arvense	2			2	2	III	(2)
Lolium perenne	3					I	(3)
Senecio jacobaea		1				I	(1)
Ranunculus repens	1					I	(1)
Sward height (cm)	45	40	40	8	35		
Plant cover (%)	100	100	90	95	100		
Bryophyte cover (%)	0	0	0	0	0		
Litter cover (%)	10	5	0	10	15		
Bare ground (%)	60	65	80	65	55		
No. of species	9	7	6	6	7		Av. 7.0

VG2 **U1d *Festuca ovina-Agrostis capillaris-Rumex acetosella* grassland,**

***Anthoxanthum odoratum-Lotus corniculatus* sub-community**

Sample number	85	86	87	88	89		
Holcus lanatus	10	9	4	10	4	V	(4-10)
Agrostis capillaris	2	4	10	1	7	V	(1-10)
Plantago lanceolata	2	3	2	3	4	V	(2-4)
Hypochaeris radicata	3	4	3	3	2	V	(2-3)
Senecio jacobaea	3	2	3	2	2	V	(2-3)
Trifolium repens	2	1	1	5	2	V	(1-5)
Cerastium fontanum	3	2	3	3	1	V	(1-3)
Vulpia bromoides	3	2		3	4	IV	(2-4)
Dactylis glomerata		3	2	3	4	IV	(2-4)
Brachythecium albicans	1	2	1		5	IV	(1-5)
Ornithopus perpusillus	3	3	1		1	IV	(1-3)
Rumex acetosella	2		2		2	III	(2)
Trifolium dubium	2	1	3			III	(1-3)
Filago vulgaris	3				2	II	(2-3)
Aira praecox	1				3	II	(1-3)
Trifolium glomeratum			2		2	II	(2)
Aira caryophyllea			1		2	II	(1-2)
Crepis capillaris			1	2		II	(1-2)
Spergularia rubra	1		2			II	(1-2)
Rhytidiadelphus squarrosus					6	I	(6)
Arenaria serpyllifolia				3		I	(3)
Anthoxanthum odoratum				2		I	(2)
Scleropodium purum					2	I	(2)
Festuca ovina	1					I	(1)
Vicia sativa nigra				1		I	(1)
Trifolium campestre				1		I	(1)
Hypochaeris glabra			1			I	(1)
Veronica arvensis	1					I	(1)
Erodium cicutarium	1					I	(1)
Rubus fruticosus agg	1					I	(1)
Sward height (cm)	9	9	3	18	5		
Plant cover (%)	95	95	100	100	85		
Bryophyte cover (%)	1	2	1	0	40		
Litter cover (%)	10	5	30	20	10		
Bare ground (%)	65	70	40	50	40		
No. of species	19	12	17	14	18		Av. 16.0

RB1 **S26 *Phragmites australis-Urtica dioica* tall-herb fen**

	157	158	159	160	161	162	163	164	165	166		
Phragmites australis	10	7	7	8	10	10	10	10	9	10	V	(7-10)
Urtica dioica	4	5	7	3	2	1	4	4	2	2	V	(1-7)
Galium aparine	2	2			1	1	1		2	1	IV	(1-2)
Angelica sylvestris	1	1	1	2	2	1	1				IV	(1-2)
Juncus articulatus	4	4	4	7	5	2					III	(2-7)
Vicia cracca	2	3	2	2	1	2					III	(1-3)
Galium palustre					3	2	2	2	1	1	III	(1-3)
Carex acutiformis	1				1		3	2	2	1	III	(1-3)
Lotus pedunculatus	2	2	2	1	2	1					III	(1-2)
Iris pseudacorus	1	2	1	2	1		1				III	(1-2)
Arrhenatherum elatius	2	8	6	2			1				III	(1-8)
Rumex acetosa			1	2	1	2	1				III	(1-2)
Agrostis stolonifera			5	3	4	5					II	(3-5)
Epilobium hirsutum						2	2		1	2	II	(1-2)
Carex disticha			1	1	2	2					II	(1-2)
Cirsium palustre			2	1	1	2					II	(1-2)
Calystegia sepium								1	3	2	II	(1-3)
Equisetum palustre				2	1	2					II	(1-2)
Solanum dulcamara						2	1	1			II	(1-2)
Juncus effusus					1	1			1		II	(1)
Festuca arundinacea				1	1	1					II	(1)
Lathyrus pratensis		1	1	1							II	(1)
Phalaris arundinacea									4	2	I	(2-4)
Holcus lanatus				3	2						I	(2-3)
Poa trivialis								2	2		I	(2)
Galium uliginosum					2	2					I	(2)
Ranunculus repens					1	2					I	(1-2)
Cirsium vulgare	1						1				I	(1)
Rubus fruticosus agg		2									I	(2)
Epilobium ciliatum							1				I	(1)
Lythrum salicaria										1	I	(1)
Juncus inflexus										1	I	(1)
Mentha aquatica						1					I	(1)
Sward height (cm)	220	100	105	125	200	210	220	280	220	215		
Plant cover (%)	100	100	100	100	100	100	100	100	100	100		
Bryophyte cover (%)	0	0	0	0	0	0	0	0	0	0		
Litter cover (%)	70	70	70	70	70	70	70	70	70	70		
Bare ground (%)	0	0	0	0	0	0	0	0	0	0		
Water depth (cm)	0	0	0	0	0	0	0	0	0	0		
No. of species	11	11	13	16	20	20	13	7	10	10	Av. 13.1	

WW1 **W6a *Alnus glutinosa-Urtica dioica* woodland, Typical sub-community**

WW2 **W2a *Salix cinerea-Betula pubescens-Phragmites australis* woodland, *Alnus glutinosa-Filipendula ulmaria* sub-community**

WW3 **W5a *Alnus glutinosa-Carex paniculata* woodland, *Phragmites australis* sub-community**

WW4 **W10d *Quercus robur-Pteridium aquilinum-Rubus fruticosus* woodland, *Holcus lanatus* sub-community**

	W6a							**W2a**				**W5a**							**W10d**			
Sample number	167	168	169	170	171			179	180	181		174	175	176	177	178			172	173		
Alnus glutinosa	10	9	8	10	10	V	(8-10)	5	2	7	3	10	9	9	8	6	V	(6-10)	4	4	2	(4)
Fraxinus excelsior	1	4				II	(1-4)	2		5	2			4	5	8	III	(4-8)	4	5	2	(4-5)
Betula pubescens			5			I	(5)	4	1	2	3			1		4	II	(1-4)	4	7	2	(4-7)
Ilex aquifolium	1					I	(1)															
Quercus robur													4			4	II	(4)	6	1	2	(1-6)
Populus tremula															3		I	(3)				
Salix cinerea		2	5	3		III	(2-5)	8	10	7	3		2	3	2		III	(2-3)				
Alnus glutinosa sapling	1	1		1		III	(1)			2	1	3	2				II	(2-3)		4	1	(4)
Sambucus nigra	1			1		II	(1)								1		I	(1)				
Crataegus monogyna	1					I	(1)		1		1			1		1	II	(1)	1		1	(1)
Fraxinus excelsior sapling		2				I	(2)			1	1					2	I	(2)		4	1	(4)
Betula pubescens sapling				1		I	(1)												1	1	2	(1)
Rosa canina agg									1		1				1	1	II	(1)				
Corylus avellana																			2		1	(2)
Acer pseudoplatanus sapling																			1		1	(1)
Quercus robur sapling																			1		1	(1)
Salix caprea																				1	1	(1)
Ilex aquifolium shrub																			1		1	(1)
Eurhynchium praelongum	8	5	3	5	6	V	(3-8)		5		1	6	5	7	7	8	V	(5-8)	4	4	2	(4)
Poa trivialis	3	3	2	5	3	V	(2-5)	2	3		2		4	5			II	(4-5)				
Urtica dioica	4	4	3	2	3	V	(2-4)	1	2		2	2		1	2		III	(1-2)	1	1	2	(1)
Phragmites australis		2	3	2	2	IV	(2-3)	5	3	6	3	3	4	4			III	(3-4)		3	1	(3)
Glechoma hederacea	2	1		3	2	IV	(1-3)							1			I	(1)	3		1	(3)
Dryopteris dilatata	2		3	2		III	(2-3)							2	2	3	III	(2-3)	3	1	2	(1-3)
Galium aparine	2	3			1	III	(1-3)		2		1	1			2		I	(1-2)				

Rubus fruticosus agg	2		1		1	III	(1-2)		3	1	2			3	2	2	III	(2-3)	2	1	2	(1-2)
Mnium hornum			4	4		II	(4)							5	4	2	III	(2-5)	2		1	(2)
Carex acutiformis	3	3				II	(3)	3	2	2	3		3		4	4	III	(3-4)				
Iris pseudacorus			2	3		II	(2-3)		1	3	2	1	2			4	III	(1-4)		2	1	(2)
Juncus effusus			1	4		II	(1-4)									1	I	(1)	1	2	2	(1-2)
Brachythecium rutabulum	2	2				II	(2)	3	8	3	3	3	1		1	2	IV	(1-3)				
Lophocolea bidentata sl			2	2		II	(2)															
Mentha aquatica	1	2				II	(1-2)	1		2	2	1				1	II	(1)				
Rumex sanguineus	2			1		II	(1-2)							1			I	(1)	1	1	2	(1)
Holcus lanatus				6		I	(6)							3			I	(3)	9	8	2	(8-9)
Pteridium aquilinum			3			I	(3)												2		1	(2)
Apium nodiflorum				3		I	(3)															
Lonicera periclymenum				2		I	(2)							1	1		II	(1)	2	4	2	(2-4)
Angelica sylvestris		2				I	(2)	2	1	2	3	1	1				II	(1)				
Ranunculus repens		2				I	(2)	2			1				2		I	(2)	1		1	(1)
Geranium robertianum	2					I	(2)							1			I	(1)	1	1	2	(1)
Cardamine pratensis				2		I	(2)					2					I	(1)				
Eupatorium cannabinum		1				I	(1)		1	2	2	3	3			3	III	(3)				
Cirsium palustre		1				I	(1)	2		2	2	2	2			1	III	(1-2)	1	1	2	(1)
Solanum dulcamara	1					I	(1)	1			1		2	1		2	III	(1-2)		2	1	(2)
Filipendula ulmaria		1				I	(1)		1	2	2	2	1				II	(1-2)				
Corylus avellana	1					I	(1)								1		I	(1)	2	2	2	(2)
Plagiothecium denticulatum	1					I	(1)								1		I	(1)				
Lysimachia vulgaris		1				I	(1)															
Ribes rubrum				1		I	(1)															
Silene dioica	1					I	(1)															
Cardamine flexuosa	1					I	(1)															
Betula pubescens seedling			1			I	(1)															
Ceratocapnos claviculata				1		I	(1)															
Galium palustre								1	1	3	3		1				I	(1)				
Agrostis stolonifera								4		3	2			2			I	(2)				
Equisetum palustre									2	1	2											
Lotus pedunculatus								1		1	2									2	1	(2)
Juncus articulatus										3	1											
Plagiomnium undulatum									2		1											
Vicia cracca										2	1											
Epilobium hirsutum								1			1		2				I	(2)				
Rumex acetosa										1	1									1	1	(1)

Valeriana officinalis									1	1	1					I	(1)				
Salix cinerea sapling											3	2			1	III	(1-3)				
Fraxinus excelsior seedling														2		I	(2)		1	1	(1)
Hedera helix															2	I	(2)				
Carex remota													2			I	(2)				
Lycopus europaeus												1				I	(1)		2	1	(2)
Lophocolea heterophylla												1				I	(1)				
Ajuga reptans															1	I	(1)				
Berula erecta												1				I	(1)				
Crataegus monogyna seedling													1			I	(1)				
Molinia caerulea																		2		1	(2)
Atrichum undulatum																		2		1	(2)
Betula pendula sapling																		2		1	(2)
Sparganium erectum																			2	1	(2)
Alnus glutinosa seedling																			1	1	(1)
Canopy height (m)	30	30	25	30	30		12	10	12		20	20	25	25	30			25	20		
Canopy cover (%)	95	90	90	80	90		90	100	80		95	90	95	90	90			75	80		
Bryophyte cover (%)	70	20	10	25	30		3	80	3		30	20	60	50	65			10	5		
Litter cover (%)	10	40	50	40	40		70	5	70		5	10	0	10	0			45	45		
Bare ground (%)	0	20	20	10	5		0	0	0		40	45	15	10	10			20	25		
Open water (%)	0	0	0	0	0		0	0	0		0	0	0	0	0			0	0		
Water depth (cm)	0	0	0	0	0		0	0	0		0	0	0	0	0			0	0		
No. of species	23	20	15	22	8	Av. 17.6	18	20	24	Av. 20.67	16	21	22	19	22	Av. 20.00		28	28	Av. 28	

RI134 **U1c *Festuca ovina-Agrostis capillaris-Rumex acetosella* grassland,**

SD12a*Carex arenaria-Festuca ovina-Agrostis capillaris* dune grassland,

***Erodium cicutarium-Teesdalia nudicaulis* sub-community, with reference to**

***Anthoxanthum odoratum* sub-community**

Sample number	2007									2008							
	340	341	342	343	344	345	346	347	348	2	3	5	7	8	12		
Agrostis capillaris	5	5	6	7	5	8	7	7	7	7	7	7	8	8	7	V	(5-8)
Rumex acetosella	5	5	6	5	5	3	2	5	2	3	2	2	4	2	3	V	(2-6)
Polytrichum juniperinum	8	8	8	6	6	5	5	3	2	5	1	5	2	1	2	V	(1-8)
Scleropodium purum		2	3		1	4		4	2	3	4		4	1	3	IV	(1-4)
Anthoxanthum odoratum		1	3	2				3	2	1	4	2	2	3	2	IV	(1-4)
Hypnum jutlandicum		4			2	4		4	5	6		3	5	2		III	(2-6)
Poa annua	3	1	3						2	2	2	2		5	3	III	(1-5)
Aira praecox	3	1		3				1		2	2	3	3		2	III	(1-3)
Hypnum cupressiforme		2		1	1				3	2	2	5	2			III	(1-5)
Carex arenaria	2		2		3		3	2		3						II	(2-3)
Eurhynchium praelongum						3			8		9			6	3	II	(3-9)
Campylopus pyriformis	4	4		7	2								5			II	(2-7)
Holcus lanatus			3	2		4			2				3			II	(2-4)
Rhytidiadelphus squarrosus									4	5	4	3				II	(3-5)
Aphanes australis	2									3		2		3		II	(2-3)
Pteridium aquilinum		3				1		1	1							II	(1-3)
Ornithopus perpusillus			2							2		2	1			II	(1-2)
Hypochaeris radicata		1		1						1			1			II	(1)
Dicranum scoparium		1			7			6								I	(1-7)
Syntrichia ruraliformis		4		3	1											I	(1-4)
Luzula campestris									3		3			1		I	(1-3)
Sagina procumbens			2	1										3		I	(1-3)
Festuca ovina					1			3				1				I	(1-3)
Crassula tillaea			1				3					1				I	(1-3)
Pinus nigra seedling				1									1		1	I	(1)
Galium saxatile			3						3							I	(3)
Brachythecium albicans							1								5	I	(1-5)
Cladonia foliacea				2	3											I	(2-3)
Vulpia bromoides	1								3							I	(1-3)
Stellaria pallida										2					2	I	(2)
Cladonia coniocraea					2										2	I	(2)
Cladonia furcata				3	1											I	(1-3)
Ulex europaeus seedling						1									1	I	(1)
Rubus fruticosus agg						4										I	(4)
Ptilidium ciliare									3							I	(3)
Spergularia rubra							3									I	(3)
Holcus mollis		2														I	(2)
Dicranella heteromalla								2								I	(2)
Poa pratensis			2													I	(2)
Lonicera periclymenum															2	I	(2)
Bryum sp.			2													I	(2)
Acer campestre seedling														2		I	(2)
Lophocolea bidentata sl															1	I	(1)
Cerastium fontanum									1							I	(1)
Hypochaeris glabra												1				I	(1)
Dryopteris dilatata									1							I	(1)
Cladonia impexa					1											I	(1)
Plantago major														1		I	(1)
Sward height (cm)	2	4	4	3	1	2	4	2	4	1	1	4	3	1	3		
Sward cover (%)	40	25	50	45	35	70	45	65	55	45	50	40	70	80	45		
Bryophyte/lichen cover (%)	60	80	60	60	80	50	20	50	90	70	90	35	40	30	20		
Plant litter cover (%)	1	3	2	3	3	10	10	5	15	3	5	3	15	20	5		
Bare ground (%)	25	15	30	20	15	10	30	10	20	20	10	60	50	40	45		
No. of species	9	15	14	14	15	10	7	12	18	15	11	14	13	13	15		Av. 13.0

RI135

U4b *Festuca ovina-Agrostis capillaris-Galium saxatile* grassland, *Holcus lanatus-Trifolium repens* sub-community
with reference to
U20 Pteridium aquilinum-Galium saxatile dune grassland - Variant A
SD12a *Carex arenaria-Festuca ovina-Agrostis capillaris* dune grassland, *Anthoxanthum odoratum* sub-community - Variant B

	Variant a																					Variant b										
	2007												2008									2007					2008					
Sample number	3449	3550	3511	3522	3533	3544	3559	3600	3611	3622	3633	3644	1	4	6	9	10	11	18	19		3555	3566	3577	3588	3605	13	14	15	16	17	
Agrostis capillaris	9	10	8	9	9	9	8	7	8	8	9	7	9	9	6	9	7	10	5	6	V (5-10)	7	8	6	4	8	6	9	9	7	7	V (4-9)
Eurhynchium praelongum	6	2	9	4	7	4	4	6	3	7	9			9	9	2			4	7	IV (2-9)	5	2	3	1	5	6	5	4	9	8	V (1-9)
Holcus lanatus	3	2		1		4	3	2	3	3		3		1	5	6	4	3	2	4	IV (1-6)	2		3	4	1					4	III (1-4)
Poa annua	3		2			2	5	5	4		2	3	4	4	4						III (2-5)	5	4		7			3	4	5	5	IV (3-7)
Anthoxanthum odoratum	2	3		2	5	2	4	3	4		3	4	2	3	5	5	7	4			IV (2-7)	3		6					2		4	II (2-6)
Rumex acetosella				3		3			1	2	5	4			2	5	1	4	3		III (1-5)		2	4		6	3	3	3			III (2-6)
Rhytidiadelphus squarrosus	5	8	3			2	7	5	4	4	4	8	9	5							III (2-9)	3		6		8	5	6				III (3-8)
Scleropodium purum	3		3	8	5	4		6		2	4					2	2	1	1		III (1-8)	2		6		2		3	4			III (2-6)
Rubus fruticosus agg									1		1	2	1	1		1	2	2	2	2	III (1-2)	1					2	1				II (1-2)
Pteridium aquilinum	1			1	1						2				2	2	1	1		2	III (1-2)			3								I (3)
Cerastium fontanum										3	1							1			I (1-3)	3	1	2					1	1	2	III (1-3)
Luzula campestris			2									3	3	2		3		2			II (2-3)			5					1			I (1-5)
Hypochaeris radicata															2						I (2)							2	2	2	1	II (1-2)
Stellaria pallida																		2			I (2)							2	3	1		II (1-3)
Sagina procumbens										1											I (1)	3	2							1		II (1-3)
Galium saxatile			3	1												4					I (1-4)		1					3				I (1-3)
Ornithopus perpusillus											1				1						I (1)			3								I (3)
Ceratocapnos claviculata																				1	I (1)						2					I (2)
Betula pendula seedling									1	1											I (1)			1								I (1)
Pinus nigra seedling																			2		I (2)			1								I (1)
Hypnum jutlandicum		2	6			8	2			4					4		1			6	II (1-8)										
Dicranella heteromalla	4	1	2	2		1												1			II (1-4)										
Holcus mollis	2							4			2									6	I (2-6)										
Dicranum scoparium			1				3		2	1											I (1-3)										
Ptilidium ciliare	2	3			2																I (2-3)										
Aira praecox			1													1		1			I (1)										
Lophocolea bidentata sl							1						2								I (1-2)										
Hypnum cupressiforme						2															I (2)										
Agrostis vinealis																		2			I (2)										
Ulex europaeus seedling															1						I (1)										
Hyacinthoides non-scripta																1					I (1)										
Acer pseudoplatanus seedling														1							I (1)										
Senecio jacobaea																										1		2	2	1		II (1-2)
Stellaria media																						1					1			1	2	II (1-2)
Aphanes australis																						3	3			1						II (1-3)
Vulpia bromoides																							3			1						II (1-3)
Carex arenaria																									3	3						I (3)
Dactylis glomerata																														3	3	I (3)
Festuca rubra																														2	4	I (2-4)
Plantago lanceolata																													2		2	I (2)
Glechoma hederacea																						1		3								I (1-3)
Veronica arvensis																												2	1			I (1-2)
Taraxacum officinale agg																									1						2	I (1-2)
Claytonia perfoliata																												1	2			I (1-2)
Poa pratensis																						3										I (3)
Fissidens taxifolius																											3					I (3)
Trifolium repens																							3									I (3)
Cerastium semidecandrum																												2				I (2)
Festuca ovina																												1				I (1)
Brachythecium albicans																													1			I (1)
Plantago major																												1				I (1)
Geranium molle																							1									I (1)
Lolium perenne																									1							I (1)
Urtica dioica																									1							I (1)
Rumex obtusifolius																						1										I (1)
Sward height (cm)	8	3	3	11	9	9	5	6	5	1	4	5	3	4	6	4	8	5	1	14		1	1	5	5	4	5	1	1	2	8	
Vegetation cover (%)	85	90	80	90	80	90	80	80	80	50	95	70	90	90	70	95	85	95	20	65		70	80	80	50	75	30	85	90	60	75	
Bryophyte/lichen cover (%)	85	80	90	80	80	95	60	60	20	50	95	70	80	95	85	4	2	2	5	70		40	0	50	1	70	50	50	15	80	65	
Plant litter cover (%)	2	30	10	20	5	20	20	3	15	5	5	10	5	5	20	35	30	25	5	0		2	5	10	3	5	10	10	5	0	15	
Bare ground (%)	10	40	6	10	0	5	5	25	10	5	0	10	15	5	5	1	10	5	70	20		5	15	5	50	10	40	2	5	5	2	
No. of species	11	8	11	9	6	11	9	8	10	11	12	8	7	9	11	12	8	13	7	8	Av. 9.5	15	11	14	8	10	8	16	16	11	12	Av. 10.3

CE1 **SD8 *Festuca rubra-Galium verum* fixed dune grassland**

Sample number	1	2	3	6	8	9	10	11	12	13		
Festuca rubra	9	4	9	8	10	9	9	8	7	6	V	(4-10)
Plantago lanceolata	3	4	5	4	1	2	3	2	2	4	V	(1-5)
Vicia sativa nigra	5	2	3	3	3	3	1	3	2	3	V	(1-5)
Poa pratensis	4	6		3	2	4	4	3	7	4	V	(2-7)
Anthoxanthum odoratum			4	4	3	7	6	5	6	8	IV	(3-8)
Hypochaeris radicata	2	1	1	2	2	1	1		2		IV	(1-2)
Elytrigia repens	3	4	4	4			4	4		4	IV	(3-4)
Holcus lanatus	1	8	2			4	3	2	4		IV	(1-8)
Vicia hirsuta	2	1				2	5	2	4	3	IV	(1-5)
Trifolium dubium				2		1	2	2	3	5	III	(1-5)
Senecio jacobaea	3	4		2	1				3	3	III	(1-4)
Leucanthemum vulgare				2		3	4	4	2		III	(2-4)
Crepis capillaris		3	2	3					3	3	III	(2-3)
Taraxacum officinale agg	2	3	3		1				2		III	(1-3)
Lotus corniculatus		2			1			1	2	2	III	(1-2)
Brachythecium rutabulum	8	6		4						4	II	(4-8)
Ononis repens	3	2	4		3						II	(2-4)
Agrostis stolonifera					2	2		1		3	II	(1-3)
Dactylis glomerata				1	1			2			II	(1-2)
Galium verum	4	4									I	(4)
Elytrigia juncea		1		2							I	(1-2)
Trifolium campestre							1	2			I	(1-2)
Daucus carota carota						1	1				I	(1)
Medicago lupulina									7		I	(7)
Anisantha sterilis										4	I	(4)
Eurhynchium praelongum	4										I	(4)
Vulpia bromoides							2				I	(2)
Carex arenaria			2								I	(2)
Trifolium repens									2		I	(2)
Achillea millefolium							2				I	(2)
Potentilla reptans			2								I	(2)
Pohlia nutans							1				I	(1)
Bromus hordeaceus hordeaceus									1		I	(1)
Festuca rubra glauca										1	I	(1)
Cirsium vulgare		1									I	(1)
Rumex crispus								1			I	(1)
Anchusa arvensis									1		I	(1)
Centaurea nigra								1			I	(1)
Pilosella officinarum		1									I	(1)
Rubus fruticosus agg					1						I	(1)
Sward height (cm)	24	16	22	28	21	22	17	28	16	15		
Sward herb cover (%)	90	85	95	95	90	90	90	90	90	90		
Bryophyte cover (%)	70	30	0	10	0	0	1	0	0	5		
Litter cover (%)	40	50	50	40	60	70	60	70	25	35		
Bare ground (%)	0	10	20	30	10	5	15	10	55	35		
No. of samples	14	18	12	14	13	12	16	16	18	15	Av. 14.8	

CE2 **Parched grassland**

Sample number	16	17	18	19	20	21	22	23	24	25		
Brachythecium rutabulum	5	6	7	6	9	2	4	4	10	5	V	(2-10)
Lotus corniculatus	6	2	5	7	1	2	3	6	5	6	V	(1-7)
Leontodon hispidus	5	5	4		4	4	3	3	5	2	V	(2-5)
Holcus lanatus	4	1	4	5	5	1		2	3	3	IV	(1-5)
Carex arenaria		2	2	2	3	1	5	3		2	IV	(1-5)
Vulpia bromoides		3	6	9	3	3		2	3		IV	(2-9)
Dactylis glomerata			1	4		3	5	4	3	5	IV	(1-5)
Vicia sativa nigra	2		2		1		3	3	3	2	IV	(1-3)
Trifolium repens		1	2		3		4		2	5	III	(2-4)
Festuca rubra	4					1	7	5	4	6	III	(1-7)
Plantago lanceolata			3	1	1		3	2		1	III	(1-3)
Catapodium marinum		3	2		3	3		3			III	(2-3)
Crepis capillaris				3			2	2	1	1	III	(1-3)
Taraxacum officinale agg	1	1	1		1				2		III	(1-2)
Leucanthemum vulgare			2	2	3				4		II	(2-4)
Poa pratensis	4					1	7	4			II	(1-7)
Trifolium dubium							2	1	2	2	II	(1-2)
Medicago lupulina			1		1	1			1		II	(1)
Trifolium arvense					3	3	2				II	(2-3)
Anisantha sterilis	2	3	3								II	(2-3)
Pohlia nutans		5				1			1		II	(1-5)
Centaurium erythraea						2	2	1			II	(1-2)
Hypochaeris radicata		2				2		1			II	(1-2)
Bromus hordeaceus hordeaceus		1	1		1						II	(1)
Senecio jacobaea				2		2					I	(2)
Brachythecium albicans						9		1			I	(1-9)
Tortula ruralis ruraliformis		1						4			I	(1-4)
Eurhynchium praelongum	1			4							I	(1-4)
Achillea millefolium				2	1						I	(1-2)
Festuca ovina						1		1			I	(1)
Veronica arvensis		1				1					I	(1)
Agrostis stolonifera	1								1		I	(1)
Lolium perenne						1			1		I	(1)
Hypnum cupressiforme							6				I	(6)
Cynosurus cristatus	6										I	(6)
Polytrichum juniperinum							2				I	(2)
Anthoxanthum odoratum	2										I	(2)
Poa annua	2										I	(2)
Agrostis capillaris					1						I	(1)
Scleropodium purum					1						I	(1)
Trifolium striatum		1									I	(1)
Myosotis ramosissima						1					I	(1)
Festuca rubra glauca			1								I	(1)
Anthyllis vulneraria			1								I	(1)
Ononis repens			1								I	(1)
Daucus carota carota								1			I	(1)
Bryum sp.								1			I	(1)
Carex flacca							1				I	(1)
Quercus robur seedling					1						I	(1)
Sward height (cm)	4	5	7	7	9	4	25	6	4	26		
Sward herb cover (%)	60	40	50	90	35	20	90	45	40	60		
Bryophyte cover (%)	30	55	50	45	90	90	35	25	95	10		
Litter cover (%)	5	2	5	5	1	1	40	5	1	50		
Bare ground (%)	50	15	20	20	10	10	20	45	1	30		
No. of samples	14	16	19	12	19	21	17	21	17	12	Av. 16.8	

CE3 **W23 *Ulex europaeus* scrub**

Sample number	4	5	7	14	15		
Pinus sylvestris				5		I	(5)
Acer pseudoplatanus				4		I	(4)
Quercus ilex				4		I	(4)
Ulex europaeus	9	8	9	8	9	V	(8-9)
Prunus spinosa		5	4		6	III	(4-6)
Festuca rubra	5	5	4	5	6	V	(4-6)
Anthoxanthum odoratum	4	3	2	5	2	V	(2-5)
Vicia sativa nigra	1	1	1	2	2	V	(1-2)
Elytrigia repens	7	8	5	4		IV	(4-8)
Rubus fruticosus agg		1	2	2	1	IV	(1-2)
Holcus lanatus	3			4		II	(3-4)
Dactylis glomerata				1	2	II	(1-2)
Galium aparine			2	1		II	(1-2)
Veronica hederifolia			3			I	(3)
Achillea millefolium				2		I	(2)
Senecio jacobaea			1			I	(1)
Poa trivialis			1			I	(1)
Sward height (cm)	130	150	210	250	240		
Sward herb cover (%)	100	95	95	100	90		
Bryophyte cover (%)	0	0	0	0	0		
Litter cover (%)	40	20	30	50	50		
Bare ground (%)	30	50	50	20	20		
No. of samples	6	7	11	13	7	Av. 8.8	

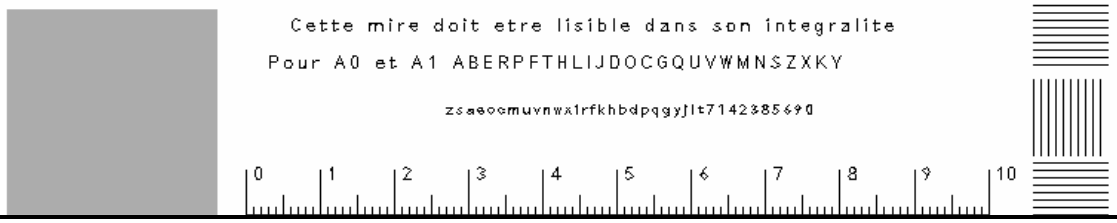
A	17/12/10	Chris Hill	Andrew Brooks	Draft	Draft Issue for EDF comment	Emma Toovey
Revision	**Date**	**Prepared by**	**Checked by**	**Status**	**Reasons for revision**	**Approved by**

EDF **CIDEN**	**N/A**	**N/A**
DEVCO022-EDF\023 Report 05		**SUPPLIER WBS CODE** **N/A**

ENTEC

CONTRACT KR1001	**ITEM NUMBER** --	**ELEMENTARY SYSTEM** --	**BUILDING** --
SCALE N/A	**NUCL/REP/EPR/UKEPR/**		**IPS** **Yes** ☐ **No** X
FORMAT A4	28130ca135 Aldhurst Farm Extended Phase 1 Habitat Survey Report 2010.doc		

DOCUMENT TYPE :	**DOCUMENT CLASSIFICATION CODE**	**PAGE**
REPORT	**01 P00**	1/20
SUBCONTRACTOR COMPANY TRADE NAME **N/A**	**SUBCONTRACTOR INTERNAL IDENTIFICATION NR** **N/A**	



ACCESSIBILTY

☐	**Confidential**	• Name list of addressees is established by the initiator. Each recipient receives one numbered exemplary and is not allowed to extend the distribution without initiator authorization
☐	**Restricted**	• Name list of addresses is established by the initiator. Each recipient may extend the distribution under his/her own responsibility
X	**EDF access**	• Must not be distributed outside of EDF except by a Section Manager
☐	**Free access**	• Unrestricted distribution

NNB Generation Company

Aldhurst Farm (East), Leiston

Extended Phase 1 Habitat Survey Report

December 2010

Entec UK Limited

EDF Energy

Aldhurst Farm, Leiston

Extended Phase 1 Habitat Survey Report

December 2010

Entec UK Limited

Report for

Christine Blythe
Barnett Way
Barnwood
Gloucester
GL4 3RS

Main Contributors

Andrew Brooks
Chris Hill

Issued by

.....
Chris Hill

Approved by

.....
Emma Toovey

Entec UK Limited

17 Angel Gate
City Road
London
EC1V 2SH
England
Tel: +44 (0) 207 843 1400
Fax: +44 (0) 207 843 1410

h:\projects\28130 sizewell ecology studies\reports\aldhurst farm\phase 1\28130 aldhurst farm phase 1 final i1.doc

Certificate No. FS 13881 Certificate No. EMS 69090

Copyright and Non-Disclosure Notice

Third Party Disclaimer

Contents

1. Introduction

1.1 Introduction

An area of land directly north of the Sizewell 'B' Power Station has been identified as having the potential to accommodate a new nuclear plant 'Sizewell C'. To facilitate the development of Sizewell C a number of additional sites beyond the NNB Generation Company landholding have been identified including the land at Aldhurst Farm. Entec UK Ltd. (Entec) was commissioned by NNB Generation Company to undertake an ecological assessment of Aldhurst Farm, Leiston[1] (OS Grid Reference TM 449 635). In completing this assessment a survey of the site was undertaken, in which any potential ecological issues that might be associated with the development of the site was identified.

1.2 Purpose of the Report

An assessment of the ecological baseline conditions has been undertaken for the site in order to inform any future proposals for the site. Such proposals potentially include the use of part of the site for the creation of wetland habitats. This report details the methods adopted, results of the survey work, recommendations for further survey work and mitigation measures are also detailed where this is appropriate. The findings of this report have formed the basis for a number of further ecological surveys that have already been completed on site.

1.3 Site Context

The site sits to the west of the Sizewell Marshes SSSI, separated from the SSSI by Lover's Lane that bounds the east and north of the survey area. The survey area is also bounded by Valley Road and gardens of houses on Valley Road to the south and Abbey Road (and an industrial area) to the west. The survey area comprises of approximately 69ha of farmland of which the majority is arable.

[1] Hereinafter, the areas of land to be directly affected by the development are referred to as the site.

2. Methodology

2.1 Desk Study

2.1.1 Biodiversity Records

A data-gathering exercise has been undertaken for the main Sizewell C new build site to obtain information relating to statutory and non-statutory nature conservation sites, priority habitats and species, and legally protected and controlled species (see Boxes 1 and 2, and Appendix A). Since the study areas overlap, the findings are also relevant for the Aldhurst Farm. The findings of the study are provided in a separate stand alone report[2].

[2] Entec UK Ltd (2008) *Sizewell Scoping Report*, Entec UK Ltd, London

Box 1 Designated wildlife sites, and priority habitats and species

Statutory nature conservation sites

Internationally important sites: Special Areas of Conservation (SACs) and candidate SACs, Special Protection Areas (SPAs) and proposed SPAs, Sites of Community Importance, Ramsar sites and European offshore marine sites.

Nationally important sites: Sites of Special Scientific Interest (SSSIs) that are not subject to international designations and National Nature Reserves (NNRs)

Local Nature Reserves (LNRs) are statutory sites that are of importance for recreation and education as well as nature conservation. Their level of importance is defined by their other statutory or any non-statutory designation (e.g. if an LNR is also an SSSI but is not an internationally important site, it will be of national importance). If an LNR has no other statutory or non-statutory designation it should be treated as being of metropolitan-level importance for biodiversity (although it may be of greater socio-economic value).

Non-statutory nature conservation sites

County Wildlife Sites (CWS): CWS are designated by the Suffolk CWS panel made up of representatives from Suffolk County Council, Suffolk Biological Records Centre (SBRC), Suffolk Wildlife Trust and Natural England, meets to assess and designate CWS using the Suffolk CWS criteria.

Priority habitats and species

In this report, the geographic level at which a species/habitat has been identified as a priority for biodiversity conservation is referred to as its level of 'species/habitat importance'. For example, habitats and species of principal importance for the conservation of biological diversity in England (see the first bullet point below) are identified as of national species/habitat importance reflecting the fact that these species/habitats have been defined at a national level. The level of importance therefore pertains to the species/habitat as a whole rather than to individual areas of habitat or species populations, which cannot be objectively valued, other than for waterfowl, for which thresholds have been defined for national/international 'population importance'.

- National importance: Habitats and species of principal importance for the conservation of biological diversity in England. These are listed on: http://www.naturalengland.org.uk/Images/S41_NERC_List_Nov2008v4_tcm6-8158.xls. These include those UK Biodiversity Action Plan (UK BAP) priority habitats and species that occur in England.
- National importance: Species listed as being of conservation concern in the relevant UK Red Data Book (RDB) or the Birds of Conservation Concern[3] Red List.
- National importance: Nationally Scarce species, which are species recorded from 16-100 10x10km squares of the national grid.
- National importance: Ancient woodland (i.e. areas that have been under continuous woodland cover since at least 1600).
- Local importance: Species listed in the Suffolk BAP.

[3] Eaton, M.A. et al. (2009). Birds of Conservation Concern 3: the population status of birds in the United Kingdom, Channel Islands and Isle of Man. *British Birds* **102**:296-341.

Box 2 Legally protected and controlled species

Legal protection

Many species of animal and plant receive some degree of legal protection. For the purposes of this study, legal protection refers to:

- species included on Schedules 1, 5 and 8 of the *Wildlife and Countryside Act 1981* (as amended), excluding species that are only protected in relation to their sale (see Section 9[5] and 13[2]), reflecting the fact that the proposed development does not include any proposals relating to the sale of species;
- species included on *The Conservation of Habitats and Species Regulations 2010*; and
- badgers, which are protected under the *Protection of Badgers Act 1992*.

Legal control

Schedule 9 of the *Wildlife and Countryside Act 1981* (as amended) lists species of animal that it an offence to release or allow to escape into the wild and species of plant that it is an offence to plant or otherwise cause to grow in the wild.

2.2 Field Surveys

2.2.1 Flora

A walkover survey of the site was undertaken on the 25th February 2010 by Andy Brooks of Entec UK Ltd.

The survey was based on the Phase 1 habitat ecological survey methodology[4] (JNCC, 2003). Distinct habitats were identified and mapped and any features of nature conservation interest were subject to a more detailed description in a target note (TN). As the standard Phase 1 habitat survey methodology is, in the main, concerned only with vegetation communities, the survey was extended[5] to allow for the provision of information on other important ecological features, particularly to identify the presence/potential presence of legally protected species.

2.2.2 Fauna

The methodologies used to establish the presence/potential presence of faunal species are summarised below. These relate to those species/biological taxa that the desk study and habitat types present indicated could occur on the site.

Badger

The survey aimed to identify and examine areas where badgers might occur by noting any evidence of badgers observed. This included:

- mammal paths;

[4] Joint Nature Conservation Committee (2003) *Handbook for Phase 1 habitat survey, a technique for environmental audit*, JNCC

[5] Institute of Environmental Assessment (1995) *Guidelines for Ecological Assessment* Chapman and Hall

- badger hairs caught in sett entrances/fences/vegetation;
- paw prints;
- evidence of foraging (usually in the form of 'snuffle holes');
- latrines; and
- badger setts.

A mammal path was assumed to be used by badgers if the character of the path (in terms of size) was appropriate and if any other signs were in the close vicinity (e.g. a badger sett).

Bats

An assessment of the suitability of the habitats on the site to support populations of bats was made. Mature trees were inspected for evidence of cavities, splits, cracks, loose bark and dense and woody ivy (*Hedera helix*) growth that could be used by bats for roosting.

Birds

The site was assessed for its potential to provide nesting habitat for breeding birds or to support important assemblages of rare or notable bird species.

Great crested newt

On-site water bodies, associated terrestrial habitats and off-site water bodies visible from the site boundary were assessed for their potential to support great crested newt. Suitable habitats include generally still, fish-free water bodies with adjacent woodland or grassland areas where there is optimal invertebrate prey potential. The results from this initial site assessment gave rise to a further survey for great crested newts in April and May 2010 focussing on one pond directly on the site boundary (adjacent to Brick Kiln Farm).

The aim of the pond survey was to identify the presence or likely absence of great crested newt (*Triturus cristatus*). The method used was that prescribed by Natural England[6]. This requires undertaking up to four survey visits in suitable weather conditions (average night air temperature of >5ºC) from mid-March to mid-June, with at least two of these visits between mid-April and mid-May.

Natural England recommends the use of at least three survey methods be used on each visit however the pond possessed a combination of sheer sides and deep water with a dense covering of vegetation around the fringes therefore netting and trapping survey methodologies for great crested newts was unviable. The survey method below was used on four separate visits.

- Torchlight survey: The entire perimeter (where possible) of the water body is walked whilst illuminating the water's edge with a powerful torch. The surveys are undertaken during the period between dusk and midnight. Two torches are used, each with a suitable candle-watt power for the water body itself.

[6] English Nature (now Natural England) (2005). *Great crested newt mitigation guidelines.* English Nature,Sandy, Bedfordshire.

Water Voles

Ditches on site were assessed during the phase 1 habitat survey for their suitability and potential to support water voles. Water voles generally prefer wide swathes of riparian vegetation both growing from the bank and in the water in which to forage and shelter. Earth banks are often required for burrows and the species prefers slow-flowing water more than 1m deep[7]. Results from this initial site assessment gave rise to a more detailed assessment for water voles (and otters).

On the 29th March 2010 all the water courses at Aldhurst farm were surveyed in detail to identify all evidence of water vole activity as well as picking up otter activity. Surveys were carried out based on methods recommended by Strachan & Moorhouse (2006). This involved searching bankside vegetation for:

- Latrines/droppings – water vole droppings are often concentrated in discreet latrine sites near the nest, at range boundaries and places where they regularly enter and exit the water. While most droppings will be deposited in latrines, some may be found scattered along runways in vegetation;
- Feeding stations – feeding remains in the form of neat piles of chewed lengths of vegetation, are often found in runways and at haul-out platforms;
- Burrows - these are typically found along the waters edge and on top of the bank up to 5m from the waters edge. Holes on top of the banks often have grazed 'lawns' around them;
- Nests – Where vegetation cover is dense and the water table is high (limiting opportunities for burrowing), water vole nests may be found woven into the base of rushes, sedges or grass tussocks; and
- Footprints – these may be identified in soft mud or silt.

Also recorded at each surveyed water body was the depth and speed of water flow[8], the waterway width, bank side vegetation and surrounding land use: all of these being factors that may determine the suitability of habitat for supporting water voles.

The survey was undertaken at an appropriate time of year for detecting water vole presence, with water voles actively marking their breeding territories with latrines between late April and early October (Strachan & Moorhouse, 2006).

Otters

Ditches, streams and adjacent terrestrial habitats were assessed during the survey for their suitability and potential to support otters. During the survey the following signs, indicating the presence of otter, were also searched for in the vicinity of the watercourses:

[7] Strachan, R. and Moorhouse, T. (2006). *Water vole Conservation Handbook. Second edition*. Wildlife Conservation Research Unit, Oxford.

[8] Speed of flow was estimated during a visual assessment.

- Spraints (faeces) – which are often located on prominent features within the channel or on the bank (including weirs, bridges, rocks, tree roots, confluences of streams etc); and
- Footprints – located in soft mud, silt, or sand banks.

Results from this initial site assessment gave rise to a more detailed assessment for otters and water voles as outlined above.

Reptiles

The site was assessed for its potential to provide sheltering, foraging and breeding habitats for the four common reptile species: slow worm (*Anguis fragilis*), viviparous lizard (*Zootoca vivipara*), grass snake (*Natrix natrix*) and adder (*Vipera berus*). These native reptile species generally require open areas with mixed-height vegetation, such as heathland, rough grassland, open scrub or (in the case of grass snake) water body margins. Suitable well drained and frost free areas are needed so that they can survive the winter. The results from this initial site assessment gave rise to a further presence/absence survey and a full reptile population assessment.

A preliminary presence/absence survey was carried out within areas of habitat highlighted by the initial ecological survey as having potential to support reptiles. The survey involved an initial seven visits to the site, however once the presence of reptiles had been confirmed the survey was extended to a total of twenty visits in order to obtain further data to inform a population assessment. Survey visits comprised the following methods (based on: Griffiths and Inns, 1998; Froglife, 1999):

- Direct Observation – during each visit to the site the locations of any reptiles observed basking in the open were recorded;
- Refugia Searches – any existing potential refugia on the site were carefully searched for reptiles; especially log-piles, rubble and discarded wood or old carpet;
- Artificial refugia – 0.5m x 1m sheets of roofing felt and corrugated metal, were placed in appropriate locations on the site. These included three main regions: a field margin of rank grassland along the eastern site boundary, an area of rank grassland adjacent to a wet ditch in the east of the site, and a section of semi-improved grassland in the centre of the site. **Figure 2.1** illustrates the locations of these artificial refugia in the field. Survey visits involved recording all reptiles observed under, on top of or next to these refugia.

A maximum of 5ha of within the Aldhurst Farm was identified as being suitable to support reptiles. In line with best practice guidelines (Froglife 1999), which recommend placing 5-10 artificial refugia per hectare (ha) of suitable habitat a total of 44 refugia were employed during the survey.

Other species

In addition, an assessment was made of the potential for the site to support any other species considered to be of value for nature conservation and that were identified as occurring within the study area by the desktop study.

3. Results

3.1 Desk Study

Contextual desk study information is provided in the separate stand alone report (Entec UK Ltd, 2008) and any relevant local records have been summarised in the results sections below.

3.2 Habitats

The habitats on site are predominately arable however areas of grassland, scrub, woodland, and hedgerows were recorded with water bodies also present within the survey area. The locations of the various habitats recorded during the surveys and target notes are shown on the Phase 1 Habitat map illustrated in **Figure 3.1**.

3.2.1 Grassland

Rank grass is located in narrow strips around the field margins, boundary hedges and along the banks of a main stream which crosses the site (west to east). The rank grassland margins are widest along features in the north eastern corner of the site. An area (c. 0.8 ha) of rank, semi-improved grassland and scattered scrub comprising predominantly of bramble (*Rubus fruticosus* agg.) is also located centrally on the highest point of the survey area.

3.2.2 Woodland

Woodland areas present within Aldhurst Farm consist of a small block of broad-leaved deciduous woodland located adjacent to a former reservoir and a mixed conifer and deciduous plantation woodland (c. 0.8 ha) with species comprising predominantly of pine (*Pinus* sp.) and willow (*Salix* sp.) located in the south east of the site bordering the Leiston sewage treatment works. There are a range of other mature trees scattered throughout the site, predominantly adjacent to the ditches, including pollarded crack willows (*Salix fragilis*)(TN2), ash (*Fraxinus excelsior*), sycamore (*Acer pseudoplatanus*), holly (*Ilex aquifolium*) and lime.

3.2.3 Boundary features

Site boundaries are formed by post and rail fences for much of the northern boundary, the western boundary is comprised of semi mature hawthorn (*Crataegus monogyna*) hedge, garden boundaries and an overgrown industrial area. The southern boundary is formed by garden fences and hedge comprising of species such as hawthorn, bramble, blackthorn (*Prunus Spinosa*) and regularly planted young oak (*Quercus* sp.) for the remainder along Valley Road. This hedge extends along the eastern edge of the site and also supports mature Scot's pine (*Pinus sylvestris*) in places.

A number of tree lines and field boundary features are present on site including an east-west oriented tree line comprising predominantly of lime (*Tilia* sp.) which runs alongside a track from a former reservoir. A field boundary between Lover's Lane and a main stream crossing the site (TN1), comprises predominantly of mature lime interspersed with blackthorn, field

maple (*Acer campestre*), cherry (*Prunus* sp.), alder (*Alnus glutinosa*) and elder (*Sambucus nigra*) with an understorey of nettle (*Urtica dioica*), ground ivy (*Glechoma hederacea*), hogweed (*Heracleum sphondylium*) and ivy (*Hedera helix*).

3.2.4 Waterbodies

A deeply incised, silt lined stream (TN3) flows from west to east across the site, with a strong flow at the time of survey. The stream appears to arise from a location approximately 300m from the north-western corner of the survey area, is thought to be spring fed and exits the site to Sizewell Marshes SSSI, passing under Lovers Lane through a concrete culvert under the road bridge. A small reservoir is located towards the downstream end of the stream and no longer holds water and is overgrown with reed (*Phragmites australis*), with the stream flowing around the edge of the former reservoir. There is little aquatic vegetation although fool's water-cress (*Apium nodiflorum*) is present.

Several smaller drains and ditches are present on site with Leiston Sewage Treatment Works discharging into a branch which joins the main ditch around 100m upstream of the Lovers Lane road bridge. A small drain (TN4) leads from Brick Kiln Farm to the valley bottom and is thought to link with the main stream. A further wet ditch is located on site (TN5) and predominately supports branched bur-reed (*Sparganium erectum*).

The desk study shows the site sits 30m west of the Sizewell Marshes SSSI, separated from the SSSI by Lover's Lane. Sizewell Marshes SSSI contains nationally important areas of lowland fen, marsh and swamp and areas of neutral lowland grassland.

3.3 Species

Any sightings or evidence of protected species seen during the surveys are described in the sections below. The potential for each species or group of species to occur based on the habitats present is also discussed.

3.3.1 Badger

No evidence of the presence of badgers was noted within the site. The woodland habitat within the site is considered suitable to support the building of setts and foraging activities but no signs of activity were identified during the site visit.

There is a recorded history of badgers occurring within the adjacent Sizewell Estate. Surveys recently undertaken in December 2010 by Entec UK Ltd recorded high levels of badger activity across the estate and within the wider area. Given this level of activity within the wider landscape it is likely that badgers do use the site intermittently and levels of activity may increase if site conditions change.

3.3.2 Bats

No direct evidence of bat activity was identified during the survey. There are potential roosting opportunities within the deciduous woodland, coniferous plantation and mature trees around the site. The on-site water bodies, grassland and scrub habitats also provide foraging opportunities for bats roosting in the nearby vicinity, both in trees and in the buildings adjacent to the site.

Desk studies and extensive survey work of the directly adjacent Sizewell estate has been carried out in 2007 (report ref: 19801cb114), 2008 (report ref: 19801cb205), 2009 (report ref: 19801ca405) and 2010(19801cb205). Details of the results of the survey work and supplementary desk studies can be found in the relevant reports and have been summarised below:

There are a number of known bat roosts within the Sizewell estate which include small roosts of Natterer's bat (Upper Abbey Barn), brown long-eared bat (Upper Abbey Barn and Ash Cottages), common and soprano pipistrelle (bat boxes in Kenton Hills, Upper Abbey Barn), noctule (bat boxes in Kenton Hills – which can include hibernating bats) and barbastelle (mature trees within the wider estate).

A total of ten species of bats have been recorded during bat activity and trapping/radio tracking surveys: common pipistrelle, soprano pipistrelle *Pipistrellus pygmaeus*, Nathusius' pipistrelle *Pipistrellus nathusii*, brown long-eared bat *Plecotus auritus*, Natterer's bat *Myotis nattereri*, Daubenton's bat *Myotis daubentonii*, noctule *Nyctalus noctula*, Leisler's bat *Nyctalus leisleri*, serotine *Eptesicus serotinus* and barbastelle.

3.3.3 Birds

Bird species noted during the extended Phase 1 survey included 8 wigeon (*Anas penelope*) and a little egret (*Egretta garzetta*) using standing water in the fields and the drains. Woodcock (*Scolopax rusticola*) and a number of common farmland bird species such as skylark (*Alauda arvensis*), woodpigeon (*Columba palumbus*) and yellowhammer (*Emberiza citrinella*) were also noted on site. The woodland, trees, hedgerows, scrub and grassland within the site were thought to have the potential to provide nesting and cover opportunities for notable breeding farmland birds.

The winter bird community of the adjacent Sizewell Estate contains a number of bird communities of particular conservation interest which reflects the mosaic of wetland, farmland and woodland habitats present, and the position of the site in relation to large areas of semi-natural (mainly wetland) habitat.

Results from previous desk studies and bird survey reports (19801cb156 & 19801cr080) recorded a wide range of bird species including notable passerine species bearded tit, kingfisher, Cetti's warbler, firecrest, and crossbill, raptors such as barn owl, waders including curlew, lapwing, snipe and woodcock and wildfowl such as gadwall, mallard, teal and mute swan. The Qualifying species bittern and marsh harrier of the Minsmere to Walberswick SPA were also found to breed within the adjacent Sizewell Estate.

3.3.4 Great crested newt

The water bodies located within the site boundary are considered unsuitable to support great crested newts due to a lack of suitable aquatic vegetation, fast flow rates (streams/ditches only) and the presence of water fowl. The pond located on the site boundary adjacent to Brick Kiln Farm was also identified as a fishing pond that was stocked with fish and a number of wildfowl were present. Minimal aquatic vegetation was present thus reducing the suitability of the pond due to a lack of egg-laying opportunities. The pond possessed a combination of sheer sides and deep water with a covering of dense bramble and common reed mace (*Typha latifolia***).**

The National Biodiversity Network gateway shows a record of great crested newt at Leiston Abbey 500m north of the site from 1985, in total there are 24 records of this species dating from 1985 to 2007 from within the 10km grid square the site lies in. Previous newt surveys in 2007 and 2010 at adjacent Sizewell estate found no presence of great crested newts.
Due to the local records of great crested newts within the vicinity of the site, torch surveys were undertaken on the 26th April, 27th April, 5th May and 6th May 2010. No newts were recorded during these survey visits.

3.3.5 Water vole

Habitats
Four of the five sections of ditch surveyed all generally provide suitable aquatic habitat for water voles (see **Table 3.1**), comprising slow-flowing or still water over <0.5m deep with wide swathes of riparian vegetation and earth banks. Bordering land use is exclusively arable. Other land uses bordering the ditches at Aldhurst farm included a small area of reed bed, a sewage works and main road. Two of the transects had one bank dominated by trees and scrub cover and were therefore somewhat shaded by vegetation. Bank profiles were general steep and provided suitable burrowing habitat for water voles. Within each of the survey ditches the riparian vegetation required for foraging and sheltering water voles was abundant at varying levels. Some ditches provided a wide margin of grasses, reeds and sedges, whilst others were dominated by patches of scrub with only a narrow strip of reeds.

Of the five sections of ditch surveyed, one was considered to offer relatively poor habitat for water voles. This was predominantly due to two key main factors:

- The strip of grassland separation the ditch from the arable field was very thin, less than 1m.
- Very little water within the ditch line, sections with less than 30cm of water and many dry sections.

Table 3.1 below outlines the habitat variables recorded at each ditch.

Table 3.1 Description of the ditches surveyed

Ditch reference	Bordering land uses	Bank profile[9]	Depth (m)	Width (m)	Dominant bankside vegetation
1	Arable land	Steep	<0.5	2-5	Tall grass
2	Arable land	Steep	<0.5	2-5	Tall grass
3	Arable land	Steep	<0.5	2-5	Bankside trees with scrub, tall grass and area of reed bed
4	Arable land	Steep	<0.5	2-5	Bankside trees with scrub and tall grass

[9] Bank profile: flat <10°, shallow <45°, steep >45°, vertical/undercut.

5	Arable land	Steep	<0.5	1	Short grass

Water vole activity

The water vole field signs identified by the survey are summarised in **Table 3.2**. Evidence of water vole activity in the form of footprints, latrines, feeding remains, and/or burrows was found on four of the five sections of ditch surveyed, with the exception of ditch 5. Ditch 5 was considered to offer poor habitat for water voles. Very few sign of water vole activity were identified within ditch 4 with only a single burrow and latrine. Parts of this ditch where shaded, with little bank side vegetation and parts of the water course were silted up. A medium to high density of different field signs was recorded from ditches 1, 2 and 3, and these are considered to provide good water vole habitat.

Table 3.2 Water vole field signs identified

Ditch reference	Transect length (m)	Water Vole Signs Found			
		Latrines	Feeding Station	Burrow	Other
1	250	1	0	4	1 Footprint
2	300	7	0	16	Rat dropping
3	500	6	3	4	1 Footprint
4	600	1	0	1	
5	200	0	0	0	

3.3.6 Otter

Otter spraints were identified at the culvert that passes under Lovers Lane on the eastern boundary of the site but no further signs of otter were observed within the network of water courses within the site boundary. The habitats are suitable for otter but are considered to be sub-optimal for this species due to the abundance of exposed arable land that lies adjacent to the water courses, thereby limiting the availability of shelter. Furthermore, the water courses on site are frequently dry and do not link well with other water courses within the wider catchment. Habitats within the adjacent SSSI are considered to be optimal for this species both for feeding and shelter. As such, although otters are likely to pass through the site, the value of the site is limited to a certain extent.

3.3.7 Reptiles

Survey Findings

During the survey of artificial refugia three reptile species were recorded: viviparous lizard, grass snake and adder. Both adult and juvenile viviparous lizard and grass snake were detected, although observations of adder included only adults. A maximum adult count of seven was made for viviparous lizard, two for grass snake and one for adder. While it is never possible in

a survey such as this to confirm the absolute absence of a species on a site, no observations have been made of slow worm, and it is therefore considered unlikely that this species occurs on the site.

Viviparous lizard was the most abundant reptile species recorded, widely distributed across all three key survey areas, with the greatest densities recorded in the area of semi improved grassland at the centre of the site. The distribution of viviparous lizard observations made during the survey work is illustrated in **Figure 3.2**

Grass snake was less widespread, being recorded along the eastern field margin, the wet ditch and the area of semi improved grassland. Adder was recorded under a single artificial refugia located adjacent to the wet ditch by the eastern boundary. The distribution of both snake species during the survey work is illustrated in **Figure 3.3**

The full results of the survey are provided in **Appendix B**.

Population Classification

As per Froglife's guidelines[4], the relative size of viviparous lizard, adder and grass snake populations was assessed on the basis of the maximum adult count made during any one survey visit. The criteria for population size classification, based on these guidelines are outlined in **Table 3.1**.

Table 3.1 Classification of the Relative Size of Reptile Populations (based on Froglife, 1999)

Species	Low Population	Good Population	Exceptional Population
Viviparous lizard	< 5	5 – 20	> 20
Slow worm	< 5	5 – 20	> 20
Adder	< 5	5 – 10	> 10
Grass snake	< 5	5 – 10	> 10

N.B. Figures in the table refer to maximum number of adults seen by observation and/or under tins (placed at a density of up to 10 per hectare), by one person in one day.

Based upon these criteria, the classification of the relative size of populations for each species within the survey area as a whole is summarised in **Table 3.2** below.

Table 3.2 Relative Reptile Population Sizes for species recorded at Aldhurst Farm

Species	Maximum Adult Count	Population Classification
Viviparous lizard	7	Good
Adder	1	Low
Grass snake	2	Low

3.3.8 Other Species

Invertebrates

The site lies adjacent to the Sizewell Marshes SSSI that is designated for its mosaic of wetland habitats and associated assemblages of invertebrate species. Although the ditch network within the SSSI extends out onto the Aldhurst Farm site, the conditions experienced within the ditch network on site are very different. Due to the reduced water levels present and the absence of significant aquatic and marginal vegetation, the assemblages present within the SSSI are unlikely to be supported by the ditches within the Aldhurst Farm site. Notwithstanding this, it is likely that some species present within the SSSI habitats are also supported by the watercourses on site, at least at some periods of the year.

4. Discussion and Conclusions

4.1 Overview of Site Ecology

Habitats

The majority of the site comprises arable fields which have limited biodiversity value. Natural vegetation on site consists of rank grassland limited to field margins, stream banks and a small area of rank semi-improved grassland and scrub in the centre of the site. Other habitats on site include a small block of broad-leaved deciduous woodland and a mixed conifer and deciduous plantation woodland and tree lines, streams and wet ditches intersect the site.

The habitats on site are fragmented from the wider landscape by the arable land and due to their limited size and quality offer limited biodiversity value. Notwithstanding this, the site itself sits within an ecologically valued landscape, adjacent to the Sizewell SSSI and a number of County Wildlife Sites associated with the Sizewell Estate. Furthermore, the water courses that pass through the site pass directly into the Sizewell Belts SSSI and as such have direct ecological continuity with habitats of national value for nature conservation. The linear nature of the field boundaries and habitats associated within the riparian corridor also offer green corridors that integrate with the wider landscape, providing valued connectivity particularly for more mobile species.

Fauna

Surveys undertaken across the site confirmed the presence of the following species within the site boundaries:

- Populations of viviparous lizard, adder and grass snake;
- Water voles;
- Otters; and
- An assemblage of arable bird species.

The phase 1 survey also identified the potential for the following species to be supported by the habitats present on site;

- Roosting, foraging and commuting bat species;
- Foraging badgers (and potentially set building); and
- An assemblage of aquatic invertebrates.

The following species are currently not likely to be present within the site boundaries:

- Great crested newts

Key

- Site boundary
- Suitable reptile habitat
- # Reptile refugia location

0 m 200 m

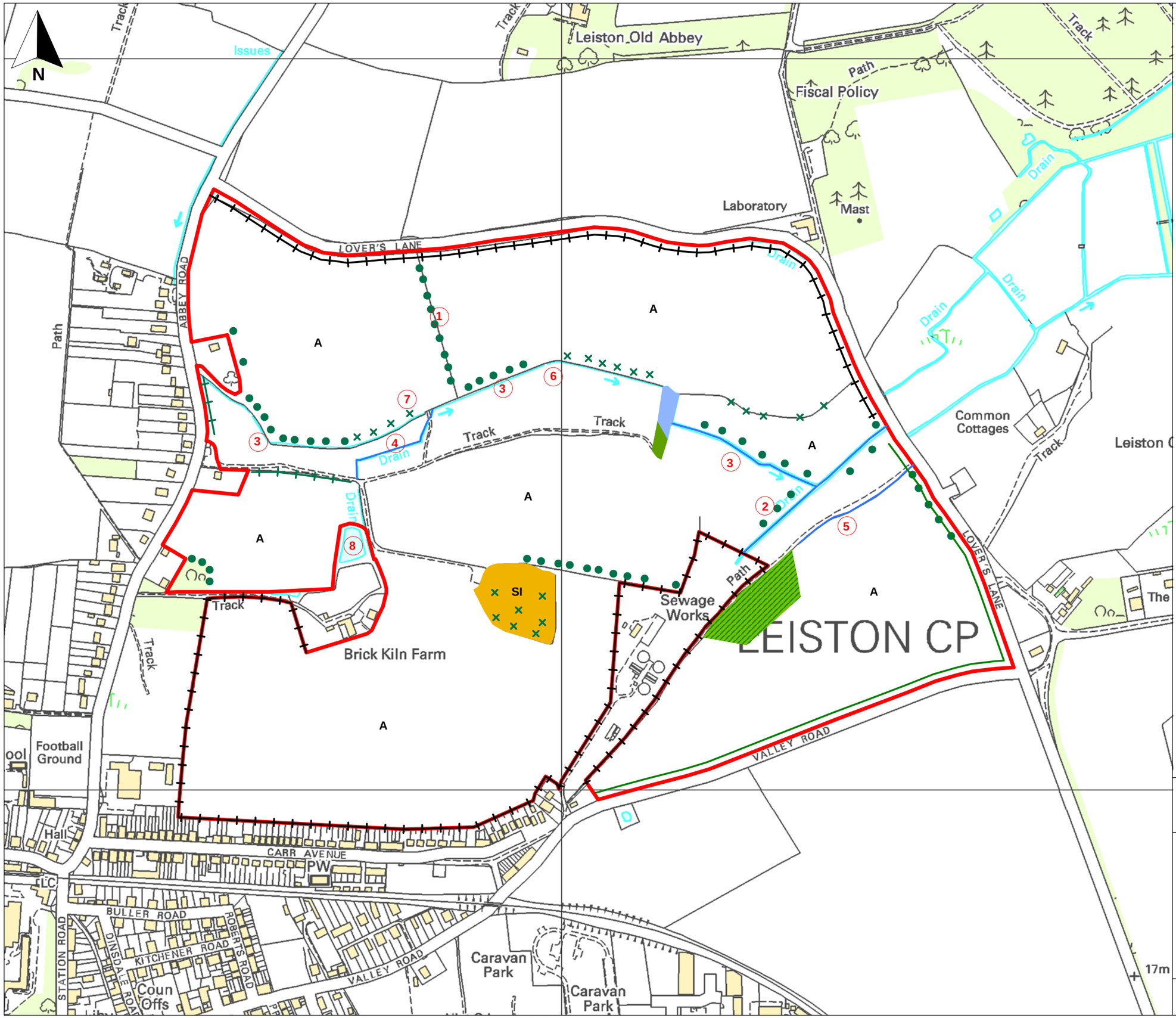
Scale 1:4,000 @ A3

Aldhurst Farm
Phase 1 Habitat Survey Report

Figure 2.1

Approximate location of reptile refugia and suitable reptile habitat

July 2011
28130-A24a.WOR tugwc

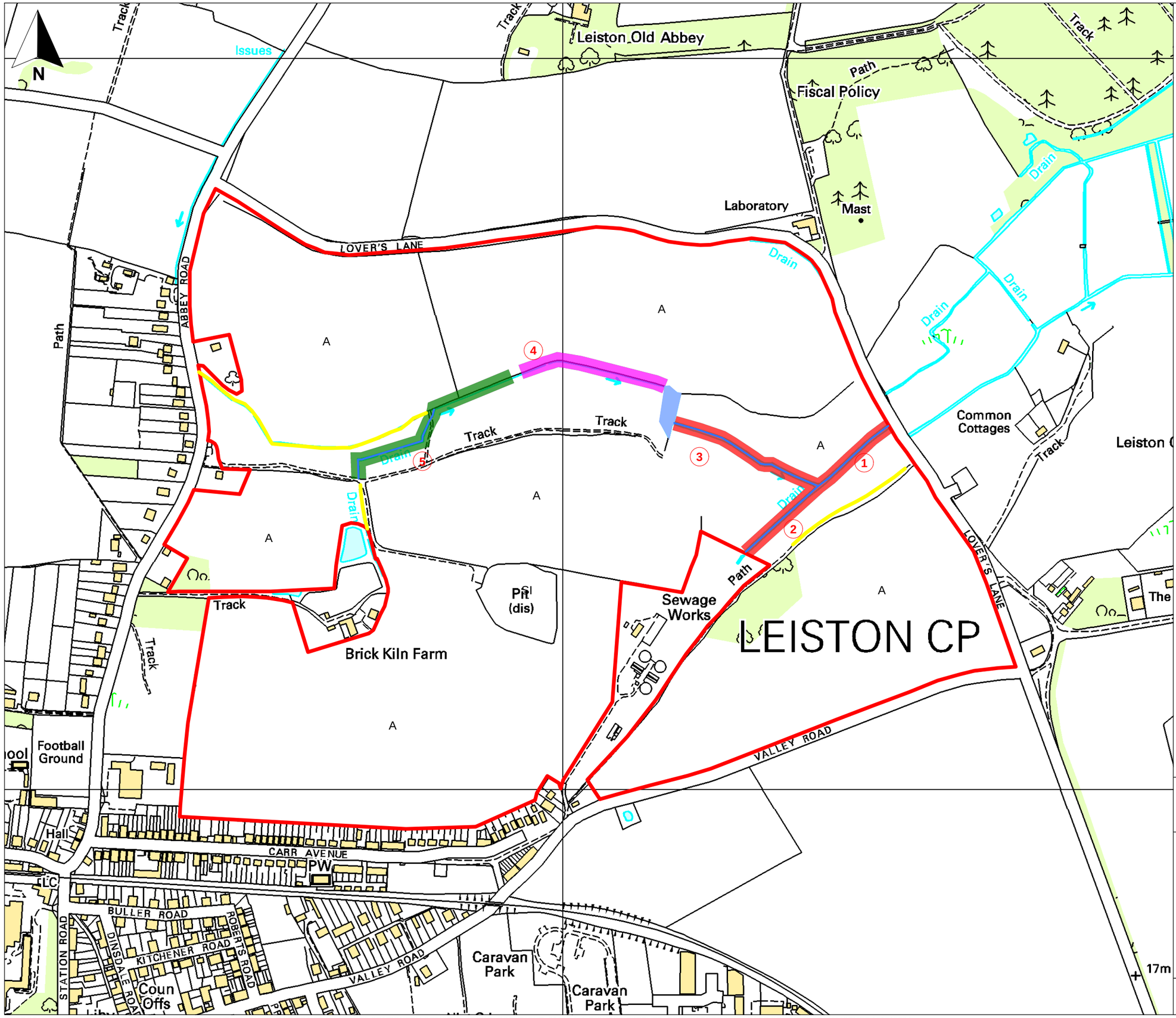


Aldhurst Farm
Extended Phase 1 Habitat Survey Report

Figure 3.1
Phase 1 Habitat Plan

April 2010
19801-R716.WOR tugwc

Entec



Key

- Site boundary
- (2) Transect reference
- Standing water
- Running water
- A Arable
- Dry ditches
- High quality habitat
- Medium quality habitat
- Poor quality habitat

0 m 250 m

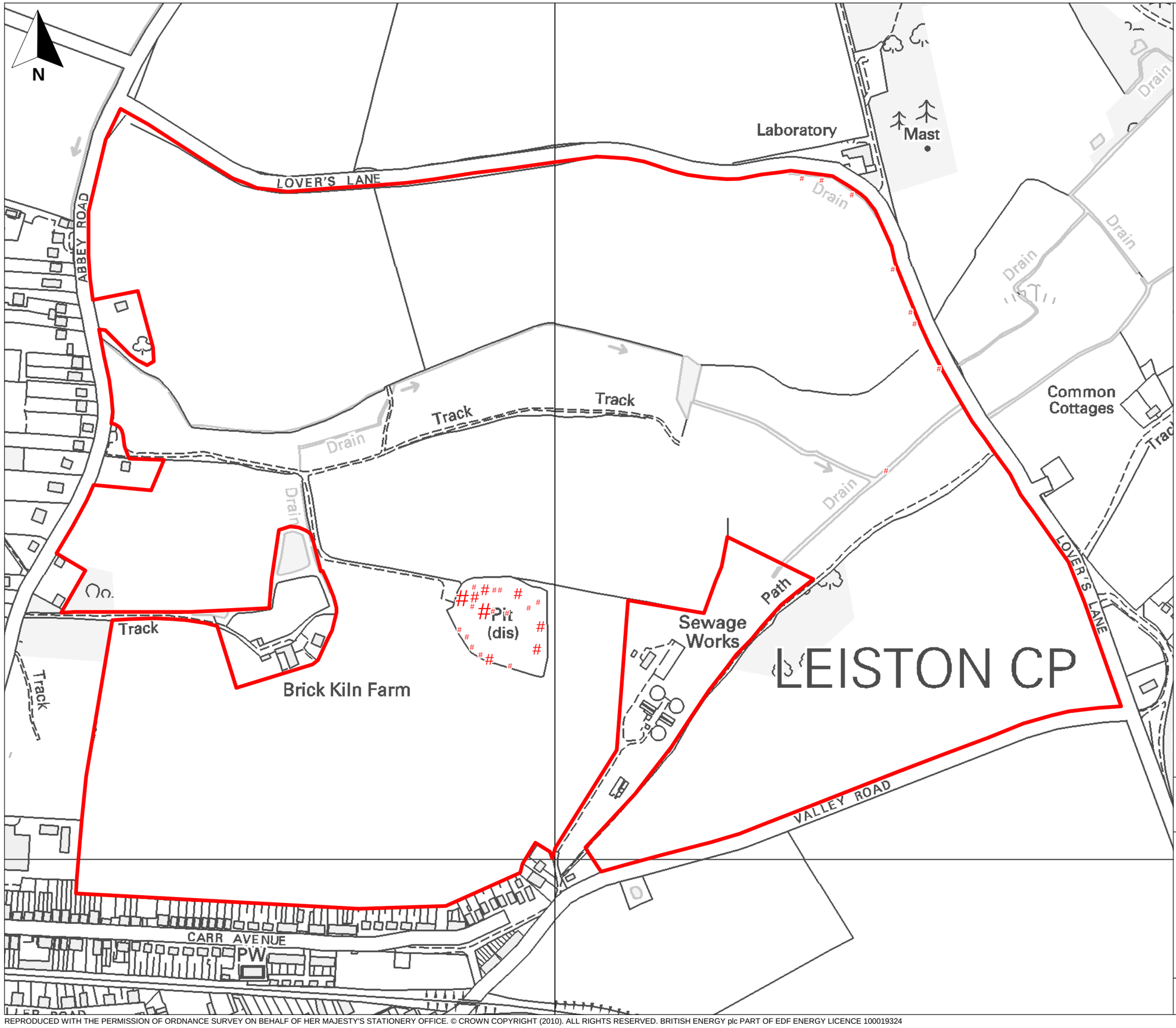
Scale 1:5,000 @ A3

Aldhurst Farm
Phase 1 Habitat Survey Report

Figure 3.2

Water Vole Survey Results

July 2011
28130-A130.WOR tugwc



Key

Site boundary

Viviparous Lizards - Maximum count

(per day at any point during the survey period)

Total 1

Total 2

Total 3

0 m 200 m

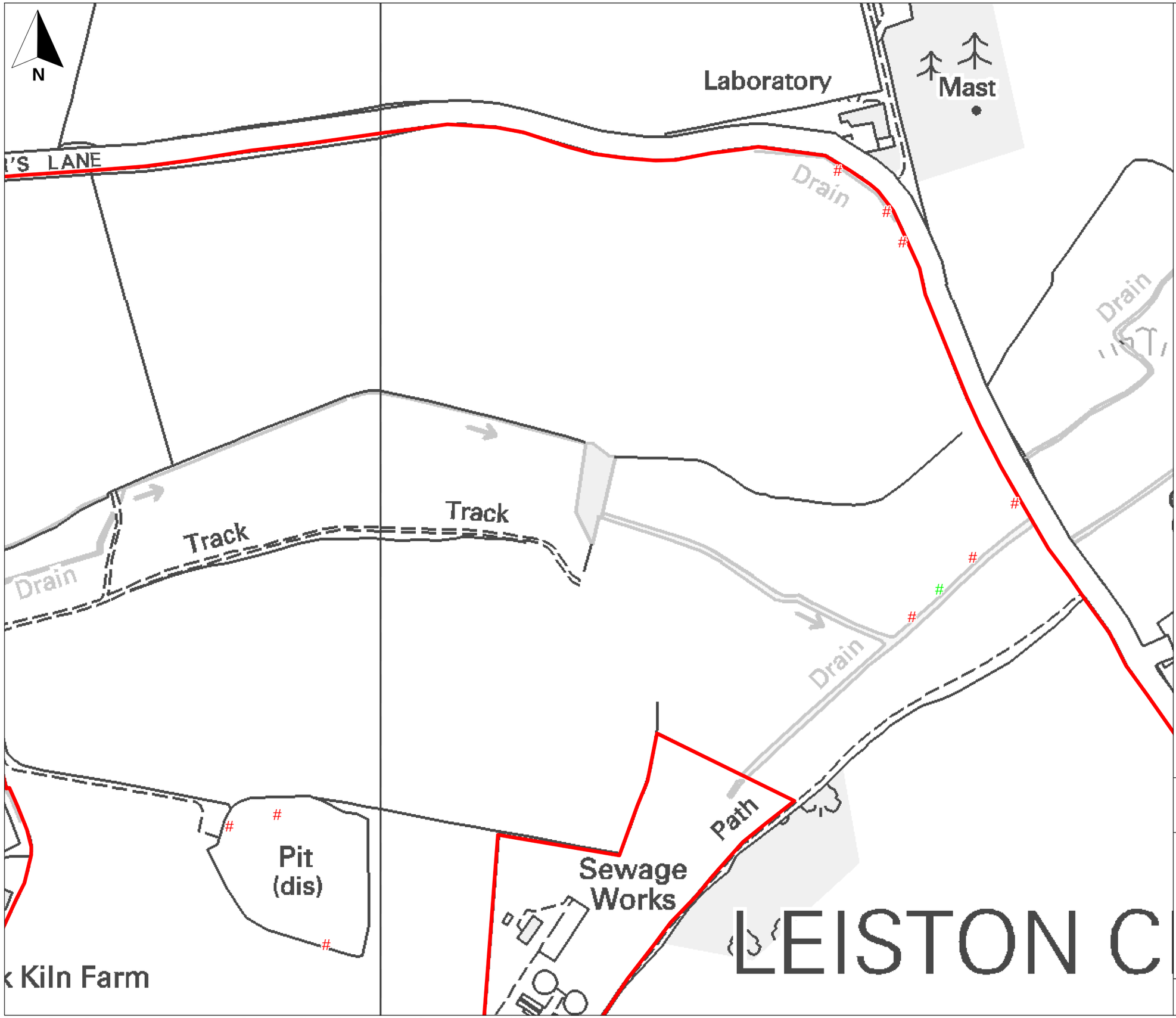
Scale 1:4000 @ A3

Aldhurst Farm
Phase 1 Habitat Survey Report

Figure 3.3

Viviparous Lizard distribution map and Survey Area

July 2011
28130-A25a.WOR tugwc



Key

Site boundary

Snakes - Maximum count

(per day at any point during the survey period)

Grass snake - Total 1

Adder - Total 1

0 m 100 m

Scale 1:2500 @ A3

EDF

Aldhurst Farm
Phase 1 Habitat Survey Report

Figure 3.4

Grass snake and Adder distribution map and Survey Area

July 2011
28130-A26a.WOR tugwc

amec

Appendix A
Protected Species Legislation

UK Protected Species

A number of wildlife species receive different levels of protection in the UK under the *Wildlife and Countryside Act 1981* (as amended). Furthermore, many wild animals are afforded additional protection by legislation relating to animal welfare issues (see below).

European Protected Species

A number of species that are protected under UK law receive further protection under Regulation 39 of the *Conservation (Natural Habitats &c.) (Amendment) Regulations 2007* (known as the Habitats Regulations), which make provision for the purpose of implementing the European Union Directive on the *Conservation of Natural Habitats and of Wild Fauna and Flora 1992*.

Bats

All British bat species are listed on Schedule 5 of the *Wildlife and Countryside Act 1981* (as amended) and are afforded full protection under Section 9 of this Act. The Act makes it an offence, *inter alia*, to:

- Intentionally kill, injure, or take (handle) a bat;
- Intentionally or recklessly damage, destroy or obstruct access to any place that a bat uses for shelter or protection (this is taken to mean all bat roosts whether bats are present or not); or
- Intentionally or recklessly disturb a bat while it is occupying a structure or place that it uses for shelter or protection.

All British bat species are listed in Schedule 2 of the Habitats Regulations, which makes it an offence, *inter alia*, to:

- Deliberately capture or kill a bat;
- Damage or destroy a breeding site or resting place of any bat; or
- Deliberately disturb a bat (this applies anywhere, not just at its roost) in such a way as to be likely to significantly affect:
  - The ability of any significant group of bat species to survive, breed, or rear or nurture their young; or
  - The local distribution or abundance of that bat species.

In addition, five British bat species are listed on Annex II of the Habitats Directive. These are:

- Greater horseshoe bat (*Rhinolophus ferrumequinum*);
- Lesser horseshoe bat (*Rhinolophus hipposideros*);

- Bechstein's bat (*Myotis bechsteinii*);
- Barbastelle (*Barbastella barbastellus*);
- Greater mouse-eared bat (*Myotis myotis*);

In certain circumstances where these species are found the Directive requires the designation of Special Areas of Conservation (SACs) by EC member states to ensure that their populations are maintained at a favourable conservation status. Outside of SACs, the level of legal protection that these species receive is the same as for other bat species.

Badgers

The *Protection of Badgers Act 1992* consolidates previous legislation (including the *Badgers (Further Protection) Act 1991*). It makes it a serious offence to intentionally or recklessly:

- Kill, injure or take, or attempt to kill, injure or take a badger;
- To damage, destroy or obstruct access to a sett; or
- To disturb a badger when it is occupying a sett.

Great Crested Newts

The great crested newt is listed on Schedule 5 of the *Wildlife and Countryside Act 1981* (as amended) and is afforded full protection under Section 9 of this Act. The Act makes it an offence, *inter alia*, to:

- Intentionally kill, injure or take (handle) a great crested newt;
- Intentionally or recklessly damage, destroy or obstruct the access to any place that a great crested newt uses for shelter or protection; or
- Intentionally or recklessly disturb a great crested newt while it is occupying a structure or place that it uses for shelter or protection.

The great crested newt is listed in Schedule 2 of the Habitats Regulations, which makes it an offence, *inter alia*, to:

- Deliberately capture or kill a great crested newt;
- Damage or destroy a breeding site or resting place of any great crested newt;
- Deliberately take or destroy the eggs of a great crested newt
- Deliberately disturb a great crested newt in such a way as to be likely to significantly affect:
  - The ability of any significant group of great crested newts to survive, breed, or rear or nurture their young; or
  - The local distribution or abundance of great crested newts.

This relates to both the aquatic and terrestrial habitat that it may occupy. The legislation applies to all life stages of great crested newts.

Reptiles

The four widespread[10] species of reptile that are native to Britain, namely common lizard, slow worm, adder and grass snake, are listed on Schedule 5 of the *Wildlife and Countryside Act 1981* (as amended) and are afforded limited protection under Section 9 of this Act. This makes it an offence, *inter alia*, to:

- Intentionally kill or injure any of these species.

Water Voles

The water vole is listed on Schedule 5 of the *Wildlife and Countryside Act 1981* (as amended) and is afforded limited protection under Section 9 of this Act. This makes it an offence to:

- Intentionally or recklessly damage or destroy or obstruct access to any structure or place which water voles use for shelter or protection; or
- Intentionally or recklessly disturb water voles while they are using such a place.

Otter

Otters are listed on Schedule 5 of the *Wildlife and Countryside Act 1981* (as amended) and are afforded full protection under Section 9 of this Act. The Act makes it an offence, *inter alia*, to:

- Intentionally kill, injure, or take (handle) an otter;
- Intentionally or recklessly damage, destroy or obstruct access to any place that an otter uses for shelter or protection; or
- Intentionally or recklessly disturb an otter while it is occupying a structure or place that it uses for shelter or protection.

All otters are also listed in Schedule 2 of the Habitats Regulations, which makes it an offence, *inter alia*, to:

- Deliberately capture or kill an otter;
- Damage or destroy a breeding site or resting place of any otter; or
- Deliberately disturb an otter in such a way as to be likely to significantly affect:
  - The ability of any significant group of otters to survive, breed, or rear or nurture their young; or
  - The local distribution or abundance of otters.

In addition, the otter is listed on Annex II and IV of the Habitats Directive. In certain circumstances where this species is found the Directive requires the designation of Special

[10] The two other native species of British reptile (sand lizard and smooth snake) receive a higher level of protection under the *Wildlife and Countryside Act* 1981 (as amended). However, the distribution of these species is restricted to only a very few sites.

Areas of Conservation (SACs) by EC member states to ensure that populations are maintained at a favourable conservation status.

All Wild Mammals (including Rabbits and Foxes)

Under the *Wild Mammals (Protection) Act 1996* it is an offence to cause unnecessary suffering to any wild animal.

Appendix B
Reptile Survey Findings

Table C.1 below summarises the results of the survey across the whole survey area.

Table C.1 Summary of Reptile Survey Results

Survey	Date	Weather conditions	Reptile observations*			
			Viviparous lizard lizards	Slow worm	Adder	Grass snake
1	19/08/10	Cloud cover: <5%. Wind speed: light. Ground moisture: dry. Rain: none Temperature: 16°C.	1F, 5 Juv, 2M	0	0	2 adult
2	23/08/10	Cloud cover: <5%. Wind speed: light. Ground moisture: dry. Rain: none Temperature: 22°C.	2 Juv.	0	0	0
3	24/08/10	Cloud cover: 0%. Wind speed: light. Ground moisture: dry. Rain: none Temperature: 15°C.	4F, 11 Juv, 1M	0	0	2 adult, 1 Juv.
4	25/08/10	Cloud cover: <5%. Wind speed: light. Ground moisture: dry. Rain: none Temperature: 17°C.	1F, 3 Juv, 1M	0	0	0
5	27/08/10	Cloud cover: 70%. Wind speed: Moderate. Ground moisture: Dry. Rain: None Temperature. 19°C	2 Juv, 1M	0	0	0
6	28/08/10	Cloud cover: 20%. Wind speed: Moderate Ground moisture: Damp. Rain: Overnight Temperature. 14°C	3F, 1 Juv, 1M	0	0	2 adult
7	7/09/10	Cloud cover: 0%. Wind speed: none. Ground moisture: Dry. Rain: None. Temperature. 17°C.	4F, 3 Juv, 3M	0	0	2 adult
8	8/09/10	Cloud cover: 100%. Wind speed: Moderate. Ground moisture: Dry. Rain: None. Temperature. 19°C.	2F, 5 Juv, 3M	0	0	1 adult
9	14/09/10	Cloud cover: 20%. Wind speed: None. Ground moisture: Dry. Rain: None. Temperature. 22°C.	3 Juv, 1M	0	0	1 adult

Survey	Date	Weather conditions	Reptile observations*			
			Viviparous lizard lizards	Slow worm	Adder	Grass snake
10	15/09/10	Cloud cover: 40%. Wind speed: Light. Ground moisture: Dry. Rain: None. Temperature. 14°C.	2F, 3 Juv, 2M	0	1 F adult	1 adult
11	16/09/10	Cloud cover: <5%. Wind speed: Moderate. Ground moisture: Dry. Rain: None. Temperature. 15°C.	2F, 3 Juv.	0	0	2 adult, 1 Juv
12	30/09/10	Cloud cover: <5%. Wind speed: Light. Ground moisture: Dry. Rain: None. Temperature. 20°C.	3 Juv.	0	0	1 adult, 1 Juv
13	1/10/09	Cloud cover: <5%. Wind speed: Light. Ground moisture: Dry. Rain: None. Temperature. 15°C.	2F, 1 Juv, 1M	0	0	2 adult
14	8/10/10	Cloud cover: 30%. Wind speed: Light. Ground moisture: Dry. Rain: None. Temperature. 19°C.	2F, 4 Juv, 1M	0	1F adult	1 adult
15	11/10/10	Cloud cover: <5%. Wind speed: Light/Moderate. Ground moisture: Dry. Rain: None. Temperature. 18°C.	2F, 3 Juv, 1M	0	0	1 juv.
16	12/10/10	Cloud cover: 40%. Wind speed: Still. Ground moisture: Dry. Rain: None. Temperature. 16°C.	1F, 5 Juv, 1M	0	0	2 adult
17	13/10/10	Cloud cover: 50%. Wind speed: Light. Ground moisture: Damp. Rain: None. Temperature. 14°C.	3F, 2 Juv,	0	0	0
18	15/10/10	Cloud cover: 30%. Wind speed: Light. Ground moisture: Damp. Rain: None. Temperature. 16°C.	2F, 6 Juv, 3M	0	0	0
19	19/10/10	Cloud cover: <5%. Wind speed: Moderate. Ground moisture: Damp. Rain: None. Temperature. 12°C.	1F, 1 Juv.	0	0	0
20	20/10/10	Cloud cover: <50%. Wind speed: Moderate. Ground moisture: Damp. Rain: Overnight. Temperature. 11°C.	0	0	0	0
Maximum survey count per species made in any one visit		**Adult**	7	0	1	2
		Juvenile	11	0	0	1

*F = Female, M = Male, Juv = Juvenile

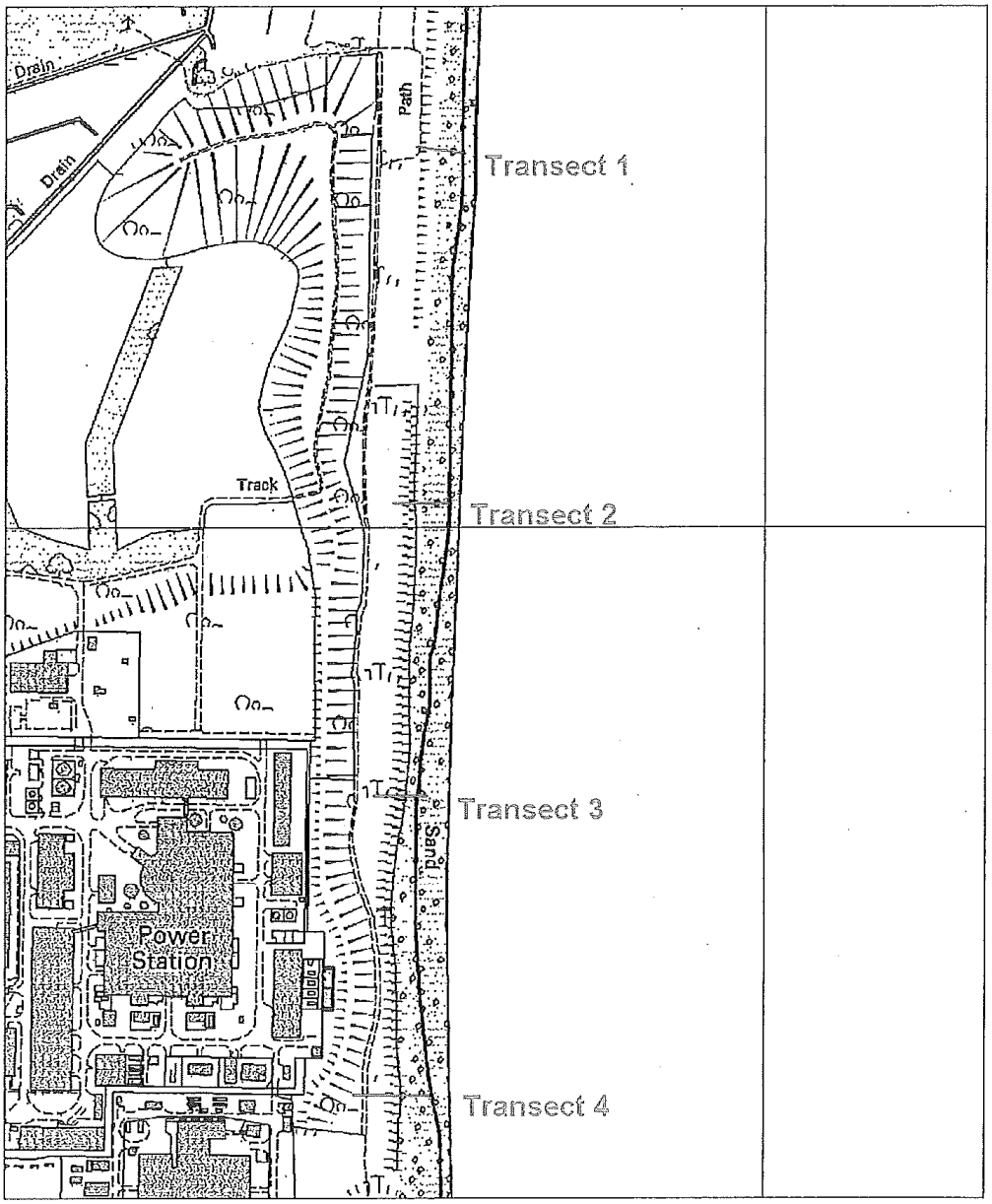
APPENDIX

Sizewell Transects

Scale 1:6000

Suffolk Wildlife Trust
Brooke House
Ashbocking
Ipswich IP6 9JY

Suffolk Wildlife Trust



Produced by Suffolk Wildlife Trust on 1 July 2009 by S Stone - template E:\gis_data\gapps\templates\swta4p.wor

Transect 1						
Quadrat No. (1m x 1m)	T1Q1	T1Q2	T1Q3	T1Q4	T1Q5	T1Q6
GPS reference	TM47642 64393	TM47630 64392	TM47621 64395	TM47613 4397	TM47606 64392	TM47593 64395
Total vegetation cover	50%	80%	100%	100%	100%	100%
Observational notes	Shingle/bare sand	Sand dune	Back of dune ridge			
Ammophila arenaria	5%					
Anisantha sterilis				5%		
Anthoxanthum odoratum				10%		
Arrhenatherum elatius			10%	10%		
Bromus hordaceus ssp. thominei						2%
Carex arenaria	<1%	40%	80%	10%		
Cladonia lichen/mosses					40%	
Crambe maritima	<1%					
Cynosurus cristata				<1%		
Dactylis glomerata				5%		
Galium verum		<1%		10%	<1%	5%
Festuca arenaria		40%				
Festuca filiformis					50%	
Festuca rubra						60%
Holcus lanatus			2%	10%		
Honckenya peploides	40%	2%				
Hypochaeris radicata					<1%	
Leontodon autumnalis				<1%		
Ononis repens	<1%	2%		<1%	<1%	10%
Pilosella officinarum					10%	
Plantago lanceolata				<1%	2%	5%
Poa angustifolia		1%		5%	1%	10%
Rubus fruticosus agg.			10%			
Rumex acetosella					<1%	
Rumex crispus littoreus	<1%					
Rhinanthus minor					5%	
Sedum anglicum					<1%	
Senecio jacobaea				1%		

Sonchus arvensis	<1%					
Trifolium scabrum					<1%	
Trifolium arvense					<1%	
Trisetum flavescens				5%		
Vicia sativa				<1%		2%

Transect 2					
Quadrat No. (1m x 1m)	T2Q1	T2Q2	T2Q3	T2Q4	T2Q5
GPS reference	TM47633 64012	TM47622 64011	TM47612 64011	TM47597 64011	TM47587 64011
Total vegetation cover	5%	80%	100%	100%	100%
Observational notes	Edge of dune				
Ammophila arenaria	<5%	2%			
Anthoxanthum odoratum				<1%	
Arrhenatherum elatius			30%		
Carex arenaria		5%	20%		1%
Centaurium erythraea				<1%	<1%
Convolvulus soldanella	<1%				
Crambe maritima	<1%				
Crepis capillaris			<1%		
Dactylis glomerata		<1%	10%		
Elyrigia juncea		<1%			
Galium verum				1%	<1%
Festuca arenaria		20%			
Festuca filiformis				<1%	
Festuca rubra		40%	5%		
Glaucium flavum	<1%				
Holcus lanatus			20%	1%	50%
Hypochaeris radicata				<1%	
Lathyrus japonicus	<1%				
Luzula campestris					<1%
Ononis repens		10%	<1%	<1%	
Pilosella officinarum				70%	<1%
Plantago lanceolata				10%	10%
Poa annua				5%	
Sedum anglicum				<1%	
Senecio jacobaea			<1%	<1%	<1%
Silene uniflora	<1%	<1%			
Sonchus arvensis			<1%		
Sonchus asper			<1%		
Trifolium scabrum				<1%	
Trifolium arvense				<1%	5%
Trisetum flavescens					
Vicia hirsuta					10%
Vicia sativa					<1%
Vulpia bromoides				5%	

Transect 3						
Quadrat No. (1m x 1m)	T3Q1	T3Q2	T3Q3	T3Q4	T3Q5	T3Q6
GPS reference	TM47635 63998	TM47628 63696	TM47617 63699	TM47608 63698	TM47596 63703	TM47584 63701
Total vegetation cover	30%	40%	60%	90%	90%	100%
Observational notes				On dune	Landward side of dune	
Ammophila arenaria	20%	<1%	5%	30%	15%	
Bromus hordaceus ssp. thominei						2%
Carex arenaria				5%	5%	
Convolvulus soldanella				30%		
Crambe maritima	10%	40%				
Cynosurus cristata						5%
Elyrigia juncea	5%		5%			
Galium verum				<1%		10%
Festuca filiformis						10%
Festuca rubra			5%	5%		60%
Holcus lanatus			<1%	2%	60%	
Hypochaeris radicata				<1%		
Lathyrus japonicus	10%					
Leontodon hispidus			<1%			
Luzula campestris						1%
Medicago lupulina			<1%			
Ononis repens			20%	20%	5%	1%
Pilosella officinarum				5%		
Plantago lanceolata						5%
Poa annua						1%
Rumex crispus littoreus	2%					
Sedum anglicum						
Senecio jacobaea					<1%	2%
Senecio squalidus			<1%		1%	
Silene uniflora	5%	<1%	20%			
Sonchus asper				<1%		
Vicia sativa						<1%

Transect 4					
Quadrat No. (1m x 1m)	T4Q1	T4Q2	T4Q3	T4Q4	T4Q5
GPS reference	TM47619 63377	TM47608 63377	TM47598 63378	TM47588 63376	TM47580 63377
Total vegetation cover	10%	0%	90%	50%	90%
Observational notes			Trampled ground on edgeof track		
Aira praecox					5%
Arenaria serpyllifolia					<1%
Bromus hordaceus ssp. thominei			2%		1%
Carex arenaria			<10%	20%	5%
Centaurium erythraea			<1%		
Crambe maritima	3%				
Crassula tillaea				<1%	1%
Erodium cicutarium			<10%	2%	<1%
Galium verum			5%	<1%	1%
Geranium molle					2%
Festuca rubra			10%		
Glaucium flavum	3%				
Holcus lanatus			5%		
Hypochaeris glabra			<1%		2%
Hypochaeris radicata			<1%		
Ononis repens			<1%		40%
Pilosella officinarum			10%		
Plantago coronopus				20%	
Poa annua			2%	2%	
Sagina sp.				<1%	
Senecio jacobaea					<1%
Silene uniflora	3%				
Trifoium scabrum			10%	2%	2%
Trifolium arvense			<1%		
Vulpia bromoides				2%	

Suffolk Wildlife Trust

THE wildlife TRUSTS

SIZEWELL BEACH SSSI

Vegetation survey

July 2003

SIZEWELL BEACH SSSI

Vegetation survey

July 2003

Jonny Stone

Prepared by:
Jonny Stone
Lavender Cottage, The Street,
Easton, near Woodbridge
Suffolk IP13 0ED

Prepared for:
Suffolk Wildlife Trust
Brooke House
Ashbocking, Ipswich
Suffolk IP6 9JY

Summary

- The beach at Sizewell has undergone a period of extensive restoration following major physical disturbance associated with the construction of Sizewell B power station in Suffolk between 1987 and 1993. The restoration included revegetating an area of compacted shingle beach and a low dune ridge between the low cliffs and banks of the coastline and the active shingle banks and beach on the seaward side.

- Suffolk Wildlife Trust commissioned the author to undertake a survey in early July 2003 of the vegetation that had established within the area subject to restoration area adjacent to Sizewell Power Station.

- The survey was conducted over a linear strip of vegetated shingle and dune ridge, from the southern edge of the power station buildings to the line of concrete block running between the beach and the northeast corner of the power station bund. According to Sneddon and Ranwell (1993), the vegetated beach substrates at Sizewell are at the sandy extreme of shingle substrates.

- Twenty sample areas, ten from both the vegetated shingle and dune ridge, were sampled by taking 20 50 x 50 cm quadrats from each sample, and details of the physical substrate. Digital images of a representative quadrat within each sample area are supplied with the report on CD-ROM. Amalgamated sample vegetation records were compared with the National Vegetation Classification and, where appropriate, with the Shingle Vegetation Classification of Sneddon and Randall (1993).

- Most samples within the vegetated shingle area revealed a mosaic of vegetation communities. Sneddon and Randall's classification places most of the variation encountered in these samples with either category 3f. Sandy grasslands or 4a.i. Mature grasslands – *Festuca rubra*. In terms of the National Vegetation Classification, the collective samples fall within two sub-communities of the **SD7 *Ammophila arenaria*-*Festuca rubra* semi-fixed dune community**, albeit as rather acidophilous examples lacking one of the community constants, *Ammophila arenaria*.

- Each dune sample contained varying proportions of *Ammophila* and *Carex arenaria*, though, in general, the southern samples were dominated by the former, and the northern samples by the latter. Both groups are best accommodated within different sub-communities the **SD6 *Ammophila arenaria* mobile dune community**.

- In terms of the classification developed by the Soil Survey of England and Wales, the vegetated beach samples are placed within the **Dungeness series**, a typical ranker-like alluvial soil (Avery 1980). The pits on the dune ridge revealed a consistent **raw sand** soil type, which is not described by the Soil Survey.

Sizewell Beach SSSI

Vegetation survey 2003 Jonny Stone

Introduction

Vegetated shingle is a scarce habitat in Britain. The beach at Sizewell has undergone a period of extensive restoration following major physical disturbance associated with the construction of Sizewell B power station in Suffolk between 1987 and 1993. The restoration included revegetating an area of compacted shingle beach and a low dune ridge between the low cliffs and banks of the coastline and the active shingle banks and beach on the seaward side.

Suffolk Wildlife Trust commissioned the author to undertake a survey in early July 2003 of the vegetation that had established within the area subject to restoration area adjacent to Sizewell Power Station.

Location of survey area

The survey was conducted over a linear strip of vegetated shingle and dune ridge, from the southern edge of the power station buildings to the line of concrete block running between the beach and the northeast corner of the power station bund (see Map 1). The landward edge of the survey area was the base of the low cliff and artificial bunding on the westward side of the beach. The seaward margin was established on or in line with a paling fence that currently runs along the seaward edge of the dune ridge. This fence ends south of the end of the survey area, but its line is apparent as far as the corner of the area.

General character of the survey area

The survey is based on the flora of the stable shingle flat, and of the 2-5 m high marram dune ridge of variable stability. In part the ridge consists of loose wind-blown sand, dominated by *Ammophila*, while elsewhere the sand is fully stabilised and entirely vegetated, with *Carex arenaria* dominant.

The vegetated shingle habitat is essentially a dry acidic one, with affinities to heathland. It is nutrient-poor and generally contains little organic matter. The prescription for the survey included an examination of the visual substrate characters of the vegetated shingle comonent of the site. Three key factors were shown by Randall (1977) to be essential in the establishment of vegetation on shingle beaches. The first is the mobility of the beach substrate. A second factor is the presence of a fine matrix in the shingle. The survey repeatedly found large quantities of sand mixed with the shingle, as well as surficial shingle layers. The final factor is the hydrological status of the shingle. Clearly, shingle has a high porosity and low water retention. However, this is overcome to some extent by the presence of the sand

matrix which acts as a reservoir of water which is critical at the germination stage of seed development.

The Sizewell area is underlain by early Pleistocene Norwich Crag that has produced deep, brown, calcareous sandy soils above the beach, which is composed of Holcene marine deposits. These overlie the Crag on the beach and is composed of layers of aggregate, ranging from fine sand to coarse shingle. According to Sneddon and Ranwell (1993), the beach substrates at Sizewell are at the sandy extreme of shingle substrates. However, the material is very heterogeneous, with some areas predominantly coarse flint shingle. The shingle at Sizewell Beach is assumed to have derived as glacial sediments deposited offshore which have been reworked with rising sea levels to be redeposited along the coast, and from active erosion of existing coastal cliffs consisting of crag deposits and the Westleton Member.

Walmsley's (1997b p146) study found very large differences in the particle-size composition across the beach. The proportion of <4 mm ∅ particles was much greater in the seaward half of the beach, and the proportion of >9.5 mm ∅ increased steadily landwards. The composition of the sand and silt fraction (<2 mm ∅) was similar throughout, although there was a smaller proportion of >0.5 mm ∅ and a larger proportion of <0.25 mm ∅ in the landward half of the field experiment.

Survey methods

Fieldwork was conducted in July 2003. The vegetated shingle beach and sand ridge were first surveyed by eye to identify stands of homogeneous vegetation or mosaics of vegetation, both along the central line of the vegetated beach and as blocks along the line of the sand ridge. 10 sample areas were selected for both vegetated beach and dune ridge components of the survey area as a pair. The southern margins of both beach and ridge samples area were lined up with each other, and with a permanent or semi-permanent feature on the landward edge of the survey area. For the southern samples, this proved to be some feature of the power station complex. For the northern samples, less permanent features were selected, related to the bund or the landward fenceline of the survey area. A approximate location of the sample areas is shown on Map 1.

Vegetated beach samples. A 10 x 10 m sample area was established by marking the southern corners along the baseline, located in the central area of the vegetated beach, away from a landward track, and the often trampled area at the foot of the dune ridge. The sample areas are only roughly re-locatable

Dune ridge samples. A sample area was established across the dune ridge, each being 5m wide from the southern baseline, and forming a corridor from the landward foot of the ridge to the fenceline on the seaward side. The fence comes to end towards the north margin of the survey area, and here the eastern side of the quadrat was established on the line of the fence or at the edge of the vegetated ridge.

Within each of the twenty sample sites (ten each for the vegetated beach and the dune ridge) 20 random 50 x 50 cm quadrats were allocated. All species of vascular plant, bryophytes and lichens (excluding saxicolous lichens) were listed from each quadrat to produce a presence/absence record. In addition, details of substrate character, sward height and percentage of bare ground were recorded.

Small soil pits were dug from each sample area. Appendix 1 describes the possible soil types of the vegetated shingle area; the soil pits on the dune ridge revealed a consistent raw sand soil type, which is not described by the Soil Survey of England and Wales.

Amalgamated sample vegetation records were compared with the National Vegetation Classification and, where appropriate, with the Shingle Vegetation Classification of Sneddon and Randall (1993), the relevant sections of which are reproduced in Appendix 2.

Description of samples

Vegetated beach samples

Digital images of a representative quadrat within each sample area are supplied with the report on CD-ROM.

Samples at the southern end of the sample (Beach samples 1, 2, 3) were both heavily trampled and rabbit grazed, forming a short, turf of 1-2 cm with a shallow peat topsoil (0-4 cm deep) over a substrate of sandy shingle and stony sand. The samples were a mosaic of grass and moss dominated patches, the former forming an overstorey to strands of moss, the latter permitting the ingress of numerous grass shoots and diminutive plants and the seedlings of winter annuals. Patches of low-growing *Ammophila* were present in less-trampled spots within sample 2.

The remaining beach samples contained vegetation of 15 – 35 cm height, with little or no trampling. Some rabbit-grazing was seen, notably in the shorter, moss and lichen patches amongst the longer grass. Sample 4 was dominated by patches of *Carex arenaria*; samples 5, 10, 6, 7, 8 and 9 were differing mixtures of grasses. All samples contained patches of mosses, either on the surficial shingle drifts, or as an understorey or admixture to the grassy sward.

Sample 10 included a trampled pathway, with a low-growing flora of bryophytes with *Trifolium arvense* and *Plantago coronopus*.

A summary table of vegetation samples is given overleaf.

VEGETATED SHINGLE SAMPLES

	Beach 1	Beach 2	Beach 3	Beach 4	Beach 5	Beach 6	Beach 7	Beach 8	Beach 9	Beach 10
Agrostis capillaris	3	9	7	5			8	6	5	4
Aira praecox	3	2					2	1		
Anthoxanthum odoratum				14				13		
Brachythecium albicans	6	5		1		1	2	7	2	
Bromus hordeaceus							1		1	6
Bryum capillare					1	1		3		
Campanula rotundifolia				1						
Carduus tenuiflorus	1									
Carex arenaria		9		11						
Catapodium marinum					8	15				
Centaurium erythraea			7	3						
Cerastium diffusum diffusum	1									
Cerastium semidecandrum	5									
Cladonia chlorophaea					4	2				
Cladonia fimbriata		4				4	2			
Cladonia furcata						2	1	8		
Cladonia rangiformis						2		7		
Crepis capillaris	4				5			3		
Cynosurus cristatus			20	4					4	1
Cytisus scoparius										1
Dactylis glomerata	1						1	1	1	
Daucus carota carota	1									
Dicranum scoparium		1				2	1	5	3	2
Elytrigia juncea		7		5	7	18	3		3	
Erodium cicutarium	2									
Erophila verna					2					
Eryngium maritimum						1				
Festuca ovina	8	6			16	3	14	13	11	14
Festuca rubra composite	6	6	12	5	4	5	3	7	8	6
Galium verum	7	3	2	11	7	3	6	2	6	1
Geranium molle	2									
Holcus lanatus	2		1	3	1					
Hypnum cupressiforme	14	9		3	2	3	1	8	3	
Hypochaeris radicata	1	3	2	2		3	2	7	4	2
Jasione montana						2	4		2	2
Koeleria macrantha					4		1	2		
Leontodon saxatilis		2			5	4		3		
Lolium perenne							3			
Lotus corniculatus	13	2	6	6	5	1	2	4	1	15
Luzula campestris								4		
Myosotis ramosissima					2		1			
Ononis repens	5	4		9	2		7	8	5	6

Peltigera rufescens						1				
Phleum arenarium						1				
Pilosella officinarum	3		4	2	8	4		10	7	
Plantago coronopus	2	8				3	6		4	2
Plantago lanceolata	1		3	7	17	5	14		15	1
Poa pratensis composite	8	2		10	3	2	16	6	2	3
Polytrichum piliferum						1				
Pseudoscleropodium purum				2	1	4		1	2	3
Rhinanthus minor								5	5	
Rumex acetosella									5	2
Sedum acre		6				1	1	2	3	1
Senecio jacobaea	6	3	4	5	3					2
Senecio vulgaris										1
Sonchus arvensis				1						1
Sonchus asper				2						1
Trifolium arvense		1	6	2	13	16				7
Trifolium repens	1		1	1	1					
Trifolium scabrum			2	1						
Trifolium striatum	1						2			
Urtica dioica										1
Veronica arvensis	2				1					
Vicia lathyroides			1					12	9	4
Vulpia bromoides	18	16			6	7	3			
Vulpia fasciculata							6			
Xanthoria parietina					1					
Bare ground	5	9	0	0	11	2	1	0	3	0

Vegetation communities

Most samples within the vegetated shingle area revealed a mosaic of vegetation communities. Examination of Sneddon and Randall's classification (Appendix 2) places most of the variation encountered in these samples with either category 3f. Sandy grasslands or 4a.i. Mature grasslands – *Festuca rubra*. The assemblages found within the samples quadrats were:

Code	Shingle plant community	NVC code
SH59	*Ammophila arenaria-Carex arenaria-Festuca rubra*	SD7
SH57	*Festuca rubra-Poa pratensis-Ammophila arenaria-Carex arenaria*	SD8
SH55	*Holcus lanatus-Agrostis capillaris-Ammophila arenaria-Hypochaeris radicata*	SD7
SH50	*Festuca rubra-Aira paecox-Plantago coronopus*	MC5
SH48	*Festuca rubra-Hypnum cupressiforme-Lotus corniculatus-Plantago lanceolata*	SD7
SH45	*Vulpia bromoides-Bromus hordeaceus-Hypochaeris radicata*	U1f

In terms of the National Vegetation Classification, the collective samples fall within two sub-communities of the **SD7 *Ammophila arenaria-Festuca rubra* semi-fixed dune community,** albeit as rather acidophilous examples lacking one of the community constants, *Ammophila arenaria*. Sample areas containing *Ononis repens* are best located within the SD7c *Ononis*

repens sub-community. Where *Hypnum cupressiforme* is occupying significant cover within the plots, then the SD7b *Hypnum cupressiforme* sub-community is preferred. As often in East Anglia, the presence or absence of *Festuca ovina* complicates the analysis. On the vegetated shingle the species is present in quantity, and represent the acidophilous component to the flora.

Soil assessment

The upper part of the soil was assessed after each sample had been recorded. Considerable variation in the character of the substrate was found within most sample areas.

Two typical profiles were found:

Profile 1: in 50 x 50 cm quadrats dominated by grasses, the uppermost 0 – 40 mm was a dark red brown peaty sand/sandy peat matrix with occasional rounded stones (5 – 40 mm ∅); from 40 - 100 mm a dark brown sometimes humic coarse sand with occasional to frequent stones and frequent fine fibrous roots; below 100 mm the coarse sand was yellow with only occasional stone and few roots.

Profile 2: in 50 x 50 cm quadrats with a low to high cover of mosses and lichens, the substrate consisted of a shallow bed of stones (5 – 40 mm ∅) from 40 – 150 mm thick, containing low to moderate amounts of sand. This material was humus-stained in the upper part and otherwise a natural light grey to pale yellow. Below this shingle cover, the subtending substrate varied from one similar to the complete Profile 1 to yellow sand with occasional stones.

In terms of the classification developed by the Soil Survey of England and Wales, the samples may best be placed within the **Dungeness series**, a typical ranker-like alluvial soil (Avery 1980).

Dune ridge samples

Digital images of a representative quadrat within each sample area are supplied with the report on CD-ROM.

Each dune sample contained varying proportions of *Ammophila* and *Carex arenaria*, though, in general, the southern samples were dominated by the former, and the northern samples by the latter. In their respective areas, each species varied in density from a thick, exclusive stand to scattered individuals. The accompanying flora was an eclectic mix of winter annuals, dune specialists and an assemblage of species also found on the vegetated beach, or on disturbed ground in the locale. Occasional fronds of bracken, and arching stems of dog rose and bramble were also recorded. Where the close canopy thinned, notably on the trampled zone on the ridge apex and by the fenceline, scattered tufts of lichens and mosses were found, but rarely as a dune-stabilising factor.

A summary table of vegetation samples is given overleaf.

DUNE RIDGE SAMPLES	Dune 1	Dune 2	Dune 3	Dune 4	Dune 5	Dune 6	Dune 7	Dune 8	Dune 9	Dune 10
Agrostis capillaris	10	2			2		4	13		1
Ammophila arenaria	17	16	17	18	12	5	4		3	4
Anthoxanthum odoratum	4							5		3
Arrhenatherum elatius								9	7	1
Beta maritima						1				
Blackstonia perfoliata		1	1	7						
Brachythecium albicans			4			3				
Calystegia soldanella						5	1			
Campanula rotundifolia	2		3			2				
Carex arenaria	3	5			9	16	18	11	19	20
Catapodium marinum			2							
Centaurium erythraea	1		3	2						
Cirsium vulgare			1							
Cladonia furcata	2									1
Cladonia rangiformis	2						2	3		1
Crambe maritima							1			
Cytisus scoparius									1	
Dactylis glomerata	1				3				4	
Dicranum scoparium	2									2
Elytrigia juncea	11	5		7	9	11	8		3	3
Eryngium maritimum			1							
Festuca ovina			5			7				1
Festuca rubra	15	7	13	6	13		5	4		
Galium aparine				1	2					
Galium verum	9		7	6	7				3	
Holcus lanatus		1	2		2		7	11	8	3
Honckenya peploides					2	3				1
Hypnum cupressiforme		3			3		2			2
Hypochaeris radicata	4	4	7	5	5	2	2	4	5	
Jasione montana			2							
Lathyrus japonicus				2						
Leontodon hispidus	3			2		4	2			
Lupinus arboreus						1			1	
Ononis repens	7	12		2	2		5		3	4
Peltigera canina	1									1
Phleum arenarium						2				
Pilosella officinarum	2		5	4	4		3			
Plantago coronopus									1	
Plantago lanceolata					5		8			
Pleurozium schreberi									3	
Poa pratensis	6	7	3		6			4		5
Poa trivialis	2				1					

Pteridium aquilinum	2	1								
Rhytidiadelphus squarrosus			2			4				
Rosa canina agg						1				
Rubus fruticosus agg						1		5	2	3
Rumex acetosella	3	2								
Rumex crispus									2	
Sedum anglicum	1									
Senecio jacobaea	6	4	3	5	4		2		5	
Senecio vulgaris			1		2					
Sonchus arvensis			3	3	4					
Stellaria pallida	2									
Taraxacum officinale agg			2			1				
Tortula ruralis ruraliformis			3	4						
Trifolium arvense			1							
Trifolium repens						2				
Ulex europaeus			1							
Vicia lathyroides				3	4				4	
Vulpia bromoides	4	2	1							
Bare ground (%)	0	5	30	40	5	40	35	10	5	0

Vegetation communities

The samples fall into two major groups, those were *Ammophila arenaria* (Samples 1-5) is dominant and those where *Carex arenaria* forms an extensive stand (Samples 6-10). The sample data reveals a strong contribution from a large number of other species. However, in terms of ground cover (the attribute used by the NVC), no other species with the exception of *Elytrigia juncea* scores more than 3 on the DOMIN scale. For this reason, both groups are best accomodated within the **SD6 *Ammophila arenaria* mobile dune community.** The *Ammophila* group is assigned to the SD6e *Festuca rubra* sub-community. This is often transitional to the kind of vegetation found on the vegetated shingle area, and the two assemblages share many species. The *Carex arenaria* group is assigned to the SD6g *Carex arenaria* sub-community. This can be an extremely stable vegetation, and, in time, may gradually give way to the more acidophilous component of the vegetated shingle area.

Soil assessment

The soil substrate of the dune ridge was examined within each sample area. In the *Ammophila* group, the samples were of soft, coarse sand, with a small component of very fine shingle. In the *Carex arenaria* group of samples, the ridge was lower, and was composed of a similar, but sandier mix with fewer but larger stones. The ridge at samples 6-10 had a less definate boundary with the active shingle beach and a vegetative transition iin places with the flora of unvegetated shingle.

References

Avery BW (1980) *Soil Classification for England and Wales (higher categories).* Technical Monograph No. 14. Soil Survey of England and Wales, Harpenden.

Avery BW (1990) *Soils of the British Isles.* CAB International, Wallingford.

Hodge CAH, RGO Burton, WM Corbett, R Evans and RS Seale (1984) *Soil and their use in Eastern England.* Bulletin No. 13. Soil Survey of England and Wales, Harpenden.

Rodwell J ed. (2000) *British Plant Communities, Volume 5. Maritime communities and vegetation of open habitats.* Cambridge University Press, Cambridge.

Sneddon P, RE Randall (1993) *Coastal vegetated shingle structures of Great Britain: main report.* Joint Nature Conservation Committee, Peterborough,

Stace C (1991) *New Flora of the British Isles.* Cambridge University Press, Cambridge.

Stewart A et al. (1994) *Scarce plants in Britain.* Joint Nature Conservation Committee, Peterborough.

Walmsley CA and AJ Davy (1997) The restoration of coastal shingle vegetation: effects of substrate composition on the establishment of seedlings. *Journal of Applied Ecology* 34, 143-153.

Appendix 1 Possible soil types of the coastal vegetated shingle at Sizewell Beach

The following notes are from Avery (1980, 1990) and Hodge et al (1984).

The Soil Survey of England and Wales map Sizewell Beach within this soil association:

Sandwich Association 361
Deep non-calcareous sandy soils on sand dunes, marine shingle and related beach deposits. Soil profile development on the dunes is largely dependent upon the vegetation cover and the degree to which this has stabilised the dune system. The most extensive soil, Sandwich series, which belongs to the typical sand pararendzinas, is found on old fixed dunes. Younger, unstable dunes, particularly those nearest the sea, are unvegetated or only thinly colonised by marram grass and lyme grass. The shape of the dunes alters constantly as a result of wind erosion and here raw sands predominate. Soils of the Beckfoot series, typical sand-rankers, occur on stabilised non-calcareous dunes. As sand is blown onto fixed dunes, buried topsoils are widespread and it is common for several to occur in one profile where they form distinctive organic-rich layers.

Because surface horizons contain little clay and organic matter, the soils are easily eroded. Disturbance along paths and trackways through the dunes, usually to the beaches beyond, increases vulnerability to erosion in periods of strong winds.

Sandwich series Profile No. SN 69/0840 in sandy, stoneless drift.
Stabilised sand dune grassland with red fescue, restharrow, buttercup, moss, lichen, ribwort and viola (100% cover)
0-7cm Ah. Dark brown, stoneless fine sand; dry; very weakly developed fine subangulaar blocky; low packing density; very weak soil and ped strength; abuundant fine fibrous roots; non-calcareous; clear smooth boundary.
7-120cm Cu. Light brownish grey stoneless fine sand; slightly moist; single grain; low packing density; loose soil strength; few fine fibrous roots; slightly calcareous.

Beckfoot series Profile No. NY 05/9808 in sandy stoneless drift.
Lowland heath with ling, purple heather and gorse.
0-12cm Ah. Dark reddish brown sand; dry; single grain; low packing density; moderately weak soil strength; abundant very fine fibrous roots; smooth sharp boundary.
12-30cm BCu. Dark brown stoneless sand; dry; single grain; low packing density; moderately weak soil strength; common fine fibrous roots; gradual smooth boundary.
Etc.

Avery (1990) gives the following on soils of coastal sand and shingle:

Lithomorphic soil group
The key feature of these weakly developed soils is the presence of little altered regolith at shallow depth. These soils are restricted to young ground surfaces affected by recent erosion

or deposition. Rates of natural colonisation and consequent soil horizon developemnt depends on the supply of plant propagules, in inclination of the surface, the physical and chemical properties of the substrate, including its erodibility.

Two sub-groups are relevant to the Sizewell beach deposits: sandy regosols and rego-alluvial soils, where alluvium refers to marine sediments of Holocene age.

Sandy regosols

Avery (1990) includes in this sub-group all non-alluvial sandy soils, including those classed as sand-rankers and sand pararendzinas in England and Wales (Avery 1980). Sandy regosols so defined are widely distributed in coastal dunes and in relatively flat areas of blown sand which adjoin them in places on the landward side. The sandy subsurface horizons are often of considerable thickness but can rest on bedrock or a lithologically contrasting sediment such as beach shingle within 80 cm. Variants transitional to gley soils in which ochreous mottles indicative of periodic weteness appear between 40 and 80 cm occur in relatively low-lying sites in dune lows and in places where the sandy subsurface horizon overlies an impervious substratum. (Such as where dense packed sand and shingle have accumulated iron from crag sands.)

Raw sand and shingle surfaces behave as 'edaphic deserts' on account of their very small available water capacity. Nearly bare dune surfaces also undergo very large diurnal temperature fluctuations in dry sunny weather, but the temperature range decreases markedly with depth because of the small thermal conductivity of the sand. Similarly, the water content of deeper layers remains relatively constant because the coarse texture severaly limits upward movement, though once plants occupy the ground they quickly exhaust the small resrves of retained water in the subsoil. Following stabilisation of the surface beneath a closed vegetative cover, diurnal temperature fluctuations decrease and the total water holding capacity of the upper soil layer increases in close accordance with increases in organic matter content, but much of the extra water is retained at suctions too great for it to be available to plants.

Non-calcaric sandy regosols

These are the regosols in non-calcareous sands. One profile from the Sands of Forvie, Aberdeenshire (NK 016 276) offers one reference point for the Sizewell Beach soils (Avery 1990). It is summarised below.

Vegetation: *Calluna* dominant, with *Carex arenaria, Empetrum nigrum*, lichens (particularly *Cladonia sylvatica*) and the mosses *Hylocomium splendens* and *Pleurozium schreberi.*
L,F,H 0-6 cm. Mor humus
Ah/Ea 6-9 cm. Dark greyish brown sand with uncoated grains; abundant roots.
BC 9-50 cm. Brown to light yellowish brown sand; frequent roots.
Cu 50-86 cm. Light yellowish brown sand; occasional roots.
Avery (1980) classifies this soil as a typical sand-ranker; sandy stoneless drift (**Beckfoot series**).

MAP 1

MAP 1 SURVEY AREA

OS NORTH

British Energy

Mean Low Water

Mean High Water

10

9

2

0

Power Station

647000m

Sizewell B Reach Scale NTS (A3) Sketch No Sxb Beach 02

Appendix 2 Relevant sections of the Shingle Community Classification (Sneddon and Randall 1993)

Community division	Code	Shingle plant community	NVC code	Comments
2b.iii Moss-rich communities	SH85	*Pseudoscleropodium purum-Polypodium vulgare-Dicranum scoparium*	-	There is no clear NVC equivalent
	SH83	*Agrostis capillaris-Dicranum scoparium-Hypnum cupressiforme-Galium saxatile*	U4	
3d. *Festuca rubra* grasslands	SH68	*Festuca rubra-Plantago lanceolata-Poa pratensis*	SD8a	
	SH67	*Festuca rubra-Dactylis glomerata-Lolium perenne-Bromus hordeaceus*	SD8a	
	SH66	*Festuca rubra-Plantago lanceolata-Lotus corniculatus*	SD8a	
	SH65	*Festuca rubra-Achillea millefolium-Lotus corniculatus*	SD8a	
3e. Mixed grasslands	SH64	*Festuca rubra-Holcus lanatus-Plantago lanceolata-Rumex acetosa*	SD8	
	SH63	*Festuca rubra-Plantago lanceolata-Dicranum scoparium*	SD8a	
	SH62	*Festuca rubra-Agrostis stolonifera-Poa pratensis-Anthoxanthum odoratum*	SD8	
	SH62a	*Festuca rubra-Agrostis stolonifera-Poa pratensis-Anthoxanthum odoratum, Trifolium repens* sub-comm	SD8	
	SH60	*Agrostis stolonifera-Holcus lanatus-Trifolium repens-Plantago lanceolata*	SD8a	Contains more *Festuca rubra* and *Galium verum* than would be expected
	SH60a	*Agrostis stolonifera-Holcus lanatus-Trifolium repens-Plantago lanceolata, Poa trivialis* and *Lolium perenne* sub-comm	-	No clear NVC equivalent
3f. Sandy grasslands	SH61	*Festuca rubra-Anthoxanthum-Lotus corniculatus*	SD12a	This is not a close match
	SH59	*Ammophila arenaria-Carex arenaria-Festuca rubra*	SD7	
	SH58	*Ulex europaeus-Festuca rubra-Poa pratensis*	SD7	Closest match but with additional *Ulex europaeus*
	SH57	*Festuca rubra-Poa pratensis-Ammophila arenaria-Carex arenaria*	SD8	
	SH56	*Festuca rubra-Peltigera canina-Senecio jacobaea*	SD12	Has *F. rubra* instead of *F. ovina*
	SH56a	*Festuca rubra-Peltigera canina-Senecio jacobaea, Armeria maritima-Sedum acre* sub-comm	SD12	Has *F. rubra* instead of *F. ovina*
	SH55	*Holcus lanatus-Agrostis capillaris-Ammophila arenaria-Hypochaeris radicata*	SD7	The closest match but more species-rich

4a.i Mature grasslands – *Festuca rubra*	SH51	*Cladonia furcata-Festuca rubra-Cochlearia danica*	MC5	This is not a close match
	SH50	*Festuca rubra-Aira paecox-Plantago coronopus*	MC5	
	SH49	*Festuca rubra-Lotus corniculatus-Thymus praecox arcticus-Cladonia furcata*	SD7/CG7	Intermediate between SD7 and CG7
	SH48	*Festuca rubra-Hypnum cupressiforme-Lotus corniculatus-Plantago lanceolata*	SD7	
	SH47	*Festuca rubra-Lotus corniculatus-Plantago lanceolata*	SD8a	
	SG46	*Festuca rubra-Ceratodon-Sedum* spp.	SD7	The closest match but there is no *Ammophila arenaria* in SH46
	SH45	*Vulpia bromoides-Bromus hordeaceus-Hypochaeris radicata*	U1f	This is not a close match
4a.ii Mature grasslands – *Dicranum scoparium*	SH44	*Dicranum scoparium-Rumex acetosella-Aira praecox*	U1	The closest match but *F. rubra* substitutes for *F. ovina*
	SH43	*Dicranum scoparium-Festuca rubra-Plantago lanceolata*	SD7	
	SH43a	*Dicranum scoparium-Festuca rubra-Plantago lanceolata, Sedum anglicum* sub-comm	-	No clear NVC equivalent
	SH42	*Dicranum scoparium-Cladonia impexa-Festuca rubra*	H11	The closest match but SD42 contains less *Calluna vulgaris* and *Carex arenaria* than expected
4b.i Less mature grasslands – pure shingle	SH70	*Festuca rubra-Silene maritima-Lotus corniculatus*	SD7c	
	SH69	*Festuca rubra-Achillea millefolium-Lotus corniculatus-Silene maritima*	SD7c	
	SH54	*Festuca rubra-Plantago lanceolata-Lotus corniculatus*	SD8a	
	SH53	*Festuca rubra-Ononis repens-Anthyllis vulneraria*	SD7b	
	SH52	*Ammophila arenaria-Ceratodon purpureus*	SD6	

Brooke House, Ashbocking, Ipswich IP6 9JY
Tel: 01473 890089 Fax: 01473 890165
Email: info@suffolkwildlife.cix.co.uk
Visit our Web site at: www.wildlifetrust.org.uk/suffolk

A company limited by guarantee no 695346 Registered charity no 262777

Sizewell C Hedgerow Assessment Survey

Methodology

A Hedgerows Regulations Assessment was conducted to determine the legislative status of the hedgerows (i.e. the status of each hedge with regards to the Hedgerows Regulations (1997) (Ref. 1) under the wildlife and landscape criteria) within the Sizewell C Main Development Site boundary. Further information on the Hedgerow Assessment are presented within Appendix 1. A survey of the hedgerows within the site boundary was undertaken in 2015.

Results

Table 1 presents the results of the important hedgerows recorded within the site boundary. A total of six important hedgerows were recorded within the site boundary.

Table 1. Hedgerow Regulations record sheets

Hedge No.	H1	H2	H3	H4	H5	H6
Important	✓	✓	✓	✓	✓	✓
Bridleway/path	✓	✓	✓	X	X	✓
Pn/Sot/Tic/Tip	X	X	X			
No. woody spp./30m	5	5	6	6	6	6
Bank/wall	X	X	X	X	X	X
Intact	✓	✓	✓	✓	✓	✓
Trees	✓	✓	✓	✓	✓	✓
3 flora spp.	X	X	X	X	X	X
Ditch	X	X	X	X	X	X
Connect ≥ 4 points	✓	✓	✓	✓	✓	✓
Parallel hedge	✓	✓	✓	X	X	X
Woody spp present	Ulm Sn Cm Qu Ps	Ulm Sn Cm Qu Ps	Qu Sn Cm Ps Fe Rosa	Ulm Ac Fe Ps Qu Sn	Ulm Ac Fe Ps Qu Sn	Qu Sn Cm Ps Fe Rosa
Ground flora (dominant)	Ud Alexanders					

Other ground flora inc notable spp						
Notes						

References

Ref. 1 Anon (1997) The Hedgerows Regulations Accessed on-line at http://www.legislation.gov.uk/uksi/1997/1160/contents/made

Appendix 1 - Hedgerow Regulations Assessment Details

Accompanying Notes for Hedgerows Regulations (1997) Record Sheet

These Regulations only apply to hedgerows adjacent to land in agricultural/horticultural use. A hedgerow may be classified as 'important' for archaeological/historical reasons, or according to Wildlife and Landscape criteria. To be classified as 'important' under the Wildlife and Landscape criteria, the hedgerow must be over 30 years old and should comprise one of the following:

- *at least 7 woody species/30m;
- *at least 6 woody species/30m and at least 3 features;
- *at least 6 woody spp/30m including any one of Pn/Sot/Tic/Tip (see below);
- *at least 5 woody species and at least 4 features;
- or if adjacent to a bridleway/footpath, at least 4 woody species and at least 2 features.

*If the hedgerow is situated wholly or partly in one of the counties listed in Criteria 7 sub-paragraph (2) of the Regulations, the number of woody species should be reduced by one.

(N.B. A hedgerow may also be classified as 'important' due to the presence/recorded presence of particular animal and plant species (see Criteria 6 sub-paragraphs (1)-(4) of the Regulations for details).)

The **woody species** 'recognised' by the Hedgerows Regulations are listed below, along with the species codes to be used on the record sheet:-

Spp code	Latin name	English name	Spp code	Latin name	English code
Ac	*Acer campestre*	Field Maple	**Pa**	*Prunus avium*	Wild Cherry
Ag	*Alnus glutinosa*	Alder	**Pp**	*Prunus padus*	Bird Cherry
Bpe	*Betula pendula*	Silver Birch	**Ps**	*Prunus spinosa*	Blackthorn
Bpu	*Betula pubescens*	Downy Birch	**Pyc**	*Pyrus communis*	Pear
Bxs	*Buxus sempervirens*	Box	**Qp**	*Quercus petraea*	Sessile Oak
Cb	*Carpinus betulus*	Hornbeam	**Qr**	*Quercus robur*	Pedunculate Oak
Cos	*Cornus sanguinea*	Dogwood	**Rc**	*Rhamnus catharticus*	Buckthorn
Ca	*Corylus avellana*	Hazel	**Ruv**	*Ribes uva-crispa*	Gooseberry
Cla	*Crataegus laevigata*	Midland Hawthorn	**Ros**	*Rosa* sp(p)	Rose
Cm	*Crataegus monogyna*	Hawthorn	**Rac**	*Ruscus aculeatus*	Butcher's-broom
Cys	*Cytisus scoparius*	Broom	**Sx**	*Salix* sp(p)	Willow
Dl	*Daphne laureola*	Spurge-laurel	**Sxv**	*Salix viminalis*	Osier
Ee	*Euonymus europaeus*	Spindle	**Sn**	*Sambucus nigra*	Elder
Fs	*Fagus sylvatica*	Beech	**Sac**	*Sorbus aucuparia*	Rowan
Fa	*Frangula alnus*	Alder Buckthorn	**Sor**	*Sorbus* sp(p)	Whitebeam
Fe	*Fraxinus excelsior*	Ash	**Sot**	*Sorbus torminalis*	Wild Service-tree
Hr	*Hippophae rhamnoides*	Sea-buckthorn	**Tb**	*Taxus baccata*	Yew
Ia	*Ilex aquilfolium*	Holly	**Tic**	*Tilia cordata*	Small-leaved Lime
Jr	*Juglans regia*	Walnut	**Tip**	*Tilia platyphyllos*	Large-leaved Lime
Jc	*Juniperus communis*	Common Juniper	**Ue**	*Ulex europaeus*	Gorse
Liv	*Ligustrum vulgare*	Wild Privet	**Ug**	*Ulex gallii*	Western Gorse
Ms	*Malus sylvestris*	Crab Apple	**Umi**	*Ulex minor*	Dwarf Gorse
Pal	*Populus alba*	White Poplar	**Um**	*Ulmus* sp(p)	Elm
Pn	*Populus nigra sub-species betulifolia*	Black-poplar	**Vl**	*Viburnum lantana*	Wayfaring-tree
Pot	*Populus tremula*	Aspen	**Vop**	*Viburnum opulus*	Guelder Rose
Pcan	*Populus x canescens*	Grey Poplar			

The presence of a number of **features** along a hedgerow influences the classification under the Regulations. The terms used on the record sheet are explained below, and their presence is indicated by a '✓':

Bank/wall	The hedgerow is supported along at least half of its length by a bank/wall.
Intact	The hedgerow contains less than 10% gaps along its length.
Trees	The hedgerow supports at least 1 standard tree per 50 m length of hedgerow (standard trees are defined as those which when measured at 1.3m above ground level have a diameter of at least 20 cm, or 15 cm for multi-stemmed trees).
3 flora spp.	The hedgerow supports at least 3 of the valuable ground flora species defined by the Regulations. The hedgerow is considered to support a plant if it is rooted within 1m (in any direction) of the hedgerow.
Ditch	There is a ditch along at least half of the length of the hedgerow.
Connections ≥ 4 points	A hedgerow must score 4 or more 'connections points', where connections with an adjoining hedgerow(s) score 1 point each, and a connection with a pond or woodland (in which the majority of the trees are broad-leaved)scores 2 points each. A hedgerow is considered to be connected if it meets the feature, or if it has a point within 10 m of it and would meet it if the line of the hedgerow continued.
Parallel hedge	A parallel hedgerow is present within 15m.

An explanation of additional terms used on the Hedgerows Regulation Record Sheet follows:

Hedge No.	Hedgerow Number (within survey area/ site)
Important	Would the hedgerow be classified as 'important' under the Hedgerows Regulations?
Bridleway/path	The hedgerow runs parallel to a designated bridleway/footpath.
Pn/Sot/Tic/Tip	The presence of these trees within the hedgerow influences the classification. An explanation of the species codes is shown above.
Woody species	A list of the woody species found along the hedgerow (this is likely to list more species than are present along 30 m length(s)).
Ground flora spp.	A list of any dominant/ notable ground flora species recorded along the hedgerow.

Valuable ground flora species with regard to the Hedgerows Regulations (1997)

Adoxa mochatellina	Moschatel
Ajuga reptans	Bugle
Allium ursinum	Ramsons
Anemone nemorosa	Wood Anemone
Arum maculatum	Lord's-and-Ladies
Athyrium filix-femina	Lady-fern
Blechnum spicant	Hard Fern
Brachypodium sylvaticum	False-brome
Bromus ramosa	Hairy Brome
Campanula latifolia	Great Bell-flower
Campanula trachelium	Nettle-leaved Bellflower
Carex sylvatica	Wood Sedge
Circaea lutetiana	Enchanter's Nightshade
Common Polypody	Polypodium vulgare
Conopodium majus	Pignut
Dryopteris affinis	Scaly Male-fern
Dryopteris carthusiana	Narrow Buckler-fern
Dryopteris filix-mas	Male-fern
Epipactis helleborine	Broad-leaved Helleborine
Equisetum sylvaticum	Wood Horsetail
Euphorbia amygdaloides	Wood Spurge
Festuca gigantea	Giant Fescue
Fragaria vesca	Wild Strawberry
Galium odoratum	Woodruff
Galium saxatile	Heath Bedstraw
Geranium robertianum	Herb-Robert
Geum urbanum	Wood Avens
Hyacinthoides non-scripta	Bluebell
Lamiastrum galeobdolon	Yellow Archangel
Lathraea squamaria	Toothwort
Luzula sylvatica	Greater Wood-rush
Lysimachia nemorum	Yellow Pimpernel
Melampyrum pratense	Common Cow-wheat
Melampyrum sylvaticum	Small Cow-wheat
Melica uniflora	Wood Melick
Mercurialis perennis	Dog's Mercury
Milium effusum	Wood Millet
Orchis mascula	Early –purple Orchid
Oxalis acetosella	Wood Sorrel
Paris quadrifolia	Herb Paris
Phyllitis scolopendrium	Hart's-tongue
Poa nemoralis	Wood Meadow-grass
Polypodium vulgare	Polypody
Polystichum aculeatum	Hard Shield-fern
Polystichum setiferum	Soft Shield-fern
Potentilla erecta	Potentilla erecta
Potentilla sterilis	Barren Strawberry
Primula elatior	Oxlip
Primula vulgaris	Primrose
Ranunculus auricomus	Goldilocks Buttercup
Sanicula europaea	Sanicle
Teucrium scorodonia	Wood Sage
Veronica montana	Wood Speedwell
Viola odorata	Sweet Violet
Viola reichenbachiana	Early Dog-violet
Viola riviniana	Common Dog-violet

Sizewell C Arable Weed Survey

Methodology

1.1.1 To confirm the presence or absence of scare weed species within the arable field margins of the Sizewell C Main Development Site, an arable weed survey was undertaken on the 28 April 2015, repeated at the end of July 2015. The survey work was undertaken by Mark Lang, MCIEEM, CENV.

1.1.2 The survey involved a walk along the margins of all arable fields within the northern part of the EDF Energy Sizewell Estate, and recording the weed species present. Since the arable weed species were sparse in distribution, a single list of species was compiled, rather than a separate species list for each individual field. The species data was then reviewed against guidance produced by Plantlife (Byfield & Wilson, 2005) to allow a score equating to the conservation value of sites for arable weeds to be calculated. A threshold score of below 20 would indicate local importance, 20 to 34 would indicate a site of **County** Importance, 35-69 **National** Importance, and 70+ **European** Importance.

Results

1.1.3 The arable margins were largely devoid of weed species, the arable crops being intensively managed and treated with herbicide. Weeds were restricted to small areas where crops and failed to establish; however, the light sandy soils present do provide suitable habitat for the establishment of arable weed species.

1.1.4 Small Nettle (*Urtica urens*), Fat-hen (*Chenopodium album agg.*) and Scented Mayweed (*Matricaria recutita*) were the dominant weed species recorded, with all other weed species much more sparsely distributed. The weed species recorded, and the associated threshold scores, are presented below in **Table 1**. Photographs of the margins are presented in **Appendix 1**, whilst the fields surveyed are shown on **Figure 1**, in **Appendix 2**.

Table 1 Conservation value scores for arable weed species recorded

Weed Species Recorded	Plantlife Score
Corn Spurrey (*Spergula arvensis*)	7
Wild Pansy (*Viola tricolor*)	6
Knotted Hedge-parsley (*Torilis nodosa*)	3
Common Stork's-bill (*Erodium cicutarium agg.*)	1
Bugloss (*Anchusa arvensis*)	1
Groundsell (*Senecio vulgaris*)	No score
Common Field-speedwell (*Veronica persica*)	No score
Scented Mayweed (*Matricaria recutita)*	No score
Small nettle (*Urtica urens*),	No score
Fat-hen (*Chenopodium album agg.*)	No score
Buck's-horn Plantain (*Plantago coronopus*)	No score
Field Penny-cress (*Thlaspi arvense*)	No score

Weed Species Recorded	Plantlife Score
Parsley-piert (*Aphanes arvensis*)	No score
Bird's-foot *(Ornithopus perpusillus*)	No score
Common Fiddleneck (*Amsinckia micrantha*)	No score
Dove's-foot Crane's-bill (*Geranium molle*)	No score
Springbeauty (*Claytonia perfoliata*)	No score
Shepherd's Cress (*Teesdalia nudicaulis*)	No score
Red Dead-nettle (*Lamium purpureum*)	No score
Score	**18**

Conclusions

1.1.5 The arable weed assemblage does not meet the threshold for a site of County Importance (Byfield & Wilson, 2005). On the basis of the above it is considered that the arable weed assemblage present is of local conservation value only.

References

Byfield, A.J. and Wilson, P.J. (2005). Important Arable Plant Areas: Identifying Priority Sites for Arable Plant Conservation in the United Kingdom. Plantlife International, Salisbury UK.

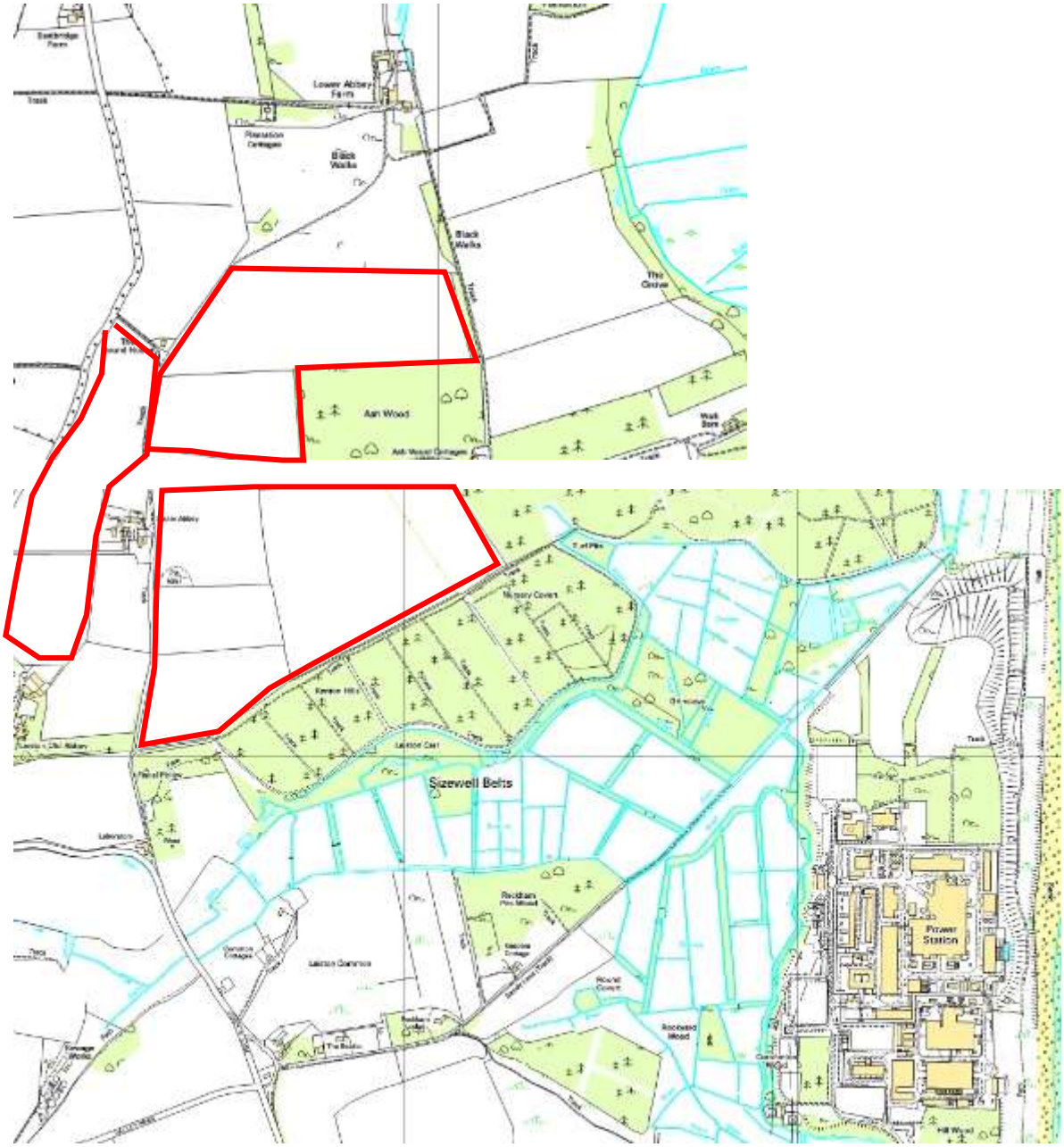
Appendix 1

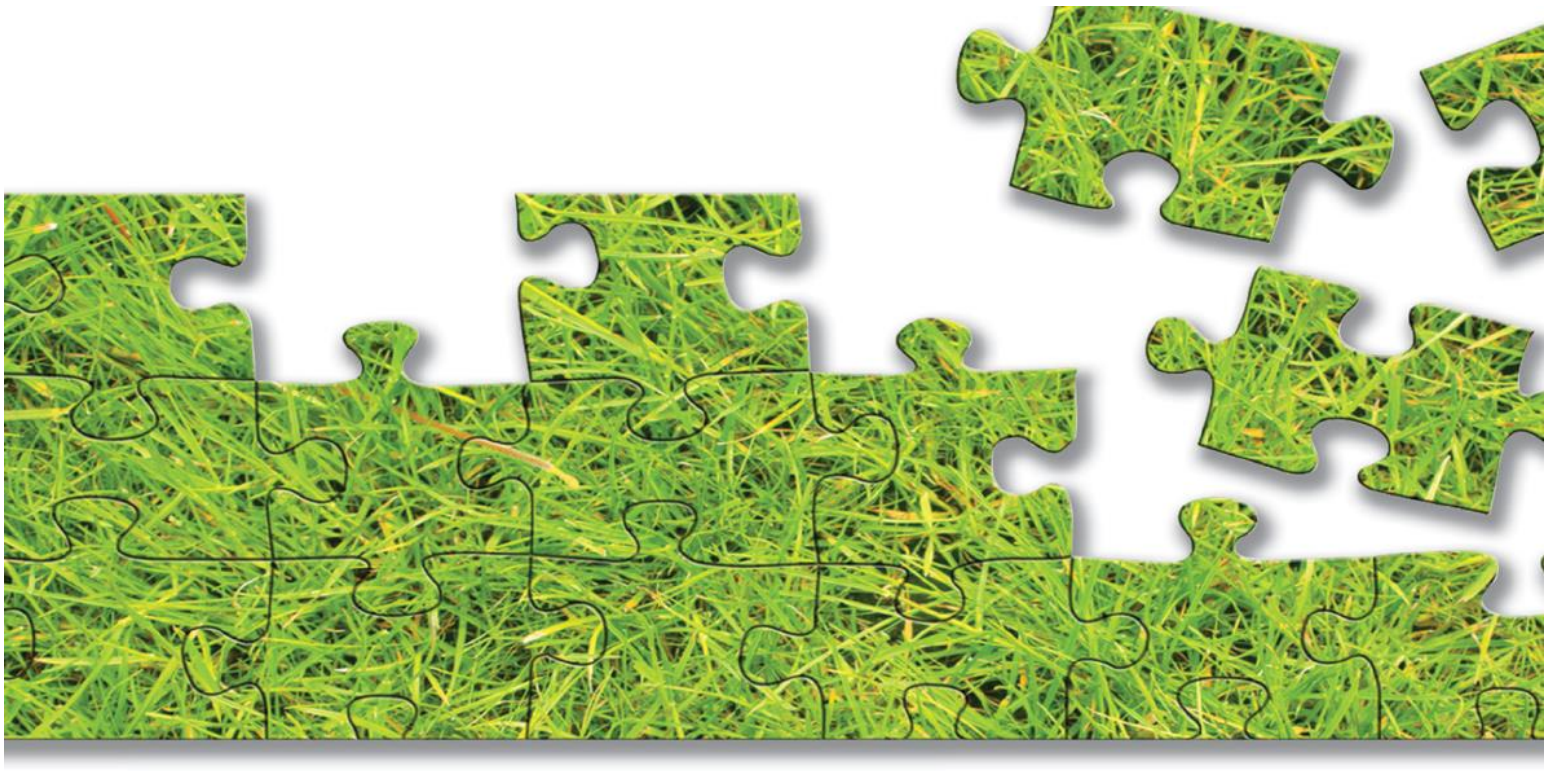
Photographs of the margins within the northern part of the EDF Energy Sizewell Estate

Typical arable margins within the northern part of the EDF Energy Sizewell Estate

Appendix 2

Location of arable margins surveyed located within the northern part of the EDF Energy Sizewell Estate.





VEGETATION SURVEY & ASSESSMENT

SIZEWELL C NUCLEAR POWER STATION

BASELINE BRYOPHYTE ASSESSMENT

A REPORT PREPARED FOR HYDER CRESSWELL LTD

July 2015

CONTENTS

Sharon Pilkington BSc (Hons) MSc CEnv MCIEEM
Vegetation Survey & Assessment Ltd
66 Newtown
Westbury
Wiltshire
BA13 3EF

Tel: 01373 827074
Mob: 07801 627449
www.vegetationsurvey.co.uk

1. SUMMARY

An assessment of the communities of bryophyte in habitats within a zone of likely nitrogen deposition from Sizewell C Power Station emissions evaluated dune grassland, sand dune, woodland and vegetated shingle.

Bryophytes were found to be a significant component of some of these habitats, especially in dune grassland within part of Minsmere to Walberswick Heaths and Marshes SAC, where cover of ground-dwelling mosses was typically 30% or more. However, the bryophyte communities lacked the diversity of the associated vascular plants and species found were considered to be relatively common and widespread species.

A review of species-specific nitrogen (fertility) values confirmed that the characteristic mosses of the dune grassland, which was by far the most extensive kind of vegetation in the study area, were restricted to habitats with low or very low soil fertility. Although there has been some research into the effects of nitrogen deposition on bryophytes, it has not always been directly relevant to the bryophyte-supporting habitats assessed in the current survey. However, given what is known about the response of bryophytes to nutrient enrichment, it was concluded that dune grassland and sand-dune species are likely to be very sensitive to increased nitrogen deposition and that long-term operation of Sizewell C may prompt a shift to bryophytes characteristic of more fertile places within these vegetation types.

2. INTRODUCTION

Vegetation Survey & Assessment Ltd (hereafter referred to as 'VSA') was commissioned by Hyder Cresswell Ltd to assess the nature and value of bryophyte communities in part of Minsmere to Walberswick Heaths and Marshes Special Area of Conservation (SAC) and in undesignated habitats close to Sizewell B Power Station. A key objective of the assessment was to identify any species/communities of moss or liverwort that would be sensitive to elevated levels of atmospheric pollutants calculated to be emitted during the operational phase of the proposed new Sizewell C Nuclear Power Station.

3. METHODS

The survey was undertaken over the period 22 – 24 June 2015 when weather conditions were fine and dry. An initial walkover of the defined survey area (Figure 1) defined particular vegetation communities where bryophytes were present and where survey effort should be sampled. These included:

- Dune grassland;
- Sand-dunes;
- Vegetated shingle; and
- Woodland.

Reed-bed was also present but after an initial visual evaluation, was considered to support few, if any bryophytes and was therefore not sampled.

Various localities within each habitat were sampled in order to gain a comprehensive baseline of the species present. This involved recording the presence and estimated abundance[1] of all mosses and liverworts within a 2-3m radius of a number of sampling points within representative areas of different vegetation stands. A hand-held GPS receiver (Garmin eTrex HCX) connected to the European Geostationary Navigation Overlay Service (EGNOS) was used to record such areas; when the receiver's averaging function is used (as it was for the current survey) it is generally accurate to within 2-3 m.

[1] Measured using the DAFOR scale where D=Dominant; A=Abundant; F=Frequent; O=Occasional; R=Rare.

All species of bryophyte were identified where possible in the field. Samples of some particularly small and/or difficult species were collected and verified under the microscope later.

Nomenclature used for bryophytes in this report follows Hill *et al* (2008), whilst vascular plants follow Stace (2010).

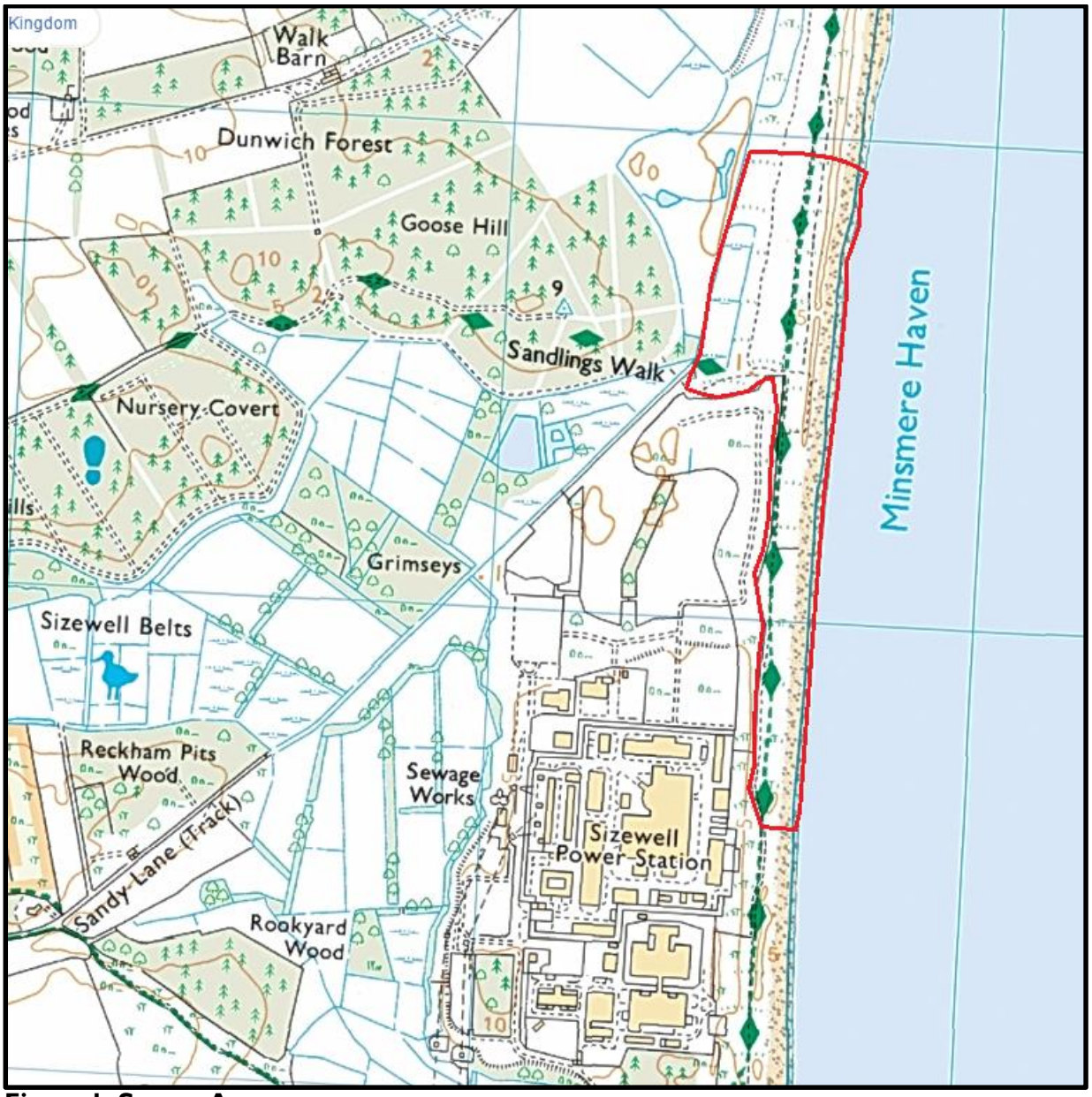


Figure 1. Survey Area

4. RESULTS

A total of 23 sampling points were recorded across the survey area; 13 from dune grassland including 6 from trampled ground/unmade tracks; 7 from sand-dunes, 1 from vegetated shingle on the beach and 2 from woodland. All sampling points are shown in Figure 2.

4.1 Bryophyte Communities

Tabulated results by vegetation type are presented as Appendix I, with the bryophyte communities described subjectively in Sections 4.1.1 to 4.1.4. In total, 26 bryophytes (24 mosses and 2 liverworts) were recorded across all habitats.

4.1.1 Dune Grassland

SAC Grassland

The majority of the survey area comprised acid dune grassland which occupied level to slightly undulating ground behind the dune ridge. Its structure and floristic composition varied greatly and samples were taken from representative stands, including relatively undisturbed grassland, trampled ground in unmade tracks and paths across it and shingle-sided depressions within it (these are probably remnants of shell craters).

On the whole, the dune grassland within the SAC was less disturbed than its counterpart to the south. It also supported a scattered element of dwarf shrub heath comprising mature bushes of *Calluna vulgaris* (Ling) and *Erica cinerea* (Bell Heather), which were absent to the south. Samples 01, 04 and 06 were taken in undisturbed SAC grassland and confirmed the presence of a well-developed bryophyte element (often with cover >30%) though lacking species diversity. 9 mosses were recorded, the most abundant of which were *Dicranum scoparium*, *Campylopus introflexus* and *Hypnum cupressiforme* var. *lacunosum*. *Pseudoscleropodium purum*, *Polytrichum juniperinum* and *Hypnum jutlandicum* were more local.

These bryophytes were characteristic of acid dune grassland among a sparse community of vascular plants e.g. *Festuca ovina* (Sheep's-fescue), *F. filiformis* (Fine-leaved Sheep's-fescue), *Anthoxanthum odoratum* (Sweet Vernal-grass), *Carex arenaria* (Sand Sedge), *Agrostis capillaris* (Common Bent), *Rumex acetosella* (Sheep's Sorrel) and *Hypochaeris radicata* (Cat's-ear).

Disturbed ground in tracks across the SAC dune grassland (Plate 1) supported nearly all of same species, though most were less abundant than in adjacent undisturbed grassland. Sample numbers 02, 03, 07 and 10 were located in this microhabitat. *Campylopus introflexus* was particularly abundant, along with *D. scoparium*, *H. cupressiforme* var. *lacunosum* and *P. juniperinum*.

Plate 1. This track at Sample no. 03 supported high cover of mosses

Other Grassland

Dune grassland between the sand dunes and the perimeter fence of Sizewell B Power Station was more variable than its counterpart in the SAC and may have been reprofiled in the past. There were significant areas of shingle-rich ground (including within probable shell craters) indicated by a very diverse high plant and lichen community (samples 12, 13 and 15) as well as longer, species-poor grassland dominated by mixtures of grasses with few bryophytes (sample 23).

Despite its rich higher plant vegetation, the shingle-rich dune grassland supported a small number of bryophytes (6), the commonest of which was *H. cupressiforme* var. *lacunosum*, which characteristically formed quite large mats on the ground. It was frequently joined by *D. scoparium* and *P. juniperinum*, whilst both *Bryum capillare* and *Ceratodon purpureus* occurred in small patches. Vascular associates of these bryophytes included *Sedum anglicum* (English Stonecrop), *A. odoratum*, *F. ovina*, *Ononis repens* (Common Restharrow), *R. acetosella*, *Pilosella officinarum* (Mouse-ear Hawkweed), *Aira praecox* (Early Hair-grass), *Galium verum* (Lady's Bedstraw) and *Rhinanthus minor* (Yellow-rattle). Plate 2 shows a typical example of this grassland.

Plate 2. *Dicranum scoparium* and *Hypnum cupressiforme* var. *lacunosum* were abundant at Sample no. 12

Closed-sward dune grassland was typically very poor in bryophytes. Sample 23, for example, only supported 3 mosses: the large pleurocarps *P. purum* and *H. cupressiforme* var. *lacunosum* sprawling among the grasses, accompanied by scattered *D. scoparium*.

Trampled ground across the dune grassland was represented by samples 18 and 20. This micro-habitat supported very few bryophytes; like the adjacent dune grassland *H. cupressiforme* var. *lacunosum* formed extensive mats where levels of trampling were not too high. *P. juniperinum* and *C. purpureus* were frequent associates, whilst small colonies of the acrocarpous moss *Syntrichia ruralis* var. *ruraliformis* appeared occasionally. Because of the trampling, there was considerable bare ground in the tracks and the vascular community was quite sparse. Among the species present were *C. arenaria*, *Phleum arenarium* (Sand Cat's-tail), *Festuca rubra* (Red Fescue), *Jasione montana* (Sheep's-bit), mouse-ears (*Cerastium* spp.), *O. repens* and *Trifolium arvense* (Hare's-foot Clover).

4.1.2 Sand Dune

A narrow dune ridge of dunes occupied the length of the survey area, delimiting the shingle beach from dune grassland behind. In the part of the SAC that was surveyed, the dunes were poorly developed and very narrow; it is possible that erosion had been at work here. Further south (outside the SAC) the dunes were better developed and supported more intact examples of dune vegetation. Most bryophyte sampling locations (11, 14, 16, 17, 19 and 21) were therefore outside the SAC.

Much of the bryophyte interest of the dunes was confined to informal foot tracks or areas where the dune face had been grazed low by Rabbits *Oryctolagus cuniculus* (Plate 3). Elsewhere, the tall grasses of the dunes were too dense to allow much bryophyte interest among them. The dune bryophyte community was a little more diverse than that of the dune grassland, with a total of 12 mosses recorded there. These included the majority of the species present in the dune grassland (with the exception of *Dicranella heteromalla*) together with a few additional species. Five species were particularly characteristic of the sand-dune community: *Brachythecium rutabulum, B. albicans*, *B. capillare*, *D. scoparium* and *P. purum*.

The bryophytes grew within a diverse matrix of vascular species including *C. arenaria*, *Glaux maritima* (Sea-milkwort), *A. capillaris*, *A. praecox*, *Ammophila arenaria* (Marram), *Elytrigia juncea* (Sand Couch), *G. verum*, *F. rubra* and many others.

Plate 3. *Bryum capillare* and *Brachythecium albicans* were very frequent in disturbed places in the dunes as here at Sample no. 21

4.1.3 Vegetated Shingle

The vegetated shingle strand-line community was well-developed only on the beach near Sizewell B Power Station and was not present within the part of the SAC that was surveyed. Although rich in definitive shingle plants, this vegetation community mostly lacked bryophytes, except in a few places where it was consolidated with a little sand. As such, only 1 sample (no. 22) was recorded – see Plate 4. It supported a community of 5 mosses, 3 of which – *B. albicans*, *B. capillare* and *S. ruralis* var. *ruraliformis* – occurred at quite high cover in that particular locality. *C. purpureus* and *Bryum algovicum* var. *rutheanum* were occasional associates.

Associated vascular species within this shingle community included *F. rubra*, *E. juncea*, *Lathyrus japonicus* (Sea Pea), *Silene uniflora* (Sea Campion), *Vulpia fasciculata* (Dune Fescue), *Leontodon saxatilis* (Lesser Hawkbit), *Rumex crispus* ssp. *littoreus* (Curled Dock), *Glaucium flavum* (Yellow Horned-poppy) and *Crambe maritima* (Sea-kale).

Plate 4. Sample no. 22 supported a restricted community of bryophytes in shingle vegetation

4.1.4 Woodland

Woodland was not a major habitat within the survey area but nonetheless a belt of mixed plantation grading into willow carr at the edge of reed-bed habitat in the SAC was sampled in two places (sample no's 08 and 09). 9 mosses and 1 liverwort were recorded, 8 of which were epiphytes growing on the trunks and branches of trees and shrubs in the woodland. Bryophytes were quite sparse in the woodland, with many trees supporting no bryophytes or only a few. However, several species were relatively common, including *Orthotrichum affine*, *Metzgeria furcata*, *Cryphaea heteromalla* and *Hypnum* cf. *andoi*.

Bryophytes were most frequent on *Salix cinerea* (Grey Willow) growing close to the reed-bed, especially where wet channels lay below the canopy, raising local humidity. Sample no. 08 was recorded within a strip of mixed plantation dominated by *Betula* spp. (birches), *Pinus* spp. (pines) and *Ulex europaeus* (Gorse) where many trees and shrubs were devoid of epiphytes. Sample 09 was from more humid *S. cinerea* carr and recorded more species, including *Orthotrichum striatum*, an uncommon but increasing epiphyte in Suffolk.

4.2 Bryophyte Species

In total, 26 bryophytes (24 mosses and 2 liverworts) were noted in the different kinds of vegetation that were sampled. Table 1 lists these species with an indication of current national status according to Blockeel et al (2014).

Table 1. Species of moss and liverwort present in the Survey Area

Species	National Status	Remarks
Brachythecium albicans	Common	
Brachythecium rutabulum	Common	
Bryum algovicum var. rutheanum	Frequent	Most characteristic of coastal sand habitats
Bryum capillare	Common	
Campylopus introflexus	Common	Introduced moss
Campylopus pyriformis	Common	
Ceratodon purpureus	Common	
Cryphaea heteromalla	Common	Epiphyte with high sensitivity to airborne SO_2
Dicranella heteromalla	Common	
Dicranum scoparium	Common	
Hypnum cupressiforme cf. andoi	Common	
Hypnum cupressiforme var. lacunosum	Common	
Hypnum jutlandicum	Common	
Kindbergia praelonga	Common	
Leptodictyum riparium	Common	
Metzgeria furcata	Common	
Orthotrichum affine	Common	
Orthotrichum diaphanum	Common	
Orthotrichum striatum	Common	Epiphyte with high sensitivity to airborne SO_2; Most common in N and W Britain but increasing in the east
Oxyrrhynchium hians	Common	
Polytrichum juniperinum	Common	
Pseudoscleropodium purum	Common	
Radula complanata	Common	Epiphyte with high sensitivity to SO_2 and some other airborne pollutants
Syntrichia ruralis var. ruraliformis	Common	Most characteristic of coastal sand habitats
Syntrichia ruralis var. ruralis	Common	
Ulota bruchii	Common	

5. DISCUSSION

5.1 Nitrogen Requirements

Bryophytes are among the most sensitive components of vegetation communities with respect to pollutant deposition and can be sensitive to nitrogen. Too much nitrogen can change morphology, often leading to growth-forms that are desiccation prone and less efficient at suppressing competitors; photosynthesis can be compromised along with membrane integrity and sexual reproduction may also be suppressed.

Ellenberg values for bryophytes are among the attribute data that has been published by the Centre for Ecology and Hydrology (Hill *et al* 2007). BRYOATT classifies species by a number of major scales (Ellenberg *et al* 1991) as modified by Hill *et al* (1999). Of relevance to this assessment is the scale for nitrogen (N), which is a general indication of fertility, grouping species associated with sites from the extremely infertile through to those of richly fertile places (Table 2).

Table 2. Ellenberg values of Nitrogen (N)

Code	Explanation
1	Species characteristic of extremely infertile sites; almost all are calcifuges but there are a few exceptions.
2	Indicator of infertile sites; these include calcifuges, middling species and calcicoles.
3	Indicator of moderately infertile sites; these include a range of calcifuges, middling species and calcicoles
4	Between 3 and 5; these plants are found mainly in the lowlands but include calcifuges as well as species of more basic substrates.
5	Indicator of moderately fertile sites; these are almost without exception lowland species with a few calcifuges but most are tolerant of basic conditions.
6	Between 5 and 7; these are mostly plants of eutrophic lowlands, apart from a few taxa on upland dung and carcases.
7	Species characteristic of richly fertile places.

Table 3 lists the values of N given by Hill *et al* (2007) for all of the bryophytes found in the current assessment, together with the habitat(s) which supported populations of each species and an estimate of the frequency of the species in those habitats. The more common species have been highlighted.

Table 3.

Species	Nitrogen N	Vegetation Classes	Estimated Frequency
Brachythecium albicans	3	Dune/Dune grassland	Locally frequent
Brachythecium rutabulum	6	Dune	Rare
Bryum algovicum var. rutheanum	4	Shingle	Rare
Bryum capillare	4	Dune/Dune grassland/Shingle	Frequent in dunes
Campylopus introflexus	2	Dune/Dune grassland	Frequent
Campylopus pyriformis	2	Dune grassland	Rare
Ceratodon purpureus	3	Dune/Dune grassland/Shingle	Frequent
Cryphaea heteromalla	5	Woodland (epiphyte)	Occasional
Dicranella heteromalla	3	Dune grassland	Rare
Dicranum scoparium	2	Dune/Dune grassland	Very common
Hypnum cf. andoi	3	Woodland (epiphyte)	Rare
Hypnum cupressiforme var. lacunosum	2	Dune/Dune grassland	Common
Hypnum jutlandicum	2	Dune grassland	Locally common
Kindbergia praelonga	5	Dune/Woodland	Rare
Leptodictyum riparium	7	Woodland (ground)	Rare
Metzgeria furcata	3	Woodland	Occasional
Orthotrichum affine	5	Woodland (epiphyte)	Occasional
Orthotrichum diaphanum	5	Woodland (epiphyte)	Occasional
Orthotrichum striatum	4	Woodland (epiphyte)	Rare
Oxyrrhynchium hians	6	Dune	Rare
Polytrichum juniperinum	2	Dune grassland	Common
Pseudoscleropodium purum	3	Dune/Dune grassland	Locally frequent
Radula complanata	3	Woodland (epiphyte)	Rare
Syntrichia ruralis var. ruraliformis	3	Dune/Dune grassland/Shingle	Rare
Syntrichia ruralis var. ruralis	4	Dune	Rare
Ulota bruchii	4	Woodland (epiphyte)	Rare

Analysis of Table 3 shows that the range of N values across all species is large – from 2 up to 7. This is to be expected, as samples were taken from widely differing habitats. Wet woodland in particular is likely to have higher levels of soil fertility than dry open acid habitats and the bark of trees and shrubs is often naturally high in nitrogen and other plant nutrients. However, if dune grassland is considered to be the dominant vegetation type across the survey area, it can be seen that the species that are most characteristic i.e. *D. scoparium*, *H. cupressiforme* var. *lacunosum* and *C. introflexus* all have N values of 2-3, indicating a preference for infertile to moderately infertile sites.

5.2 Predicted Response to increased Nitrogen Deposition

The characteristics of certain kinds of vegetation can make them potentially sensitive to nutrient deposition. Habitats most likely to be sensitive to nutrient enrichment include those with low levels of nutrients in their soils, those dominated by stress tolerant species and those that depend on atmospheric inputs as their primary source of nutrients.

Stevens *et al* (2009) studied the nitrogen sensitivity of a number of habitats. They reasoned that coastal vegetated shingle is a pioneer community composed of many nutrient loving ruderal species. Close to the sea the nutrients are mainly supplied by organic matter deposited by the sea. Bryophytes (and vascular plants) in this community are therefore unlikely to be sensitive to atmospheric nitrogen deposition as the supply of nutrients is primarily driven by the sea.

The same researchers concluded that sand dunes are more sensitive to nitrogen deposition. They drew together a number of studies which demonstrated a negative relationship between (vascular) plant species richness and atmospheric nitrogen deposition, along with changes in species composition where certain species have been identified as being stimulated by deposition of airborne nitrogen. However, the equivalent response of sand-dune bryophytes was not described in any detail.

They did not analyse dune grassland but found that lowland dry acid grasslands – which are broadly equivalent in nutrient and soil reaction terms - are very sensitive to eutrophication. The soils are poorly buffered against changes in pH and toxic metals are commonly mobilised.

Other studies of lowland species have identified both nitrogen sensitive and nitrogen tolerant mosses. For example, Leith *et al* (2005) studied woodland affected by ammonia deposition and found *Kindbergia praelonga* and *Brachythecium rutabulum* tolerant of very high tissue nitrogen concentrations. The majority of bryophytes present in the woodlands in the survey area were epiphytes, growing directly on the bark of trees and shrubs and more typical of moderately fertile conditions. These species are therefore much more likely to be tolerant of slight increases in atmospheric nitrogen.

6. CONCLUSIONS

The current survey shows that dune grassland vegetation within both the SAC and elsewhere supports populations of common mosses which are strongly preferential to habitats which have infertile acid soils. These species are likely to be sensitive to increased nitrogen deposition from predicted Sizewell C emissions although it is not possible to quantify the predicted response. However, higher levels of atmospheric nitrogen deposition may promote a long-term decline in abundance of stress-tolerant species such as *D. scoparium*, *H. jutlandicum*, *H. cupressiforme* var. *lacunosum*, *B. albicans* and *C. purpureus* toward those which prefer more fertile conditions e.g. *B. rutabulum* and *K. praelonga*.

REFERENCES

Blockeel T.L, Bosanquet S.D.S., Hill M.O. and Preston C.D. 2014. **Atlas of British and Irish Bryophytes**. Pisces Publications.

Ellenberg H., Weber H.E., Düll R., Wirth V, Werner W. and Paulissen D. 1991. **Ziegerwerte von Pflanzen in Mitteleuropa**. Scripta Geobotanica, **18**, 1-248.

Hill M.O., Mountford J.O., Roy D.B. and Bunce R.G.H. 1999. **Ellenberg's indicator values for British plants. ECOFACT Volume 2 technical annex**. Institute of Terrestrial Ecology, Huntingdon.

Hill M.O., Preston C.D., Bosanquet S.D.S. and Roy D.B. 2007. BRYOATT: **Attributes of British and Irish Mosses, Liverworts and Hornworts**. Natural Environment Research Council.

Hill M.O., Blackstock T.H., Long D.G. and Rothero G.P. 2008. **A Checklist and Census Catalogue of British and Irish Bryophytes**. British Bryological Society.

Leith, I.D., van Dijk, N., Pitcairn, C.E.R., Wolseley, P.A., Whitfield, C.P. and Sutton, M.A. 2005. **Biomonitoring methods for assessing the impacts of nitrogen pollution: refinement and testing**. JNCC Report No. 386.

Stace C.A. 2010. **New Flora of the British Isles 3rd edition**. Cambridge University Press.

Stevens, C.J., Caporn, S.J.M., Maskell, L.C., Smart, S.M., Dise, N.B. and Gowing, D.J. 2009. **Detecting and attributing air pollution impacts during SSSI condition assessment**. JNCC Report No. 426.

APPENDIX I: SURVEY RESULTS

Sample no.	Vegetation type	Species	Abundance (DAFOR)
01	Dune grassland	Brachythecium albicans	R
		Campylopus introflexus	F
		Campylopus pyriformis	R
		Dicranella heteromalla	O
		Dicranum scoparium	A
02	Dune grassland (track)	Campylopus introflexus	A
		Campylopus pyriformis	O
		Ceratodon purpureus	O
		Dicranum scoparium	O
		Polytrichum juniperinum	F
03	Dune grassland (track)	Campylopus introflexus	F
		Ceratodon purpureus	O
		Dicranum scoparium	A
		Hypnum cupressiforme var. lacunosum	F
		Hypnum jutlandicum	O
		Polytrichum juniperinum	F
		Pseudoscleropodium purum	O
04	Dune grassland	Dicranum scoparium	A
		Pseudoscleropodium purum	A
05	Dune	Brachythecium rutabulum	F
		Bryum capillare	O
		Campylopus introflexus	O
		Ceratodon purpureus	O
		Dicranum scoparium	O
		Hypnum cupressiforme var. lacunosum	O
		Oxyrrhynchium hians	O
06	Dune grassland	Campylopus introflexus	O
		Dicranum scoparium	A
		Hypnum cupressiforme var. lacunosum	F
		Hypnum jutlandicum	R
		Polytrichum juniperinum	O
07	Dune grassland (track)	Campylopus introflexus	D
		Dicranum scoparium	F
		Hypnum cupressiforme var. lacunosum	A
		Hypnum jutlandicum	O
		Polytrichum juniperinum	A
08	Woodland	Cryphaea heteromalla	R
		Hypnum cf. andoi	O
		Metzgeria furcata	R
		Orthotrichum affine	R
		Ulota bruchii	R
09	Woodland	Cryphaea heteromalla	O
		Kindbergia praelonga	R
		Leptodictyum riparium	R
		Metzgeria furcata	O
		Orthotrichum affine	O
		Orthotrichum diaphanum	R
		Orthotrichum striatum	R
		Radula complanata	R

Sample no.	Vegetation type	Species	Abundance (DAFOR)
10	Dune grassland (track)	Bryum capillare	R
		Campylopus introflexus	O
		Ceratodon purpureus	F
		Dicranum scoparium	R
		Hypnum cupressiforme var. lacunosum	A
		Polytrichum juniperinum	A
		Pseudoscleropodium purum	R
11	Dune	Bryum capillare	O
		Campylopus introflexus	R
12	Dune grassland	Bryum capillare	O
		Ceratodon purpureus	O
		Dicranum scoparium	A
		Hypnum cupressiforme var. lacunosum	F
		Polytrichum juniperinum	R
		Pseudoscleropodium purum	O
13	Dune grassland	Bryum capillare	O
		Dicranum scoparium	A
		Hypnum cupressiforme var. lacunosum	F
		Polytrichum juniperinum	F
14	Dune	Brachythecium albicans	F
		Bryum capillare	R
		Kindbergia praelonga	O
		Pseudoscleropodium purum	F
15	Dune grassland	Hypnum cupressiforme var. lacunosum	A
		Polytrichum juniperinum	O
16	Dune	Brachythecium rutabulum	O
		Bryum capillare	F
		Ceratodon purpureus	O
		Dicranum scoparium	F
		Hypnum cupressiforme var. lacunosum	O
17	Dune	Brachythecium albicans	A
		Bryum capillare	F
		Campylopus introflexus	R
		Hypnum cupressiforme var. lacunosum	O
		Kindbergia praelonga	O
18	Dune grassland (track)	Ceratodon purpureus	F
		Hypnum cupressiforme var. lacunosum	A
		Polytrichum juniperinum	F
19	Dune	Brachythecium albicans	F
		Brachythecium rutabulum	F
		Bryum capillare	F
		Ceratodon purpureus	O
		Hypnum cupressiforme var. lacunosum	O
		Syntrichia ruralis var. ruraliformis	O
		Syntrichia ruralis var. ruralis	O
20	Dune grassland (track)	Hypnum cupressiforme var. lacunosum	D
		Syntrichia ruralis var. ruraliformis	R
21	Dune	Brachythecium albicans	O
		Bryum capillare	A
		Ceratodon purpureus	O
		Hypnum cupressiforme var. lacunosum	O
		Syntrichia ruralis var. ruraliformis	O

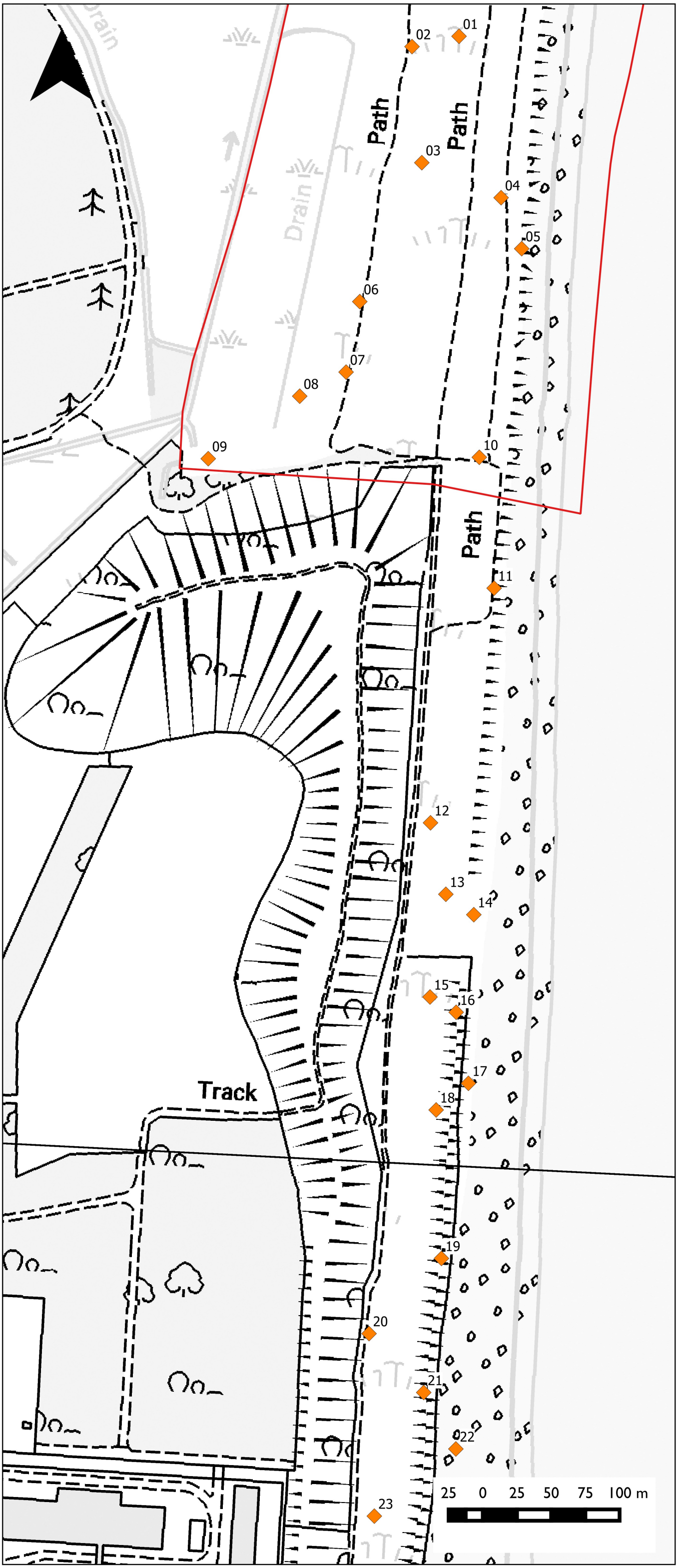
Sample no.	Vegetation type	Species	Abundance (DAFOR)
22	Vegetated shingle	Brachythecium albicans	F
		Bryum algovicum var. rutheanum	O
		Bryum capillare	A
		Ceratodon purpureus	O
		Syntrichia ruralis var. ruraliformis	F
23	Dune grassland	Dicranum scoparium	O
		Hypnum cupressiforme var. lacunosum	F
		Pseudoscleropodium purum	F

Sizewell C Bryophyte Assessment

Figure 2 Sampling Locations

Minsmere to Walberswick Heaths and Marshes SAC

Sample points



VEGETATION SURVEY & ASSESSMENT

Lichen Survey at Sizewell Power Station

Presented to Hyder / Arcadis

November 2015

Biocensus The Malt House, 17 – 20 Sydney Buildings, Bath, BA2 6BZ
Tel: 0845 459 4810 E-mail: enquiries@biocensus.co.uk; Website: www.biocensus.co.uk

Tables

Figures

Lichen Survey at Sizewell Power Station

Version 2a. 15.11.15

Author: A. Acton
Biocenus QA: G. Wilson

1 Summary

The diesel generators at the proposed Sizewell C Nuclear Power station will potentially have an impact on air quality in the vicinity. Lichens are widely acknowledged to be good indicators of air quality because many lichen species are sensitive to air-borne pollutants, especially sulphur dioxide (SO2) and atmospheric nitrogen compounds (e.g. Richardson, 1992). In 2015 Hyder / Arcadis commissioned Biocensus to conduct a lichen survey of an area that is most likely to be impacted by the operation of the diesel generators. The northern section of the study site lies within the Minsmere to Walberswick Heaths and Marshes Special Area of Conservation (SAC).

A range of habitats were surveyed in the study site. The main habitats with lichen interest were the dune grasslands, patches of dune heath and native broadleaved woodland. Additional interest was recorded on some patches of shingle, fence posts and the wartime coastal defences known as the 'dragon's teeth'.

The lichen flora was locally well-developed and adds significantly to the biodiversity of the study site with 69 lichen taxa recorded. No species of high conservation value were recorded. However the lichen assemblage of the dune system is of some conservation value at the local and possibly regional scale.

The operation of the diesel generators could potentially have a significant negative impact on the lichen flora. Potential impacts and advice on monitoring are given in a separate report: Lichen Survey at Sizewell Power Station: The Impacts of Changes in Air Quality, and Considerations For Monitoring.

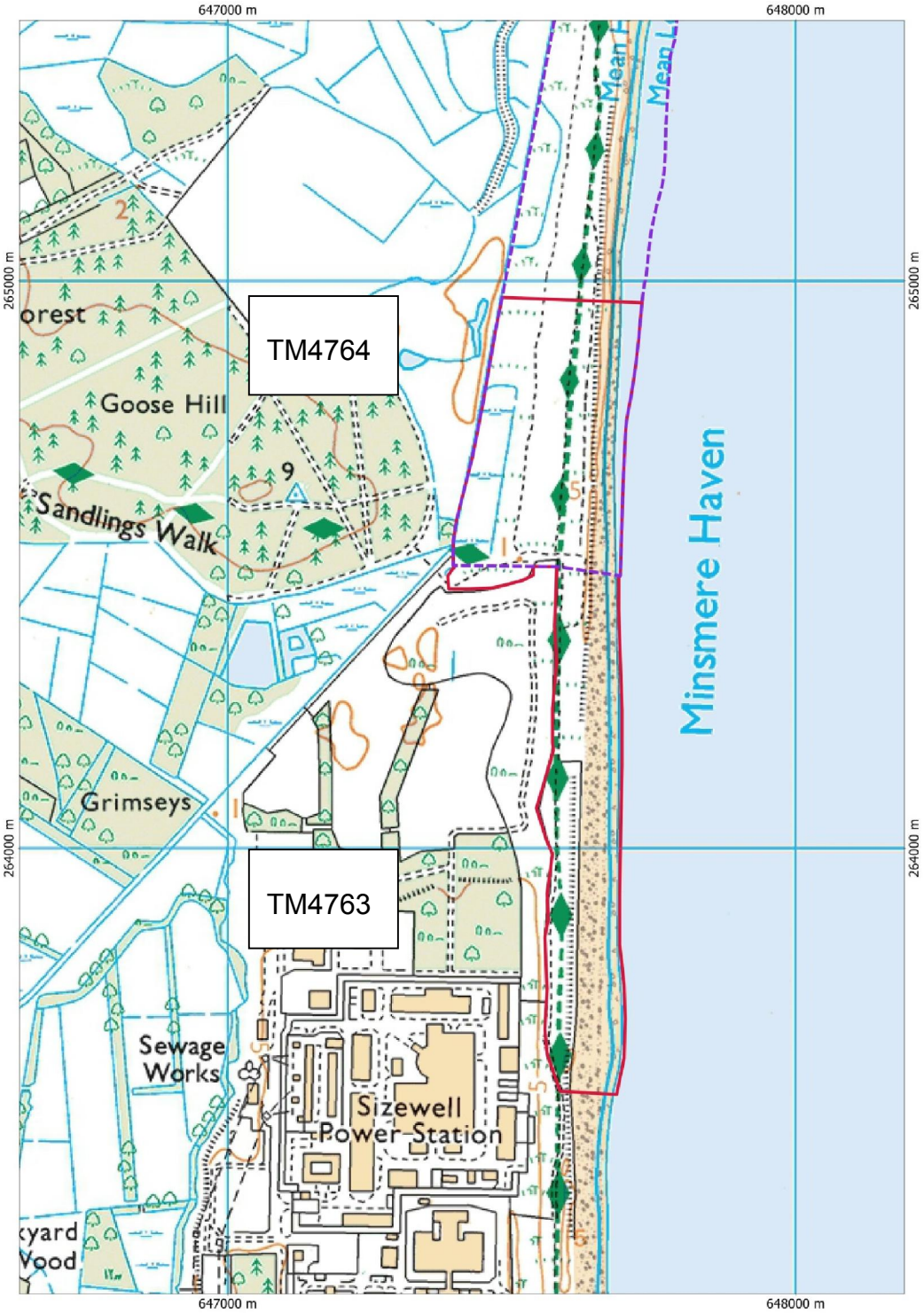
2 Aims

2.1 The project brief

- Survey and assess the lichen flora within the study site (Figure 2.1).
- Assess the vulnerability of the lichen flora to any changes in air quality due to the operation of the diesel generators at the proposed Sizewell C Station.
- Advise on any long term monitoring that might be required by the Habitat Regulations Assessment (HRA)/Environmental Impact Assessment (EIA).

This report deals with the survey and assessment of the lichen flora. A separate report considers the impact of changes in air quality and gives consideration to lichen monitoring (Lichen Survey at Sizewell Power Station: The Impacts of Changes in Air Quality, and Considerations For Monitoring).

Figure 2.1 Map of the study site.
The red line indicates the boundary of the study site. The SAC boundary is indicated by the purple dotted line. Ordnance Survey © Crown Copyright 2015. All rights reserved. Licence number 100022432.



3 Methods

3.1 Field Methodology

The survey was carried out by Andy Acton (BA Hons. Oxon). The field survey took the form of a walkover survey of the study site. The site was surveyed over 2 days in dry weather (7-8 September 2015). Potential lichen habitats within the study site were briefly examined for conspicuous lichens, with a closer inspection where the lichen flora appeared particularly well developed. Survey effort concentrated on those habitats likely to support notable species and well- developed lichen communities (e.g. dune grassland, patches of lichen heath, old shrubs, and woodland/trees).

A list of lichen taxa was recorded and target notes were recorded to indicate the locations of well-developed lichen habitat, and species indicative of good quality lichen habitat etc. Locations of target notes were recorded with a Garmin eTrex H Global Positioning System (GPS).

Samples were collected of species that were not readily identifiable to species level in the field for subsequent identification in the laboratory using microscopes, chemical tests and the standard literature (e.g. Smith *et al.* 2009). Some samples were sent to Dr. Brian Coppins (formerly of the Royal Botanic Garden Edinburgh) for confirmation/identification.

3.2 Nomenclature

Nomenclature follows Smith *et al.* (2009). Conservation Status follows Woods & Coppins (2012). Conservation Status categories are LC = Least Concern (i.e. not threatened in GB though it may still be of conservation value), NE = not evaluated by Woods & Coppins, NS = Nationally Scarce and NR = Nationally Rare. Lichen taxa occurring in Britain are allocated a unique identifier by the British Lichen Society (BLS). This identifier is listed in tables in this report as the BLS number.

3.3 Constraints

Many lichens are very small and inconspicuous so easily overlooked without thorough searching which can be very time consuming. It is likely that species have been overlooked during this rapid survey, and this could possibly include notable lichens. This is most likely for inconspicuous species with 'look-a-likes', i.e. similar in appearance to other, less notable species; these require speculative sampling and critical examination in the laboratory (e.g. using microscopes).

Despite these potential constraints, the survey was considered sufficient to enable an assessment of lichen interest of the study site.

4 Results

4.1 General

Sixty nine lichen taxa were recorded during the survey (Table 4.1). These species were associated with dune grassland/heath and the associated scrub, coastal shingle, woodland, fence posts and concrete. The lichen interest of these habitats is described in sections 4.2-4.7.

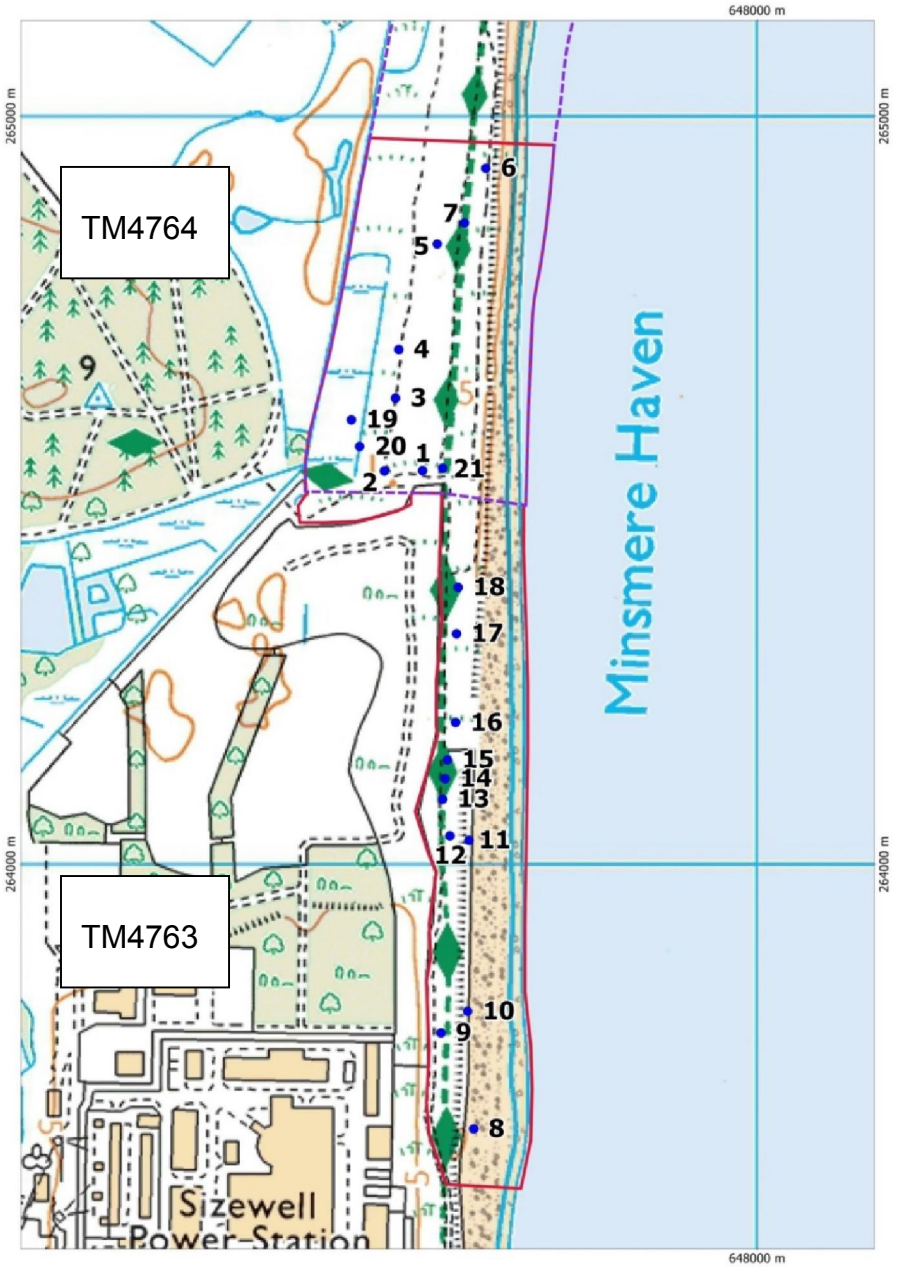
Twenty one target notes were recorded to describe features of particular lichen interest. Target note (TN) locations are indicated on the map in Figure 4.1. Full details of the target notes are given in Appendix 1. Note that lichen interest is not confined to these target notes. Lichen interest occurs throughout much of the study site. The only areas where lichen flora is absent/negligible are along the disturbed ground of the sandy foreshore and mobile beach shingle, on very young shrubs, on very new fences, and in the area of reedbed.

Table 4.1 The sixty-nine lichen taxa recorded in the study site.
Conservation status follows Coppins & Coppins (2012) where LC = Least Concern (i.e. not threatened at the national scale), NS = Nationally Scarce and NR = Nationally Rare. BLS no. = British Lichen Society number.

BLS no.	Taxon name	Status
0212	*Amandinea punctate*	LC
0068	*Arthonia punctiformis*	LC
1742	*Arthonia ligniariella*	LC NS
0069	*Arthonia radiate*	LC
	Arthonia sp.	
0140	*Bacidia chloroticula*	LC NS
0130	*Bacidia neosquamulosa*	LC NS
0200	*Buellia aethalea*	LC
2442	*Caloplaca arcis*	LC NS
2443	*Caloplaca dichroa*	LC NS
2315	*Caloplaca flavocitrina*	LC
0267	*Caloplaca marina*	LC
2461	*Caloplaca oasis*	LC
0291	*Candelariella aurella f. aurella*	LC
0298	*Candelariella vitellina f. vitellina*	LC
0306	*Catillaria chalybeia* var. *chalybeia*	LC
0430	*Cetraria aculeata*	LC
0371	*Cladonia chlorophaea s. lat.*	LC
0372	*Cladonia ciliata var. ciliata*	LC
0373	*Cladonia ciliata var. tenuis*	LC
0387	*Cladonia foliacea*	LC
0389	*Cladonia furcata subsp. Furcate*	LC
0376	*Cladonia humilis*	LC
0396	*Cladonia macilenta*	LC
0409	*Cladonia portentosa*	LC
0359	*Cladonia ramulosa*	LC
0412	*Cladonia rangiformis*	LC
0751	*Clauzadea monticola*	LC
0496	*Diplotomma alboatrum*	LC
0511	*Evernia prunastri*	LC
0987	*Flavoparmelia caperata*	LC
0582	*Hypogymnia physodes*	LC
0613	*Lecania cyrtella*	LC
0616	*Lecania erysibe s. str.*	LC
0159	*Lecania naegelii*	LC
1996	*Lecanora compallens*	LC NS
0646	*Lecanora dispersa*	LC
0649	*Lecanora expallens*	LC
0621	*Lecanora hagenii*	NE
0672	*Lecanora pulicaris*	LC
0688	*Lecanora symmicta*	LC
0690	Lecanora varia	LC
0797	*Lecidella elaeochroma f. elaeochroma*	LC
0820	*Lepraria incana s. lat.*	
0998	*Melanelixia fuliginosa*	LC
1020	*Melanelixia subaurifera*	LC
0948	*Opegrapha herbarum*	LC
2542	*Opegrapha hochstetteri* in ed.	LC NR
1022	*Parmelia sulcata*	LC
1008	*Parmotrema perlatum*	LC
1039	*Peltigera canina*	LC
1053	*Peltigera didactyla*	LC
1110	*Phlyctis argena*	LC
1112	*Physcia adscendens*	LC
1120	*Physcia tenella*	LC
0732	*Placynthiella icmalea*	LC
2070	*Punctelia subrudecta s. str.*	LC
1235	*Ramalina fastigiata*	LC
1289	*Rinodina oleae*	LC
1306	*Sarcogyne regularis*	LC
	Trapelia sp.	
	Verrucaria aff. dolosa	
1507	*Verrucaria muralis*	LC
1508	*Verrucaria murina*	LC NS
1510	*Verrucaria nigrescens f. nigrescens*	LC
	Verrucaria sp.	
1526	*Xanthoria calcicola*	LC
1530	*Xanthoria parietina*	LC
1531	*Xanthoria polycarpa*	LC
1909	*Xanthoria ulophyllodes*	LC NS

BLS no.	Taxon name	Status	BLS no.	Taxon name	Status
0627	*Lecanora albescens*	LC			
0636	*Lecanora carpinea*	LC			
0639	*Lecanora chlarotera*	LC			

Figure 4.1 Target note map.
The red line indicates the boundary of the study site, with numbered Target Notes. The SAC boundary is indicated by the purple dotted line. The Ordnance Survey 1km grid square numbers are shown. Ordnance Survey © Crown Copyright 2015. All rights reserved. Licence number 100022432.



4.2 Dune grassland

Dune grassland is the main semi-natural lichen habitat in the study site. Fixed dune grassland is an Annex 1 habitat, 2130 Fixed dunes with herbaceous vegetation (`grey dunes`) and lichens can be a prominent feature of dune grassland. Lichens are a prominent component of the flora of this habitat type in OS grid square TM4764. Fifteen species were recorded as terricolous (i.e. growing on soil or plant debris) in dune grassland (additional species were recorded on trees and scrub on the dune grassland). The lichen flora is generally dominated by *Cladonia* species with *Cladonia portentosa* and/or *Cladonia rangiformis* providing most of the cover. See *Table 4.2* and Figures 4.2 – 4.5.

Dune grassland is maintained in good condition for lichens by browsing. Where the vascular sward is suppressed the lichen cover can be high. Where the swards are tall and rank the lichen flora is much more species poor. The poorest area for dune grassland lichens is in the ranker swards that dominate in the south of the site (much of grid square TM4763). These ranker swards do support lichens but lichen cover is low and lichen diversity is low (e.g. TN9). It is important for the lichen flora that grazing (including rabbits) is maintained on site. The browsing is also important to help prevent the further encroachment of scrub onto the dune grassland.

Some areas of dune grassland in the southern section of the site (outwith the SAC) have some indicators of good quality fixed dune grassland habitat including locally abundant *Cetraria aculeate* (see TN13, 14, 15, 16) and *C. foliacea* (TN 13, 14, 17, 18). *C. aculeata* was not recorded within the SAC and *C. foliacea* was only noted once in the SAC (near TN2)

Table 4.2 Fifteen lichen taxa recorded growing on soil (i.e. terricolous) in dune grassland.
An additional sample collection of candidate *Placynthiella uliginosa* was unfortunately damaged in transit and so identification could not be confirmed. Conservation status follows Coppins & Coppins (2012) where LC = Least Concern (i.e. not threatened at the national scale) and NS = Nationally Scarce.

BLS no.	Taxon name	Status
1742	*Arthonia ligniariella*	LC NS
0430	*Cetraria aculeata*	LC
0371	*Cladonia chlorophaea* s. lat.	LC
0373	*Cladonia ciliata* var. tenuis	LC
0387	*Cladonia foliacea*	LC
0389	*Cladonia furcata* subsp. *furcata*	LC
0376	*Cladonia humilis*	LC
0396	*Cladonia macilenta*	LC
0409	*Cladonia portentosa*	LC
0359	*Cladonia ramulosa*	LC
0412	*Cladonia rangiformis*	LC
0511	*Evernia prunastri*	LC
1039	*Peltigera canina*	LC
1053	*Peltigera didactyla*	LC
0732	*Placynthiella icmalea*	LC

Figure 4.2 *Festuca-Cladina* dune grassland at TN1.

Figure 4.3 *Carex arenaria-Cladina* dune grassland at TN3.

Figure 4.4 Dune grassland at TN14 with locally abundant *Cladonia rangiformis* and some well-developed patches of *Cetraria aculeata* and *Cladonia foliacea.*

Figure 4.5 Dune grassland at TN16 with some exposed but stable shingly hollows and ridges. This area supported abundant *Cetraria aculeata.*

4.3 Costal lichen heath

Lichen heath is quite patchy across the site – often occurring as small patches within a matrix of dune grassland. Ericoids may have formerly been more widespread but have since been grazed out from large areas (e.g. those areas today without ericoids but with abundant *Cladonia portentosa* and *Cetraria aculeata*). If so, it is clear that patches of heath have persisted in the north of the site and here it appears that a recent relaxation in browsing has permitted ericoids to establish as quite dense (though usually still small) patches. Lichens are largely absent where the ericoid sward is very dense. Lichens can get a foothold where the ericoid sward is not so dense, often because it is suppressed or broken up by animal grazing/trampling (Figure 4.6). However, the lichens are generally best developed within the dune grassland matrix and the lichen flora of the heathy patches is species poor.

Table 4.3 Five lichen taxa recorded growing on soil (i.e. terricolous) in dune heath. Conservation status follows Coppins & Coppins (2012) where LC = Least Concern (i.e. not threatened at the national scale) and NS = Nationally Scarce.

BLS no.	Taxon name	Status
0409	*Cladonia portentosa*	LC
0389	*Cladonia furcata* subsp. *furcata*	LC
0732	*Placynthiella icmalea*	LC
0376	*Cladonia humilis*	LC
0372	*Cladonia ciliata* var. *ciliata*	LC

Figure 4.6 Coastal *Erica cinerea* heath at TN4.
The lichens are best developed where the dense ericoid sward is broken by small tracks and depressions through the heathy patches caused by animal grazing/trampling.

4.4 Shingle

Most of the shingle in the site is along the foreshore and is too mobile for lichen colonisation. However at one location the shingle is stable (TN8). This has a pioneer lichen flora of fifteen species that are common and widespread in Britain. The area is partially fenced, possibly to exclude trampling, and as the vascular flora becomes ranker many of the lichens are likely to be outcompeted. See Table 4.4 and Figures 4.7 – 4.9.

Table 4.4 Sixteen lichen taxa recorded on shingle or in the terricolous niche (either on soil or dead vascular plants) between the stones/pebbles.
Taxa listed were recorded on shingle unless the notes indicate otherwise. Conservation status follows Coppins & Coppins (2012) where LC = Least Concern (i.e. not threatened at the national scale) and NS = Nationally Scarce. The *Trapelia* sp. is possibly an undescribed species (Brian Coppins pers. comm.)

BLS no.	**Taxon name**	**Status**	Notes
0140	*Bacidia chloroticula*	LC NS	
0212	*Amandinea punctata*	LC	
0613	*Lecania cyrtella*	LC	Terricolous on dead vascular stem
0627	*Lecanora albescens*	LC	
0646	*Lecanora dispersa*	LC	
0688	*Lecanora symmicta*	LC	Terricolous on dead vascular plant stem
0998	*Melanelixia fuliginosa*	LC	
1112	*Physcia adscendens*	LC	On shingle as well as terricolous on dead vascular plant stem
1120	*Physcia tenella*	LC	
1289	*Rinodina oleae*	LC	
	Trapelia sp.		Terricolous crust
	Verrucaria aff. *dolosa*		
1507	*Verrucaria muralis*	LC	
1508	*Verrucaria murina*	LC NS	
1530	*Xanthoria parietina*	LC	On shingle as well as terricolous on dead vascular plant stem
2315	*Caloplaca flavocitrina*	LC	

Figure 4.7 The shingle habitat at TN8.

Figure 4.8 Closer view of the shingle habitat (showing the distinctive yellow patches of *Xanthoria parietina).*

Figure 4.9 *Physcia adscendens* on shingle.

4.5 Woodland

A belt of planted trees (mostly young birch) includes some older oaks (e.g. c. TN 19, 20). No notable species were recorded here but several epiphytes here were not recorded elsewhere so these trees add to the lichen biodiversity of the site (Table 4.5).

Table 4.5 Twenty two lichen taxa recorded on a belt of planted trees in the north of the site. All of these species were recorded on oak. Conservation status follows Coppins & Coppins (2012) where LC = Least Concern (i.e. not threatened at the national scale) and NS = Nationally Scarce.

BLS no.	Taxon name	Status
0212	*Amandinea punctata*	LC
0068	*Arthonia punctiformis*	LC
0069	*Arthonia radiata*	LC
0130	*Bacidia neosquamulosa*	LC NS
0511	*Evernia prunastri*	LC
0987	*Flavoparmelia caperata*	LC
0582	*Hypogymnia physodes*	LC
0639	*Lecanora chlarotera*	LC
0613	*Lecania cyrtella*	LC
0159	*Lecania naegelii*	LC
0797	*Lecidella elaeochroma* f. *elaeochroma*	LC
0820	*Lepraria incana* s. lat.	LC
0998	*Melanelixia fuliginosa*	LC
1020	*Melanelixia subaurifera*	LC
0948	*Opegrapha herbarum*	LC
1008	*Parmotrema perlatum*	LC
1022	*Parmelia sulcata*	LC
1110	*Phlyctis argena*	LC
1112	*Physcia adscendens*	LC
2070	*Punctelia subrudecta* s. str.	LC
1235	*Ramalina fastigiata*	LC
1530	*Xanthoria parietina*	LC

Additional species recorded on trees and scrub on dune grassland (including *Rosa* sp. *Ulex europaeus* and an unidentified tree) are listed in Table 4.6

Table 4.6 Additional epiphytes recorded on scrub and scattered trees growing on the dune grassland.
Conservation status follows Coppins & Coppins (2012) where LC = Least Concern (i.e. not threatened at the national scale) and NS = Nationally Scarce.

BLS no.	Taxon name	Status
0636	*Lecanora carpinea*	LC
1996	*Lecanora compallens*	LC NS
0621	*Lecanora hagenii*	NE
1120	*Physcia tenella*	LC
1531	*Xanthoria polycarpa*	LC
1909	*Xanthoria ulophyllodes*	LC NS

4.6 Wooden fence posts and steps

The bare lignum of old wooden fencepost can often support a well-developed lichen flora. Most of the wooden structures seen on the site are relatively new and this is reflected in the poor lichen flora. Most surfaces were devoid of lichens with lichens just starting to colonise. Species recorded from wooden fence posts and steps are listed in Table 4.7.

Table 4.7 Six species recorded from wood in the study site (fence posts and wooden steps).
Conservation status follows Coppins & Coppins (2012) where LC = Least Concern (i.e. not threatened at the national scale) and NS = Nationally Scarce.

BLS no.	Taxon name	Status
0212	*Amandinea punctata*	LC
0649	*Lecanora expallens*	LC
0621	*Lecanora hagenii*	NE
0672	*Lecanora pulicaris*	LC
0690	*Lecanora varia*	LC
0797	*Lecidella elaeochroma* f. *elaeochroma*	LC

4.7 Concrete

A number of species were recorded on concrete – mainly on the wartime tank defences known as 'dragon's teeth' but also on small bits of concrete found scattered amongst the dune grassland/shingle. Table 4.8 lists the species recorded from concrete. All the Nationally Scarce species recorded are probably common and widespread in Britain and considered to be nationally under recorded and so listed in Woods & Coppins (2012) as Least Concern (LC). The Nationally Rare *Opegrapha* species is a lichenicolous fungus growing on the common lichen *Verrucaria muralis*.

Table 4.8 Twenty four species recorded from concrete.
Conservation status follows Coppins & Coppins (2012) where LC = Least Concern (i.e. not threatened at the national scale), NS = Nationally Scarce and NR = Nationally Rare.

BLS no.	Taxon name	Status
0200	*Buellia aethalea*	LC
2442	*Caloplaca arcis*	LC NS
2443	*Caloplaca dichroa*	LC NS
2315	*Caloplaca flavocitrina*	LC
0267	*Caloplaca marina*	LC
2461	*Caloplaca oasis*	LC
0291	*Candelariella aurella f. aurella*	LC
0298	*Candelariella vitellina* f. *vitellina*	LC
0306	*Catillaria chalybeia var. chalybeia*	LC
0751	*Clauzadea monticola*	LC
0496	*Diplotomma alboatrum*	LC
0616	*Lecania erysibe s. str.*	LC
0627	*Lecanora albescens*	LC
0646	*Lecanora dispersa*	LC
2542	*Opegrapha hochstetteri* in ed.	LC NR
1112	*Physcia adscendens*	LC
1306	*Sarcogyne regularis*	LC
	Verrucaria aff. *dolosa*	
1507	*Verrucaria muralis*	LC
1508	*Verrucaria murina*	LC NS
1510	*Verrucaria nigrescens* f. *nigrescens*	LC
	Verrucaria sp.	
1526	*Xanthoria calcicola*	LC
1530	*Xanthoria parietina*	LC

Two additional notable species have been recorded from concrete tank traps at Sizewell (Chris Hitch, pers. comm.):

- *Opegrapha rupestris* (LC NS, at TM 475635) i.e. just south of the study site.
- *Caloplaca albolutescens* (LC, NS, grid reference unknown and not listed on NBN, 2015).

These two species were not recorded on the tank traps examined during this survey.

5 Discussion and assessment of the lichen flora

Although the lichen flora within each habitat type was not particularly species rich, the lichen flora was locally well-developed and adds significantly to the biodiversity of the study site with 69 lichen taxa recorded (for comparison 26 bryophytes were recorded within the same study site by Pilkington, 2015). A number of lichens of interest were recorded including seven Nationally Scarce species. These Nationally Scarce species are all lichens that are generally accepted as under-recorded in Britain (Coppins & Woods, 2012). Although no species of particular conservation value at National or International scale were recorded, the lichens are an important component of the dune grassland habitat and add considerably to the biodiversity of the dune grassland. Fixed Dune grassland is an Annex 1 habitat and lichen are recognised as an important component of some types of dune systems. The lichen rich areas should be considered to be an important dune habitat quality indicator and an important early indicator of decline in dune habitat (there can be serious decline in biodiversity, due to decline in the lichen flora, before there is any significant impact on the vascular plant flora).

A separate report considers the impact of changes in air quality due to the operation of the diesel generators at the proposed Sizewell C Station, and discusses monitoring options (Lichen Survey at Sizewell Power Station: The Impacts of Changes in Air Quality, and Considerations For Monitoring).

6 References

NBN, 2015. The National Biodiversity Network (NBN) Gateway at http://data.nbn.org.uk/.

Pilkington, S. 2015. *Sizewell C Nuclear Power Station. Baseline bryophyte assessment*. Unpublished report to Hyder Cresswell Ltd.

Richardson, D. H. S. 1992. *Pollution monitoring with lichens*. Naturalist's Handbook 19. Richmond publishing.

Smith, C. W., Aptroot, A., Coppins, B. J., Fletcher, A., Gilbert, O. L., James, P. W., and Wolseley, P.A. (Eds), 2009. *The Lichens of Great Britain and Ireland*. British Lichen Society.

Woods, R.G. & Coppins, B. J., 2012. *A Conservation Evaluation of British Lichens and Lichenicolous Fungi. Species Status 13.* Joint Nature Conservation Committee, Peterborough

7 Appendices

Table 7.1 Target notes recorded during the survey.

TN	Easting	Northing	Other notes
1	647553	264526	Photo of *Festuca-Cladina* dune grassland (Figure 3).
2	647502	264526	Small patch of dune heath
3	647517	264623	Photo of *Cladina-Carex arenaria* dune grassland (Figure 4).
4	647521	264688	Photo of *Erica cinerea* dune heath (Figure 7). Best developed lichens associated with small animal tracks through dune heath.
5	647572	264829	Dune grassland with small patches of heath
6	647637	264930	Track through dune grassland
7	647609	264857	Most of the lichen interest is west of this track (both south and north of this location)
8	647621	263646	Photos of pioneer colonisation of stabilising shingle (Figures 8, 9 and 10).
9	647577	263775	Vascular plants dominate (c. 100%), lichens largely absent but includes *Cladonia furcata* and *Cladonia rangiformis*.
10	647613	263804	Dune grassland with some bare patches with Marram grass.
11	647615	264032	Dune grassland gets better for lichens at this grid and north of this grid including locally abundant *Cladonia rangiformis*. The Dune grassland is very poor for lichens in the area of the study site with TM 4763.
12	647590	264038	Dune grassland with locally abundant *Cladonia rangiformis*
13	647580	264087	Dune grassland with locally abundant *Cladonia rangiformis, Cladonia foliacea, Peltigera canina* and *Cetraria aculeata.*
14	647583	264115	Some well-developed patches of *Cetraria aculeata* amongst dune grassland with locally abundant *Cladonia rangiformis*. See Figure 5.
15	647586	264140	Dune grassland with locally abundant *Cladonia rangiformis* and *Cetraria aculeata* and also *Evernia prunastri* (rare).

TN	Easting	Northing	Other notes
16	647597	264189	Dune grassland with abundant *Cladonia portentosa* and *Cetraria aculeata*. Includes some exposed but stable shingly hollows and ridges (see Figure 6).
17	647598	264308	Dune grassland with abundant *Cladonia portentosa.*
18	647600	264370	Dune grassland with abundant *Cladonia portentosa.*
19	647458	264594	Oak-birch woodland with *Bacidia* sp. tbc
20	647469	264558	Oak-birch woodland
21	647579	264530	Concrete 'Dragon's teeth' tank traps

Sizewell B Relocated Facilities – National Vegetation Classification Survey June 2019 Technical Note

CONTENTS

TABLES

FIGURES

APPENDICES

1 INTRODUCTION

1.1.1 EDF Energy Nuclear Generation Limited, herein referred to as 'EDF Energy (NGL)', submitted a planning application to East Suffolk Council (ESC) for the demolition and relocation of a number of existing facilities at Sizewell B nuclear power station (known as the Sizewell B Relocated Facilities Project and herein referred to as the 'Proposed Development') in April 2019 (DC/19/163/FUL). The facilities that would be relocated, demolished or replaced are ancillary to the process of electricity generation and have a broad range of functions, including industrial (within the Nuclear Licenced Site), workplace, education, cultural and infrastructure.

1.1.2 As part of the Proposed Development, a pedestrian footpath has been proposed between the Outage Car Park and Coronation Wood Development Area. To minimise the disturbance to residents of Rosery Cottages, the footpath has been aligned to the west of Sandy Lane, resulting in a small section of Sizewell Marshes Site of Special Scientific Interest (SSSI) falling within the Sizewell B Relocated Facilities site boundary (referred to as the 'Site' throughout this technical note).

1.1.3 EDF Energy commissioned Arcadis Consulting (UK) Limited (Arcadis) to complete a National Vegetation Classification (NVC) survey of the section of Sizewell Marshes SSSI within the Site. The purpose of this survey was to determine the botanical value of this area.

1.1.4 This Technical Note provides the results of the NVC survey within the Site (see Appendix A for the site boundary and for where Sizewell Marshes SSSI is located within the site boundary indicated in green).

2 METHODOLOGY

2.1 NVC survey

2.1.1 The purpose of this survey was to assess the section of Sizewell Marshes SSSI within the Site for its botanical interest.

2.1.2 A full NVC survey was undertaken, comprising a quadrat-based sampling approach following the NVC protocol, as outlined by Joint Nature Conservation Committee (JNCC) (Ref. 1). The survey was undertaken on the 12 June 2019 by suitably qualified ecologists. The grassland in the vicinity of the proposed footpath was considered to be homogenous in floristics and structure. As per the JNCC guidance, five representative 2 by 2 metre (m) quadrats were placed within this homogeneous stand of vegetation. All species were recorded within the quadrats, with each species given a score using the Domin scale, a ten-point scale of abundance/cover used to record the extent of species in NVC samples.

2.1.3 A comprehensive list of species with Dominant, Abundant, Frequent, Occasional and Rare (DAFOR) scores (Ref. 2) was also recorded for the homogeneous stand of vegetation. This included species absent from the quadrats but present within other areas of the stand. Although not part of NVC survey protocol, this provided additional information to help fully assess the botanical value of the survey area.

2.2 Limitations

2.2.1 The survey was undertaken in suitable conditions at an appropriate time of year and as such, no limitations were identified.

3 RESULTS

3.1 NVC survey results

3.1.1 Approximate quadrat locations are shown on Figure 1 and photographs of each quadrat, as well as the surrounding area, are included within Appendix B.

i. Site description

3.1.2 Within the area of Sizewell Marshes SSSI that is within the Site, the vegetation comprises rank, species-rich semi-improved pasture. The area surveyed is at the southern end of Sizewell Marshes SSSI on higher and drier ground than other parts of Sizewell Marshes SSSI, and so does not support the fen meadow or rush pasture communities that are designated features of Sizewell Marshes SSSI. The main grasses recorded were Common Bent *Agrostis capillaris*, Perennial Rye-grass *Lolium perenne* and Yorkshire-fog *Holcus lanatus*, and there is a diversity of other grasses and forbs. The soil is sandy and there may be some calcareous influence, as indicated by the presence of species such as Common Stork's-bill *Erodium cicutarium*, Musk Thistle *Carduus nutans* and Lady's Bedstraw *Galium verum*. There was evidence of grazing by cattle but this seemed to be of low intensity and the grassland is tall and rank, and there is frequent Cock's-foot *Dactylis glomerata* and Common Ragwort *Senecio jacobaea*, an abundance of thistles, and locally abundant Common Nettle *Urtica dioica*. Bracken *Pteridium aquilinum* is encroaching into the grassland at the southern end.

ii. NVC Community

3.1.3 The area of grassland surveyed is considered to conform most closely to the MG6 *Lolium perenne – Cynosurus cristatus* grassland NVC community. Although no Crested Dog's-tail *Cynosurus cristatus* was present, the other

species identified including Perennial Rye-grass, Yorkshire-fog, Red Fescue *Festuca rubra*, White Clover *Trifolium repens* and Common Mouse-ear *Cerastium fontanum* are typical of this community. The high frequency and abundance of Common Bent means the MG6b *Anthoxanthum odoratum* subcommunity is the closest fit.

3.1.4 Although this grassland forms part of Sizewell Marshes SSSI, the MG6 grassland community is not a designating feature of Sizewell Marshes SSSI.

3.1.5 Table 3-1 details species present within each quadrat while Table 3-2 details additional species recorded not present within the quadrats.

Table 3-1 – Species present within quadrats

Common name	Latin name	Q1	Q2	Q3	Q4	Q5	Frequency[1]	Domin Range[2]	DAFOR[3]
Common Bent	*Agrostis capillaris*	8	8	9	8	4	V	4-9	A
Yorkshire-fog	*Holcus lanatus*	7	7	8	7	8	V	7-8	A Id
Perennial Rye-grass	*Lolium perenne*	8	6	5	4	3	V	3-8	A
White Clover	*Trifolium repens*	8	3	2	7	5	V	2-8	A
Germander Speedwell	*Veronica chamaedrys*	4	3	7	3	5	V	3-7	A
Creeping Thistle	*Cirsium arvense*	4	5	6	2	1	V	1-6	F
Cock's-foot	*Dactylis glomerata*	2	2	2	4	2	V	2-4	F
Smooth Meadow-grass	*Poa pratensis*	3	3	3	3	3	V	3	F
Cut-leaved Crane's-bill	*Geranium dissectum*		2	5	3	3	IV	2-5	A
Common Ragwort	*Senecio jacobaea*		4	2	2	1	IV	1-4	F
Rough-stalked Feather-moss	*Brachythecium rutabulum*		5	3	7		III	3-7	A
Common Nettle	*Urtica dioica*		2	6		2	III	2-6	F Ia

[1] Frequency (Ref. 1) – signifies how often a species is encountered across the quadrat irrespective of the abundance within each quadrat.
[2] Domin Range (Ref. 1) – signifies the lowest and highest domin score for which the species was recorded.
[3] DAFOR (Ref. 2) – Dominant, Abundant, Frequent, Occasional and Rare. 'L' denotes 'Locally' in the case of LD, LA, etc.

Common name	Latin name	Q1	Q2	Q3	Q4	Q5	Frequency[1]	Domin Range[2]	DAFOR[3]
Red Fescue	*Festuca rubra*		4	5	4		III	4-5	A
Creeping Buttercup	*Ranunculus repens*	3	3	5			III	3-5	F
Dandelion	*Taraxacum officinale agg.*	1	3	2			III	1-3	O
Common Mouse-ear	*Cerastium fontanum*	2	2			2	III	2	F
Ribwort Plantain	*Plantago lanceolata*	2			1		II	1-2	O
White Campion	*Silene latifolia*				1	2	II	1-2	O
Spear Thistle	*Cirsium vulgare*			1		1	II	1	F la
Bracken	*Pteridium aquilinum*					6	I	6	ld
Bare ground						4	I	4	R
Ground-ivy	*Glechoma hederacea*					3	I	3	la
Field Horsetail	*Equisetum arvense*	2					I	2	O
Common Soft-brome	*Bromus hordeaceus subsp. Hordeaceus*	2					I	2	O
Field Wood-rush	*Luzula campestris*	2					I	2	R
Wavy Bitter-cress	*Cardamine flexuosa*				2		I	2	R
Common Stork's-bill	*Erodium cicutarium*					2	I	2	R
Meadow Buttercup	*Ranunculus acris*	1					I	1	R
Common Cudweed	*Filago vulgaris*				1		I	1	R

Common name	Latin name	Q1	Q2	Q3	Q4	Q5	Frequency[1]	Domin Range[2]	DAFOR[3]
Shepherd's-purse	*Capsella bursa-pastoris*					1	I	1	R
Lesser Trefoil	*Trifolium dubium*					1	I	1	R

Table 3-2 - Additional species recorded not present within the quadrats

Common name	Latin name	DAFOR
Sweet Vernal-grass	*Anthoxanthum odoratum*	O
Curled Dock	*Rumex crispus*	O
Broad-leaved Dock	*Rumex obtusifolius*	O
Musk Thistle	*Carduus nutans*	O
Hogweed	*Heracleum sphondylium*	R
Lady's Bedstraw	*Galium verum*	R
Yarrow	*Achillea millefolium*	R
Lesser Burdock	*Arctium minus*	R
Red Clover	*Trifolium pratense*	R
Common Cat's-ear	*Hypochaeris radicata*	R
Common Sorrel	*Rumex acetosa subsp. acetosa*	R
Timothy	*Phleum pratense*	R
Lesser Stitchwort	*Stellaria graminea*	R
Lesser Hawkbit	*Leontodon saxatilis*	R

4 DISCUSSION AND RECOMMENDATIONS

4.1.1 The habitat within the area of the proposed footpath comprises rank MG6 grassland. Although this forms part of Sizewell Marshes SSSI, this NVC community is not a designating feature of Sizewell Marshes SSSI. However, it contributes to the overall habitat mosaic within the SSSI.

4.1.2 The area of habitat to be lost is 0.045ha, which equates to approximately 0.043% of the overall habitat resource available within Sizewell Marshes SSSI (total area of habitat available is 104.33ha). While the habitat loss is relatively small compared to Sizewell Marshes SSSI as a whole, it is recommended that it is kept to a minimum. The retained grassland surrounding the footpath should be managed in such a way as to encourage the development of species-rich neutral grassland. This could be achieved by maintaining appropriate grazing and/or cutting regimes. It is also recommended that the spread of thistles, docks, nettles and ragwort is controlled, and the Bracken encroachment to the south is managed.

4.1.3 In addition, the following Environmental Statement measures will also be conducted:

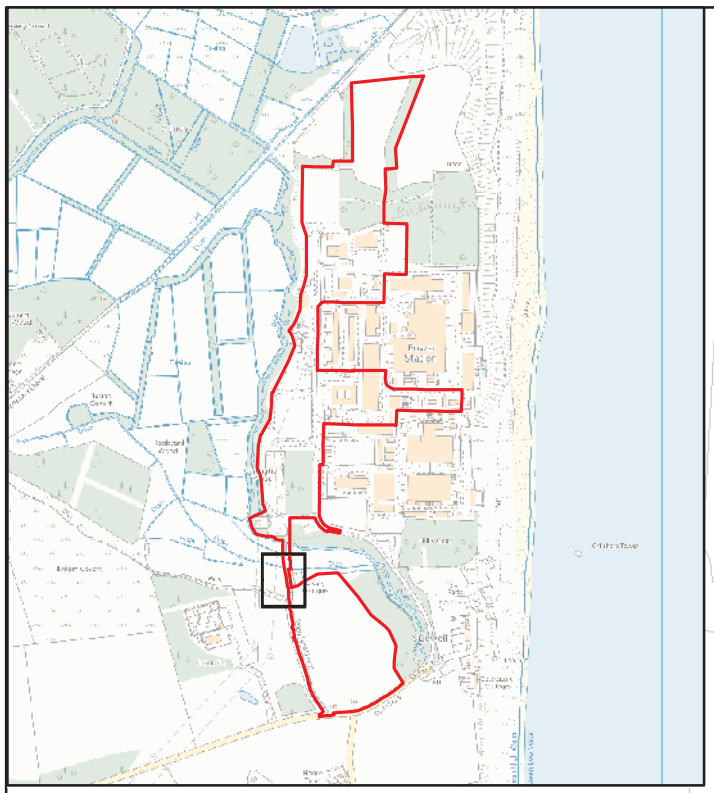
- All soil removed during excavation within Sizewell Marshes SSSI will be stored and retained for reuse during habitat reinstatement within this area.
- Following completion of the construction of the footpath through Sizewell Marshes SSSI, any adjoining land affected will be reinstated to its original habitat. Soil will be re-laid in the correct order (sub-soil followed by top-soil). The same soil removed during any excavations will be reused in the reinstatement. The habitat will be allowed to regenerate through the natural germination of the existing seed bank. The growth of weeds will be appropriately controlled to prevent spread.

REFERENCES

Ref. 1 Joint Nature Conservation Committee. 2006. *National Vegetation Classification: Users' handbook*. Peterborough: Joint Nature Conservation Committee.

Ref. 2 Kent, M. and Coker, P. 1992. *Vegetation Description and Analysis: A Practical Approach*. John Wiley & Sons, Chichester

FIGURES



KEY

- NVC SAMPLING POINT
- SIZEWELL B RELOCATED FACILITIES SITE BOUNDARY

DRAWING TITLE:
FIGURE 1 - NVC QUADRAT LOCATIONS

NOT PROTECTIVELY MARKED

DRAWING NO:
FIGURE 1

DATE:	DRAWN:	SCALE :
JUL 2019	R.M.	1:400 @A3

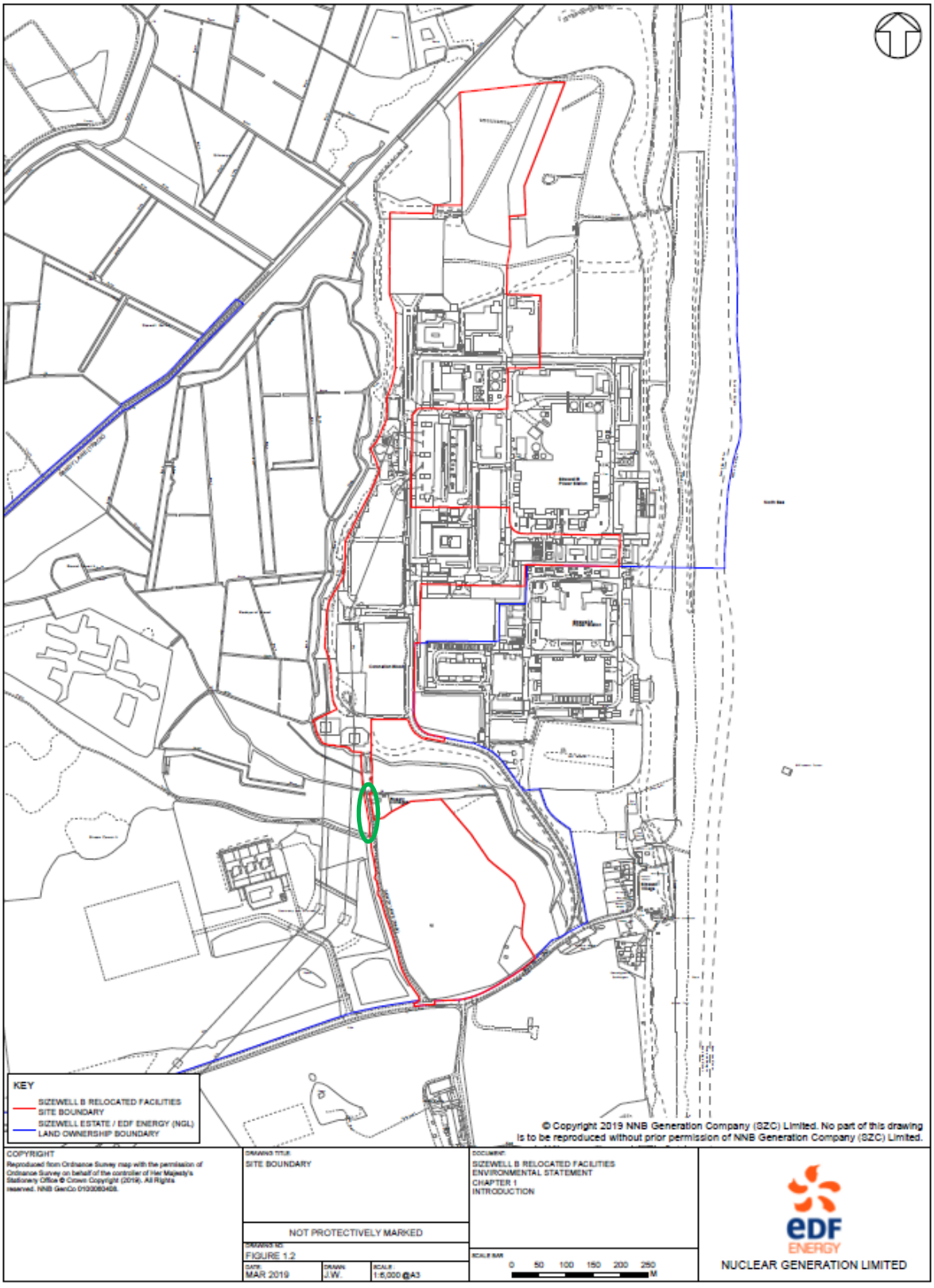
DOCUMENT:
SIZEWELL B RELOCATED FACILITIES
NVC SURVEY JUNE 2019
TECHNICAL NOTE

SCALE BAR
0 4 8 12 16 20 M

NUCLEAR GENERATION LIMITED

APPENDIX A: SITE BOUNDARY (ES FIGURE)

The part of Sizewell Marshes SSSI located within the Site is indicated within the green circle.


KEY
SIZEWELL B RELOCATED FACILITIES SITE BOUNDARY
SIZEWELL ESTATE / EDF ENERGY (NGL) LAND OWNERSHIP BOUNDARY
© Copyright 2019 NNB Generation Company (SZC) Limited. No part of this drawing is to be reproduced without prior permission of NNB Generation Company (SZC) Limited.
COPYRIGHT
Reproduced from Ordnance Survey map with the permission of Ordnance Survey on behalf of the controller of Her Majesty's Stationery Office © Crown Copyright (2019). All Rights reserved. NNB GenCo 010308408.
SITE BOUNDARY
NOT PROTECTIVELY MARKED
FIGURE 1.2
MAR 2019
J.W.
1:5,000 @A3
SIZEWELL B RELOCATED FACILITIES
ENVIRONMENTAL STATEMENT
CHAPTER 1
INTRODUCTION
0 50 100 150 200 250 M
NUCLEAR GENERATION LIMITED

APPENDIX B: PHOTOS OF SITE AND QUADRATS

General Site

Quadrat 1

Quadrat 2

Quadrat 3

Quadrat 4

Quadrat 5

1	23/3/15	Mark Lang	Jon Davies	Draft		
Rev.	**Date**	**Prepared by**	**Checked by**	**Status**	**Reasons for revision**	**Approved by**

DIRECTION PRODUCTION INGENIERIE **Centre National d'Equipement Nucléaire**	1ST PARTNER	2ND PARTNER

CONTRACTOR REF. No	CONTRACTOR WBS CODE
CONTRACTOR COMPANY NAME **HYDER CRESSWELL**	CONTRACT NUMBER **NNB GenCo Ref:** SZC-NNBPEA-XX-000-PAP-000722
	SAFETY related **Yes ☐ No ☐**

APPLICABILITY:

- 1: Document related to Unit 1

- 2: Document related to Unit 2

- 9: Document that applies to buildings/systems common to units 1 & 2

- 0: documents that relate exclusively to buildings or systems that are common to the whole site (e.g. OSC building, parkings, ancillary buildings...)

NUCL/REP/EPR/UKEPR							
HPC (doc: HK)				SZC (doc: SZ)			
0	1	2	9	0	1	2	9
				X			

SYSTEM

00

BUILDING

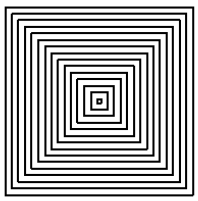
00

SCALE	**DESCRIPTION:**
SIZE	
PAGE	Sizewell C Project Sizewell C NVC Survey 2014

DOCUMENT REFERENCE No

Project		Contract No. / Orig. Co		Asset / Zone		System/ building		Doc. Type		Chrono No.

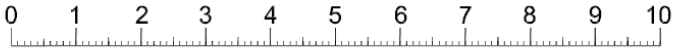
DOCUMENT SUB-TYPE **REPORT**	EDF CLASSIFICATION CODE
SUBCONTRACTOR COMPANY NAME	SUBCONTRACTOR DOCUMENT REF.



This staff must be entirely readable

For A0 and A1 : ABERPFTHLIJOOCGQUVWMNSZXKY

zsaeocmuvnwxirfkhbdpqgyjlt 71423855690



EDF MARKING:	**Interne** X	**Restreint** ☐	**Confidentiel** ☐	**PIDU case 3**

EDF Energy/NNB GenCo

Sizewell C Project

Sizewell C NVC Survey 2014

Hyder Consulting (UK) Limited
2212959
The Mill
Brimscombe Port
Stroud
Glos GL5 2QG
United Kingdom
Tel: +44 (0)1453 423 100
Fax: +44 (0)1453 887 979
www.hyderconsulting.com

EDF Energy/NNB GenCo

Sizewell C Project

Sizewell C NVC Survey 2014

Author Mark Lang

Checker Samantha Walters

Approver Jon Davies

Report No UA004506 – S-EX097 001

Date March 2015

This report has been prepared for NNB Genco in accordance with the terms and conditions of appointment for Sizewell Marshes NVC Survey dated 2014. Hyder Consulting (UK) Limited (2212959) cannot accept any responsibility for any use of or reliance on the contents of this report by any third party.

CONTENTS

Appendices

Figures

SUMMARY

EDF Energy/NNB GenCo is to submit an application for a Development Consent Order to construct and operate a new nuclear power station, Sizewell C, near the town of Leiston in Suffolk. The proposal site is within an Area of Outstanding Natural Beauty and therefore within an area of high landscape importance. The proposal site is also within an area of ecological sensitivity. It is adjacent to the Minsmere to Walberswick Heaths and Marshes Special Area of Conservation (SAC), Special Protection Area (SPA) and Ramsar, the Sandlings SPA and the Outer Thames Estuary SPA. Sizewell Marshes Site of Special Scientific Interest (SSSI) and Suffolk Shingle Beaches County Wildlife Site (CWS) are also within the proposal site

Detailed botanical surveys of Sizewell Marshes SSSI and the coastal frontage to the proposed C Station were undertaken in 2007 and 2008 by Amec, and in 2014 these were updated and extended by Hyder Consulting (UK) Ltd. Suffolk Wildlife Trust has also commissioned botanical monitoring surveys of Sizewell Marshes SSSI since 1995, and these surveys are still ongoing. The Wildlife Trust also undertook botanical surveys of the coastal vegetation in 2003. The results of the pre-2014 surveys have been reviewed as part of the current study; however, a detailed comparison between all the survey reports has not been undertaken.

This report presents the results of detailed botanical surveys carried out in 2014 using the National Vegetation Classification (NVC) to assign habitat areas, wherever possible, to recognised NVC communities. The aim of the work is to provide an up-to-date ecological baseline of vegetation that could potentially be directly affected by the works on the proposal site.

The 2014 survey area comprised habitat within three designated sites of nature conservation importance. These comprised: reedbeds, woodland, fen meadows and ditches within Sizewell Marshes SSSI; coastal vegetation within Minsmere to Walberswick Heaths and Marshes SAC/ Ramsar; and coastal vegetation within Suffolk Shingle Beaches CWS. The survey area was divided into separate compartments, labelled Area A to Area I, the locations of which are shown on Figure(0038 – UA004506-UE21D-03 Survey areas and quadrat locations) (note that ‘Area’ D is actually a series of ditches, marked with a red line on the figure) The vegetation within each survey area was sampled using quadrats (the locations of which are also shown on Figure 0038). All plant species rooted within each quadrat were recorded and assigned a cover value using a Domin score of 1 to 10. The quadrat data, together with photographs of representative samples of the vegetation, have been appended to this report.

The 2014 survey results showed strong correlations with the previous survey data. The majority of the plant communities recorded were similar to those recorded in the earlier surveys, both in terms of the NVC plant community and the extent of the area covered by each community. Changes in the composition of the plant communities were, however, recorded in two places. One was in Area E (reedbed and wet woodland in Sizewell Marshes SSSI south of Goodrums Fen) where less Common Nettle was recorded in the reedbed. This change has affected the NVC plant community that was assigned to the vegetation (both are reed-dominated), but does not appear to have affected plant species diversity. The other change has occurred in Area F (fen meadows in Sizewell Marshes SSSI west of the Sizewell C Station Platform) where Blunt-flowered rush was more prevalent than had been recorded previously and the plant community was less diverse. It was considered that this minor change could have been the result of prolonged surface water flooding in previous years. This change to the plant assemblage was not sufficient to alter the classification of the NVC plant community.

A small number of plant species that are uncommon in Britain were recorded in the quadrats. These plants have also been recorded within the survey area in the course of previous surveys. Note that plant species growing outside of the quadrat locations were not recorded.

The results of the botanical surveys are summarised in the table below.

Plant communities and scarce plants recorded within the survey area in 2014

Location	Vegetation sampled	NVC communities and scarce plants *(latter in bold italic)*
Area A	***Goodrums Fen*** (***Sizewell Marshes SSSI)*** Wet woodland (Quadrats 1 to 5)	W5 Alder - Greater Tussock-sedge woodland. W5a Common Reed sub-community
Area B	***Goodrums Fen*** (***Sizewell Marshes SSSI)*** Wet reedbed (Quadrats 6 to 11)	S4 Common Reed swamp and reedbeds. S4a typical sub-community.
Area C	***Goodrums Fen*** (***Sizewell Marshes SSSI)*** Dry reedbed (quadrats 13 to14) Woodland and dry reedbed/grassland (Quadrats 15 to 17)	S26 Common Reed-Common Nettle tall-herb fen. W5 Alder-Greater Tussock-sedge woodland community.
Area D	***Ditches*** D1 Northern boundary Goodrums Fen (within Sizewell Marshes SSSI) (Quadrats 18 to 22) D2 Southern boundary Goodrums Fen (within Sizewell Marshes SSSI) (Quadrats 23 to 27) D3 and D6 South of Goodrums Fen (within Sizewell Marshes SSSI) (Quadrats 28 and 29 and 39 to 41) D4 D5 D5a Located within fen meadows to the west of Sizewell C Station Platform (within Sizewell Marshes SSSI) (Quadrats 30 to 38)	D1, D2, D3, D4, D5, D5a & D6: Emergent flora - no NVC community assigned. D1, D6: Floating vegetation - A2 Common Duckweed aquatic community. D1, D2 Submerged flora - no NVC community assigned. D2, D3, D4, D5 & D5a: Floating vegetation - A3 Greater Duckweed-Frogbit aquatic community. D3, D4, D5, D5a & D6 Submerged flora - A6 Soft Hornwort aquatic community In Ditches 1,2,4,5 & 5a: ***Frogbit.*** In Ditches 3,4,5 & 5a & 6: ***Soft Hornwort***
Area E	***Reedbed and wet woodland in Sizewell Marshes SSSI south of Goodrums Fen*** Reedbed and wet woodland (Quadrats 42 to 46)	S4 Common Reed swamp and reedbeds. S4a typical sub-community. W5 Alder-Greater Tussock-sedge woodland. W5a the Common Reed sub-community
Area F	***Fen meadows in Sizewell Marshes SSSI west of the Sizewell C Station Platform*** Fen meadow (Quadrats 47 to 55)	M22 Blunt-flowered Rush -Marsh Thistle mire community.
Area G	***Minsmere to Walberswick Heaths and Marshes SAC/Ramsar coastal vegetation extending to the north of Sizewell C Station Platform***.	Leiston Drain: S26 Common Reed-Common Nettle tall-herb fen, A2 Common Duckweed aquatic community, A16 Common Water-

Location	Vegetation sampled	NVC communities and scarce plants *(latter in bold italic)*
	Leiston Drain (quadrats 59 to 61) Reedbed adjacent Leiston Drain (quadrats 62 to 65) Dune grassland (Quadrats 66 & 67) Sand dune (Quadrats 56 to 58)	starwort aquatic community, typical sub-community. Reedbed: S26 Common Reed-Common Nettle tall-herb fen. Dune grassland & sand dune: SD12 Sand Sedge-Sheep's Sorrel-Common Bent dune grassland. Sand dune: ***Rat's-tail Fescue***
Area H	***Suffolk Shingle Beaches CWS coastal vegetation*** Dune grassland (Quadrats 78 to 82) Sand dune (Quadrats 68 to 77) Shingle (Quadrats 83 to 92)	Dune grassland: SD8 Red Fescue-Lady's Bedstraw fixed dune community. Sand dune: SD7 Marram-Red Fescue semi-fixed dune community. Shingle: SD2 Sea Sandwort-Sea-kale strandline community. SD1 Curled Dock-Yellow Horned-poppy shingle community. SD1a Sea Pea sub-community. Dune grassland: ***Rat's-tail Fescue*** Sand dune and shingle: ***Rush-leaved Fescue*** Shingle: ***Sea Pea***
Area I	***Wet woodland in Sizewell Marshes SSSI west of Sizewell C Station Platform*** Wet woodland (Quadrats 93 to 95)	W5 Alder-Greater Tussock-sedge woodland community.

1 Introduction

EDF Energy/NNB GenCo is to submit an application for a Development Consent Order to construct and operate a new nuclear power station, Sizewell C, near the town of Leiston in Suffolk. The proposal site is within an Area of Outstanding Natural Beauty and therefore within an area of high landscape importance. The proposal site is also within an area of ecological sensitivity. It is adjacent to the Minsmere to Walberswick Heaths and Marshes Special Area of Conservation (SAC), Special Protection Area (SPA) and Ramsar, the Sandlings SPA and the Outer Thames Estuary SPA. Sizewell Marshes Site of Special Scientific Interest (SSSI) and Suffolk Shingle Beaches County Wildlife Site (CWS) are also within the proposal site..

A considerable amount of ecological survey work has been carried out within and adjacent to the proposal site. This has included surveys undertaken by Amec in 2007 and 2008 of the plant communities on Sizewell Marshes SSSI and the existing coastal vegetation on the seaward side of the proposals site. Prior to this, in 2003, Suffolk Wildlife Trust (SWT) undertook botanical surveys of the coastal vegetation. Both Amec and SWT used the National Vegetation Classification (NVC) to assign the plant communities to the vegetation (for further information regarding the NVC see JNCC (2006)). In addition, SWT have commissioned a long-term monitoring project in Sizewell Marshes SSSI; this commenced in 1995 and is ongoing (Ecology Land and People, 2010).

Following on from NNB GenCo's Stage 1 Pre-Application Consultation on its initial proposals and options for Sizewell C, which ended on 6th February 2013, the priorities for 2014 were to progress the conceptual engineering design and technical studies relating to the development, as well as to undertake further essential environmental studies in order to inform this work and support a robust Stage 2 Consultation.

The development proposals are likely to result in direct impacts upon the Suffolk Shingle Beaches CWS and part of Sizewell Marshes SSSI. In addition, vegetation within the Minsmere to Walberswick Heaths and Marshes SAC, in close proximity of the C Station Platform, could potentially also be indirectly affected by changes in ground water, surface water and air quality.

Therefore, in 2014, Hyder Consulting undertook targeted NVC surveys of these areas. These surveys were undertaken in response to a direct request from consultees to provide a greater spatial resolution of the location, type and extent of habitats likely to be affected and the plant species that they support. This report presents the results of these surveys and also considers the results of the earlier survey work.

The areas covered by the 2014 surveys are illustrated on Figure 0038 – UA004506-UE21D-03 Survey areas and quadrat locations

2 Methodology

2.1 Extent of the survey area

The Sizewell C Development has the potential to directly affect habitats within designated sites of nature conservation importance that are in close proximity to the development proposals. These designated sites, together with the habitats most likely to be affected, are summarised in Table 1 below:

Table 1 Designated sites and habitats that could potentially be directly affected by the Sizewell C proposals.

Designated site	Qualifying habitats
Minsmere to Walberswick Heaths and Marshes SAC [International importance to nature conservation]	Annual vegetation of drift lines. European dry heaths. Perennial vegetation of stony banks.
Minsmere to Walberswick Ramsar site [International importance to nature conservation]	Mosaic of marine and freshwater habitats that supports nationally scarce plants.
Suffolk Shingle Beaches CWS [County importance to nature conservation]	The stretches of shingle beach along the Suffolk coast are of conservation importance for the range of shingle plants that grow there. There are also rare invertebrates species found in these coastal sites.

The 2014 NVC survey focussed on the plant communities within the areas most likely to be directly and/or indirectly affected by the development proposals. The following distinct areas were sampled:

- Two areas of the Sizewell Marshes SSSI likely to be directly affected by the proposed development (where direct habitat loss is likely); this included reedbed, ditch vegetation and wet woodland vegetation within Goodrums Fen, and ditch vegetation, fen meadow and woodland vegetation adjacent to the western edge of the C Station platform;
- An area of coastal vegetation (including ditch, reedbed and dune grassland) immediately to the north of the proposed C Station Platform, forming part of the Minsmere to Walberswick SAC and Ramsar Site; and
- A strip of coastal vegetation (including dune grassland, sand dune and shingle) to the seaward side of the proposed C Station Platform, forming part of the designated Suffolk Shingle Beaches CWS.

2.2 Selection of sampling locations

A total of nine areas, defined by broad habitat type, were surveyed within the three locations described in 2.1, above. For the purposes of this survey these areas have been labelled Areas A to I as illustrated on Figure 0038 – UA004506-UE21D-03 Survey areas and quadrat locations.

All of these areas are denoted by a blue line, with the exception of 'Area' D, which is actually a series of ditches, marked with a red line on the figure. Standard botanical quadrats were used to survey all of these areas, and the quadrat locations (totalling 95) are alsoshown on Figure 1.

Table 2, below, sets out the habitats that were surveyed and the quadrats that were used to sample these areas. Photographs of each habitat are presented in Appendix A of this report. Botanical names follow Stace (1997).

Table 2 Quadrat locations

Location	Vegetation sampled
Area A	***Goodrums Fen*** (***Sizewell Marshes SSSI)*** • Wet woodland (Quadrats 1 to 5)
Area B	***Goodrums Fen*** (***Sizewell Marshes SSSI)*** • Wet reedbed (Quadrats 6 to 11)
Area C	***Goodrums Fen*** (***Sizewell Marshes SSSI)*** • Dry reedbed (quadrats 13 to14) • Woodland and dry reedbed/grassland (Quadrats 15 to 17)
Area D	***Ditches*** • D1 Northern boundary Goodrums Fen (within Sizewell Marshes SSSI) (Quadrats 18 to 22) • D2 Southern boundary Goodrums Fen (within Sizewell Marshes SSSI) (Quadrats 23 to 27) • D3 and D6 South of Goodrums Fen (within Sizewell Marshes SSSI) (Quadrats 28 and 29 and 39 to 41) • D4 D5 D5a Located within fen meadows (within Sizewell Marshes SSSI) to the west of Sizewell C Station Platform (quadrats 30 to 38)
Area E	***Reedbed and wet woodland in Sizewell Marshes SSSI south of Goodrums Fen*** • Reedbed and wet woodland (Quadrats 42 to 46)
Area F	***Fen meadows in Sizewell Marshes SSSI west of the Sizewell C Station Platform*** • Fen meadow (Quadrats 47 to 55)
Area G	***Minsmere to Walberswick Heaths and Marshes SAC/Ramsar coastal vegetation extending to the north of Sizewell C Station Platform***. • Leiston Drain (quadrats 59 to 61) • Reedbed adjacent Leiston Drain (quadrats 62 to 65) • Dune grassland (Quadrats 66 & 67) • Sand dune (quadrats 56 to 58)
Area H	***Suffolk Shingle Beaches CWS coastal vegetation*** • Dune grassland (Quadrats 78 to 82) • Sand dune (Quadrats 68 to 77) • Shingle (Quadrats 83 to 92
Area I	***Wet woodland in Sizewell Marshes SSSI west of Sizewell C Station Platform*** • Wet woodland (Quadrats 93 to 95)

2.3 Botanical survey methodology

The targeted botanical survey was carried out in accordance with the NVC Users Handbook (JNCC 2006). The results of the previous survey work that had been undertaken by Amec and SWT, together with a large-scale aerial photograph (dated 2013, provided by NNB GenCo) were used to identify homogenous stands of vegetation to be surveyed. The majority of these stands of vegetation were sampled using a standard 2m x 2m square quadrat. The exceptions to this were the woodland canopies (which were sampled using 50m x 50m square quadrats), and the ditch vegetation (which was sampled using a 1m x 4m rectangular quadrat).

With regard to ditch habitat, the NVC divides the emergent, floating and submerged (aquatic) plants within the ditches into separate plant communities. Consequently, the plants that were growing in these different locations within each quadrat were recorded as separate layers. It was not possible to record all of the plant species from the ditch bank, and therefore a grapple attached to a rope was used to obtain samples of the ditch vegetation to confirm identification and/or confirm the presence and species of submerged plants.

The percentage cover of each plant species rooted within each quadrat was recorded using the standard Domin logarithmic scale, as defined in Table 3 below:

Table 3 Domin values

Cover Value	Domin Value
91–100%	10
51–75%	9
76–90%	8
34–50%	7
26–33%	6
11–25%	5
4–10%	4
<4% (many individuals	3
<4% (several individuals)	2
<4% (few individuals)	1

NVC plant community boundaries were mapped in the field using both the results of the field surveys and 2013 aerial photographs.

The NVC survey was undertaken by a team of two experienced botanists over a period of three weeks between June and August 2014. Following the sampling survey, the quadrat results were compared against the habitat keys and floristic tables in the relevant NVC handbooks (Volumes 1 to 5) to confirm the identification of the vegetation communities present (Rodwell 1991a & b, 1992, 1995, 2000).

2.4 Limitations to survey

The surveys were undertaken at a time of year when the majority of the plant species present were in flower or had set seed, making identification to species relatively straightforward. Plants that flower particularly early or late in the season could have been missed. However, the majority of the plants that form the plant communities that were sampled would have been visible at the time of survey, including the uncommon and scarce plants that have been recorded within the sample areas previously. It is not considered necessary to repeat the survey at another time of year.

Plant species growing outside of the quadrat locations were not recorded.

The locations for the detailed quadrat survey were determined largely by a combination of accessibility and health & safety implications. Not all of the areas were therefore sampled in detail; however, it was possible to survey a representative sample of the habitats present.

3 Results

The results of the NVC survey are summarised below, with photographs of the vegetation presented in Appendix A, and NVC community boundaries illustrated on Figure 2 he detailed NVC floristic tables are presented in Appendix B.

3.1.1 Sizewell Marshes SSSI, Goodrums Fen

A significant proportion of Goodrums Fen would be lost to the proposed Sizewell C development. This part of the SSSI contains wet woodland and reedbed with water-filled ditches on the northern and southern boundaries. The surveys undertaken by Amec revealed the presence of a bank of spoil within the middle of the site that supported the open habitat community OV25 Common Nettle (*Urtica dioica*) - Creeping Thistle (*Cirsium arvense*) community (see grey shading on Figure 2). In 2014, this bank was found to be covered by False Oat-grass (*Arrhenatherum elatius*) and Common Nettle. It is possible that the plant community has changed, but it is not considered that this area of disturbed soil would support a plant community of conservation importance; it was therefore not subject to detailed survey in 2014.

Sample areas A to C are located within Goodrums Fen. The quadrat locations are illustrated on Figure 0038 – UA004506-UE21D-03 Survey areas and quadrat locations, whilst the distribution of the habitats described across Goodrums Fen is shown in Figure 0039 - UA004506-UE21D-03 NVC community bounadaries.. It should be noted that whilst these three areas were selected for sampling because they represent large patches of homogenous habitat, the actual detailed distribution of the constituent habitats (S4, S26 and W5) within Goodrums Fen is more complex than this, as illustrated in Figure 0039 - UA004506-UE21D-03 NVC community bounadaries..

Area A (Quadrats 1 to 5)

This part of the survey area comprised wet woodland, with a closed canopy of young Alder (*Alnus glutinosus*) and Ash (*Fraxinus excelsior*) trees. The ground was slightly drier on the western edge, where Ash was dominant in the canopy. A mixture of shrub species, predominantly comprising Goat Willow (*Salix caprea*) and Raspberry (*Rubus idaeus*), was recorded scattered beneath the main canopy. Mature trees were not present in this woodland.

Twenty five plant species characteristic of wetland were recorded in the ground flora, the most abundant species being Rough Meadow-grass (*Poa trivialis*) and Bittersweet *(Solanum dulcamara*). Other ground flora species were widely distributed throughout the woodland.

This woodland is attributable to the W5 Alder - Greater Tussock-sedge (*Carex paniculata*) woodland community, and was considered to correspond most closely to the W5a Common Reed (*Phragmites australis*) sub-community. This is less diverse than the other W5 sub-communities. This classification was due the scarcity of the ground flora, the frequency of Bittersweet and the dominance of Common Reed elsewhere within Goodrums Fen. W5 is a widely-distributed wet woodland community throughout the English lowlands, and W5a is the most common and widely-distributed of the W5 sub-communities.

The 2014 survey results accord with the survey work undertaken by Amec, and there does not appear to have been a significant change in the composition of the woodland community or its extent since the Amec surveys were undertaken in 2007 and 2008.

Area B (Quadrats 6 to 11)

This part of the survey area comprised the wet reedbed located within the central part of Goodrums Fen. The reedbed was species-poor and located on a wet substrate. Dense

Common Reed dominated the vegetation (between 90 and 100% cover in the quadrats) restricting the growth of other plant species. Fewer than 10 plant species were recorded in each quadrat. Species growing amongst the Common Reed included Common Nettle, Cleavers (*Galium aparine*) and Hedge Bindweed (*Calystegia sepium*). A small area (10m by 10m) of swamp vegetation located on the northern edge of the reedbed was an exception to the species–poor conditions. This area was sampled by Quadrat 11; however, it has not been possible to assign a different NVC plant community to this single quadrat due to the small sample size and limited extent of the vegetation.

The wet reedbed in Goodrums Fen is considered to be attributable to S4a, the typical sub-community of the NVC community S4 Common Reed swamp and reedbeds. As with W5a, S4a is a plant community that is widely distributed across the British lowlands.

Again, the 2014 survey results accord well with the previous survey work undertaken by Amec, and there does not appear to have been a significant change in the composition of the reedbed community or its extent since the Amec surveys were undertaken.

Area C (Quadrats 13 to 17)

Area C comprised areas of open vegetation dominated by Common Reed (dry reedbed) with patches of Alder and willow (*Salix* sp.) scrub. Quadrats 13 and 14 sampled the dry reedbed, whilst quadrats 15 to 17 sampled areas with reedbed and scrub.

The dry reedbed comprised Common Reed (90% cover in the quadrats) and Common Nettle (over 50% cover in the quadrats)(the layered nature of the vegetation in the quadrats makes it possible for the vegetation in each quadrat to exceed 100%). The drier reedbed areas were moderately diverse, supporting 16 plant species indicative of wetland habitat. Species recorded included Gypsywort (*Lycopus europaeus*), Hemp-agrimony (*Eupatorium cannabinum*), Water Mint (*Mentha aquatica*), Wild Angelica (*Angelica sylvestris*), Bittersweet and Cleavers. These species were sparsely distributed, with 10% cover or less within individual quadrats.

The drier reedbed areas are attributable to the NVC community S26 Common Reed – Common Nettle tall-herb fen due to co-dominance of Common Reed and Common Nettle. This is a vegetation community that is widely distributed in lowland Britain, in particular the fens and Broadlands of East Anglia.

The woodland/scrub was not as discrete and well-defined as the woodland in sample Area A. In Area C, it consisted of small scattered stands of Alder and willow which have not formed a closed canopy. These stands of trees and shrubs supported a moderately diverse flora, with 11 species indicative of wetland recorded. These included Water Dock (*Rumex hydrolapathum*), Water-pepper (*Persicaria hydropiper*), Greater Bird's-foot-trefoil (*Lotus pedunculatus*) and Floating Sweet-grass (*Glyceria fluitans*). In addition, common and widespread species more indicative of drier woodland habitats were also recorded, including Bramble (*Rubus fruticosus agg.)*, Cock's-foot (*Dactylis glomerata*), Yorkshire-fog (*Holcus lanatus*) and Herb-Robert (*Geranium robertianum*). These areas of woodland/scrub closely resembled W5 Alder-Greater Tussock-sedge woodland community.

The 2014 survey results accord with the survey work undertaken by Amec and there does not appear to have been a significant change in the composition of the reedbed and/or scrubby woodland community and their extent.

3.1.2 Ditches

Area D

Sample area D (see the red lines on Figure 0038 – UA004506-UE21D-03 Survey areas and quadrat locations) comprised drainage ditches within Sizewell Marshes SSSI and on the edge of the Sizewell C platform. The ditches sampled were:

- Ditch D1 - The northern boundary of Goodrums Fen (within Sizewell Marshes SSSI) (Quadrats 18 to 22);
- Ditch D2 - The southern boundary of Goodrums Fen (within Sizewell Marshes SSSI) (Quadrats 23 to 27);
- Ditch D3 and D6 - Located south of Goodrums Fen, alongside Area E (within Sizewell Marshes SSSI) (Quadrats 28 and 29 and 39 to 41); and
- Ditches D4, D5 and D5a - Located within the area of fen meadow within Sizewell Marshes SSSI, to the west of C Station Platform (Quadrats 30 to 38).

The ditches within Sizewell Marshes SSSI support diverse emergent and aquatic plant communities, including at least two nationally scarce plant species. The ditches within the SSSI have been managed on a long cycle of rotational management. This has created a wide range of conditions throughout the ditch network. Some ditches support a deep layer of silt, others are shaded by riparian tree and shrub growth, whilst others have been recently cleared of silt and plants and support open water.

The range of aquatic plant species supported within each ditch reflects its stage of development within this management cycle. The ditches that supported open water and receive plenty of light (those that are not shaded by riparian trees and scrub) supported the greatest diversity of aquatic plant species, whilst those that were heavily shaded or had a deep layer of silt supported the lowest number of aquatic plant species. This is illustrated by the photographs in Appendix A, with the shaded ditches supporting a covering of Common Duckweed (*Lemna minor*) and Greater Duckweed (*Spirodela polyrhiza*), with few other aquatic plants.

As discussed above, the emergent, floating and submerged (aquatic) plants are considered to be components of separate plant communities within the NVC system. For example, a ditch full of Common Reed with a floating carpet of duckweed (*Lemna sp*.) would constitute an emergent community of S4 Common Reed swamp growing over a floating carpet of A2 Common Duckweed aquatic community.

Two scarce aquatic plant species were recorded in the ditches sampled. These were: Frogbit (*Hydrocharis morsus-ranae*), which is uncommon but is recorded from more than 100 10km grid squares in Britain; and Soft Hornwort (*Ceratophyllum submersum*), a nationally scarce aquatic plant recorded from between 16 and 100 10km grid squares (Stewart *et al.* 1994).

Each of the ditches sampled are discussed below.

Ditch D1 - (Quadrats 18 to 22)

This ditch forms the northern boundary to Goodrums Fen. The western portion of the ditch (Q18) was within the fen meadow, and was thus relatively unshaded and supported a diverse emergent flora (12 plant species). However, further east the ditch was shaded by overhanging trees and vegetation and supported fewer emergent species. It was not possible to assign the emergent plants to an NVC community, since no particular suite of species was dominant.

The surface of the ditch supported a dense floating carpet of Common Duckweed and Greater Duckweed. This community is attributable to the A2 Common Duckweed aquatic community. The shade cast by overhanging vegetation and the floating carpet of duckweed has reduced the diversity of the submerged vegetation, with only Lesser Water-parsnip (*Berula erecta*) and Common Water-starwort (*Callitriche stagnalis sens. Lat*) recorded. Again, it was not possible to assign the submerged plants to an NVC community, since no particular suite of species was dominant.

Ditch D2 (Quadrats 23 to 27)

This ditch forms the southern boundary to Goodrums Fen. Like Ditch D1, for the majority of its length this ditch was shaded by trees and other vegetation and supported only a limited suite of emergent species. Common Reed and Reed Canary-grass (*Phalaris arundinacea*) were the most abundant emergent plant species recorded. The surface of the ditch supported a dense floating carpet of duckweed species and a sparse cover (less than 50%) of Frogbit. The floating vegetation has been attributed to the A3 Greater Duckweed – Frogbit aquatic community due the presence of both duckweed and Frogbit.

Shade from trees and vegetation had reduced the diversity of submerged vegetation. Plants recorded included Nuttall's Waterweed (*Elodea nuttallii*), Common Water-starwort and Fennel Pondweed (*Potamogeton pectinatus*). It was not possible to assign the submerged plants to an NVC community, since no particular suite of species was dominant.

Ditch D3 and D6 (Quadrats 28, 29 and 39 to 41)

These two ditches were also located within Sizewell Marshes SSSI, but south of Goodrums Fen. They are parallel to each other and separated by an earth track. Ditch D3 was located on the western side of the track and D6 on the eastern side. D6 was shaded by overhanging trees and supported a lower diversity of aquatic species than D3, which was unshaded for most of its length.

Both ditches supported a limited diversity of emergent plants, with Common Reed and Lesser Pond-sedge (*Carex acutiformis*) the most frequently recorded species in ditch D3. All plant species were present at a low abundance (10% cover). The emergent vegetation in ditch D6 comprised sparse Soft-Rush (*Juncus effusus*). It was not been possible to assign the emergent plants in either ditch to an NVC community due to the paucity of the plant species recorded.

The surface of ditch D3 supported a dense floating carpet of duckweed species, together with a few Frogbit and Lesser Water-parsnip plants. This floating vegetation has been attributed to the A3 Greater Duckweed-Frogbit aquatic community due the presence of both Duckweed and Frogbit. The surface of ditch D6 supported a dense floating carpet of Common Duckweed and Greater Duckweed. This community is attributable to the A2 Common Duckweed aquatic community.

Submerged species recorded in both ditches included Rigid Hornwort *(Ceratophyllum demersum*) and Soft Hornwort, but on the whole the diversity was relatively poor. Soft Hornwort was abundant in places (e.g. Q34 and Q40), and the submerged plants have been attributed to the A6 Soft Hornwort aquatic community.

Ditches D4, D5 and D5a (Quadrats 30 to 38)

These ditches are located around areas of marshy grassland/fen meadow within Sizewell Marshes SSSI to the west of the proposed C Station Platform. These ditches were the most botanically diverse ditches that were sampled in 2014. This is largely due to the fact that they were not shaded by tree and shrub vegetation. Eleven emergent species were recorded in the

quadrats. These included False Fox-sedge (*Carex otrubae*), Lesser Water-parsnip, Grey Club-rush (*Schoenoplectus tabernaemontani*) and Greater Pond-sedge (*Carex riparia*). All species were present at a low abundance (10% cover in the quadrats), and so it has not been possible to assign the emergent plants to an NVC community.

Where surface vegetation was present, the ditches supported a dense floating carpet of duckweed species, together with several Frogbit and Lesser Water-parsnip plants. The floating vegetation has been attributed to the A3 Greater Duckweed-Frogbit aquatic community due to the presence of both duckweed and Frogbit.

Rigid Hornwort, Soft Hornwort and Nuttall's Waterweed were also recorded, but overall few submerged species were recorded. Soft Hornwort was recorded in abundance in places, and the submerged plants have therefore been attributed to the A6 Soft Hornwort aquatic community.

Amec sampled a wider selection of ditches across the SSSI as the extent of the proposals was unknown at that stage. The results from the 2014 surveys are comparable to those recorded by Amec, with a similar range of NVC communities.

3.1.3 Sizewell Marshes SSSI - reedbed south of Goodrums Fen

Area E (Quadrats 42 to 46)

This part of the survey area was located southwest of Goodrums Fen and west of the proposed C Station platform. It comprised a reedbed with scattered Alder and willow trees. The reedbed was surrounded by a narrow strip of wet woodland. The northern part of this reedbed was inaccessible, so the quadrats are focussed on the southern end.

Common Reed dominated the vegetation (cover of 90 to 100% in the quadrats sampled). A diverse mixture of plants characteristic of wetland and woodland habitats were recorded amongst the reeds (25 species were recorded). These included Branched Bur-reed (*Sparganium erectum*), Hemp-agrimony, Wild Angelica, Skullcap (*Scutellaria galericulata*), Herb-Robert and Red Campion (*Silene dioica*). These wetland plants were recorded at low abundance, most with below 10% cover (in the quadrats sampled). The exception was Common Nettle, which was recorded in a single quadrat at a cover of 75%.

The dominance of Common Reed and the lack of Common Nettle within most of the quadrats sampled led to a classification of S4a, the typical sub-community of the NVC community S4 Common Reed swamp and reedbeds. Amec classified this area as S26 Common Reed – Common Nettle tall-herb fen. Both S4 and S6 are plant communities dominated by Common Reed. However, it would appear that in 2014, Common Nettle was less abundant than it had been previously.

In contrast to Goodrums Fen, the woodland on the edge of this area supported mature Alder trees. This woodland is attributable to the W5 Alder-Greater Tussock-sedge woodland community, and corresponds to the W5a Common Reed sub-community, which is less species-rich than the other W5 sub-communities. The assignment of this sub-community is due to the paucity of the ground flora, the frequency of Bittersweet and the dominance of Common Reed.

The 2014 survey results accord with the survey work undertaken by Amec, and there does not appear to have been a significant change in the composition of the woodland community or its extent.

3.1.4 Sizewell Marshes SSSI – fen meadow west of C station platform

Area F (Quadrats 47 to 55)

This part of the survey area comprised two fen meadows in Sizewell Marshes SSSI located to the west of the proposed C Station platform. Only the northern portion of each field was surveyed, as this is the area that has the potential to be affected by the development proposals. A total of 41 plant species were recorded in all of the quadrats across the survey area, which makes this the most diverse area surveyed during the 2014 survey. Each quadrat supported between 11 and 21 species.

However, the plant species diversity is less than has been recorded in similar habitat in other areas of the SSSI; for example, the long-term monitoring work undertaken for SWT recorded between 38 and 51 plant species in each of their sample plots, although it should be noted that their sample plots are larger than the 2 by 2m square quadrats. In addition, the vegetation recorded in 2014 appeared to be relatively homogenous, and was dominated by rush species. It would thus appear that this area may have been subject to a localised surface water flooding event, and for a prolonged duration. Such a flooding event would cause localised enrichment of the soil and encourage the growth of rushes, and would have a detrimental effect on plant species diversity.

The monitoring work undertaken by SWT did not include the areas sampled in 2014, and therefore no direct comparison is possible. However, the areas of the fields to the south of the areas sampled in 2014 appeared (based on visual observation) to support a greater diversity of species. It is therefore possible that the plant community recorded in 2014 may be restricted to a discrete area that has been affected by surface water flooding.

Rush species were dominant within the vegetation, with Blunt-flowered Rush (*Juncus subnodulosus*) the most abundant species, with between 75 and 90% cover (in the quadrats sampled). Common Reed was present in every quadrat, with cover values between 4 and 10%, again perhaps indicative of prolonged wet conditions. A moderately diverse range of fen meadow species were recorded in this area. These included Marsh Arrowgrass (*Triglochin palustre*), Brown Sedge (*Carex disticha*), Marsh Pennywort (*Hydrocotyle vulgaris*), Ragged-Robin (*Lychnis flos-cuculi*) and Water Mint, which are indicative of damp conditions, and Red Clover (*Trifolium pratense*), Tall Fescue (*Festuca arundinacea*), Selfheal (*Prunella vulgaris*) and Red Fescues (*Festuca rubra sens. lat*.), which are species indicative of drier grasslands. These fen meadows are attributable to the M22 Blunt-flowered Rush-Marsh Thistle (*Cirsium palustre*) mire community.

Previous survey work has identified M22 as the dominant community across Sizewell Marshes SSSI. This is a widespread plant community associated with wet, base-rich soils, with a particular concentration in East Anglia.

3.1.5 Minsmere to Walberswick Heaths and Marshes SAC/ Ramsar

Area G (Quadrats 56 to 67)

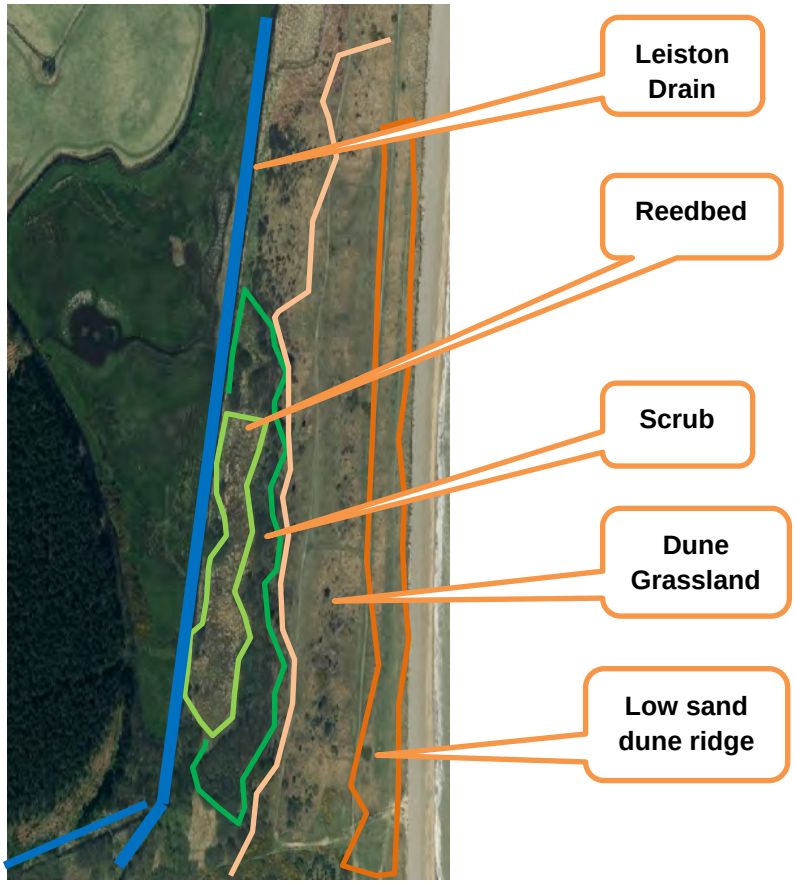
Area G sampled the southern end of the strip of coastal habitat within Minsmere to Walberswick SAC/Ramsar site. This area was sampled specifically in order to aid the assessment of groundwater and air quality effects on the vegetation present. It extends north from the C Station Platform between the Leiston Drain and the sea (see Plate 1, below); the Drain therefore forms the western boundary. Adjacent to this drainage ditch, to the east, was a linear reedbed,

approximately 30m to 40m in width. To the east of this was a strip of windswept and stunted scrub which graded into a flat area of dune grassland that was approximately 100m wide. This culminated in a low (1m-high) dune ridge overlooking bare shingle and the high tide mark (which was the eroded face of the low sand dune). There were no areas of vegetated shingle in this stretch of the SAC immediately to the north of the C Station Platform.

The belt of scrub was not sampled because it is not one the qualifying interest features of either the SAC or Ramsar site. It constituted a wide belt of trees and scrub comprising Silver Birch (*Betula pendula*), Pedunculate Oak (*Quercus robur*) and willow, with a ground flora supporting False Oat-grass (*Arrhenatherum elatius*), Common Reed and Broad Buckler-fern (*Dryopteris dilatata*). This feature was between 10 and 30m in width.

Plate 1, below, shows a simple representation of the habitats at the southern end of the SAC (north of the C station platform between the Leiston Drain and the sea) on the basis of an aerial photograph of the area. The NVC mapping of these habitat communities is presented in Figure 2, and a brief description of the different features is provided below.

Plate 1 Sequence of habitats from Leiston Drain to the sea.



Leiston Drain (Quadrats 59 to 61)

The Leiston Drain was choked by Common Reed, with Branched Bur-reed, Floating Sweet-grass and Lesser Water-parsnip scattered throughout. This emergent vegetation is attributable to the NVC Community S26 Common Reed – Common Nettle tall-herb fen.

The water surface was covered by duckweed species, including Common Duckweed and Fat Duckweed *(Lemna gibba*), with scattered Branched Bur-reed. This community is attributable to the A2 Common Duckweed aquatic community.

Only two submerged plant species were recorded, these were Fennel Pondweed and Common Water-starwort. This community is attributable to the A16 Common Water-starwort aquatic community. Fennel Pondweed was recorded at an abundance of up to 25%; the vegetation was therefore considered to be the typical A16 aquatic community, rather than the A16b Fennel Pondweed sub-community. This aquatic community is a species-poor community which occurs widely throughout lowland Britain.

Reedbed adjacent Leiston Drain (Quadrats 62 to 65)
The reedbed to the east of the Leiston Drain was species-poor, supporting only 11 plant species. The vegetation was Common Reed- and Common Nettle-dominated, with other species such as Wild Angelica, Broad Buckler-fern and Marsh Thistle recorded scattered amongst the dense growth of reeds. Lesser Pond-sedge formed a dense sedge bed in an open area amongst the Common Reed. The reedbed vegetation is attributable to the NVC community S26 Common Reed-Common Nettle tall-herb fen.

Dune grassland (Quadrats 66 & 67)
The dune grassland formed a level area between the reedbed/scrub woodland and a low dune on the seaward edge. The area consisted of a dense cover of Sand Sedge *(Carex arenaria*) and Sheep's-fescue (*Festuca ovina*) with clumps of Heather (*Calluna vulgaris*) and Bell Heather (*Erica cineria*) as well as discrete mats of Sheep's Sorrel (*Rumex acetosella*) and Cladonia lichen. The presence of Heather and Sheep's Sorrel indicates that the sand substrate is acidic in nature, either originating from acidic sands or sands which have been established for a long time and have become acidic through prolonged leaching. This area was species-poor, with 11 plant species recorded. The flat dune grassland is attributable to the SD12 Sand Sedge-Sheep's Sorrel-Common Bent (*Agrostis capillaris*) dune grassland. The 2014 survey results accord with the survey work undertaken by Amec, and there does not appear to have been a significant change in the dune grassland community or its extent.

SD12 dune grassland is more frequent in north and west England; nevertheless, it occurs in scattered localities on the coast of south-east England. It is a relatively uncommon plant community on the Suffolk Coast. SD12 favours areas of stable sand where accretion is negligible and erosion limited. This allows the process of leaching to occur, creating the acidic conditions required for this community to establish.

Sand dune (Quadrats 56 to 58)
The sand dune comprised a low (1m high) ridge on the seaward side of the dune grassland described above. The dune was observed to be actively eroding, and there were no areas of vegetated shingle on the seaward side of the dune. The dune was less consolidated than the dune grassland described above, but the plant species diversity was greater, with 21 species recorded. These included species indicative of less acidic conditions, including Lady's Bedstraw (*Galium verum*), Spiny Restharrow *(Ononis spinosa*) and Sweet Vernal-grass *(Anthoxanthum odoratum*). Both Sand Sedge and Sheep's-fescue were present in some abundance (covering between 50 and 90% of the vegetation in the quadrats sampled). Both Bell Heather and Heather were also present in discrete patches. This sand dune grassland is also attributable to SD12 Sand Sedge-Sheep's Sorrel-Common Bent dune grassland.

3.1.6 Suffolk Shingle Beaches CWS

Area H (Quadrats 68 to 92)

Area H comprised the coastal vegetation located directly on the seaward (eastern) edge of the proposed location for the Sizewell C Station platform. This area, as well as the coastal vegetation in front of the A and B Stations, has been designated as a County Wildlife Site (CWS) for the coastal habitats that it supports.

The coastal vegetation here is extremely complex for a number of reasons. In part, it is due to the fact the habitat was disturbed, altered and subsequently restored when the B Station was constructed. This has encouraged colonisation by a number of plant species characteristic of calcareous habitat, in contrast to the coastal vegetation in the Minsmere to Walberswick SAC/ Ramsar site described above (Area G). The contrast between the species-poor acidic sand dune vegetation north of the proposed location for the Sizewell C Station platform, and the more species-rich vegetation in front of the A and B Station, was quite pronounced.

The zonation of vegetation in this area follows a similar pattern to the SAC vegetation, but is more pronounced. From the eastern edge of the C and B station platforms was a broad level area of dune grassland, culminating in a low (2 to 3m high) sand dune. In front of the dune was an area of vegetated shingle; in some places, this was covered by a thin layer of windblown sand which then graded into bare shingle to the high tide mark. The beach was wider here than to the north of the C Station, and this has enabled the establishment of vegetated shingle.

Plate 2. Sequence of habitats seaward of C Station Platform

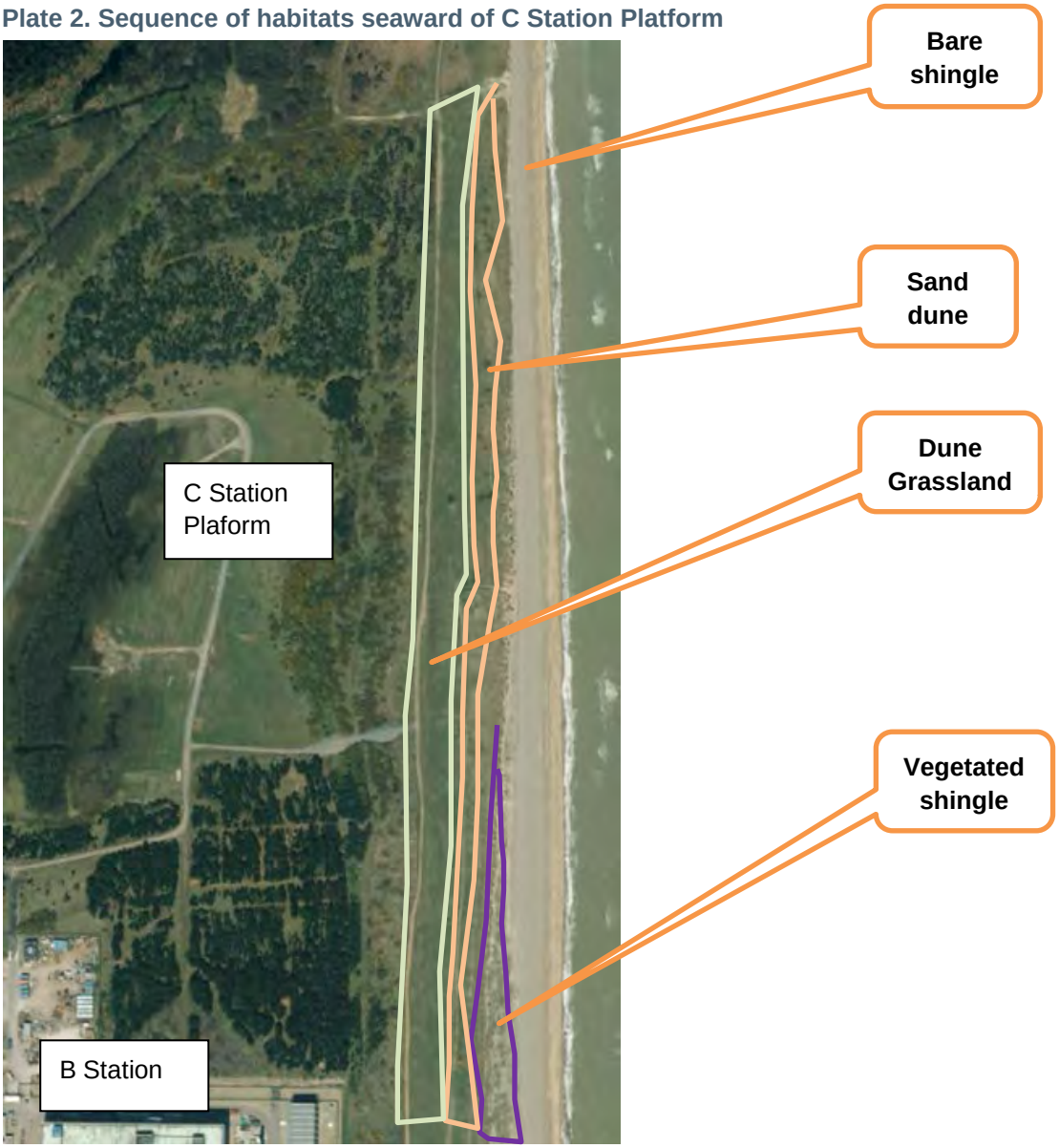


Plate 2, above, shows a simple representation of the habitats between the proposed location of the Sizewell C Station platform and the sea on the basis of an aerial photograph of the area. The NVC mapping of these habitat communities is presented in Figure 3, and a brief description of the different features is provided below.

A number of uncommon plants were recorded growing on the sand and shingle. These included Sea-kale (*Crambe maritima*), Sea Pea (*Lathyrus japonicus*), Rush-leaved Fescue (*Festuca arenaria*) and Rat's-tail Fescue (*Vulpia myuros*). Sea Pea, Rush-leaved Fescue and Rat's-tail Fescue are considered to be nationally scarce in Britain (recorded from between 16 and 100km Ordnance Survey 10km squares in Britain). Sea-kale is uncommon but would be classified as *not scarce* (i.e. it has been recorded in more than 100km squares in Britain); for further detail regarding scarce plant distributions, see Stewart *et al*. (1994).

Dune grassland (Quadrats 78 to 82)

As described above, the dune grassland occupied a flat area between the base of the B and C Station platforms and the sand dune ridge to the east**.** The low-growing sward (between 3 and 5cm high) was species-rich, with 28 grass and forb species recorded in the quadrats. The most abundant grass species were Red Fescue, Smooth Meadow-grass (*Poa pratensis*), Sheep's-fescue and Sweet Vernal-grass. The low growing forbs recorded included Common Bird's-foot-trefoil (*Lotus corniculatus*), Strawberry Clover (*Trifolium fragiferum*), Buck's-horn Plantain (*Plantago coronopus*), English Stonecrop (*Sedum anglicum*), Lady's Bedstraw, Harebell (*Campanula rotundifolia*), Ribwort Plantain (*Plantago lanceolata*) and Rough Hawkbit (*Leontodon hispidus*).

Previous surveys have identified the difficulty in assigning the sand dune and dune grassland to a particular NVC community. However, the consensus has been that the dune grassland most closely resembles the SD8 Red Fescue-Lady's Bedstraw fixed dune community. In SD8, Marram (*Ammophila arenaria*), which is usually the dominant grass on dunes, is replaced by Red Fescue and other herbaceous species to form a low close-cropped short tussocky turf. Lady's Bedstraw, Common Bird's-foot-trefoil and Ribwort Plantain are indicative of the typical sub-community. SD8 is characteristic of calcareous fixed sands on dunes and coastal plains in Britain. It is widely distributed on the coast, and the typical sub-community of SD8 is the most common sub-community on southerly coasts.

Sand Dune (Quadrats 68 to 77)

The sand dune habitat comprised a low, narrow dune, between 2 and 3m high and 5 and 6m in width. As with the dune grassland, the plant community was species-rich, with 37 plant species recorded within the quadrats. The most abundant grass species were Marram and Red Fescue, and a wide variety of forb species were recorded growing amongst the Marram tussocks. These included Common Bird's-foot-trefoil, Common Restharrow (*Ononis repens*), Mouse-ear-hawkweed (*Pilosella officinarum*), Sea Bindweed (*Calystegia soldanella*), Lady's Bedstraw, Common Centaury (*Centaurium erythraea*) and Strawberry Clover. The majority of these species are indicative of less-acidic conditions than the plant species recorded on the sand dune located north of the proposed C Station platform. Notwithstanding this, a small number of plant species indicative of slightly more acidic conditions were recorded, including both Sheep's Sorrel and Sheep's-fescue, but these plant species were present at low abundance (between 10 and 20% cover in the quadrats).

This dune vegetation is attributable to the SD7 Marram-Red Fescue semi-fixed dune community, which is the characteristic vegetation type of less mobile sands around the British coast.

Vegetated shingle (Quadrats 83 to 92)

Two shingle communities were recorded within Area H. Along the strand line was a sparse line of vegetation that comprised individual plants of Sea Sandwort (*Honckenya peploides*), Sea-kale and Halberd-leaved Orache (*Atriplex hastata*). These plants were present at a low density (between 2 and 3 individuals per square metre). This community was not sampled by quadrat due to the scarcity of the vegetation. Nevertheless, it was possible to assign an NVC community to this vegetation; it was attributable to the SD2 Sea Sandwort-Sea-kale strandline community.

Just above the strandline, where windblown sand had begun to cover the shingle, there was a more established shingle vegetation community, comprising a mixture of sand specialists such as Marram and Sand Sedge, together with shingle specialists including Sea-kale, Sea-holly (*Eryngium maritimum*), Sea Pea and Sea Campion (*Silene uniflora*). The shingle vegetation was moderately species-rich with 18 species recorded in the quadrats.

This shingle vegetation was considered to be attributable to the SD1 Curled Dock (*Rumex crispus*)-Yellow Horned-poppy (*Glaucium flavum*) shingle community and, in particular, the SD1a Sea Pea sub-community. This is due to the presence of species associated with sand and shingle. SD1 is the characteristic pioneer vegetation of maritime shingle on the coast of the warmer parts of the British Isles. It is a relatively uncommon vegetation type, with the Sea Pea sub–community largely restricted to the south-east coast.

These survey results accord with the survey work undertaken by both Amec and SWT in this area, and there does not appear to have been any significant change in the nature and extent of these shingle plant communities.

3.1.7 Woodland to the west of C Station Platform

Area I (Quadrats 93 to 95)

Area I comprised an area of wet woodland within Sizewell Marshes SSSI that formed the western boundary of the proposed C Station platform. The woodland canopy comprised young even-aged Alder trees (between 20 and 30 years of age) with a shrub layer of Goat Willow, Silver Birch and White Willow (*Salix alba*).

On the edge of the platform, the ground flora was dominated by Common Nettle and Bramble, with Cleavers, Creeping Buttercup (*Ranunculus repens*) and Wood Dock (*Rumex sanguineus*) also recorded. At the base of platform, the ground was saturated and merged into a ditch on the edge of Sizewell Marshes SSSI. Wetland plants recorded in this area included Yellow Iris (*Iris pseudacorus*), Gypsywort and Common Reed.

The woodland is attributable to the W5 Alder-Greater Tussock-sedge woodland community, due to the dominance of Alder trees. The NVC mapping of this habitat community is presented in Figure 0039 - UA004506-UE21D-03 NVC community bounadaries..

4 Conclusions

The NVC survey work carried out in 2014 has been used to map in detail the plant communities within those areas of Sizewell Marshes SSSI, Minsmere to Walberswick Heaths and Marshes SAC/Ramsar and the Suffolk Shingle Beaches CWS that could be affected by the proposals at Sizewell C, either directly or indirectly. The habitat maps for these different areas are presented in Figure 3. These maps, and the detailed plant information for the different habitat areas, will be used to establish the botanical baseline for the impact assessment for Sizewell C, for both the EIA and the HRA.

The plant communities and sub-communities recorded during the 2014 survey were similar in extent and composition to those recorded in these locations by Amec and SWT. One exception to this was the fen meadow west of the Sizewell C platform (Area F). The abundance of rush in this part of the survey area potentially indicates that localised flooding has caused a minor change in the plant assemblage. Although the NVC plant community present in this area appears not to have been altered, plant species diversity may have been reduced. This change may be temporary, and in the absence of prolonged surface water flooding plant species diversity is likely to recover over time.

A minor change was also identified in the composition of the reedbed within Sizewell Marshes SSSI, in Area E (north-west of the fen meadow). Previously the vegetation here had been assigned to the S26 Common Reed-Common Nettle tall-herb fen community. However, the vegetation sampled in 2014 supported less Common Nettle and was attributed to the S4a sub-community of S4 Common Reed swamp. Although the plant community has changed (both are reed-dominated) it would appear that plant species diversity has not altered.

Previous surveys have also revealed the presence of scarce plant species in Sizewell Marshes SSSI, the ditches and the vegetated shingle within Minsmere to Walberswick Heaths and Marshes SAC/Ramsar, and the Suffolk Shingle Beaches CWS. These plants were also recorded within the areas that were sampled in 2014.

Table 4 presents a summary of the 2014 survey results.

Table 4 Plant communities and scarce plants recorded within the survey area in 2014

Location	Vegetation sampled	NVC communities and scarce plants *(latter in bold italic)*
Area A	***Goodrums Fen*** (***Sizewell Marshes SSSI)*** Wet woodland (Quadrats 1 to 5)	W5 Alder - Greater Tussock-sedge woodland. W5a Common Reed sub-community
Area B	***Goodrums Fen*** (***Sizewell Marshes SSSI)*** Wet reedbed (Quadrats 6 to 11)	S4 Common Reed swamp and reedbeds. S4a typical sub-community.
Area C	***Goodrums Fen*** (***Sizewell Marshes SSSI)*** Dry reedbed (quadrats 13 to14) Woodland and dry reedbed/grassland (Quadrats 15 to 17)	S26 Common Reed-Common Nettle tall-herb fen. W5 Alder-Greater Tussock-sedge woodland community.
Area D	***Ditches*** D1 Northern boundary Goodrums Fen (within Sizewell Marshes SSSI)	D1, D2, D3, D4, D5, D5a & D6: Emergent flora - no NVC community assigned.

Location	Vegetation sampled	NVC communities and scarce plants *(latter in bold italic)*
	(Quadrats 18 to 22) D2 Southern boundary Goodrums Fen (within Sizewell Marshes SSSI) (Quadrats 23 to 27) D3 and D6 South of Goodrums Fen (within Sizewell Marshes SSSI) (Quadrats 28 and 29 and 39 to 41) D4 D5 D5a Located within fen meadows to the west of Sizewell C Station Platform (within Sizewell Marshes SSSI) (Quadrats 30 to 38)	D1, D6: Floating vegetation - A2 Common Duckweed aquatic community. D1, D2 Submerged flora - no NVC community assigned. D2, D3, D4, D5 & D5a: Floating vegetation - A3 Greater Duckweed- Frogbit aquatic community. D3, D4, D5, D5a & D6 Submerged flora - A6 Soft Hornwort aquatic community In Ditches 1,2,4,5 & 5a: ***Frogbit.*** In Ditches 3,4,5 & 5a & 6: ***Soft Hornwort***
Area E	***Reedbed and wet woodland in Sizewell Marshes SSSI south of Goodrums Fen*** Reedbed and wet woodland (Quadrats 42 to 46)	S4 Common Reed swamp and reedbeds. S4a typical sub-community. W5 Alder-Greater Tussock-sedge woodland. W5a the Common Reed sub-community
Area F	***Fen meadows in Sizewell Marshes SSSI west of the Sizewell C Station Platform*** Fen meadow (Quadrats 47 to 55)	M22 Blunt-flowered Rush -Marsh Thistle mire community.
Area G	***Minsmere to Walberswick Heaths and Marshes SAC/Ramsar coastal vegetation extending to the north of Sizewell C Station Platform***. Leiston Drain (quadrats 59 to 61) Reedbed adjacent Leiston Drain (quadrats 62 to 65) Dune grassland (Quadrats 66 & 67) Sand dune (Quadrats 56 to 58)	Leiston Drain: S26 Common Reed- Common Nettle tall-herb fen, A2 Common Duckweed aquatic community, A16 Common Water-starwort aquatic community, typical sub-community. Reedbed: S26 Common Reed-Common Nettle tall-herb fen. Dune grassland & sand dune: SD12 Sand Sedge-Sheep's Sorrel-Common Bent dune grassland. Sand dune: ***Rat's-tail Fescue***
Area H	***Suffolk Shingle Beaches CWS coastal vegetation*** Dune grassland (Quadrats 78 to 82) Sand dune (Quadrats 68 to 77) Shingle (Quadrats 83 to 92)	Dune grassland: SD8 Red Fescue-Lady's Bedstraw fixed dune community. Sand dune: SD7 Marram-Red Fescue semi-fixed dune community. Shingle: SD2 Sea Sandwort-Sea-kale strandline community. SD1 Curled Dock-Yellow Horned-poppy shingle community. SD1a Sea Pea sub-community.

Location	Vegetation sampled	NVC communities and scarce plants *(latter in bold italic)*
		Dune grassland: ***Rat's-tail Fescue*** Sand dune and shingle: ***Rush-leaved Fescue*** Shingle: ***Sea Pea***
Area I	***Wet woodland in Sizewell Marshes SSSI west of Sizewell C Station Platform*** Wet woodland (Quadrats 93 to 95)	W5 Alder-Greater Tussock-sedge woodland community.

5 References

Stace, C. (1997). New Flora of the British Isles Second Edition. Cambridge University Press.

JNCC (2006) National Vegetation Classification Users handbook.

Rodwell, J. Ed. (1991a) British Plant Communities Volume One, Woodlands and Scrub. Cambridge University Press.

Rodwell, J. Ed (1991b) British Plant Communities Volume Two, Mire and Heaths. Cambridge University Press.

Rodwell, J. Ed (1992) British Plant Communities Volume Three, Grassland and Montane Communities. Cambridge University Press.

Rodwell, J. Ed (1995) British Plant Communities Volume Four, Aquatic Communities, Swamps and Tall-Herb Fens. Cambridge University Press.

Rodwell, J. Ed (2000) British Plant Communities Volume Five, Maritime Communities and Vegetation of Open Habitats. Cambridge University Press.

Amec (2007 – 2008) Sizewell C, National Vegetation Classification Report 2007 – 2008

Ecology Land and People (2010). Sizewell Marshes SSSI, Report on the fen meadow vegetation monitoring programme. Fieldwork July 2010.

Stewart *et al* (1994) Scarce Plants in Britain Published by the JNCC.

Appendix A. Photographs of the habitat types present

Area A - Goodrums Fen (Sizewell Marshes SSSI) – **wet woodland**		
		
		

Area B - Goodrums Fen (Sizewell Marshes SSSI) – **wet reedbed**

Area C - Goodrums Fen (Sizewell Marshes SSSI) – **dry reedbed**

Area D – Ditches

Ditch – D1



Ditch – D2



Ditch – D3

Ditch – D4

Ditch – D5

Ditch – D5a

Ditch – D6

Area E – Reedbed in Sizewell Marshes SSSI, south of Goodrums Fen

Area F – Fen Meadow in Sizewell Marshes SSSI, west of Sizewell C Station platform

Area G - Minsmere to Walberswick Heaths and Marshes SAC/Ramsar coastal vegetation extending to the north of Sizewell C Station platform – **Leiston Drain**

Area G - Minsmere to Walberswick Heaths and Marshes SAC/Ramsar coastal vegetation extending to the north of Sizewell C Station platform – **reedbed adjacent Leiston Drain**

Area G - Minsmere to Walberswick Heaths and Marshes SAC/Ramsar coastal vegetation extending to the north of Sizewell C Station Platform – **dune grassland**

Area G - Minsmere to Walberswick Heaths and Marshes SAC/Ramsar coastal vegetation extending to the north of Sizewell C Station platform – **dune grassland and sand dune**

Area H - Suffolk Shingle Beaches CWS coastal vegetation – **shingle vegetation**



Area H - Suffolk Shingle Beaches CWS coastal vegetation – **sand dune**



Area H - Suffolk Shingle Beaches CWS coastal vegetation - **dune grassland**		
		

Area I – Wet woodland in Sizewell Marshes SSSI west of Sizewell C Station Platform		
		

Appendix B - NVC floristic tables

Area A - Goodrums Fen (Sizewell Marshes SSSI) - **Wet woodland** (Quadrats 1 to 5)

	Domin				
Plant Species	**Q1**	**Q2**	**Q3**	**Q4**	**Q5**
Alder (*Alnus glutinosus*)	**4**	**4**	**4**	**4**	**4**
Bittersweet (*Solanum dulcamara)*		**2**	**7**	**4**	**1**
Bramble (*Rubus fruticosus agg.*)		**1**	**5**		
Branched Bur-reed (*Sparganium erectum*)			**4**		
Celery-leaved Buttercup (*Ranunculus sceleratus*)			**4**	**5**	
Cleavers (*Galium aparine*)	**2**	**2**			
Climbing Corydalis (*Ceratocapnos claviculata*)	**1**				
Common Nettle (*Urtica dioica*)		**4**	**5**		**4**
Common Reed (*Phragmites australis*)		**4**			
Creeping Buttercup (*Ranunculus repens*)				**4**	**4**
Floating Sweet-grass (*Glyceria fluitans*)	**5**				**5**
Gipsywort (*Lycopus europaeus*)	**2**		**1**		**4**
Grey Club-rush (*Schoenoplectus tabernaemontani*)					
Goat Willow (*Salix caprea*)	**1**	**4**	**4**	**4**	**1**
Hedge Bindweed (*Calystegia sepium*)		**4**			
Large Bitter-cress (*Cardamine amara)*	**4**				
Lesser Water-parsnip (*Berula erecta*)					**7**
Marsh Thistle (*Cirsium palustre*)			**4**	**4**	
Oval Sedge (*Carex ovalis*)					**4**
Pendulous Sedge (*Carex pendula)*		**1**			
Raspberry (*Rubus idaeus*)				**5**	**4**
Reed Canary-grass (*Phalaris arundinacea*)		**5**	**9**		**1**
Rough Meadow-grass (*Poa trivialis*)	**4**	**9**	**4**	**8**	**5**
Skullcap (*Scutellaria galericulata*)					**4**
Soft-rush (*Juncus effusus*)		**4**			
Water Forget-me-not (*Myosotis scorpioides*)	**8**		**4**		**4**
Water Mint (*Mentha aquatica*)					**4**
Water-pepper (*Persicaria hydropiper*)	**4**		**1**	**4**	
Wood Dock (*Rumex sanguineus*)	**4**		**4**	**5**	**1**
Yellow Iris (*Iris pseudacorus*)			**1**	**4**	**4**
50 x 50m Woodland canopy Quadrats					
Ash (*Fraxinus excelsior*)					
Alder (Alnus glutinosus)				**6**	**9**
Crack-willow (*Salix fragilis*)					**5**
Dog-rose (*Rosa canina*)				**4**	
Elm (*Ulmus sp.*)					**1**
Pedunculate Oak (*Quercus robur*)				**4**	**4**
Raspberry (*Rubus idaeus*)				**9**	**5**
Goat Willow (*Salix caprea*)					**4**

Area B - Goodrums Fen (Sizewell Marshes SSSI) - **Wet reedbed** (Quadrats 6 – 11)

	Domin					
Plant Species	**Q6**	**Q7**	**Q8**	**Q9**	**Q10**	**Q11**
Bittersweet (*Solanum dulcamara)*	**4**		**4**			
Bramble (*Rubus fruticosus agg.*)			**4**	**4**		
Branched Bur-reed (*Sparganium erectum*)						**7**
Bottle Sedge (*Carex rostrata*)						**4**
Bulrush (*Typha latifolia*)					**4**	**4**
Celery-leaved Buttercup (*Ranunculus sceleratus*)						**4**
Cleavers (*Galium aparine*)	**4**		**1**	**4**		
Common Club-rush (*Schoenoplectus lacustris*)						**7**
Common Duckweed (*Lemna minor)*			**4**			
Common Nettle (*Urtica dioica*)	**4**	**4**	**4**			
Common Reed (*Phragmites australis*)	**10**	**10**	**10**	**7**	**10**	**7**
Common Spike-rush (*Eleocharis palustris*)						**5**
False Oat-grass (*Arrhenatherum elatius*)				**9**		
Greater Pond-sedge (*Carex riparia*)						**5**
Goat Willow (*Salix caprea*)	**4**					
Hard Rush (*Juncus inflexus)*						**4**
Hedge Bindweed (*Calystegia sepium*)	**4**	**4**	**5**			
Lesser Water-parsnip (*Berula erecta*)	**4**					
Oval Sedge (*Carex ovalis*)						**4**
Rough Meadow-grass (*Poa trivialis*)				**4**		
Soft-rush (*Juncus effusus*)						**6**
Water Forget-me-not (*Myosotis scorpioides*)						**4**
Water Mint (*Mentha aquatica*)						**4**
Water Dock (*Rumex hydrolapathum*)		**4**				
Wood Dock (*Rumex sanguineus*)	**1**					
Yellow Iris (*Iris pseudacorus*)						**4**

Area C - Goodrums Fen (Sizewell Marshes SSSI) - **Dry reedbed** (Quadrats 13 to 14)

	Domin	
Plant Species	**Q13**	**Q14**
Bittersweet (*Solanum dulcamara)*	**4**	
Cleavers (*Galium aparine*)	**4**	
Common Nettle (*Urtica dioica*)	**8**	**7**
Common Reed (*Phragmites australis*)	**9**	**9**
Field Horsetail (*Equisetum arvense*)	**7**	**5**
Gipsywort (*Lycopus europaeus*)		**4**
Greater Bird's-foot-trefoil (*Lotus pedunculatus)*	**4**	**4**
Hedge Bindweed (*Calystegia sepium*)	**4**	**4**
Hedge Woundwort (*Stachys sylvatica*)	**5**	
Hemp-agrimony (*Eupatorium cannabinum*)	**4**	
Herb-Robert (*Geranium robertianum*)	**4**	
Marsh Thistle (*Cirsium palustre*)	**4**	**4**
Reed Canary-grass (*Phalaris arundinacea*)		**4**
Rough Meadow-grass (*Poa trivialis*)	**5**	**5**
Soft-rush (*Juncus effusus*)		**5**
Tufted Vetch (*Vicia cracca*)	**4**	
Water Mint (*Mentha aquatica*)		**4**
Wild Angelica (*Angelica sylvestris*)		**4**

Area C - Goodrums Fen (Sizewell Marshes SSSI) - **Woodland and dry reedbed/grassland** (Quadrats 15 to 17)

	Domin		
Plant Species	**Q15**	**Q16**	**Q17**
Bramble (*Rubus fruticosus agg.*)		**1**	
Broad Buckler-fern			**1**
Bog Stitchwort (*Stellaria uliginosa*)			
Climbing Corydalis (*Ceratocapnos claviculata*)		**1**	**2**
Cock's-foot (*Dactylis glomerata*)	**4**		
Common Hemp-nettle (*Galeopsis tetrahit*)	**6**		
Common Nettle (*Urtica dioica*)	**7**	**4**	**4**
Common Reed (*Phragmites australis*)	**1**	**4**	
Dog-rose (*Rosa canina*)		**1**	
False Oat-grass (*Arrhenatherum elatius*)	**5**	**4**	
Field Horsetail (*Equisetum arvense*)			**1**
Floating Sweet-grass (*Glyceria fluitans*)		**8**	
Greater Bird's-foot-trefoil (*Lotus pedunculatus)*		**2**	
Hedge Bindweed (*Calystegia sepium*)	**4**		
Herb-Robert (*Geranium robertianum*)		**1**	
Honeysuckle (*Lonicera periclymenum*)		**1**	
Marsh Foxtail (*Alopecurus geniculatus*)		**4**	
Reed Canary-grass (*Phalaris arundinacea*)	**1**	**4**	**4**
Rough Meadow-grass (*Poa trivialis*)	**8**		**8**
Silver Birch (*Betula pendula*)			**1**
Soft-rush (*Juncus effusus*)		**4**	
Water Dock (*Rumex hydrolapathum*)	**2**		
Water-pepper (*Persicaria hydropiper*)	**4**		
Yorkshire-fog (*Holcus lanatus*)	**4**	**4**	**5**
50 x 50m Woodland canopy Quadrats			
Alder (Alnus glutinosus)			**4**
Dog-rose (*Rosa canina*)		**1**	
Hawthorn (*Crataegus monogyna)*		**5**	**4**
Pedunculate Oak (*Quercus robur*)		**1**	**4**
Poplar (*Populus sp.*)		**5**	
Goat Willow (Salix caprea)		**5**	**4**
Silver Birch (*Betula pendula*)		**8**	**8**

Area D - Ditches (Quadrats 18 to 41)

Ditch 1 Northern boundary Goodrums Fen (within Sizewell Marshes SSSI), Quadrats 18 to 22
Ditch 2 Southern boundary Goodrums Fen (within Sizewell Marshes SSSI), Quadrats 23 to 27
Ditch 3 South of Goodrums Fen (within Sizewell Marshes SSSI), Quadrats 28 and 29
Ditch 4 Located within fen meadows (within Sizewell Marshes SSSI) to the west of Sizewell C Station Platform, Quadrats 30 to 32
Ditch 5 Located within fen meadows (within Sizewell Marshes SSSI) to the west of Sizewell C Station Platform, Quadrats 34 to 36
Ditch 5a Located within fen meadows (within Sizewell Marshes SSSI) to the west of Sizewell C Station Platform Quadrats 37 and 38
Ditch 6 South of Goodrums Fen (within Sizewell Marshes SSSI), Quadrats 39 to 40

Key to tables E- Emergent F- Floating A- Aquatic

Plant Species	Domin											
	Q18			Q19			Q20			Q21		
	E	F	A	E	F	A	E	F	A	E	F	A
Bittersweet (*Solanum dulcamara)*	4									1		
Branched Bur-reed (*Sparganium erectum*)							2					
Common Bird's-foot-trefoil (*Lotus corniculatus*)	1											
Common Duckweed (*Lemna minor)*		9			7			9			9	9
Common Hemp-nettle (*Galeopsis tetrahit*)												
Common Marsh-bedstraw (*Galium palustre*)	2											
Common Nettle (*Urtica dioica*)	3									2		
Common Reed (*Phragmites australis*)	3						4			4		
Common Water-starwort (*Callitriche stagnalis sens. lat.*)						5			5			
Creeping Bent (*Agrostis stolonifer*a)	3											
Creeping Buttercup (*Ranunculus repens*)	3											
False Oat-grass (*Arrhenatherum elatius*)										1		
Field Horsetail (*Equisetum arvense*)										1		
Floating Sweet-grass (*Glyceria fluitans*)				4			5			8		
Greater Duckweed (*Spirodela polyrhiza*)		4			3			3			4	
Great Willowherb (*Epilobium hirsutum*)										1		
Lesser Water-parsnip (*Berula erecta*)	5		8				8			4		
Nuttall's Waterweed (*Elodea nuttallii*)						5						
Water-cress (*Rorippa nasturtium-aquaticum*)	8						6					
Wood Dock (*Rumex sanguineus*)	2											
Yellow Iris (*Iris pseudacorus*)	1						1					
Yorkshire-fog (*Holcus lanatus*)	3											

Plant Species	Domin											
	Q22			Q23			Q24			Q25		
	E	F	A	E	F	A	E	F	A	E	F	A
Bittersweet (*Solanum dulcamara)*	2			1			1					
Common Duckweed (*Lemna minor)*		10									8	
Common Nettle (*Urtica dioica*)	2											
Common Reed (*Phragmites australis*)	7			5			5			5		

Plant Species	Domin											
	Q22			Q23			Q24			Q25		
	E	F	A	E	F	A	E	F	A	E	F	A
Common Water-starwort (*Callitriche stagnalis sens. lat.*)			9			9			9		4	4
Creeping Bent (*Agrostis stolonifer*a)					2			2		4		
Creeping Buttercup (*Ranunculus repens*)					2			2				
False Oat-grass (*Arrhenatherum elatius*)				4			4					
Fennel Pondweed (*Potamogeton pectinatus*)												2
Field Horsetail (*Equisetum arvense*)					1			1				
Floating Sweet-grass (*Glyceria fluitans*)	3		4									
Fool's-water-cress (*Apium nodiflorum*)										2		
Frogbit (*Hydrocharis morsus-ranae*)					2			2			3	
Greater Duckweed (*Spirodela polyrhiza*)		5			6			5			6	
Great Willowherb (*Epilobium hirsutum*)	2											
Goat Willow (*Salix caprea*)				3			3					
Hard Rush (*Juncus inflexus)*				2			2					
Lesser Water-parsnip (*Berula erecta*)					4			4				
Lesser Pond-sedge (*Carex acutiformis*)										1		
Nuttall's Waterweed (*Elodea nuttallii*)						2			2			9
Purple-loosestrife (*Lythrum salicaria*)	3											
Rigid Hornwort (*Ceratophyllum demersum*)						3			3			
Water-plantain (*Alisma plantago-aquatica*)					4			4				

Plant Species	Domin											
	Q26			Q27			Q28			Q29		
	E	F	A	E	F	A	E	F	A	E	F	A
Bittersweet (*Solanum dulcamara)*							1			1		
Bottle Sedge (*Carex rostrata*)	2									2		
Common Duckweed (*Lemna minor)*		7			7			2			9	
Common Reed (*Phragmites australis*)				2			4			5		
Common Water-starwort (*Callitriche stagnalis sens. lat.*)		4	5		4							
Fat Duckweed (*Lemna gibba*)											5	
Fennel Pondweed (*Potamogeton pectinatus*)			4			4						
Frogbit (*Hydrocharis morsus-ranae*)		1			2			7	2		4	
Greater Duckweed (*Spirodela polyrhiza*)		3			5			5			6	
Lesser Pond-sedge (*Carex acutiformis*)										3		
Marsh Thistle (*Cirsium palustre*)						6						
Nuttall's Waterweed (*Elodea nuttallii*)			7									
Reed Canary-grass (*Phalaris arundinacea*)	4											
Rigid Hornwort (*Ceratophyllum demersum*)									4			4
Soft Hornwort (*Ceratophyllum submersum*)												2
Soft-rush (*Juncus effusus*)				2								
Water-pepper (*Persicaria hydropiper*)										1		
Yellow Iris (*Iris pseudacorus*)										1		

Plant Species	Domin											
	Q30			Q31			Q32			Q33		
	E	F	A	E	F	A	E	F	A	E	F	A
Blunt-flowered Rush (*Juncus subnodulosus*)				2								
Branched Bur-reed (*Sparganium erectum*)	2						6					
Bottle Sedge (*Carex rostrata*)				4			2					
Compact Rush (*Juncus conglomeratus*)				2								
Common Duckweed (*Lemna minor)*		8			9			9			5	2
Common Marsh-bedstraw (*Galium palustre*)	2			2			2					
Common Reed (*Phragmites australis*)	5									3		
Creeping Buttercup (*Ranunculus repens*)				1								
False Fox-sedge (*Carex otrubae*)	4											
False Oat-grass (*Arrhenatherum elatius*)				1								
Fat Duckweed (*Lemna gibba*)		7			6			4			5	
Fennel Pondweed (*Potamogeton pectinatus*)									2			
Field Horsetail (*Equisetum arvense*)										2		
Field Forget-me-not (*Myosotis arvensis*)				1								
Floating Sweet-grass (*Glyceria fluitans*)				1								
Frogbit (*Hydrocharis morsus-ranae*)		6	3		5			4			2	4
Greater Duckweed (*Spirodela polyrhiza*)		7			6			5			4	
Greater Pond-sedge (*Carex riparia*)	5			4						6		
Great Willowherb (*Epilobium hirsutum*)	1											
Grey Club-rush (*Schoenoplectus tabernaemontani*)	4											
Hard Rush (*Juncus inflexus)*	1									4		
Lesser Water-parsnip (*Berula erecta*)	2						1			5		
Lesser Pond-sedge (*Carex acutiformis*)	4									6		
Nuttall's Waterweed (*Elodea nuttallii*)			4						3			
Ragged-Robin *(Lychnis flos-cuculi*)				1								
Rigid Hornwort (*Ceratophyllum demersum*)			8									
Rough Meadow-grass (*Poa trivialis*)	1											
Soft Hornwort (*Ceratophyllum submersum*)						9			7			
Soft-rush (*Juncus effusus*)							2					
Water Mint (*Mentha aquatica*)				1			1			2		
Water Dock (*Rumex hydrolapathum*)		2								3		
Water-plantain (*Alisma plantago-aquatica*)	4											
Wavy Bitter-cress (*Cardamine flexuosa*)	2											
Wood Dock (*Rumex sanguineus*)	1			2								
Yellow Iris (*Iris pseudacorus*)							2					
Yorkshire-fog (*Holcus lanatus*)				1								

Plant Species	Domin											
	Q34			Q35			Q36			Q37		
	E	F	A	E	F	A	E	F	A	E	F	A
Blunt-flowered Rush (*Juncus subnodulosus*)	4						2					
Branched Bur-reed (*Sparganium erectum*)										8		
Bottle Sedge (*Carex rostrata*)	5						4			3		
Common Duckweed (*Lemna minor)*		7			9			9			4	
Common Hemp-nettle (*Galeopsis tetrahit*)												
Common Marsh-bedstraw (*Galium palustre*)	4			2								
Common Reed (*Phragmites australis*)	5						8			5		
Fat Duckweed (*Lemna gibba*)		6			4			8			4	
Frogbit (*Hydrocharis morsus-ranae*)		4			3			5			4	
Gipsywort (*Lycopus europaeus*)				4								
Greater Duckweed (*Spirodela polyrhiza*)		4			3			5			5	
Greater Pond-sedge (*Carex riparia*)	9											
Greater Tussock-sedge (*Carex paniculata*)										4		
Grey Club-rush (*Schoenoplectus tabernaemontani*)										3		
Hard Rush (*Juncus inflexus)*							6					
Lesser Water-parsnip (*Berula erecta*)	4						6			4		
Lesser Pond-sedge (*Carex acutiformis*)				6								
Lesser Spearwort (*Ranunculus flammula*)				1						1		
Nuttall's Waterweed (*Elodea nuttallii*)												4
Purple-loosestrife (*Lythrum salicaria*)				1								
Ragged-Robin *(Lychnis flos-cuculi*)	1											
Rigid Hornwort (*Ceratophyllum demersum*)									2			7
Soft Hornwort (*Ceratophyllum submersum*)			9			2						2
Soft-rush (*Juncus effusus*)				4			6			2		
Water Mint (*Mentha aquatica*)				2			4					
Water Dock (*Rumex hydrolapathum*)	2						2			1		

Plant Species	Domin											
	Q38			Q39			Q40			Q41		
	E	F	A	E	F	A	E	F	A	E	F	A
Bittersweet (*Solanum dulcamara)*							1					
Blunt-flowered Rush (*Juncus subnodulosus*)	6											
Compact Rush (*Juncus conglomeratus*)	4											
Common Duckweed (*Lemna minor)*					9			9			10	2
Common Reed (*Phragmites australis*)				1			4			2		
Fat Duckweed (*Lemna gibba*)								4				
Fine-leaved Water-dropwort (*Oenanthe aquatica*)	3											
Floating Sweet-grass (*Glyceria fluitans*)							2					
Frogbit (*Hydrocharis morsus-ranae*)					2			5	7		4	
Greater Duckweed (*Spirodela polyrhiza*)											3	
Gipsywort (*Lycopus europaeus*)				1	3							
Lesser Water-parsnip (*Berula erecta*)							7	7				
Lesser Pond-sedge (*Carex acutiformis*)	3			2			2					
Soft Hornwort (*Ceratophyllum submersum*)									9			
Soft-rush (*Juncus effusus*)	4											
Water Mint (*Mentha aquatica*)	2						4					
Water-plantain (*Alisma plantago-aquatica*)	2											
Water-pepper (*Persicaria hydropiper*)							1					

Area E - Reedbed and wet woodland in Sizewell Marshes SSSI, south of Goodrums Fen (Quadrats 42 to 46)

Plant Species	Domin				
	Q42	Q43	Q44	Q45	Q46
Bittersweet (*Solanum dulcamara)*				4	
Branched Bur-reed (*Sparganium erectum*)				7	
Bog Stitchwort (*Stellaria uliginosa*)			2		
Cleavers (*Galium aparine*)	4		4	4	
Common Hemp-nettle (*Galeopsis tetrahit*)				6	
Common Nettle (*Urtica dioica*)					8
Common Reed (*Phragmites australis*)	10	9	9	7	9
Common Sedge (*Carex nigra*)					1
Common Spotted-orchid (*Dactylorhiza fuchsii*)	1				
Hedge Bindweed (*Calystegia sepium*)	5	5		6	6
Hedge Woundwort (*Stachys sylvatica*)					
Hemp-agrimony (*Eupatorium cannabinum*)		7	5		
Herb-Robert (*Geranium robertianum*)	1	1	3	4	
Lesser Pond-sedge (*Carex acutiformis*)	4	2			
Lesser Stitchwort (*Stellaria graminea*)	2				
Marsh Foxtail (*Alopecurus geniculatus*)					
Marsh Thistle (*Cirsium palustre*)	4	4	3	4	4
Red Campion (*Silene dioica*)	1				
Rough Meadow-grass (*Poa trivialis*)	4		4	6	4
Skullcap (*Scutellaria galericulata*)	2		2		
Sharp-flowered Rush (*Juncus acutiflorus*)			5		
Tall Fescue (*Festuca arundinacea*)		2	2		
Water Figwort (*Scrophularia auriculata*)		1			
Water Mint (*Mentha aquatica*)		4	4		
Wild Angelica (*Angelica sylvestris*)	4	4			
50 x 50m Woodland canopy Quadrats					
Ash (*Fraxinus excelsior*)			4		8
Alder (Alnus glutinosus)	4	7	6	8	
Crack-willow (*Salix fragilis*)			4	4	
Dog-rose (*Rosa canina*)				4	
Elm (*Ulmus sp*.)					4
Hawthorn (*Crataegus monogyna)*				1	
Pedunculate Oak (*Quercus robur*)				4	
Red Currant (*Ribes rubrum*)					
Goat Willow (Salix caprea)	4			4	4
Silver Birch (*Betula pendula*)					
White Willow (Salix alba)			4		4

Area F - Fen meadow west of C Station Platform (Quadrats 47 to 55)

Plant Species	Domin								
	Q47	Q48	Q49	Q50	Q51	Q52	Q53	Q54	Q55
Blunt-flowered Rush (*Juncus subnodulosus*)	8	9	6	8	7	8	9	6	8
Bottle Sedge (*Carex rostrata*)	1							3	
Brown Sedge *(Carex disticha*)	5		2						
Carnation Sedge (*Carex panicea*)						2	4		
Compact Rush (*Juncus conglomeratus*)								8	
Common Marsh-bedstraw (*Galium palustre*)	1	4	3	4	7			4	
Common Reed (*Phragmites australis*)	4	4	4	2	4	4	5	4	4
Compact Rush (*Juncus conglomeratus*)			2	1					
Creeping Bent (*Agrostis stolonifer*a)	8	7			7	6	6	6	8
Creeping Buttercup (*Ranunculus repens*)								4	4
Creeping Cinquefoil (*Potentilla reptans)*						2			
False Fox-sedge (*Carex otrubae*)	8	5	4	4					
Glaucous Sedge (*Carex flacca*)		1					3		2
Greater Bird's-foot-trefoil (*Lotus pedunculatus)*		4	5	4	5	3	7	7	
Hairy Tare (*Vicia hirsuta*)						2	3	4	
Hard Rush (*Juncus inflexus)*	4					4	4		
Hedge Bindweed (*Calystegia sepium*)								1	
Lesser Pond-sedge (*Carex acutiformis*)							3		4
Lesser Spearwort (*Ranunculus flammula*)		2			2				
Marsh Arrowgrass (*Triglochin palustre*)						3			
Meadow Buttercup (*Ranunculus acris*)				1					
Meadow Fescue (*Festuca pratensis)*		4	7	7	5	2		4	
Marsh Thistle (*Cirsium palustre*)								1	
Marsh Pennywort (*Hydrocotyle vulgaris*)	6		4	4	8				
Oval Sedge (*Carex ovalis*)			4						
Red Clover (*Trifolium pratense*)						3			
Red Fescues (F*estuca rubra sens. lat.*)		4	7	7	5		7	8	
Ragged-Robin *(Lychnis flos-cuculi*)					3			1	
Ribwort plantain (*Plantago lanceolata*)			1			5	7	7	2
Selfheal (*Prunella vulgaris)*						2			
Sharp-flowered Rush (*Juncus acutiflorus*)	5	4	4	4	4				
Silverweed (*Potentilla anserina*)					2	2	3	3	3
Smooth Meadow Grass (*Poa pratensis*)						2		2	
Soft-rush (*Juncus effusus*)								3	
Sweet Vernal-grass *(Anthoxanthum odoratum*)						5	8	5	
Tall Fescue (*Festuca arundinacea*)		4	5		5	3	4	4	3
Tufted Hair-grass (*Deschampsia cespitosa*)	1								
Tufted Vetch (*Vicia cracca*)		2	4						
Water Mint (*Mentha aquatica*)	4	7			5				
White Clover (*Trifolium repens*)								1	
Yellow Iris (*Iris pseudacorus*)		2							
Yorkshire-fog (*Holcus lanatus*)	5	4	5	4	5	4	8	5	

Area G - Minsmere to Walberswick Heaths and Marshes SAC/Ramsar – **Sand dune** (Quadrats 56 to 58)

Plant Species	Domin		
	Q56	Q57	Q58
Bell Heather (*Erica cinerea*)	5		
Bryophyte Sp.	5	5	5
Cat's-ear (*Hypochaeris radicata)*	4	4	
Cladonia Lichen Sp.		7	4
Common Restharrow (*Ononis repens*)			4
Creeping Bent (*Agrostis stolonifer*a)			4
Early Hair-grass (*Aira praecox)*		6	4
English Stonecrop (*Sedum anglicum)*			5
Field Wood-rush (*Luzula campestris*)	4		
Heather (*Calluna vulgaris*)	5		
Lady's Bedstraw (*Galium verum*)			4
Mouse-ear-hawkweed (*Pilosella officinarum*)			4
Rat's-tail Fescue (*Vulpia myuros*)		4	
Ribwort plantain (*Plantago lanceolata*)			4
Sand Couch (*Elytrigia juncea*)			4
Sand Sedge (*Carex arenaria*)	7	7	4
Sea Couch (*Elytrigia atherica*)			4
Sheep's-fescue (*Festuca ovina*)	9	8	8
Sheep's Sorrel (*Rumex acetosella*)	4	5	4
Smooth Meadow Grass (*Poa pratensis*)			4
Spiny Restharrow (*Ononis spinosa*)			4
Sweet Vernal-grass *(Anthoxanthum odoratum*)	4		4

Area G - Minsmere to Walberswick Heaths and Marshes SAC/Ramsar – **Leiston Drain** (Quadrats 59 to 61)

Key to tables E- Emergent F- Floating A- Aquatic

Plant Species	Domin								
	Q59			Q60			Q61		
	E	F	A	E	F	A	E	F	A
Bramble (*Rubus fruticosus agg.*)	2								
Branched Bur-reed (*Sparganium erectum*)	5	1		2					
Common Duckweed (*Lemna minor)*		9			2			2	
Common Nettle (*Urtica dioica*)	1						2		
Common Ragwort (*Senecio jacobaea*)									
Common Reed (*Phragmites australis*)	7			7			8		
Common Water-starwort (*Callitriche stagnalis sens. lat.*)			9			9			
Creeping Thistle (*Cirsium arvense*)				1					
Fat Duckweed (*Lemna gibba*)		4			4			2	
Fennel Pondweed (*Potamogeton pectinatus*)			5			5			

Plant Species	Domin								
	Q59			Q60			Q61		
Floating Sweet-grass (*Glyceria fluitans*)	4			5					
Greater Pond-sedge (*Carex riparia*)							5		
Great Willowherb (*Epilobium hirsutum*)	1			1					
Hedge Bindweed (*Calystegia sepium*)	1								
Lesser Water-parsnip (*Berula erecta*)	5			6					
Nuttall's Waterweed (*Elodea nuttallii*)						5			
Soft-rush (*Juncus effusus*)							1		

Area G - Minsmere to Walberswick Heaths and Marshes SAC/Ramsar – **reedbed adjacent to Leiston Drain** (Quadrats 62 to 65)

	Domin			
Plant Species	**Q62**	**Q63**	**Q64**	**Q65**
Bramble (*Rubus fruticosus agg.*)	4	4	2	5
Broad Buckler-fern (*Dryopteris dilatata*)				3
Cleavers (*Galium aparine*)	2	2	4	4
Common Nettle (*Urtica dioica*)	3	3	5	5
Common Reed (*Phragmites australis*)	5	5	8	8
Creeping Thistle (*Cirsium arvense*)	3	4		
False Oat-grass (*Arrhenatherum elatius*)	3	3	7	7
Hedge Bindweed (*Calystegia sepium*)	4	4	5	6
Lesser Pond-sedge (*Carex acutiformis*)	9	9		
Marsh Thistle (*Cirsium palustre*)				5
Soft-rush (*Juncus effusus*)				5
Tufted Vetch (*Vicia cracca*)	3	3	3	
Wild Angelica (*Angelica sylvestris*)		2		5

Area G - Minsmere to Walberswick Heaths and Marshes SAC/Ramsar – **Dune grassland** (Quadrats 66 & 67)

Plant Species	Domin	
	Q66	Q67
Bramble (*Rubus fruticosus agg.*)	2	1
Bryophyte Sp.		4
Cat's-ear (*Hypochaeris radicata)*	1	2
Cladonia Lichen Sp.		5
Heather (*Calluna vulgaris*)	5	
Honeysuckle (*Lonicera periclymenum*)	4	
Pedunculate Oak (*Quercus robur*)		1
Sand Sedge (*Carex arenaria*)	9	7
Sheep's-fescue (*Festuca ovina*)	8	10
Sheep's Sorrel (*Rumex acetosella*)	5	4
Yellow Iris (*Iris pseudacorus*)	2	

Area H - Suffolk Shingle Beaches CWS – **Sand dune** (Quadrats 68 to 77)

Plant Species	Domin									
	Q68	Q69	Q70	Q71	Q72	Q73	Q74	Q75	Q76	Q77
Bramble (*Rubus fruticosus agg.*)								1		
Buck's-horn Plantain (*Plantago coronopus*)						8	9	10		
Bryophyte Sp.		2	2	2				4		
Cat's-ear (*Hypochaeris radicata)*			1	4				1		2
Cock's-foot (*Dactylis glomerata*)	3				4	4			3	
Common Bird's-foot-trefoil (*Lotus corniculatus*)		5	4	5						
Common Centaury (*Centaurium erythraea*)		*3*	*4*	*1*						
Common Ragwort (*Senecio jacobaea*)	1		1	1	1	1				
Common Restharrow (*Ononis repens*)	7	4		7	4	6	7	5		4
Creeping Bent (*Agrostis stolonifera*)					5	5	6	5	7	7
Dandelions (*Taraxacum agg.*)		1	1		1	1				
False Oat-grass (*Arrhenatherum elatius*)							3		2	2
Harebell (*Campanula rotundifolia*)			2	2	2	1				
Hop Trefoil (*Trifolium campestre)*	4									
Lady's Bedstraw (*Galium verum*)	7	6	7	7	6	4			2	7
Marram (*Ammophila arenaria*)	4	5	6	5	3	8		5	2	
Mouse-ear-hawkweed (*Pilosella officinarum*)	7	7	6	7						
Red Fescues (F*estuca rubra sens. lat.*)	7	7	4	4	2	7	7	4	3	1
Ribwort plantain (*Plantago lanceolata*)	4	4	5	4	4	3	3	5		5
Rough Hawkbit (*Leontodon hispidus*)					1					
Rush-leaved Fescue (*Festuca arenaria*)		3								
Sand Couch (*Elytrigia juncea*)	4	3	4	4	5	1	8		7	
Sand Sedge (*Carex arenaria*)						4		6	9	4
Sea Bindweed (*Calystegia soldanella)*				4		3	4	4	2	
Sea Couch (*Elytrigia atherica*)	5		4		3	5				5
Sea Sandwort (*Honckenya peploides*)							5	6		
Sheep's-fescue (*Festuca ovina*)	4		5	4				4		
Sheep's Sorrel (*Rumex acetosella*)								2		
Smooth Hawk's-beard (*Crepis capillaris*)								3	3	2
Smooth Meadow Grass (*Poa pratensis*)	3				2	4				5
Spiny Restharrow (*Ononis spinosa*)			5		7					
Strawberry Clover (*Trifolium fragiferum*)	5		3							
Sweet Vernal-grass *(Anthoxanthum odoratum*)	5	4	5		4	4		4		6
Tree Lupin (*Lupinus arboreus*)	1									
Yellow- rattle (*Rhinanthus minor*)								4		
Yarrow (*Achillea millefolium*)							3			
Yorkshire-fog (*Holcus lanatus*)	5	4	4	4	5			4	4	5

Area H - Suffolk Shingle Beaches CWS – **Dune grassland** (Quadrats 78 to 82)

Plant Species	Domin				
	Q78	Q79	Q80	Q81	Q82
Buck's-horn Plantain (*Plantago coronopus*)					4
Bryophyte Sp.	5	6	4	3	9
Cat's-ear (*Hypochaeris radicata)*	5			3	
Cladonia Lichen Sp.	8				
Cock's-foot (*Dactylis glomerata*)		3			
Common Bent (*Agrostis capillaris*)	5	6	5	6	
Common Bird's-foot-trefoil (*Lotus corniculatus*)	1				
Common Restharrow (*Ononis repens*)		5	4	5	
Early Hair-grass (*Aira praecox)*				3	4
English Stonecrop (*Sedum anglicum)*	4	3		3	
Field Wood-rush (*Luzula campestris*)	3				
Harebell (*Campanula rotundifolia*)					4
Lady's Bedstraw (*Galium verum*)			4	3	
Mouse-ear-hawkweed (*Pilosella officinarum*)	4	3	4	2	
Peltigera Lichen Sp.				1	
Rat's-tail Fescue (*Vulpia myuros*)				3	
Red Fescues (F*estuca rubra sens. lat.*)	4	7	7	2	
Ribwort plantain (*Plantago lanceolata*)			4		4
Rough Hawkbit (*Leontodon hispidus*)	5	5	3		
Sea Couch (*Elytrigia atherica*)				5	
Sheep's-fescue (*Festuca ovina*)	8	9	9	9	4
Sheep's Sorrel (*Rumex acetosella*)		3		5	
Smooth Hawk's-beard (*Crepis capillaris*)				3	
Smooth Meadow Grass (*Poa pratensis*)	1	4	4	4	
Strawberry Clover (*Trifolium fragiferum*)			3		7
Sweet Vernal-grass *(Anthoxanthum odoratum*)		5	4	4	
Yorkshire-fog (*Holcus lanatus*)		4			

Area H - Suffolk Shingle Beaches CWS – **Shingle** (Quadrats 83 to 92)

Plant Species	Domin									
	Q83	Q84	Q85	Q86	Q87	Q88	Q89	Q90	Q91	Q92
Cat's-ear (*Hypochaeris radicata)*		3		3			1			5
Cock's-foot (*Dactylis glomerata*)										1
Common Restharrow (*Ononis repens*)		4			5		8	6		5
Halberd - leaved orach (*Atriplex hastata)*	1									
Marram (*Ammophila arenaria*)		4	4	4	6	4	6	4	9	2
Rush-leaved Fescue (*Festuca arenaria*)		2			2		4			
Sand Sedge (*Carex arenaria*)					4				4	
Sea Bindweed (*Calystegia soldanella)*			4				2		5	

Plant Species	Domin									
	Q83	Q84	Q85	Q86	Q87	Q88	Q89	Q90	Q91	Q92
Sea Campion (*Silene uniflora*)		2	5	3	2	7		5		
Sea-kale (*Crambe maritima*)	3	2	2	2		1		2		
Sea-holly (*Eryngium maritimum*)				1		3	3		2	
Sea Couch (*Elytrigia atherica*)				3	6			5		
Sea Pea (*Lathyrus japonicus)*		5	5	4		4			1	4
Sea Sandwort (*Honckenya peploides*)		4	4	1				2		
Sheep's-fescue (*Festuca ovina*)							5			
Smooth Sow-thistle (*Sonchus oleraceus)*		2			2				1	
Spiny Restharrow (*Ononis spinosa*)								3		5
Yorkshire-fog (*Holcus lanatus*)										1

Area I - Wet woodland in Sizewell Marshes SSSI West of C Station Platform (Quadrats 93 to 95)

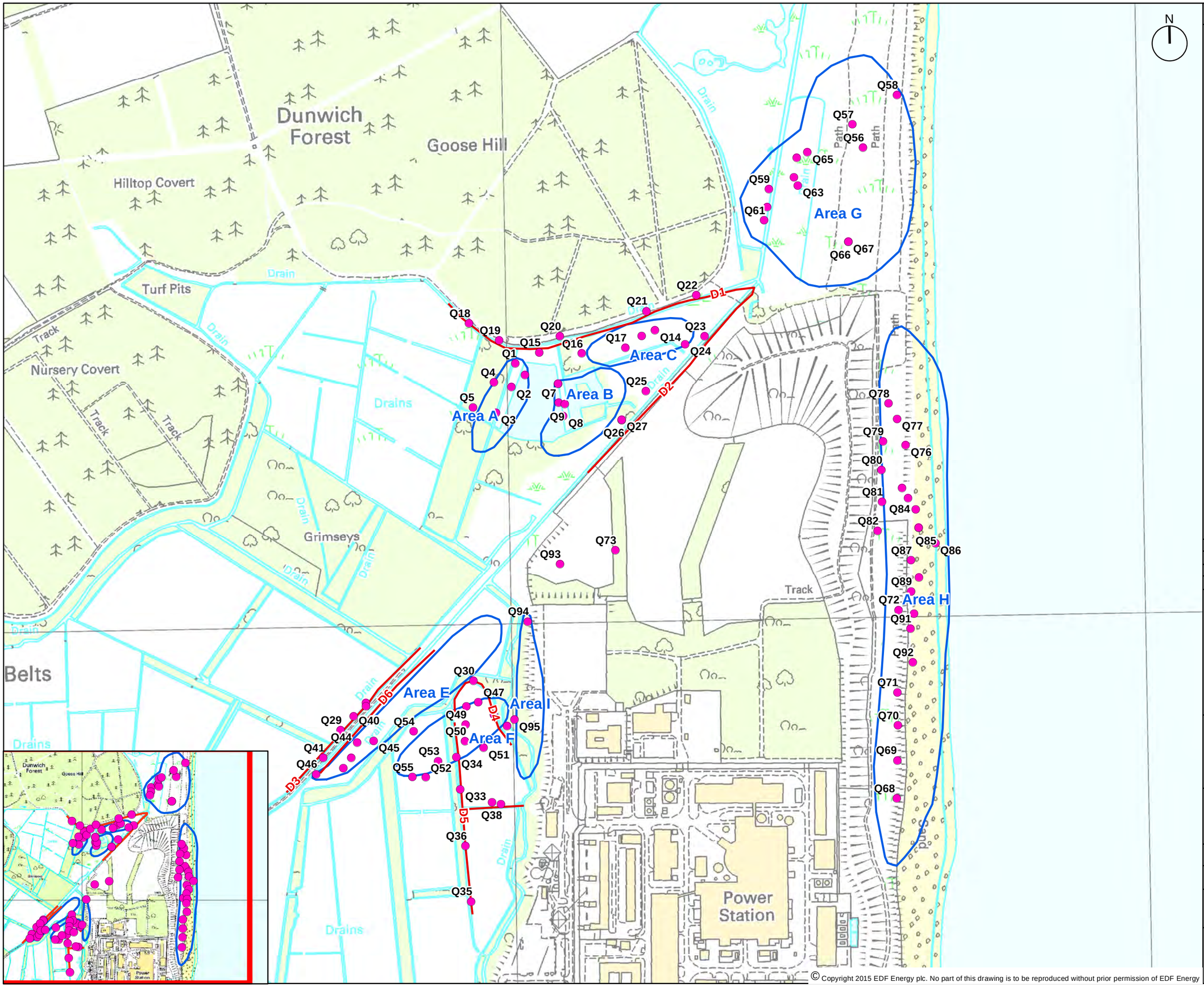
Plant Species	Domin		
	Q93	Q94	Q95
Broad Buckler-fern			1
Bryophyte Sp.			1
Cleavers (*Galium aparine*)			4
Common Duckweed (*Lemna minor)*	6	4	
Common Nettle (*Urtica dioica*)		4	9
Common Reed (*Phragmites australis*)	4		
Creeping Bent (*Agrostis stolonifera*)	3		7
Creeping Buttercup (*Ranunculus repens*)			5
False Fox-sedge (*Carex otrubae*)	4		2
False Oat-grass (*Arrhenatherum elatius*)			
Fat Duckweed (*Lemna gibba*)	4	4	
Gipsywort (*Lycopus europaeus*)	1		2
Greater Pond-sedge (*Carex riparia*)		4	
Hedge Bindweed (*Calystegia sepium*)	1		1
Hemp-agrimony (*Eupatorium cannabinum*)	1	2	
Marsh Thistle (*Cirsium palustre*)			1
Water Dock (*Rumex hydrolapathum*)		1	
Wood Dock (*Rumex sanguineus*)			1
Yellow Iris (*Iris pseudacorus*)	1	3	3
50 x 50m Woodland canopy Quadrats			
Alder (Alnus glutinosus)	1	9	9
Red Currant (*Ribes rubrum*)	9		
Goat Willow (Salix caprea)	6	7	4
Silver Birch (*Betula pendula*)			2
White Willow (Salix alba)			2

Appendix C

Figures

0038 – UA004506-UE21D-03 Survey areas and quadrat locations.

0039 - UA004506-UE21D-03 NVC community bounadaries.



INTERNAL BUSINESS COLLABORATOR REFERENCE
NOT APPLICABLE FOR ALL FIGURES

KEY

- Quadrat Locations
- Ditches
- Sample Areas

REVISION	DATE	DRAWN	CHECKED	REASONS FOR REVISION/COMMENTS	APPROVED
3.0	03/29/2015	A.D.	M.L.	Done some amendments	M.L.
2.0	02/11/2015	A.D.	M.L.	Modified Features	M.L.
1.0	11/19/2014	A.D.	M.L.	Version 1	M.L.

SIZEWELL C

DOCUMENT:
SIZEWELL C PROJECT

DRAWING TITLE:
OVERVIEW MAP

PAGE 1 OF 5

DRAWING NO: FIGURE 0038
REVISION: 3.0

DATE: MAR 2015
DRAWN: A.D.
SCALE: 1:5,500

SCALE BAR
0 0.055 0.11 0.165 0.22 0.275 KM

DRAWING SECURITY CLASSIFICATION:
☐ PROTECTIVE MARKING REQUIRED
☒ NOT PROTECTIVELY MARKED

INTERNAL BUSINESS COLLABORATOR REFERENCE
NOT APPLICABLE FOR ALL FIGURES

KEY

- Quadrat Locations
- Ditches
- Sample Areas

REVISION	DATE	DRAWN	CHECKED	REASONS FOR REVISION/COMMENTS	APPROVED
3.0	03/09/2015	A.D.	M.L.	Done some amendments	M.L.
2.0	02/11/2015	A.D.	M.L.	Modified Features	M.L.
1.0	11/19/2014	A.D.	M.L.	Version 1	M.L.

EDF ENERGY
SIZEWELL C

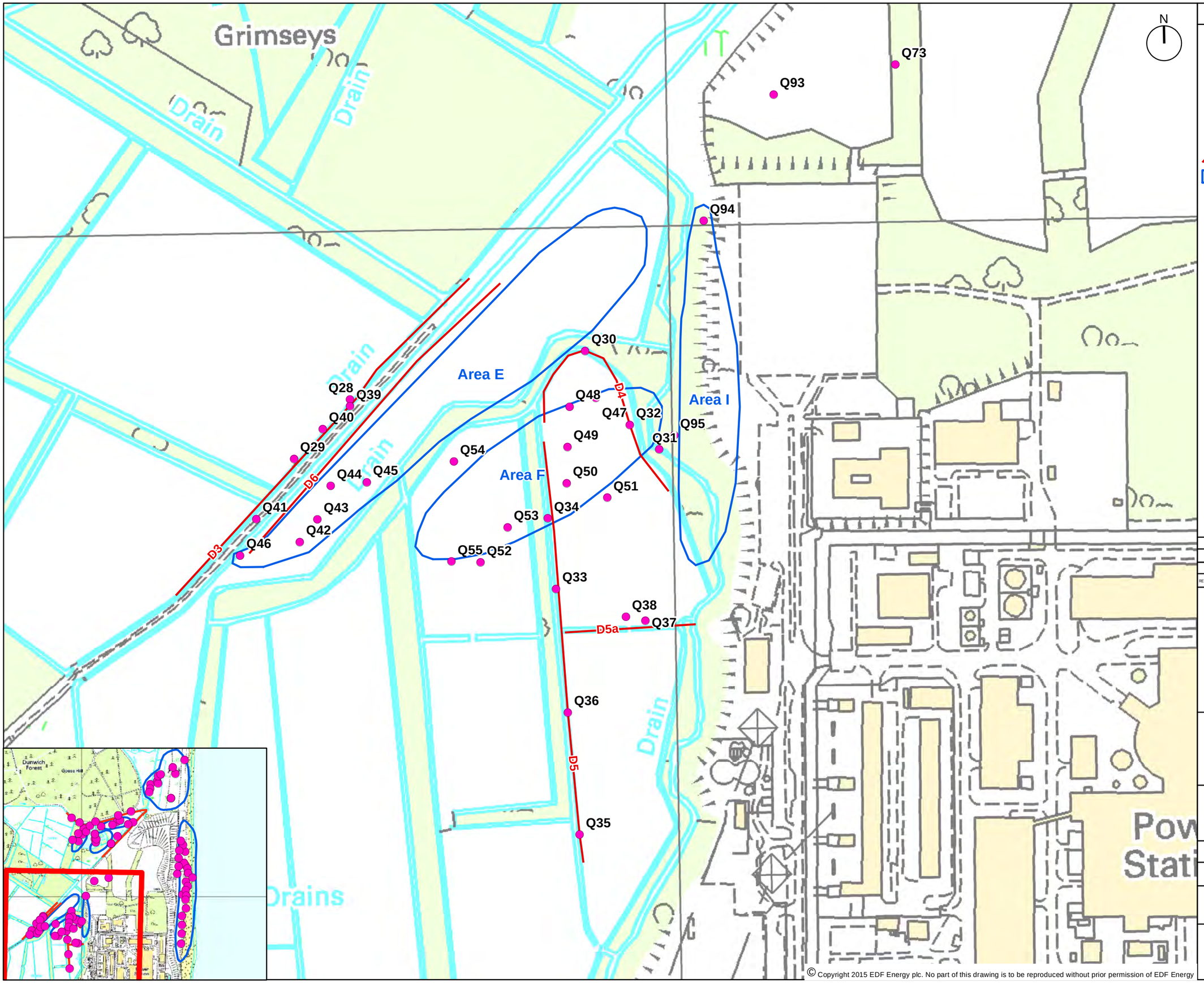
DOCUMENT:
SIZEWELL C PROJECT

DRAWING TITLE:
NVC SURVEY COMPARTMENTS AND QUADRAT LOCATIONS
PAGE 2 OF 5

DRAWING NO: FIGURE 0038
REVISION: 3.0
DATE: MAR 2015
DRAWN: A.D.
SCALE: 1:2,500

SCALE BAR
0 0.025 0.05 0.075 0.1 0.125 KM

DRAWING SECURITY CLASSIFICATION:
☐ PROTECTIVE MARKING REQUIRED
☒ NOT PROTECTIVELY MARKED



KEY

- Quadrat Locations
- Ditches
- Sample Areas

INTERNAL BUSINESS COLLABORATOR REFERENCE
NOT APPLICABLE FOR ALL FIGURES

REVISION	DATE	DRAWN	CHECKED	REASONS FOR REVISION/COMMENTS	APPROVED
3.0	03/25/2015	A.D.	M.L.	Done some amendments	M.L.
2.0	02/11/2015	A.D.	M.L.	Modified Features	M.L.
1.0	11/19/2014	A.D.	M.L.	Version 1	M.L.

SIZEWELL C

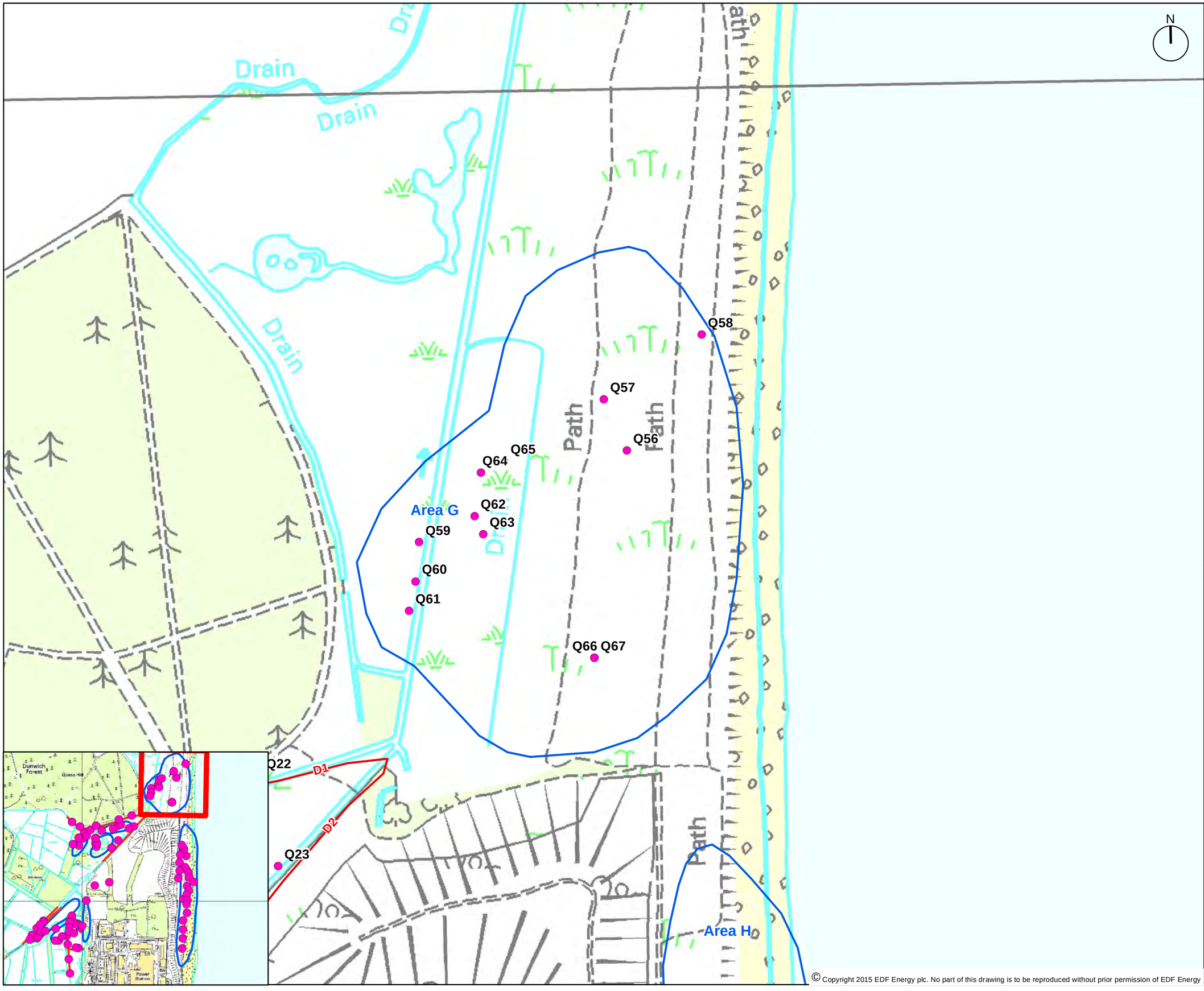
DOCUMENT:
SIZEWELL C PROJECT

DRAWING TITLE:
NVC SURVEY COMPARTMENTS AND QUADRAT LOCATIONS
PAGE 3 OF 5

DRAWING NO: FIGURE 0038
REVISION: 3.0
DATE: MAR 2015
DRAWN: A.D.
SCALE: 1:2,500

SCALE BAR
0 0.025 0.05 0.075 0.1 0.125 KM

DRAWING SECURITY CLASSIFICATION:
☐ PROTECTIVE MARKING REQUIRED
☒ NOT PROTECTIVELY MARKED



INTERNAL BUSINESS COLLABORATOR REFERENCE
NOT APPLICABLE FOR ALL FIGURES

KEY

- Quadrat Locations
- Ditches
- Sample Areas

REVISION	DATE	DRAWN	CHECKED	REASONS FOR REVISION/COMMENTS	APPROVED
3.0	03/25/2015	A.D.	M.L.	Done some amendments	M.L.
2.0	02/11/2015	A.D.	M.L.	Modified Features	M.L.
1.0	11/19/2014	A.D.	M.L.	Version 1	M.L.

SIZEWELL C

DOCUMENT:
SIZEWELL C PROJECT

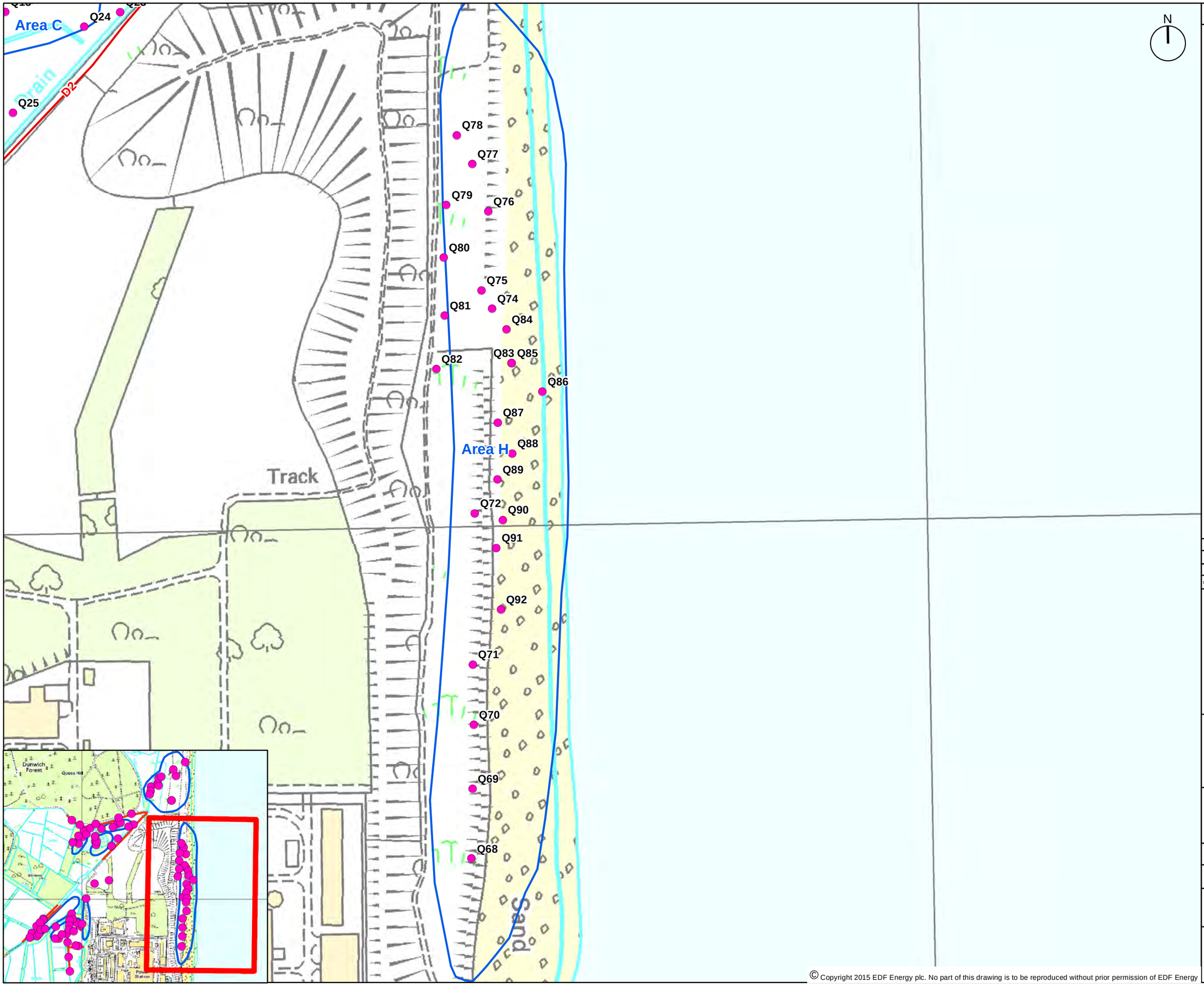
DRAWING TITLE:
NVC SURVEY COMPARTMENTS AND QUADRAT LOCATIONS
PAGE 4 OF 5

DRAWING NO: FIGURE 0038
REVISION: 3.0

DATE: MAR 2015
DRAWN: A.D.
SCALE: 1:2,500

SCALE BAR
0 0.025 0.05 0.075 0.1 0.125 KM

DRAWING SECURITY CLASSIFICATION:
☐ PROTECTIVE MARKING REQUIRED
☒ NOT PROTECTIVELY MARKED



INTERNAL BUSINESS COLLABORATOR REFERENCE
NOT APPLICABLE FOR ALL FIGURES

KEY

- Quadrat Locations
- Ditches
- Sample Areas

REVISION	DATE	DRAWN	CHECKED	REASONS FOR REVISION/COMMENTS	APPROVED
3.0	03/25/2015	A.D.	M.L.	Done some amendments	M.L.
2.0	02/11/2015	A.D.	M.L.	Modified Features	M.L.
1.0	11/19/2014	A.D.	M.L.	Version 1	M.L.

SIZEWELL C

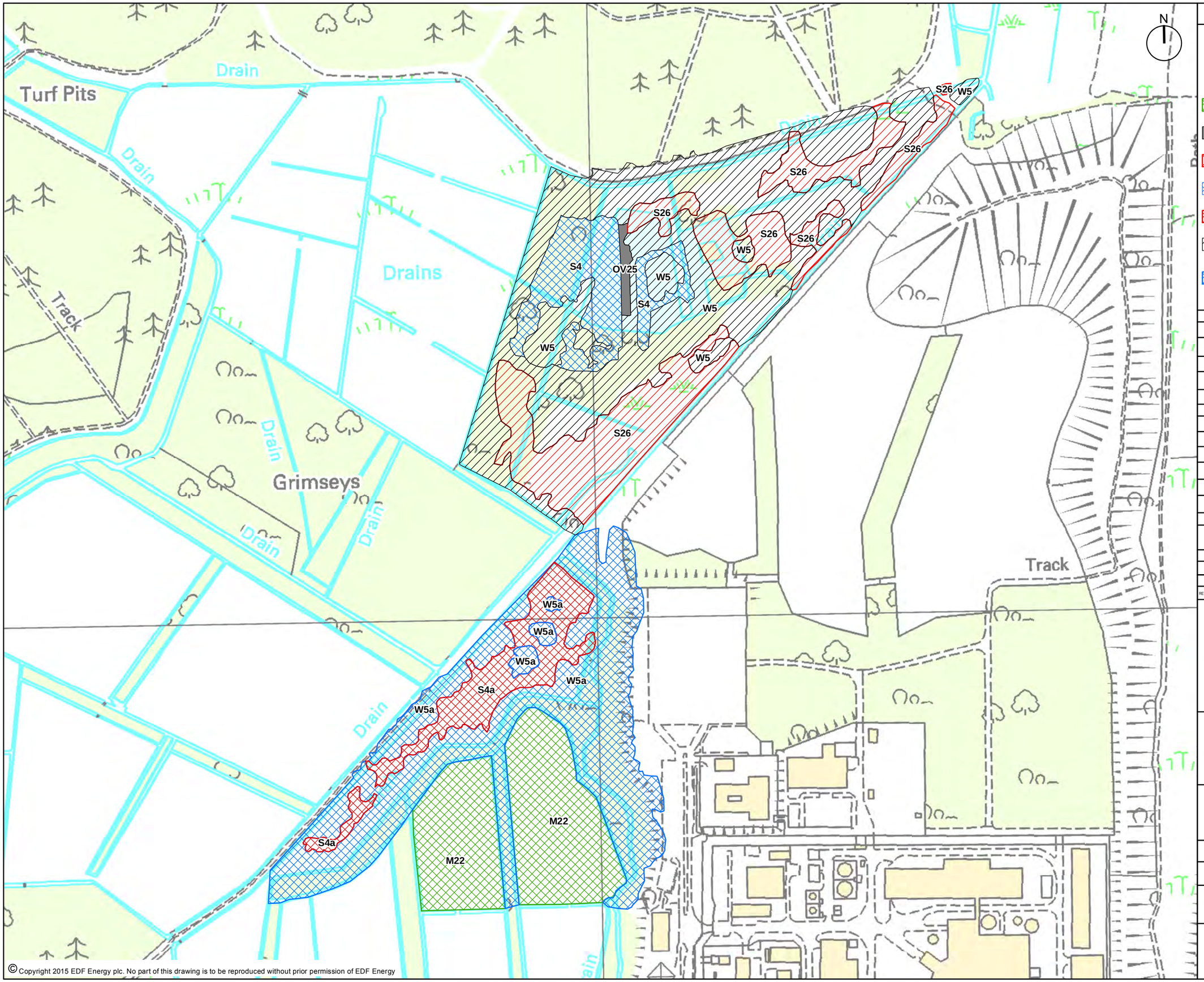
DOCUMENT:
SIZEWELL C PROJECT

DRAWING TITLE:
NVC SURVEY COMPARTMENTS AND QUADRAT LOCATIONS
PAGE 5 OF 5

DRAWING NO: FIGURE 0038
REVISION: 3.0
DATE: MAR 2015
DRAWN: A.D.
SCALE: 1:3,000

SCALE BAR
0 0.03 0.06 0.09 0.12 0.15 KM

DRAWING SECURITY CLASSIFICATION:
☐ PROTECTIVE MARKING REQUIRED
☒ NOT PROTECTIVELY MARKED



INTERNAL BUSINESS COLLABORATOR REFERENCE
NOT APPLICABLE FOR ALL FIGURES

KEY

- Blunt-flowered Rush-Marsh Thistle mire community
- Common Nettle - Creeping Thistle community
- Common Reed – Common Nettle tall-herb fen
- Common Reed swamp and reedbed community
- The typical sub-community of the S4 Common Reed swamp
- Alder - Greater Tussock-sedge woodland community
- Alder - Greater Tussock-sedge woodland, Common Reed sub-community

	Community	Area in Hector
W5a	Alder - Greater Tussock-sedge woodland, Common Reed sub-community	4.526842
SD8	Red Fescue-Lady's Bedstraw fixed dune community	2.446489
SD7	Marram-Red Fescue semi-fixed dune community	1.706516
SD1a	Curled Dock Yellow Horned-poppy shingle community, Sea Pea sub-community	0.648144
SD12	Sand Sedge-Sheep's Sorrel-Common Bent dune grassland	4.873542
	Scrub	1.735685
S4a	the typical sub-community of the S4 Common Reed swamp	1.096422
S26	Common Reed – Common Nettle tall-herb fen	3.967703
M22	Blunt-flowered Rush-Marsh Thistle mire community	2.797751
OV25	Common Nettle - Creeping Thistle community	0.082011
S4	Common Reed swamp and reedbed community	1.228447
W5	Alder - Greater Tussock-sedge woodland community	5.150946
	Total Community Area	**30.260498**

REVISION	DATE	DRAWN	CHECKED	REASONS FOR REVISION/COMMENTS	APPROVED
3.0	03/25/2015	A.D.	M.L.	Done some amendments	M.L.
2.0	02/11/2015	A.D.	M.L.	Modified Features	M.L.
1.0	11/19/2014	A.D.	M.L.	Version 1	M.L.

SIZEWELL C

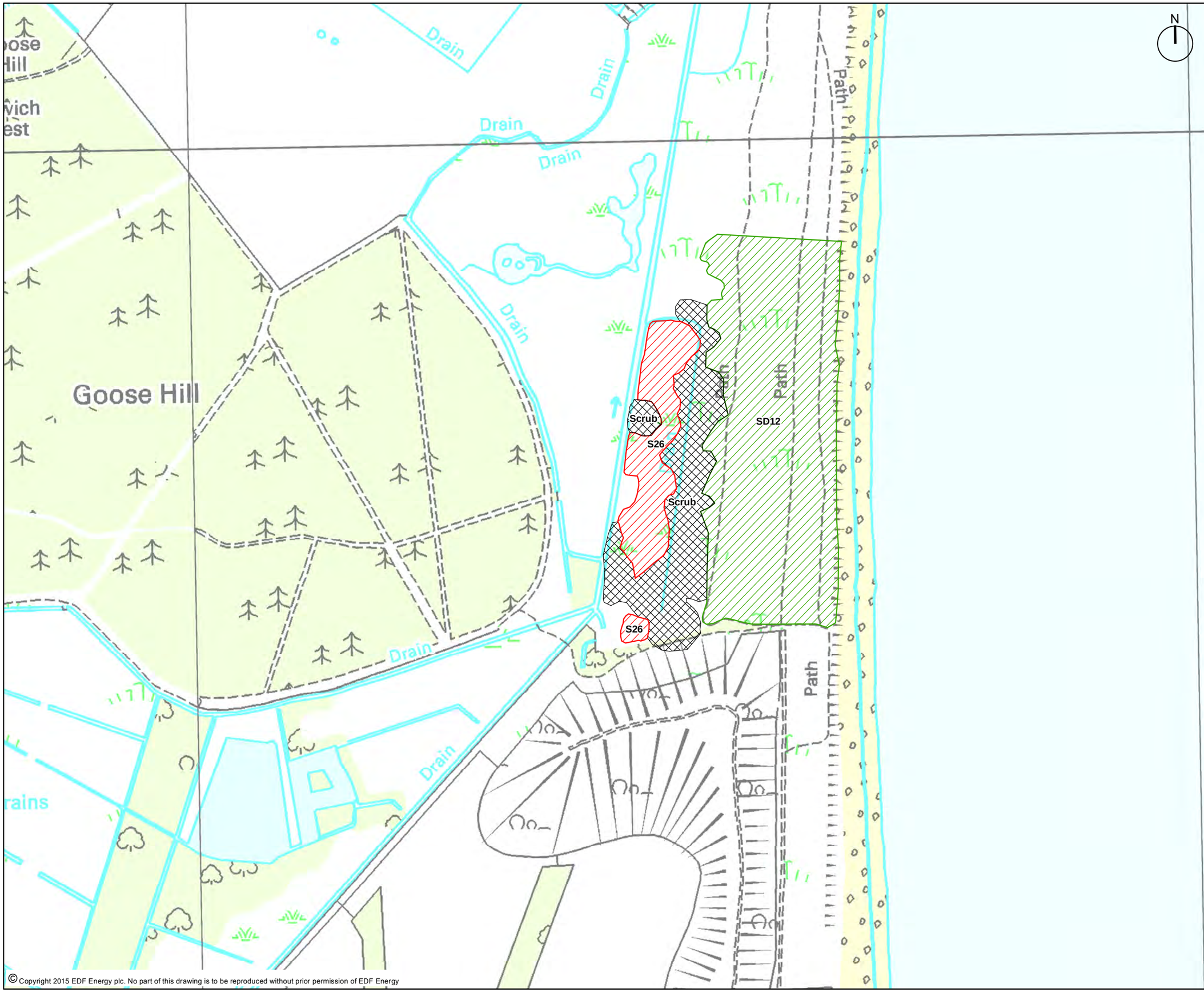
DOCUMENT:
SIZEWELL C PROJECT

DRAWING TITLE:
NVC COMMUNITY BOUNDARIES
PAGE 1 OF 3

DRAWING NO: FIGURE 0039
REVISION: 3.0
DATE: MAR 2015
DRAWN: A.D.
SCALE: 1:3,500

SCALE BAR
0 0.035 0.07 0.105 0.14 0.175 KM

DRAWING SECURITY CLASSIFICATION:
☐ PROTECTIVE MARKING REQUIRED
☒ NOT PROTECTIVELY MARKED



INTERNAL BUSINESS COLLABORATOR REFERENCE
NOT APPLICABLE FOR ALL FIGURES

KEY

- Common Reed – Common Nettle tall-herb fen
- Sand Sedge-Sheep's Sorrel-Common Bent dune grassland
- Scrub

	Community	Area in Hector
W5a	Alder - Greater Tussock-sedge woodland, Common Reed sub-community	4.526842
SD8	Red Fescue-Lady's Bedstraw fixed dune community	2.446489
SD7	Marram-Red Fescue semi-fixed dune community	1.706516
SD1a	Curled Dock Yellow Horned-poppy shingle community, Sea Pea sub-community	0.648144
SD12	Sand Sedge-Sheep's Sorrel-Common Bent dune grassland	4.873542
	Scrub	1.735685
S4a	the typical sub-community of the S4 Common Reed swamp	1.096422
S26	Common Reed – Common Nettle tall-herb fen	3.967703
M22	Blunt-flowered Rush-Marsh Thistle mire community	2.797751
OV25	Common Nettle - Creeping Thistle community	0.082011
S4	Common Reed swamp and reedbed community	1.228447
W5	Alder - Greater Tussock-sedge woodland community	5.150946
	Total Community Area	**30.260498**

REVISION	DATE	DRAWN	CHECKED	REASONS FOR REVISION/COMMENTS	APPROVED
3.0	03/25/2015	A.D.	M.L.	Done some amendments	M.L.
2.0	02/11/2015	A.D.	M.L.	Modified Features	M.L.
1.0	11/19/2014	A.D.	M.L.	Version 1	M.L.

SIZEWELL C

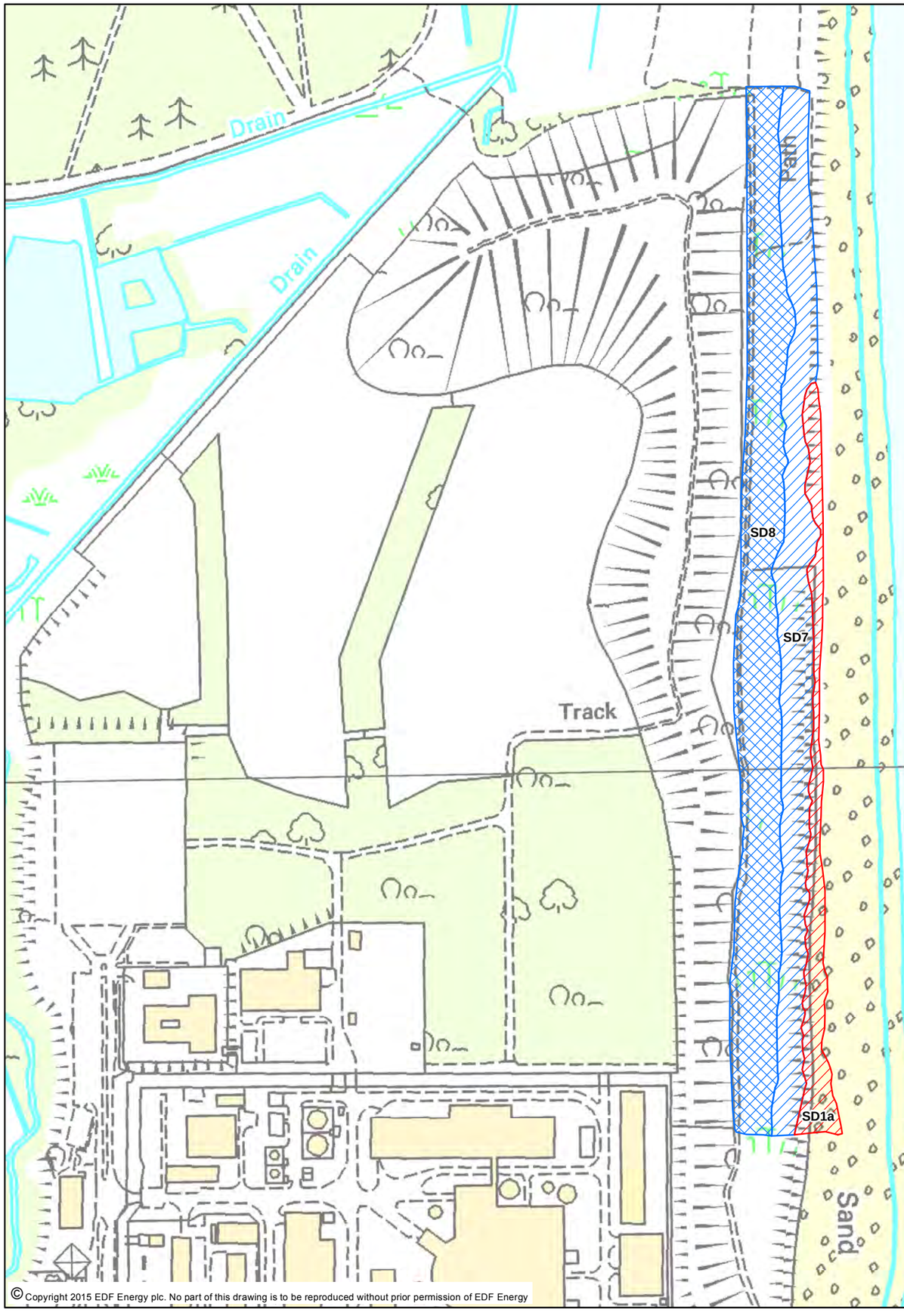
DOCUMENT:
SIZEWELL C PROJECT

DRAWING TITLE:
NVC COMMUNITY BOUNDARIES
PAGE 2 OF 3

DRAWING NO: FIGURE 0039
REVISION: 3.0
DATE: MAR 2015
DRAWN: A.D.
SCALE: 1:3,500

SCALE BAR
0 0.035 0.07 0.105 0.14 0.175 KM

DRAWING SECURITY CLASSIFICATION:
☐ PROTECTIVE MARKING REQUIRED
☒ NOT PROTECTIVELY MARKED



N

INTERNAL BUSINESS COLLABORATOR REFERENCE
NOT APPLICABLE FOR ALL FIGURES

KEY

- Curled Dock Yellow Horned-poppy shingle community, Sea Pea sub-community
- Marram-Red Fescue semi-fixed dune community
- Red Fescue-Lady's Bedstraw fixed dune community

	Community	Area in Hector
W5a	Alder - Greater Tussock-sedge woodland, Common Reed sub-community	4.526842
SD8	Red Fescue-Lady's Bedstraw fixed dune community	2.446489
SD7	Marram-Red Fescue semi-fixed dune community	1.706516
SD1a	Curled Dock Yellow Horned-poppy shingle community, Sea Pea sub-community	0.648144
SD12	Sand Sedge-Sheep's Sorrel-Common Bent dune grassland	4.873542
	Scrub	1.735685
S4a	the typical sub-community of the S4 Common Reed swamp	1.096422
S26	Common Reed – Common Nettle tall-herb fen	3.967703
M22	Blunt-flowered Rush-Marsh Thistle mire community	2.797751
OV25	Common Nettle - Creeping Thistle community	0.082011
S4	Common Reed swamp and reedbed community	1.228447
W5	Alder - Greater Tussock-sedge woodland community	5.150946
	Total Community Area	**30.260498**

REVISION	DATE	DRAWN	CHECKED	REASONS FOR REVISION/COMMENTS	APPROVED
3.0	03/25/2015	A.D.	M.L.	Done some amendments	M.L.
2.0	02/11/2015	A.D.	M.L.	Modified Features	M.L.
1.0	11/19/2014	A.D.	M.L.	Version 1	M.L.

EDF ENERGY
SIZEWELL C

DOCUMENT:
SIZEWELL C PROJECT

DRAWING TITLE:
NVC COMMUNITY BOUNDARIES
PAGE 3 OF 3

DRAWING NO: FIGURE 0039
REVISION: 3.0

DATE: MAR 2015
DRAWN: A.D.
SCALE: 1:3,500

SCALE BAR
0 0.035 0.07 0.105 0.14 0.175 KM

DRAWING SECURITY CLASSIFICATION:
☐ PROTECTIVE MARKING REQUIRED
☒ NOT PROTECTIVELY MARKED