

Cornwall Energy Recovery Centre (CERC), Rostowrack Farm, St. Dennis, Cornwall

In respect of the Planning Appeal by SITA Cornwall Ltd

Cornwall Council Reference: CC4/2

Planning Inspectorate Reference: APP/D0840/A/09/2113075/NWF

Proof of Evidence of

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1.0 INTRODUCTION

- 1.1 My name is Kevin Webb and I am the Principal Ecologist for Bureau Veritas UK Ltd, an environmental consulting firm. I have nearly 20 years experience in the field of ecology and conservation including latterly 10 years professional experience of designing, managing and undertaking ecological survey and mitigation works for all British protected species in a range of consultancy environments.
- 1.2 I was appointed to act for Cornwall Council (previously Cornwall County Council) in May 2008 (when I took over this project from a departing colleague) and was responsible for undertaking a technical review of the Ecological Assessments submitted by the applicant in support of the planning application for the Cornwall Energy Recovery Centre (CERC) that was submitted in March 2008. Further to this I have continued to provide technical ecological advice relevant to this application to Cornwall Council.

2.0 QUALIFICATIONS

2.1 I am a full member of the Institute of Ecology & Environmental Management (IEEM), and currently hold or have held the following protected species licences:

- Great crested newt (GCN) survey licence – All Counties;
- Bird ringing licence (including barn owl survey and ringing) – All Counties;
- GCN and smooth snake EPS licences development; and,
- Badger sett closure licences.

2.2 I hold a BSc (Hons) in Zoology (Animal Ecology) and an MSc in Soil Science both awarded by the University of Aberdeen.

2.3 My 10 years of post graduate training as an Ecological Consultant has equipped me with wide and varied experience of carrying out ecological surveys and writing supporting technical reports. One particularly relevant project which I continue to be involved in is:

2.4 **Lydd Airport:** London Ashford Airport (LAA) submitted two outline planning applications for a 150m extension of an existing runway and the construction of a new terminal building at Lydd Airport, Kent. Proposals would see an increase from 3,000 passengers per annum (ppa) to 500,000 ppa.

2.5 Within close proximity to the Airport are two existing European sites, Dungeness to Pett Levels Special Protection Area (SPA) and Dungeness Special Area of Conservation (SAC). I was appointed, as Principal Ecologist at Bureau Veritas UK Ltd, by the local planning authority to carry out an Appropriate Assessment to meet the requirements of the Habitats Directive, to consider the implications of the proposal on European sites in view of their conservation objectives.

2.6 Assessment of the site showed that development proposals will potentially impact on an Annex II species the great crested newt through loss of ditch habitat and the deterioration in water quality.

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- 2.7 Annex I species, Bewick's Swan, Common Tern, Little Tern, Mediterranean Gull and Shoveler may potentially be impacted by noise disturbance through the implementation of a Bird Hazard Control Programme, and the loss and deterioration of suitable habitat.
- 2.8 The proposals may also impact on lichens and vascular plants associated with vegetated shingle (an SAC feature of the nearby Natura 2000 site) through increases in nitrogen and acid deposition through an increase in aircraft movements.

3.0 SCOPE OF EVIDENCE

- 3.1 My proof of evidence considers the potential effects of the operation of the Cornwall Energy Recovery Centre (CERC) at Rostowrack Farm upon nearby sites of ecological importance.
- 3.2 The two sites considered are:
- Breney Common, Goss and Tregoss Moors Special Area of Conservation (SAC); and,
 - St Austell Clay Pits SAC.
- 3.3 Both sites are designated as SAC's under the EC Habitats Directive. Article 3 of the Habitats Directive requires the establishment of a European network of important high-quality conservation sites that will make a significant contribution to conserving the 189 habitat types and 788 species identified in Annexes I and II of the Directive (as amended). The listed habitat types and species are those considered to be most in need of conservation at a European level (excluding birds). Of the Annex I habitat types, 78 are believed to occur in the UK. Of the Annex II species, 43 are native to, and normally resident in, the UK².
- 3.4 Each SAC is nominated on the basis that it regularly supports one or more of the Annex I habitat types and/or one or more Annex II species.
- 3.5 Breney Common and Goss and Tregoss Moors SAC covers an area of 816 hectares and is designated for three Annex I habitat types, specifically:
- Northern Atlantic wet heaths with *Erica tetralix*;
 - European dry heaths; and,
 - Transition mires and quaking bogs.

² www.jncc.gov.uk/page-23

- 3.6 In addition Breney Common and Goss and Tregoss Moors supports a population of one Annex II species, the marsh fritillary (*Euphydryas aurinia*) butterfly.
- 3.7 St Austell Clay Pits SAC consists of three smaller sites covering a total area of 0.6ha designated for regularly supporting a population of the Annex II species Western rustwort (*Marsupella profunda*) which is a liverwort and the UK's only occurring Annex II priority species.

Habitats Directive

- 3.8 The Conservation (Natural Habitats & c.) Regulations 1994 (as amended 2000)³, commonly referred to as the 'Habitat Regulations' transpose Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (EC Habitats Directive) into UK law. The Regulations provide for the designation and protection of 'European sites', the protection of 'European protected species', and the adaptation of planning and other controls for the protection of European Sites.
- 3.9 Under the Regulations, competent authorities i.e. any Minister, government department, public body, or person holding public office, have a general duty, in the exercise of any of their functions, to have regard to the EC Habitats Directive⁴.
- 3.10 The Regulations enable the country agencies to enter into management agreements on land within or adjacent to a European site in order to secure its conservation. If the agency is unable to conclude such an agreement, or if an agreement is breached, it may acquire the interest in the land compulsorily. The agency may also use its powers to make byelaws to protect European sites. The Regulations also provide for the control of potentially damaging operations, whereby consent from the country agency may only be granted once it has been shown through appropriate assessment that the proposed operation will not adversely affect the integrity

³ www.hmso.gov.uk/si/si2000/20000192.htm

⁴ <http://www.jncc.gov.uk/page-1379>

of the site. In instances where damage could occur, the appropriate Minister may, if necessary, make special nature conservation orders prohibiting any person from carrying out the operation. However, an operation may proceed where it is or forms part of a plan or project with no alternative solutions, which must be carried out for reasons of overriding public interest. In such instances the Secretary of State must secure compensation to ensure the overall integrity of the Natura 2000 system. The country agencies are required to review consents previously granted under the Wildlife and Countryside Act 1981 for land within a European site, and may modify or withdraw those that are incompatible with the conservation objectives of the site.

- 3.11 Natura 2000 consists of a network of ecologically valuable designated areas in Europe. This network is established under the terms of the EU Directive 92/43/EEC Conservation of Natural Habitats and of Wild Fauna and Flora (Anon., 1992). The main aim of the Habitats Directive 1992 is “to promote the maintenance of biodiversity” through the protection of habitats or species. Annex I of the Directive lists habitats and Annex II lists species for which sites are designated. The network comprises Special Areas of Conservation (SAC) designated under the Habitats Directive, and Special Protection Areas (SPA) designated under EU Directive 79/409/EEC Conservation of Wild Birds (Anon., 1979), known as the Birds Directive 1979.
- 3.12 The Regulations require competent authorities to consider or review planning permission, applied for or granted, affecting a European site and, subject to certain exceptions, restrict or revoke permission where the integrity of the site would be adversely affected. Equivalent consideration and review provisions are made with respect to highways and roads, electricity, pipelines, transport and works, and environmental controls (including discharge consents under water pollution legislation). Special provisions are also made as respects general development orders, special development orders, simplified planning zones and enterprise zones⁵.

⁵ <http://www.jncc.gov.uk/page-1379>

- 3.13 Regulation 48 (5) of the Habitat Regulations states that (subject to Regulation 49) projects may only receive consent if the competent authority has ascertained that the project will not adversely effect the integrity of the European Site. When considering the impact of potentially damaging activities, competent authorities apply the precautionary principle that consent cannot be granted unless it is ascertained that there will be no adverse effect on the integrity of the site.
- 3.14 Although, on appeal, the Secretary of State is the competent authority, with the lodging of the appeal, the impact, if any, on European Sites again became relevant. Consequently Cornwall Council undertook a 'Shadow' Screening Assessment⁶. This concluded that significant adverse effects could not be excluded and that an Appropriate Assessment was therefore required.
- 3.15 Subsequently, Cornwall Council instructed Bureau Veritas to produce a scientific report to inform 'shadow' Appropriate Assessment to inform the Public Inquiry. I was responsible for the production of this scientific report which informed that shadow Appropriate Assessment.
- 3.16 The conclusions of that report were that for Breney Common and Goss and Tregoss Moors SAC, in respect of the Annex II species, marsh fritillary butterfly, the Annex I habitat European Dry Heath, the Annex I habitat Northern Atlantic wet heath with *Erica tetralix*, and the Annex I habitat Transition Mires and Quaking Bogs, it cannot be ascertained that the CERC would not have an adverse effect upon the integrity of these designated features either alone or in combination with other projects through increases in nitrogen and acid deposition.
- 3.17 Further, it was concluded that for St Austell Clay Pits SAC, in respect of the Annex II species, Western rustwort, it cannot be ascertained that the CERC would not have an adverse effect upon the integrity of this designated

⁶ Screening for Appropriate Assessment, Cornwall Energy Recovery Centre (CERC), Bureau Veritas, November 2009

feature either alone or in combination with other projects through increases in nitrogen deposition.

- 3.18 The procedures for assessing the effects of proposed developments on European sites are set out in Part I of the ODPM Circular 06/2005 'Biodiversity and geological conservation: statutory obligations and their impact within the planning system', and the European Commissions 2001 'Assessment of plans and projects significantly affecting Natura 2000 sites'. Further guidance on interpretation of the Regulations is provided in English Nature's (now Natural England) series of Habitats Regulations Guidance Notes (HRGN) 1-6) which have been considered in making this assessment.

4.0 DESCRIPTION OF THE SCHEME

- 4.1 The planning application was originally submitted in March 2008 and sought permission for the development of the Cornwall Energy Recovery Centre (CERC).
- 4.2 It is expected that the facility will treat up to 240,000 tonnes per annum of predominantly residual municipal solid waste (MSW) from within Cornwall. The CERC will include a bottom ash recovery facility with a capacity of 60,000 tonnes per annum, along with several other buildings including an administration office and visitor centre. The single stream turbine generator will utilise the heat generated by the combustion process, generating approximately 20MW of electrical power, of which 16.6MW will be exported to the national grid. Heat will be exported to the nearby china clay dryers in the form of steam or hot water. The CERC is planned to become operational in 2012.
- 4.3 The size and scale of the scheme alone does not represent any specific threat to the nearby SAC's through habitat loss. The footprint of the main facility is 145.5m in length, up to 58.2m wide and 45m in height. The bottom ash facility is 172.2m long and up to 55.7m wide, with a height of up to 23.4m. It is proposed there will be a twin stack of 120m high, with an outside diameter of 3.4m. None of these developments will be on any land included within the SAC, with the main CERC development being located some 100m south east of the SAC.
- 4.4 The application boundary covers a total area of 14.6 hectares. This includes not only the main facility buildings but also the access road, private haul road and area for heat pipework routing in the china clay dryers, opposite. Analysis of the application boundary showed the proposed haul road to be approximately 10m from the Breney Common and Tregoss Moors SAC at Stamps Hill.

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- 4.5 The project (according to data presented within the applicants Environmental Statement, In-combination assessment and Regulation 19 response) will contribute to the deposition of nutrient Nitrogen (kg N/ha/yr) and the deposition of Acid (keq H+/ha/yr) along with the emission of a number of other airborne pollutants. These effects will be primarily associated with the operational phase of the development, when stack emissions and emissions from road traffic are acting together.
- 4.6 The proposal (through incineration and direct stack emissions) will lead to the emission to air of NO_x, SO_x, CO, HCl, HF, trace levels of metals, dioxins and furans, dioxin like PCB's (poly-chlorinated biphenyls) and PAH's (polycyclic aromatic hydrocarbons) the levels of which are summarised in Table 4.1 below.

Table 4.1 Summary of stack emissions from the CERC (values taken from Environment Agency Appendix 11⁷ for submission to Natural England, June 2009)

| Pollutant | Assessment criterion $\mu\text{g}/\text{m}^3$ | Process contribution (PC) $\mu\text{g}/\text{m}^3$ | PC as % of assessment criterion |
|--------------------------|---|--|---------------------------------|
| PM ₁₀ | 40 | 0.0087 | 0.022 |
| TOC (treated as benzene) | 5 | 0.0087 <i>Note 1</i> | 0.17 |
| HCl | 20 | 0.0087 | 0.044 |
| SO ₂ | 20 <i>Note 2</i> | 0.017 | 0.085 |
| NO ₂ | 30 <i>Note 3</i> | 0.13 | 0.43 |
| CO | 350 | 1.6 | 0.46 |
| NH ₃ | 1 <i>Note 4</i> | 0.0057 <i>Note 1</i> | 0.57 |
| Cd | 0.005 | 0.000044 <i>Note 5</i> | 0.88 |
| Tl | 1 | 0.000044 <i>Note 1</i> | 0.0044 |
| Hg | 0.25 | 0.000044 | 0.018 |
| Sb | 5 | 0.000435 <i>Note 6</i> | 0.0087 |
| As (from 31/12/2012) | 0.006 <i>Note 7</i> | 0.000435 <i>Note 6</i> | 7.25 |
| As (current) | 0.2 | 0.000435 <i>Note 6</i> | 0.218 |
| Cr | 0.1 | 0.000435 <i>Note 6</i> | 0.435 |
| Co | 0.2 | 0.000435 <i>Note 6</i> | 0.218 |
| Cu | 2 | 0.000435 <i>Note 6</i> | 0.022 |
| Mn | 1 | 0.000435 <i>Note 6</i> | 0.0435 |
| Ni (from 31/12/2012) | 0.02 <i>Note 7</i> | 0.000435 <i>Note 6</i> | 2.175 |
| Ni (current) | 1 | 0.000435 <i>Note 6</i> | 0.0435 |
| Pb | 0.5 | 0.000435 <i>Note 6</i> | 0.087 |
| V | 5 | 0.000435 <i>Note 6</i> | 0.0087 |

Note 1: Calculated by the Agency on the same basis as the SITA figures. The Critical Level of 1 $\mu\text{g}/\text{m}^3$ is only applicable to the heath and bog features of the Breney Common, Goss & Tregoss Moors SAC

Note 2: Annual mean for protection of vegetation

Note 3: Annual mean for protection of vegetation

Note 4: Annual mean for sensitive lichen communities and bryophytes

Note 5: From Table 1.1 of "Response to AQMAU interim report January 2009"

Note 6: From Table 1.3 of "Response to AQMAU interim report January 2009"

Note 7: EU Target values, due for implementation 31/12/2012

* Figures obtained from the public domain

- 4.7 Stack emissions need to be assessed together with the contribution of road traffic accessing the CERC site. Values for road traffic contribution have not been quantified by the applicant but have been modelled and shown diagrammatically on Figures A1- A5 in the combination report of February

⁷ Appendix 11, Form HR01: Proforma for New Applications within Stage 2 Criteria, Environment Agency, June 2009

2009⁸. We have used the maximum process contribution for acid deposition at Breney Common and Goss and Tregoss Moors SAC as supplied on deposition contour maps in Cornwall Energy Recovery Centre – The Conservation (Natural Habitats, &c.) Regulations 1994 (as amended 2007) In Combination Assessment. Document reference 1495.12. We have used the deposition map contours (Figures A1 – A5) and the CERC In Combination Assessment⁷ to calculate the additional contribution of traffic emissions in terms of keq/ ha/ yr for the most sensitive feature (marsh fritillary). This has been used to calculate the maximum acid deposition in combination with the stack emissions (0.00517keq/ ha/ yr) at Breney Common and Goss and Tregoss Moors. This figure has been extrapolated and added to stack emissions for all further acid calculations presented in Tables 8.2 and 8.3.

- 4.8 The Cornwall Energy Recovery Centre – The Conservation (Natural Habitats, &c.) Regulations 1994 (as amended 2007) In Combination Assessment. Document reference 1495.12 report provided by SITA does not make an assessment of the contribution of road traffic emissions in terms of Nitrogen deposition so in Tables 8.4 and 8.5 the total process contribution provided does not include the additional effects of road traffic emissions. This data was requested from the applicant but has not been provided.

⁸ Cornwall Energy Recovery Centre – The Conservation (Natural Habitats, &c.) Regulations 1994 (as amended 2007). In Combination Assessment. Reference 1495.12

5.0 PLANNING POLICY

PPS9 on Biodiversity and Geological Conservation

5.1 Planning Policy Statement 9 (PPS9) was published in August 2005 and sets out the Government's national policies on the protection of biodiversity and geological conservation through the planning system. The aims of PPS9 are to ensure that planning policies and decisions not only avoid, mitigate or compensate for harm but seek ways to enhance and restore biodiversity and geology. PPS9 suggests ways in which these principles might be achieved.

PPS9 Government Circular: Biodiversity and Geological Conservation – Statutory Obligations and their Impact within the Planning System

5.2 The PPS9 Government Circular was published in August 2005 to compliment PPS9: Biodiversity and Geological Conservation and the accompanying Good Practice Guide. This publication provides guidance on the application of the law relating to planning and nature conservation in England, and should be consulted with respect to the conservation issues arising from the impact of new developments upon SAC's, SPA's and Ramsar sites.

5.3 Of particular relevance is paragraph 20 entitled '**Ascertaining the effect on site integrity**', where the circular defines the 'integrity of a site' as "*coherence of its ecological structure and function, across its whole area, that enables it to sustain the habitat, complex of habitats and/or the levels of populations of the species for which it was classified*".

5.4 It then goes on to state:

"It is for the decision-taker to consider the likely and reasonably foreseeable effects and to ascertain that the proposal will not have an adverse effect on the integrity of the site before it may grant permission. If the proposal would adversely affect integrity, or the effects on integrity are uncertain but could be significant the decision-taker should not grant permission, subject to the provisions of regulations 49 and 53 as described below".

- 5.5 Regulation 49 considers whether the plan or project is required for “Imperative reasons of overriding public importance” (IROPI) and Regulation 53 makes the requirement for compensatory measures to be provided where Regulation 49 has been evoked.

Policy L6 (Cornwall Local Waste Plan)

- 5.6 Policy L6 of the Cornish Waste Local Plan should also be adhered to with respect to the CERC development. Policy L6 part (g) states that any new Energy from Waste plant “*Should not adversely effect the integrity of a candidate Special Area of Conservation*”.

- 5.7 Policy L6A states that: “*Planning permission will not be granted for EfW proposals which would:*

- *“harm landscape features such as ancient woodland, significant areas of other woodland, historic parkland, extensive areas of semi-natural vegetation, hedgerows or trees of significant landscape or nature conservation importance;*
- *cause loss of important local landscapes;*
- *be incompatible with local landscape character in terms of location, scale, building design or choice of planting;*
- *cause significant light pollution of surrounding rural landscapes;*
- *cause significant impact on the visual amenity of local residents or recreational users.”*

Non-Statutory Policies

- 5.8 The UK Biodiversity Action Plan 1995 (UKBAP) sets out priorities for conservation of habitats and species in Britain and includes habitat action plans and species action plans.
- 5.9 Individual Action Plans define actions and measures to meet the objectives defined in the strategy, and specify measurable targets. They determine the broad habitats and species that are of value to the natural environment of the UK, and identify actions and projects that could be undertaken to help

protect or enhance the national biodiversity. BAPs are split into Habitat Action Plans (HAPs) and Species Action Plans (SAPs) identifying those habitats and species that are of particular value to nature conservation and determining plans and targets for retention and creation of habitats and species.

- 5.10 Local Biodiversity Action Plans (LBAPs) are implemented through planning policy, identifying habitats and species of particular value or endangerment at the local or regional level. BAPs in the UK have no statutory status but provide a framework for implementing conservation requirements. The Site is covered by the Cornwall Biodiversity Action Plan (implemented in 1998 and reviewed in 2001) which includes a SAP for the marsh fritillary butterfly as well as several HAPs relevant to the Site.

European and National Legislation

- 5.11 Relevant European legislation relevant to the CERC and its immediate surrounds is detailed below.
- 5.12 The Natura 2000 network in the UK and supporting legislation is summarised in section 3.11 above.
- 5.13 The Conservation (Natural Habitats &c.) Regulations 1994 place a duty on planning authorities to meet the requirements of the Habitats Directive, and to provide protection for priority habitats and species listed in the Habitats Directive outside of protected areas.
- 5.14 In order to meet obligations to avoid deterioration to Natura 2000 sites, bodies are required to review those consents, permissions or authorisations which may affect the integrity of these sites. The government territorial advisors determine or advise on those proposals that may affect protected species. Natural England has a duty to ensure that Natura 2000 sites are managed favourably for conservation in line with the Habitats Directive⁹.

⁹ <http://www.naturalengland.org.uk/ourwork/conservation/designatedareas/sac/default.aspx>

Regulation 50 of the Habitats Directive implements the duty to preserve Natura 2000 sites in favourable condition.

6.0 DESIGNATED FEATURES OF BRENEY COMMON AND GOSS AND TREGOSS MOORS SAC

6.1 In this section I focus on the characteristics of the designated features of Breney Common and Goss and Tregoss Moors SAC.

6.2 Breney Common and Goss and Tregoss Moors SAC is designated for the presence of three Annex I habitat types (transition mire and quaking bog, European dry heath and Northern Atlantic wet heaths with *Erica tetralix*) and one Annex II species the marsh fritillary (*Euphydryas aurinia*) butterfly. I will focus on the characteristics of each in turn.

European Dry Heath

6.3 European dry heaths¹⁰ typically occur on freely-draining, acidic to circumneutral soils with generally low nutrient content. Ericaceous dwarf-shrubs dominate the vegetation. The most common is heather (*Calluna vulgaris*), which often occurs in combination with gorse (*Ulex* spp.), bilberry (*Vaccinium* spp.) or bell heather (*Erica cinerea*), though other dwarf-shrubs are important locally. Nearly all dry heath is semi-natural, being derived from woodland through a long history of grazing and burning. Most dry heaths are managed as extensive grazing for livestock or, in upland areas, as grouse moors.

6.4 Twelve National Vegetation Classification¹¹ (NVC) types in Britain meet the definition of this habitat type:

- H1 *Calluna vulgaris* – *Festuca ovina* heath;
- H2 *Calluna vulgaris* – *Ulex minor* heath;
- H3 *Ulex minor* – *Agrostis curtisii* heath;
- H4 *Ulex gallii* – *Agrostis curtisii* heath;
- H7 *Calluna vulgaris* – *Scilla verna* heath;

¹⁰ <http://www.jncc.gov.uk/ProtectedSites/SACselection/habitat.asp?FeatureIntCode=H4030>

¹¹ Rodwell, J.S. 2006. *National Vegetation Classification: Users' Handbook*. Joint Nature Conservation Committee.

- H8 *Calluna vulgaris* – *Ulex gallii* heath;
- H9 *Calluna vulgaris* – *Deschampsia flexuosa* heath;
- H10 *Calluna vulgaris* – *Erica cinerea* heath;
- H12 *Calluna vulgaris* – *Vaccinium myrtillus* heath;
- H16 *Calluna vulgaris* – *Arctostaphylos uva-ursi* heath;
- H18 *Vaccinium myrtillus* – *Deschampsia flexuosa* heath; and,
- H21 *Calluna vulgaris* – *Vaccinium myrtillus* – *Sphagnum capillifolium* heath.

6.5 European dry heaths are found in every EU Member State except for Greece, but are only extensive in the western oceanic fringes of Europe. A high proportion of the EU resource of European dry heaths occurs in the UK, although this proportion is not as high as that of Northern Atlantic wet heaths with *Erica tetralix*. Dry heaths in the UK exhibit exceptional diversity in comparison with examples found elsewhere in the EU. The Joint Nature Conservation Committee (JNCC) has produced a map showing the UK distribution of European dry heath. An extract from this map is reproduced in Figure 1 Appendix 1.

6.6 The designated SACs within the UK accommodates the wide geographical range and ecological variation of European dry heaths, and takes account of the UK's special responsibilities for the habitat type; this is reflected in the very large number of proposed sites. The sites that have been selected are for the most part those with the largest extent of dry heath and those where habitat structure and function are best-conserved. Sites have been selected to include all the main sub-types of the habitat and important lines of variation within the main sub-types, taking into account gradients developed in relation to climate, altitude, soil conditions and other factors. Both upland and lowland heaths are well represented in the SAC series, but there are a high proportion of the rarer and more species-rich lowland types which are particularly threatened by human activities.

- 6.7 The selected sites often hold examples of several different forms of dry heath, and also demonstrate a diverse range of associations with other habitat types including wet heath, acidic and calcareous grassland, mire, scrub and woodland. Many sites support populations of rare fauna and flora.
- 6.8 In upland areas, dry heaths are very extensive and site selection has focused on identifying large, high-quality sites; many other examples are relatively small and/or of poor quality. As with wet heaths, agri-environment schemes and Habitat Action Plans contribute to the conservation of the habitat across the wider countryside. The JNCC has produced a map showing the UK distribution of SACs with European dry heaths habitat. An extract from this map is shown in Figure 2 Appendix 1.
- 6.9 European dry heath occurs at Breney Common Goss and Tregoss Moors SAC only to a small extent. The dry heath is an example of H4 *Ulex gallii* – *Agrostis curtisii* heath, with a limited south-western distribution in Britain.

Northern Atlantic wet heath with *Erica tetralix*

- 6.10 Northern Atlantic wet heath¹² usually occurs on acidic, nutrient-poor substrates such as shallow peats or sandy soils with impeded drainage. The vegetation is typically dominated by mixtures of cross-leaved heath *Erica tetralix*, heather *Calluna vulgaris*, grasses, sedges and *Sphagnum* bog-mosses.
- 6.11 In the UK this habitat corresponds with the following National Vegetation Classification (NVC) types:

¹² <http://www.jncc.gov.uk/ProtectedSites/SACselection/habitat.asp?FeatureIntCode=H4010>

- H5 *Erica vagans* – *Schoenus nigricans* heath;
- M14 *Schoenus nigricans* – *Narthecium ossifragum* mire;
- M15 *Scirpus cespitosus* – *Erica tetralix* wet heath; and,
- M16 *Erica tetralix* – *Sphagnum compactum* wet heath.

6.12 M15 *Scirpus cespitosus* – *Erica* wet heath is found in areas with a moderate to high rainfall and is the typical form of wet heath in the north and west of the UK. *Erica tetralix* and *Calluna* species are typically accompanied by abundant deergrass (*Trichophorum cespitosum*) and purple moor-grass (*Molinia caerulea*). In the far north-west of Scotland, bell heather (*Erica cinerea*) and woolly fringe-moss (*Racomitrium lanuginosum*) are also characteristic, along with an abundance of Atlantic bryophytes. In the north, there may be a high cover of *Cladonia* lichens. At high altitude northern and montane species are represented. Where there is movement of mildly base-rich water through the peat, sedges *Carex* spp. and a wide range of species favoured by flushing occur. The latter includes distinctive variants that are often characterised by abundant bog-myrtle (*Myrica gale*), or black bog-rush (*Schoenus nigricans*).

6.13 M16 *Erica* – *Sphagnum* wet heath is characteristic of drier climates in the south and east and is usually dominated by mixtures of *Erica tetralix*, *Calluna* and *Molinia*. The bog-moss *Sphagnum compactum* is typically abundant, while on Orkney and at high altitude in the eastern Scottish Highlands, *Cladonia* lichens are abundant. In the south, species with a mainly southern distribution in Britain, such as marsh gentian (*Gentiana pneumonanthe*), brown beak-sedge (*Rhynchospora fusca*) and meadow thistle (*Cirsium dissectum*), enrich wet heaths. At high altitude in northern Scotland forms of the community rich in northern and montane species occur and often also have an abundance of *Cladonia* lichens.

6.14 Wet heaths occur in several types of ecological gradient. In the drier areas of the south and east, wet heaths are local and often restricted to the transition zone between European dry heaths and constantly wet valley

mires. In the uplands they occur most frequently in gradients between dry heath or other dry, acid habitats and blanket bogs. At high altitude in the Scottish Highlands wet heaths occur in mosaics with Alpine and Boreal heaths; in these situations lichens and northern or montane species may be well-represented. Flushed wet heaths are especially frequent in areas of high rainfall and occur as topogenous fens, usually in channels within heath or grassland vegetation.

- 6.15 Wet heath is an important habitat for supporting a range of vascular plant and bryophyte species of an oceanic or Atlantic distribution in Europe, several of which have an important part of their EU and world distribution in the UK.
- 6.16 Northern Atlantic wet heaths with *Erica tetralix* are restricted to the Atlantic fringe of Europe between Norway and Normandy. A high proportion of the European resource occurs in the UK.
- 6.17 Northern Atlantic wet heaths with *Erica tetralix* occur throughout the UK but are highly localised in parts of southern and central England. Wet heaths become increasingly extensive in the cool and wet north and west, especially in the Scottish Highlands. However, the area covered by wet heath is significantly smaller than that covered by Blanket bogs or dry heath. Figure 3 in Appendix 1 shows the UK distribution of Northern Atlantic wet Heath with *Erica tetralix*.
- 6.18 SAC sites have been selected to represent the geographical and ecological range of Northern Atlantic wet heaths. The SAC series contains examples of the full spectrum of variation shown by the habitat in the UK, ranging from lowland wet heaths in southern England (including the distinctive Cornish heath *Erica vagans* heaths on the Lizard), to upland heaths in the Scottish Highlands. Extreme oceanic forms in the west of Scotland, and lichen-rich variants in the extreme north, are also represented.
- 6.19 The sites selected are for the most part those with the largest expanses of the habitat type, the best-developed structure and function, and particularly

well-developed transitions to other habitats. The number and extent of wet heath SACs reflects the UK's special responsibilities for the conservation of the habitat.

- 6.20 Wet heath is extensively developed in western Britain and there are large areas of poor-quality habitat which do not meet the criteria for SAC selection. Although the SAC series consequently contains a relatively low proportion of the total UK resource, it comprises a large number of sites which collectively contain a high proportion of high-quality examples and in particular remnant lowland wet heaths. Outside the SAC series many wet heaths are protected through agri-environment schemes or through measures adopted under the UK Biodiversity Action Plan. Figure 4 in Appendix 1 is an extract of a map produced by the Joint National Conservation Committee (JNCC), showing the distribution of SACs with Northern Atlantic wet heaths.
- 6.21 This lowland site exhibits mosaics of various habitats including European dry heaths, wet heaths, acid grassland, bog, swamp, fen and open water communities. Although possibly the site of a former raised bog, this site lying either side of the A30 trunk road and encompassing the River Fowey is now recovering from an intensive period of china clay and gravel extraction. The soil-structure of these sites reflects past mining operations which caused poor drainage. The resulting extensive wet communities include the localised M14 *Schoenus nigricans* – *Narthecium ossifragum* mire, closely associated with M25 *Molinia caerulea* – *Potentilla erecta* mire. There are several species of bog-mosses *Sphagnum* spp. bog asphodel (*Narthecium ossifragum*), orchids and some nationally scarce plants, such as yellow centaury (*Cicendia filiformis*), marsh clubmoss (*Lycopodiella inundata*) and pillwort (*Pilularia globulifera*). The habitat supports rich assemblages of butterflies, including the Annex II species marsh fritillary (*Euphydryas aurinia*). The site also supports a wide variety of moths, dragonflies and damselflies, and also a population of European nightjar (*Caprimulgus europaeus*).

Transition mires and quaking bogs

- 6.22 The term 'transition mire' relates to vegetation that in floristic composition and general ecological characteristics is transitional between acid bog and alkaline fens, in which the surface conditions range from markedly acidic to slightly base-rich. They are wetland habitats that form across the surface of shallow ponds characterized by slow groundwater flow, causing the pond water to be acidic and low in dissolved oxygen. The vegetation normally has intimate mixtures of species considered to be acidophile and others thought of as calciphile or basophile. The roots and rhizomes of invading wetland plants form floating mats across the pond which creates an unstable, "quaking" surface.
- 6.23 In some cases the mire may occupy a physically transitional location between bog and fen vegetation, as for example on the marginal lagg of raised bog or associated with certain valley and basin mires. In other cases these intermediate properties may reflect the actual process of succession, as peat accumulates in groundwater-fed fen or open water to produce rainwater-fed bog isolated from groundwater influence.
- 6.24 Depending on the availability of nutrients, degree of soil saturation, water pH and dissolved oxygen level in a given bog, the site may evolve into a marsh or swamp. Quaking bogs support rare bog plants such as dragon's mouth orchid (*Arethusa bulbosa*), and few fruited sedge (*Carex oligosperma*).
- 6.25 The following National Vegetation Classification (NVC) types form the core of transition mire vegetation in the UK. However, this list is not exhaustive and specific sites will contain a number of other NVC species:
- M4 *Carex rostrata* – *Sphagnum recurvum* mire
 - M5 *Carex rostrata* – *Sphagnum squarrosum* mire
 - M8 *Carex rostrata* – *Sphagnum warnstorffii* mire
 - M9 *Carex rostrata* – *Calliergon cuspidatum/giganteum* mire
 - S27 *Carex rostrata* – *Potentilla palustre* tall-herb fen

- 6.26 Transition mires and quaking bogs have a wide European distribution but appear to be relatively scarce in the Mediterranean region. The Joint Nature Conservation Committee (JNCC) has produced a map showing the UK distribution of transition mire and quaking bog habitat. An extract from this map is shown in Figure 5 in Appendix 1.
- 6.27 SAC selection has placed emphasis on covering the range and variability of physiography and mire chemistry, and the site series includes examples from a range of different hydrological and geomorphological situations. Extensive examples have been favoured as these generally have the best conservation of structure and function, particularly of hydrological features. The selected SACs span the wide geographic range of the habitat and include both upland and lowland examples. Particular NVC categories are not strongly or exclusively associated with a given mire type, and most selected sites support a range of vegetation communities. The JNCC has produced a map showing the UK distribution of SACs with transition mire and quaking bog habitat. An extract from this map is shown in Figure 6 in Appendix 1.
- 6.28 Although possibly the site of a former raised bog, this site lying either side of the A30 trunk road and encompassing the River Fowey is now recovering from an intensive period of china clay and gravel extraction. Transition mire has developed in the hollows between ridges and mounds on which dry heathland forms a mosaic with acid grassland. Wet heath merges into Sphagnum-dominated fen vegetation with common cottongrass (*Eriophorum angustifolium*), round-leaved sundew (*Drosera rotundifolia*), bog-myrtle (*Myrica gale*), bog asphodel (*Narthecium ossifragum*), black bog-rush (*Schoenus nigricans*) and bog pimpernel (*Anagallis tenella*). Of particular note are the nationally scarce plants yellow centaury (*Cicendia filiformis*), marsh clubmoss (*Lycopodiella inundata*) and pillwort (*Pilularia globulifera*).
- 6.29 Emergent vegetation around the 15 ponds includes water horsetail (*Equisetum fluviatile*), bogbean (*Menyanthes trifoliata*) and marsh cinquefoil (*Potentilla palustris*). Many of the transitions include tall fen vegetation with

bulrush (*Typha latifolia*), common reed (*Phragmites australis*) and bottle sedge (*Carex rostrata*). Other wetland plants found in the pond margins and across the more shallow ponds include marsh St John's-wort (*Hypericum elodes*), sharp-flowered rush (*Juncus acutiflorus*) and ivy-leaved bellflower (*Wahlenbergia hederacea*). Of particular note are the nationally scarce Cornish moneywort (*Sibthorpia europaea*) and wavy St John's-wort (*Hypericum undulatum*). Extensive willow carr has developed over much of the central part of the Goss Moor.

Marsh Fritillary Butterfly

6.30 The marsh fritillary has a highly patterned pale yellowish-brown upperside with orange-brown markings and brown spots, giving a stained glass appearance. The underside is light orange to brown with yellow spots. The wingspan of the butterfly is typically between 3.5 and 4.6cm, although the females are generally larger than the males. The caterpillars measure up to 2.7cm in length and are black in colour with black spines along the back.

Figure 6.1: Marsh fritillary butterfly and larvae

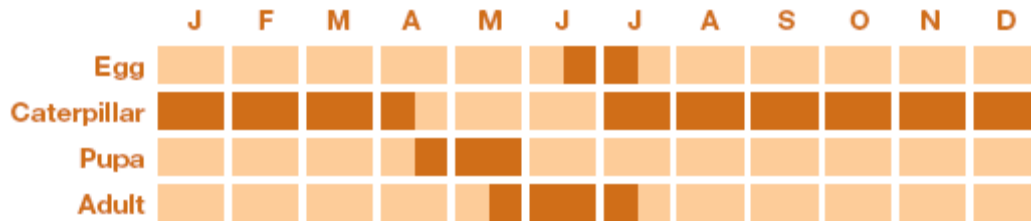


Life cycle

6.31 The butterfly is univoltine, flying between May and mid-July (peak period end of May to mid June). Eggs are laid in large batches of up to 350 eggs at first, but successive batches are smaller. In England and Wales the females lay their eggs on larger plants, typically those growing where the turf height is 8-

- 20cm; preliminary observations in Scotland indicate that the vegetation may be shorter on Scottish sites.
- 6.32 The young larvae are gregarious and spin a protective web that becomes conspicuous by the end of August. The nests, which are easy to count, occur in intermediate length swards (8-25cm), although shorter swards (5-15cm) can be used where food plants are very abundant (e.g. on downland). The larvae over winter in their fourth instar, in a small hibernaculum (c. 1cm³), which is usually formed close to the ground (within 2-5cm), usually within a dense grass tussock. Post-diapause larvae emerge in late winter or early spring and can be seen in clusters of up to 150 small black larvae when basking in the weak sunshine. As their feeding requirements increase in their fifth instar, they separate into smaller and smaller groups, and eventually become solitary by their sixth and final instar, dispersing widely over the breeding habitat. Pupae are formed low down in grassy vegetation, either deep within grass tussocks or amongst dead leaves in late April, with adults emerging at the end of May or early June. Like all butterflies this may vary with locality and year.
- 6.33 The males emerge first, often several days before females. Emergence peaks after four to eight days with males surviving (or remaining) on site an average 4-9 days and females 3-6 days. The total flight period lasts until early July in the south and mid July further north. Although many males and females are typically highly sedentary, there is known to be some dispersal from colonies and individuals are regularly seen in non-breeding habitats near to existing colonies. In years of abundance in Scotland, adults may be extremely widespread.
- 6.34 The chart below in Figure 6.2 shows the annual lifecycle of the marsh fritillary butterfly.

Figure 6.2: Marsh fritillary lifecycle (Source: Butterfly Conservation)



Foodplants

6.35 The primary food plant of the marsh fritillary butterfly is devil's-bit scabious (*Succisa pratensis*) see Figure 6.3. On calcareous grassland, it occasionally uses field scabious (*Knautia arvensis*) and small scabious (*Scabiosa columbaria*). Females select larger, more prominent food plants or patches of shorter vegetation where the food plant is very abundant.

Figure 6.3: devil's-bit scabious



Habitat

6.36 Marsh fritillaries are essentially grassland butterflies in the UK, and although populations may occur occasionally on wet heath, bog margins and woodland clearings (of more than 1 hectare in size), most colonies are found in damp acidic or dry calcareous grasslands (including *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) (NVC

- classification 6410) and Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (NVC classification 6210).
- 6.37 In southern England the marsh fritillary breeds in areas of flower-rich chalk or limestone grassland and wet grassland. On chalk the majority of sites are found in Wiltshire and Dorset. The best breeding areas occur on west to south-facing slopes where devil's-bit scabious grows in abundance.
- 6.38 Research in South Finland has revealed that the most important variables to explain the presence of marsh fritillary in a patch are patch area and the density of host plants (Devils-bit scabious), such that the larger the patch and the more host plants per hectare, the more likely the patch is to be occupied by the butterfly. Specifically the study found that when patch area was increased by one hectare, there was a sevenfold increase in the probability of occupancy by the marsh fritillary. Furthermore, increasing the number of host plants per hectare by one increased the probability of the patch being occupied by 2% (Wahlberg *et al.*, 2002).
- 6.39 Marsh fritillaries require a patchwork of short vegetation and longer tussocky grasses, ranging in vegetation height between 7 and 15cm (3-6 inches). Females tend to prefer to lay their eggs on plants with larger leaves that will offer a sufficient volume of plant material for the gregarious caterpillars. The larval webs are often found in the shorter turf pockets surrounded by grass tussocks, which offer some shelter and protection in the early stages of development. Some dead grass or leaf litter is also important for the caterpillars to bask on.
- 6.40 The overall aim of habitat management for the marsh fritillary is to produce an uneven patchwork of short and long vegetation by the end of the grazing period, between 8 and 25 cm tall on damp grassland and 5 and 15 cm on chalk grassland.
- 6.41 The butterfly requires extensive habitat networks in order to survive (probably comprising many tens of hectares) and all potentially suitable habitat in a region should be targeted for management. In regions where

habitat loss has been severe, habitat restoration should be given a high priority. Table 6.1 below sets out the basic management requirements of the marsh fritillary.

Table 6.1: Basic management requirements of the marsh fritillary (taken from the Species Action Plan)

| | |
|-----------------------------|---|
| General Habitat Type | Open, unshaded and unimproved grassland preferably with some shelter (e.g. occasional scrub patches, adjacent woodland, sheltered slopes). Abundant Devil's Bit Scabious is important. |
| Type of Stock | Traditional breeds of cattle and horses are best at coping with coarse vegetation and are less selective. Sheep are generally unsuitable although colonies persist on some lightly sheep grazed areas in Scotland. |
| Intensity of Grazing | <i>In general a long period of light grazing is better than short periods of heavy grazing.</i> No heavy grazing. Maximum grazing level tolerated is about 0.4-0.7 livestock units/ha (equivalent to 30-50 store cattle weeks or 20-35 suckler cow weeks /ha/year). Some sites may be maintained in suitable condition at lower grazing levels. The general aim should be to produce a sward with a reasonable proportion within the 10-15cm height range on damp grass and 5-15cm on calcicolous grassland. |
| Timing of Grazing | Effects poorly known. Some summer grazing is probably needed to keep coarse vegetation in check, and may be the best time on very wet sites. |
| Scrub Control | Periodic scrub control may be needed on some sites to prevent scrub invasion under low grazing levels, although some requirement for a scatter of scrub to provide shelter. |
| Cutting | Generally unsuitable, especially regular cutting or haymaking. Rotational cutting may be suitable but experiments are needed on frequency and timing. |
| Burning | Periodic burning may be useful in maintaining suitable habitat on some sites (though most larvae will probably die in the actual area burnt) and restoration management of sites. Burning on sites should only be carried out where it is traditional (as burning can be detrimental to many other invertebrates), and in rotation so that only |

| | |
|-----------------|---|
| | part of each field is burnt each year. Care should be taken in rank (neglected) sites, and bracken areas avoided. The main breeding areas on a site should be identified and avoided. |
| Releases | In order to judge habitat suitability and colony sustainability, wide consultation should take place before any release and BC code (Oates & Warren, 1990) followed. Clandestine releases and support breeding should be avoided and deterred at all costs. Releases should only be part of regional recovery strategies. |

Population structure

- 6.42 The butterfly forms close-knit colonies on discrete patches of habitat (typically 5 - 20 ha). Adults rarely fly more than 50-100m but a small proportion seem to disperse further. Marsh fritillaries are known to exist as meta-populations comprising groups of local populations connected by occasional dispersal. Adults tend to be sedentary and remain in a series of linked meta-populations, forming numerous temporary sub-populations, which frequently die out and re-colonise. Where unable to do this, populations do not seem to be able to persist in habitat fragments. It is therefore essential to conserve a cluster of sites in close proximity.
- 6.43 Patch networks are an important component of the butterfly's distribution. Thomas *et al.* (2008) found that within England and Wales, survival of the marsh fritillary has been greatest in population concentrations, or core areas, that is, in 10-km grid squares that were surrounded by other 10-km grid squares that also contained populations of marsh fritillary. In Dorset, populations were also more likely to be found in core areas, i.e. in habitat patches that were close to other populated habitat patches.
- 6.44 Marsh fritillary is renowned for its large fluctuations in population size that make it highly prone to local extinction, but in good years enable it to spread and colonise new sites as well as patches of less suitable habitat. The period 1982 to 1985 appears to have been such a time when the butterfly underwent a periodic expansion and was comparatively mobile. It is possibly

more sedentary in lean years, contracting to core sites during sequences of poor seasons.

- 6.45 The fluctuations appear to be dependent upon weather, food supply and the proportion of caterpillars killed by the parasitic braconid wasps of the genus *Cotesia* (*Apanteles* sensu lato, in part). The two parasitoids in Britain are *Cotesia melitaeorum* (Wilkinson) and *Cotesia bignellii* (Marshall). The former also parasitises some related butterflies in Europe but in Britain it also occurs as a parasitoid of the Glanville Fritillary, *Melitaea cinxia*, on the Isle of Wight. As far as is known *C. bignellii* is entirely restricted to marsh fritillary and this is certainly the case in Britain. Thus, these *Cotesia* species are at least monophagous wherever they occur in Britain, and all populations except for that of *C. melitaeorum* on the Isle of Wight are dependent on marsh fritillary.
- 6.46 Insufficient survey work has been done to be sure of the distribution of either, but *C. bignellii* has only been found in Southern Britain (recently Cornwall, Devon, Somerset, Dorset, Oxfordshire, Glamorgan, Cardiganshire), while *C. melitaeorum* appears possibly to be absent from many southern colonies of marsh fritillary. It was originally described from Hod Hill in Dorset as well as several other southern English and Irish localities. In recent years it has been found in colonies of marsh fritillary only in Glamorgan and Argyll.
- 6.47 The life histories of these two *Cotesia* species are similar though only *C. bignellii* has been studied in detail in Britain (Porter, 1981 & 1983). It appears that warm, but relatively sunless spring weather may lead to higher larval mortalities from parasitoids, which can build up rapidly at this stage of the cycle. In addition, for every marsh fritillary generation the parasitoid fits in three, building up numbers with each. In some years it can fit in a fourth generation with catastrophic effects on the caterpillar population, causing a crash in adult marsh fritillary numbers. In contrast, in cool but sunny spring weather the marsh fritillary larvae can develop rapidly and avoid heavy mortalities due to parasitoids, leading to rapid increase in adult numbers (Porter, 1983). It is thought that the parasitoid may control the size of marsh fritillary colonies, preventing them from outstripping the supply of food plant.

They are thus an integral element of the marsh fritillary population dynamics, and are themselves of significant conservation value.

- 6.48 *Tachinidae* has been reared in Britain from marsh fritillary and may be specialised to it, but probably seldom causes significant mortality in populations. It may however be a worthy conservation target in its own right, though better knowledge of its host associations is needed. There is no further information on other parasitism of marsh fritillary in Britain though probably, like most butterflies, the marsh fritillary will be subject to parasitism from relatively generalised parasitoids in its pupal stage and perhaps also as eggs.
- 6.49 The large fluctuations seen in marsh fritillary populations can cause problems if the habitats are small or of low quality and the butterfly population has become extremely small (or possibly so large that the food supply is wholly consumed, leaving the larvae unable to achieve hibernation). Under such circumstances an isolated colony can die out completely during troughs in the cycle. The periodic extinctions often give the appearance that colonies are shifting, either around fields or around a group of sites. In actual fact the phenomenon is probably caused by local extinctions which are balanced by periodic colonisations. Although the marsh fritillary is regarded as colonial and sedentary, recent research has shown that there is some emigration and movement and it may be that this butterfly, with its attendant *Cotesia parasitoids*, is adapted to this meta-population structure that also keeps parasitism in check (Warren 1994). It is therefore vital to maintain colonies or meta-populations of marsh fritillary that are centred on relatively large areas, or a viable mosaic of suitable habitat so that the process of successful dispersal at times of high population levels compensates for the periodic local extinctions to which local populations are prone (Warren 1994).
- 6.50 The sedentary behaviour of the adults and increasing fragmentation of their preferred habitats has led to the establishment of local races. The marsh

fritillary is an extremely variable butterfly, with 34 sub-species described from Europe alone.

Distribution

- 6.51 Although formerly widespread in central and eastern England, the marsh fritillary is declining in almost every European country and is now extinct in the Netherlands and Belgium. It is endangered in Hungary and Poland and vulnerable in Austria, Denmark, Ireland, Germany, Greece and Luxembourg. The butterfly is local and declining in Sweden, Switzerland and the UK but is still reasonably widespread in Finland, southern France and northern Spain, especially the Pyrenees.
- 6.52 In Britain it has become extinct over a large part of its former range, having declined by over 62% in the last 150 years. The species continues to be vulnerable in many parts of its range. It is still quite widespread in parts of south-west England and Wales, but colonies are estimated to be disappearing at a rate of well over 10% per decade. In Ireland, the butterfly's range is thought to have contracted by 50%. Surveys in 1990 indicated that there were 228 definite colonies in England, 111 in Wales, 35 in Scotland and 58 in Northern Ireland, in about 20 key areas. 44% of colonies known in Britain are within SSSIs, and 11 within NNRs. Yet, the rate of loss appears to be as high on protected sites (i.e. SSSIs and nature reserves) as on unprotected ones. Important centres of distribution are in south-west England (particularly Devon, Dorset and Wiltshire), south and west Wales, and western Scotland.
- 6.53 The JNCC has undertaken an audit of the data and judgements on conservation status in the UK's report on the implementation of the Habitats Directive (January 2001 to December 2006) for the marsh fritillary butterfly. The findings of this are summarised in Table 6.3 below.

Table 6.3: Summary of JNCC findings on the status of the marsh fritillary

| Range Information | |
|-------------------------------------|--|
| Surface area of range | 55,219km ² (1990-2006) |
| Range trend | Decreasing (1994-2006) |
| Quality of range data | Good |
| Reasons for reported trend in range | <ul style="list-style-type: none"> • Direct human influence (restoration, deterioration, destruction) • Indirect anthropo(zoo)genic influence |
| Favourable reference range | 60,883km ² (current is 10% below the favourable reference range) |
| Range conclusion | Unfavourable – Inadequate |
| Population of the Species | |
| Population estimate | 315 Occupied 1-km squares (2005) |
| Method of population estimate | Extrapolation from surveys of part of the population, sampling |
| Quality of population data | Good |
| Population trend | Decreasing (1990-2006) |
| Main pressures | <ul style="list-style-type: none"> • Cultivation • Mowing, cutting • Use of pesticides • Fertilisation • Grazing • Abandonment of pastoral systems • Planting • Burning • Other forms of transportation and communication • Outdoor sports and leisure activities • Other outdoor sports and leisure activities • Soil pollution (nutrient enrichment) • Drainage • Biocenotic evolution (scrub development) |
| Threats | <ul style="list-style-type: none"> • Mowing, cutting • Grazing • Abandonment of pastoral systems • Burning • Outdoor sports and leisure activities • Other outdoor sports and leisure activities • Soil pollution (nutrient enrichment) • Biocenotic evolution (scrub development) |

| | |
|---|------------------------------------|
| Favourable reference population | At least 410 occupied 1-km squares |
| Population conclusion | Unfavourable – Bad |
| Habitat for the Species in the Biogeographic Region or Sea | |
| Surface area of habitat | 50km ² (2000) |
| Quality of data on habitat area | Poor |
| Habitat trend | Decreasing (1994-2006) |
| Suitable habitat for the species | Unknown |
| Habitat conclusion | Unfavourable – Bad |
| Future Prospects | Poor prospects |
| Future prospects conclusion | Unfavourable – Inadequate |
| Overall Conclusion | Unfavourable – Bad |

6.54 Bulman *et al.* modelled meta-populations of the marsh fritillary in the UK to test for extinction debt in the declining species. The research showed that the habitat networks of six extant meta-populations in 16km² squares were larger, had longer modelled persistence times and higher meta-population capacity than six extinct populations. However, there was greater than 99% chance that one or more of the six extant meta-populations would go extinct in 100 years in the absence of further habitat loss. This study shows a widespread extinction debt among extant populations, necessitating conservation management or reserve designation even in apparent strongholds.

Conservation status

6.55 Marsh fritillary is listed on Annex II of the EC Habitats Directive as a species for which habitats should be designated as Special Areas of Conservation (SACs). It is protected under the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention) 1979, although the UK government has lodged a derogation for the species. It is also protected under Schedule 5 of the WCA 1981 (in respect of sale only), and fully protected under Schedule 5 and 7 of the Wildlife Order (Northern Ireland) 1985.

Factors contributing to the decline of marsh fritillary

- 6.56 The major threats to the marsh fritillary are the wholesale destruction of its habitat caused by development and agricultural improvement, inappropriate management of sites including abandonment of grazing and the increasing fragmentation and isolation of its habitats. It is a species that depends especially on extensive farming systems and appropriate habitat management in its unimproved grassland habitat.
- 6.57 Habitat loss over the last century has greatly fragmented the chalk grassland resource used by marsh fritillary across the south of England. Research has demonstrated the need for networks of large areas of suitably managed habitat if the species is to survive in the long term and emphasises the importance of sites currently unoccupied, but close enough to be re-colonised with individuals from a nearby site. There is a need for large areas of suitable habitat for the survival of the species. At such a scale changes in local population size, parasitoid attack and management problems do not have as catastrophic effects as they can on small, isolated sites.
- 6.58 Breney Common and Goss and Tregoss Moors SAC is known to support three marsh fritillary sub-populations. This represents the largest meta-population in Cornwall and probably the most westerly viable population in England. The potential impact of the CERC on the SAC is discussed in section 8.

Condition Assessments

- 6.59 The Conservation Objectives for any Natura 2000 site are accompanied by one or more definitions of habitat extent or habitat quality for the special interest features at a site. Within the Conservation Objectives, each habitat or species feature is provided with targets against which to judge favourable status. These are subject to periodic reassessment and may be updated to reflect new information or knowledge; they will be used by Natural England and other relevant authorities to determine if a site is in favourable condition.

The standards for favourable condition have been developed and are applied throughout the UK.

- 6.60 The current Natural England condition assessments for the Breney Common and Goss and Tregoss Moors SAC are presented in Appendix 2.1 with the condition assessments for St Austell Clay Pits SAC presented in Appendix 2.2.

Current Condition Assessment Breney Common and Goss and Tregoss Moors SAC

- 6.61 Breney Common and Goss and Tregoss Moors SAC is split into 19 distinct units (see Appendix 3.1) which are regularly assessed against their Conservation Objectives. Condition Assessments undertaken between 1999 and 2009 (most recent available) on these units reveals that 18 units are currently in 'unfavourable' condition with only one unit classified as favourable. Of the 18 units in unfavourable condition 13 were classified as 'unfavourable recovering', two further as unfavourable and one as 'unfavourable declining'.
- 6.62 It is not easy to extrapolate data and make direct assessments about the condition of the three Annex II habitats and one Annex I species as these features are unevenly distributed across the Site and not confined to distinct units. What is clear, however, is that the Site as a whole is in unfavourable condition. Article 3 paragraph (1) of the Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (Habitats Directive) places a duty on the member states to maintain the network of Natura 2000 Sites in favourable condition. Where sites are not in favourable condition then remedial works and management plans should be implemented to ensure that sites recover and are brought back into favourable condition.

7.0 DESIGNATED FEATURE OF ST AUSTELL CLAY PITS SAC

7.1 In this section I focus on the characteristics of the designated feature of St Austell Clay Pits SAC.

7.2 St Austell Clay Pits SAC is designated for the presence of one Annex II species Western rustwort (*Marsupella profunda*). Western rustwort is a liverwort and the only Annex II priority species which currently occurs in the UK.

Western rustwort

7.3 Western rustwort is a small reddish liverwort which colonises moist, crumbling mica-rich weathered granite and china clay waste. It nearly always occurs in small populations and is rare and threatened throughout its range. It was rediscovered in Cornwall at a single small hill with old china clay workings during a survey in 1993. More recent surveys have led to a better understanding of its distribution, and in 1996 it was found to be present on banks of china clay spoil at another location in quantity. It was most abundant on acidic clay surfaces that had been exposed for little more than five years, where other vegetation was only just beginning to colonise. Since then it has been found at several additional localities.

7.4 It is a pioneer species which is fairly mobile within its very restricted habitat; new plants grow rapidly from spores as older plants are eventually out-competed by surrounding vascular plant vegetation. It will not tolerate heavy shade and some populations are threatened by scrub invasion. Active vegetation management of sites is required to prolong their suitability for this species.

7.5 Western rustwort is protected under Schedule 8 of the WCA; it is an international conservation priority, protected under Appendix I of the Bern Convention and a Priority Species within Annex II of the EC Habitats & Species Directive; it is also a Priority Species within the UK BAP. As an acidophile of nutrient-poor habitats, it would be vulnerable to increased atmospheric deposition of nitrogen or basic pollutants (Holyoak, 2007).

- 7.6 Western rustwort is very rare and endemic to Europe, known only from a small number of sites in Portugal, Madeira, the Canary Islands and south-west England. Its status in Europe is Vulnerable and it is known in the UK from only ten sites in Cornwall which support a large proportion of the known global population; however its status in the UK is also classed as Vulnerable.
- 7.7 Western rustwort is the only Annex II Priority Species which presently occurs in the UK. SAC selection has taken into account the priority status of this species and the importance of UK populations in a European context. The two grade A sites, where Western rustwort occurs are primary reasons for selection, support the largest known populations in the UK, and the SAC series holds a very high proportion of the total UK resource. The protected sites should act as a source for colonisation of new localities which are constantly being created through china clay extraction in the surrounding areas.
- 7.8 Western rustwort is the primary reason for selection of St Austell Clay Pits as a SAC. The site is located in mid-Cornwall within china clay workings and characterised by pits, spoil tips and granitic debris with sparse vegetation cover. Western rustwort is generally found growing on micaceous or clay waste substrates which are flat or gently sloping; some patches may however occur on granitic boulders, usually where these are soft or crumbling.
- 7.9 St Austell Clay Pits SAC is split into three discrete Units which are as follows:
- Unit 1 - Trethosa:
- 7.10 This Unit is on the edge of an operational area. The base of a lower ridge, alongside a haul road, forms the eastern boundary and the western boundary is along the crest of an upper ridge. The entire Unit occupies a steeply sloping east facing bank with a redundant track at the base of the slope.

Unit 2 - The Great Wheal Prosper site:

7.11 This Unit is located on the edge of a tipping point and forms a small triangular area on a western facing slope. A low rocky ridge supports the Western rustwort at the south-western side of a mica dam.

Unit 3 - The Baal Site:

7.12 This Unit forms a rectangular area within a currently disused china clay pit.

Conservation Objectives

7.13 The Natural England Conservation Objectives (2008) for the habitat extent of Western rustwort at St Austell Clay Pits SAC are to maintain the Biodiversity Action Plan (BAP) Inland Rock habitat of the active china clay quarries and spoil tips within the site in favourable condition, or to restore these features to favourable condition if they are judged to be unfavourable.

7.14 Article 3 paragraph (1) of the Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (Habitats Directive) places a duty on the member states to maintain the network of Natura 2000 Sites in favourable condition. Where sites are not in favourable condition then remedial works and management plans should be implemented to ensure that sites recover and are brought back into favourable condition.

7.15 Maintenance of this habitat type implies restoration would be required if evidence from a condition assessment were to suggest that there had been a reduction in extent.

7.16 The latest Site of Special Scientific Interest (SSSI) summary by Natural England, compiled in November 2009, has classified 100% of the site area of St Austell Clay Pits as 'unfavourable declining' condition. Population size across all three Units of St Austell Clay Pits has been seen to significantly decrease from a total coverage of 6,400 cm² in 1999, to 2,520 cm² in 2003. This is mainly due to increased shading from birch, gorse and

Rhododendron saplings, competition from mosses and other liverworts and some large-scale tipping of china clay waste (Holyoak, 2003). Therefore maintenance is now required to restore the habitat which supports the designated species, Western rustwort.

- 7.17 The Site Specific Target range and Measures to maintain St Austell Clay Pits in favourable condition include maintaining the existing surfaces that are free from encroachment of over-shading vascular plants, and increasing the availability of habitat that is potentially suitable for colonisation by Western rustwort. Therefore, active management of the site will now be required to restore the site to favourable condition.
- 7.18 Restoration of the site would involve the control of encroaching vascular plant species. Natural England suggests that no more than 20% of the areas that are potentially suitable for Western rustwort should be allowed to be dominated by scrub species such as European gorse, birch, blackthorn, hawthorn and willow. As a pioneer species of newly exposed clay waste surfaces that requires open conditions with little competition, proactive site management would also be needed to ensure that adequate suitable habitat is created.
- 7.19 The suitable habitat for Western rustwort currently exists as bare patches created by china clay mining, which remain present for a relatively short period of time. Western rustwort relies upon its dispersal and establishment abilities to colonise suitable patches. The limiting factors, which appear to be more important to the survival of Western rustwort than dispersal factors, are patch distribution (duration), patch size, patch condition, distance between patches and spatial pattern of patches (R. Porley, 2007). Therefore, it is essential that these features of the site are managed appropriately.
- 7.20 The mobile nature of this colonist species for which habitats are continually being created by quarrying and lost to natural vegetation succession means that the protection of current sites is realistic for only the largest populations, which exist at St Austell Clay Pits. Deliberate creation and maintenance of

habitats is likely to be essential for the long-term survival of substantial populations of the species. Either bare clay patches will need to be created every few years in the vicinity of the existing colonies, or colonisation by vascular plants will need to be stopped (Holyoak, 2003).

- 7.21 Currently scrub management in the Tethosa and Baal Units and the Great Wheel Prosper Unit of St Austell Clay Pits has been carried out under five year Wildlife Enhancement Scheme (WES) agreements, to maintain the site in favourable condition. However the latest Natural England Condition Assessment in 2009 would suggest that these have not been effective in maintaining the site in favourable condition. The WES agreement for Trethosa and Baal expired on 31st January 2009 and it is unknown whether this has been renewed. The WES agreement for Great Wheel Prosper is due to expire on 31st January 2011.

8.0 ASSESSMENT OF ECOLOGICAL EFFECTS UPON BRENEY COMMON AND GOSS AND TREGOSS MOORS SAC

- 8.1 In this section I explain the effects of the project on the designated features of Breney Common and Goss and Tregoss Moors SAC. In writing these sections I have been mindful of proposed mitigation measures including the implementation of Condition 13 (f) “Measures to ensure that dust emissions are minimised” to limit the arising of fugitive dust during construction, and 13 (i) “The method of controlling and discharging groundwater during construction to avoid pollution of surface water and the underlying groundwater”, restrictions on rainwater harvesting and run-off and am satisfied that effects caused by changes in the water regime (reduced flow and water quality) can be minimised so as to be trivial or controlled completely by the imposition of appropriate planning conditions.
- 8.2 The project will contribute to the deposition of nutrient Nitrogen (kg N/ha/yr) and the deposition of Acid (keq H+/ha/yr) on the Breney Common and Goss and Tregoss Moors SAC. These effects will be primarily associated with the operational phase of the development when stack emissions and emissions from road traffic are acting together.
- 8.3 During the operational phase, it has been estimated there will be 216 heavy vehicle movements¹³ per day to transfer waste and recyclables to the site by HGV’s. There will be an estimated total of 350 vehicle movements per day including CERC workers and visitors. This will contribute to the deposition levels of both acid and nitrogen within 50m of the haul and access road. The applicant has suggested that the majority of vehicle movements serving the CERC will leave the A30 and come along Stamps Hill to gain access to the haul road just before Trerice Bridge. These vehicles would not be making the trip along Stamps Hill without the CERC being constructed and therefore it is

¹³ Cornwall Energy Recovery Centre, Environmental Statement, Chapter 6, Traffic & Transport, Sita Cornwall (Terence O’Rourke), March 2008

necessary to consider vehicle emissions not from just the red line boundary but from the point at which they leave the A30.

- 8.4 Breney Common and Goss and Tregoss Moors SAC is designated for supporting three Annex II habitats and a population of the Annex I marsh fritillary butterfly which represents the largest meta-population in Cornwall and probably the most westerly viable population in England¹⁴.
- 8.5 The production of sulphur and nitrogen oxides (NO_x and SO_x) from the CERC can have a detrimental effect upon the designated plant communities of the SAC by decreasing plant growth and altering the vegetation communities by changing the chemical properties of the soils.
- 8.6 Habitats within the Breney Common and Goss and Tregoss Moors SAC have been assigned approximate critical loads for nitrogen and acid deposition above which habitat is likely to deteriorate. These critical loads are displayed on the UK Air Pollution Information System (APIS) website which provides a “broad brush” approach by which habitats and species may be assessed for their sensitivity to airborne pollutants.
- 8.7 The habitat types within Breney Common and Goss and Tregoss Moors SAC already exceed the critical loads for acid and nitrogen deposition. Critical Loads are defined as the limit of deposition for any particular pollutant above which habitat deterioration as a direct result of that deposition will become likely.
- 8.8 A summary of the results returned by the UK Air Pollution Information System (APIS) relevant to Breney Common and Goss and Tregoss Moors SAC are given in Table 8.1 below.

¹⁴ <http://www.jncc.gov.uk/ProtectedSites/SACselection/sac.asp?EUcode=UK0030098>

Table 8.1: Summary of 2003 Depositions and Critical Load Functions for Breney Common and Goss and Tregoss Moors SAC¹

| 2003 Depositions and Critical Load Functions | |
|---|--------------------------------|
| Nitrogen deposition (current background) | 1.27 keq/ha/yr (17.8 kg/ha/yr) |
| Sulphur deposition (current background) | 0.65 keq/ha/yr (10.4 kg/ha/yr) |

¹ Source; UK Air Pollution Information System (APIS), <http://www.apis.ac.uk/>
keq = kilograms equivalent

- 8.8 This information is further elaborated in Tables 8.2, 8.3, 8.4 and 8.5 below which includes an in-combination assessment of the extra deposition as a result of the CERC, Peak Power Plant headroom and Penare Farm.

Air Quality Emissions and Impact on European Dry Heaths

- 8.9 The empirical critical loads shown (above which deterioration of habitat quality is likely), have been assigned for Nutrifcation as within the region of 10-20 kg N/ha/yr.
- 8.10 The habitat type is also sensitive to acidification, with the critical loads (keq ha/yr) as follows:

| | | |
|------------------------|------------------------|------------------------|
| MaxCLmaxN: 2.19 | MaxCLmaxS: 0.94 | MaxCLminN: 1.46 |
| MinCLmaxN: 0.96 | MinCLmaxS: 0.25 | MinCLminN: 0.50 |

Source; UK Air Pollution Information System (APIS), <http://www.apis.ac.uk/>

Max = Maximum

Min = Minimum

CL = Critical Load

N = Nitrogen

S = Sulphur

8.11 The Year 2003 Nitrogen deposition at Breney Common and Goss and Tregoss Moors SAC is recorded as 17.8 kg/ha/yr, which shows 7.8 kg/ha/yr exceedance of the minimum empirical critical load. This is shown in Figure 8.1, below.

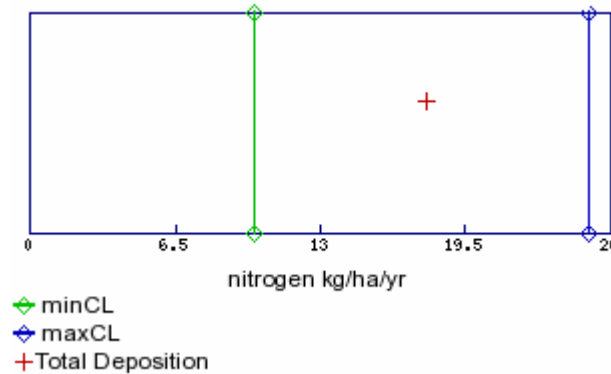


Figure 8.1. Critical Load Function for Nitrogen

Source; UK Air Pollution Information System (APIS), <http://www.apis.ac.uk/>

8.12 The Year 2003 Acid deposition on the site is also shown to exceed the minimum critical load. This is illustrated in Figure 8.2, below.

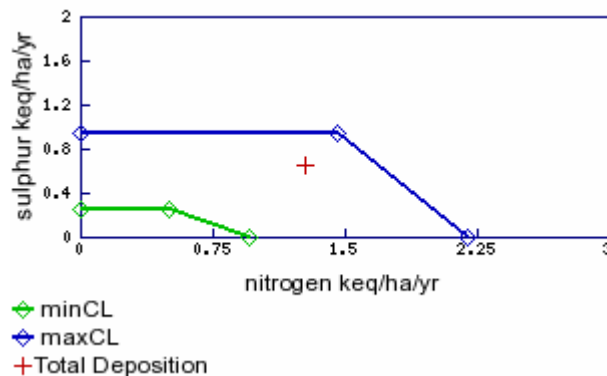


Figure 8.2. Critical Load Function for Acidification

Source; UK Air Pollution Information System (APIS), <http://www.apis.ac.uk/>

Air Quality Emissions and Impact on Northern Atlantic wet heaths with *Erica tetralix*

8.13 The empirical critical loads, above which deterioration of habitat quality is likely, have been assigned for Nitrification as within the region of 10-25 kg N/ha/yr.

8.14 The habitat type is also sensitive to acidification, with the critical loads as follows:

| | | |
|------------------------|------------------------|------------------------|
| MaxCLmaxN: 2.19 | MaxCLmaxS: 0.94 | MaxCLminN: 1.46 |
| MinCLmaxN: 0.96 | MinCLmaxS: 0.25 | MinCLminN: 0.50 |

Source; UK Air Pollution Information System (APIS), <http://www.apis.ac.uk/>

8.15 The Year 2003 Nitrogen deposition on the site is recorded as 17.8 kg/ha/yr, which shows 7.8 kg/ha/yr exceedance of the minimum empirical critical load. This is shown in Figure 8.3, below.

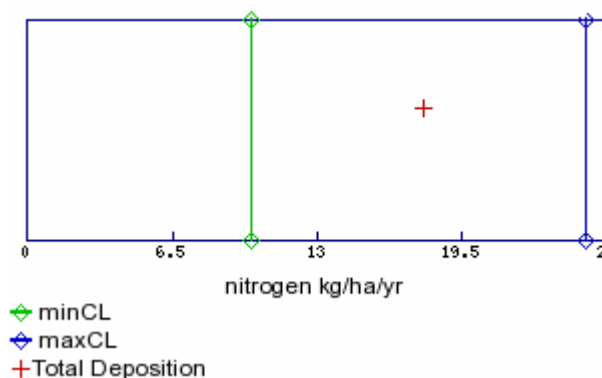


Figure 8.3. Critical Load Function for Nitrogen

Source; UK Air Pollution Information System (APIS), <http://www.apis.ac.uk/>

8.16 The Year 2003 Acid deposition on the site lies between the minimum and maximum assigned critical loads. This is illustrated in Figure 8.4, below.

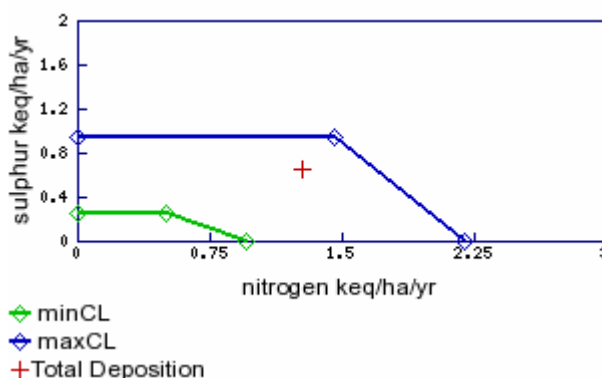


Figure 8.4. Critical Load Function for Acidification.

Source; UK Air Pollution Information System (APIS), <http://www.apis.ac.uk/>

Air Quality Emissions and Impact on Transition Mires and Quaking Bogs

8.17 The empirical critical loads above which deterioration of habitat quality is likely, have been assigned for Nitrification as within the region of 10-20 kg N/ha/yr. This habitat type is also sensitive to acidification, with the critical loads as follows:

| | | |
|------------------------|------------------------|------------------------|
| MaxCLmaxN: 0.78 | MaxCLmaxS: 0.46 | MaxCLminN: 0.32 |
| MinCLmaxN: 0.67 | MinCLmaxS: 0.34 | MinCLminN: 0.32 |

Source; UK Air Pollution Information System (APIS),
<http://www.apis.ac.uk/>

8.18 The Year 2003 Nitrogen deposition on the Site is recorded as 17.8 kg/ha/yr, which shows 7.8 kg/ha/yr exceedance of the minimum empirical critical load. This is shown in Figure 8.5, below.

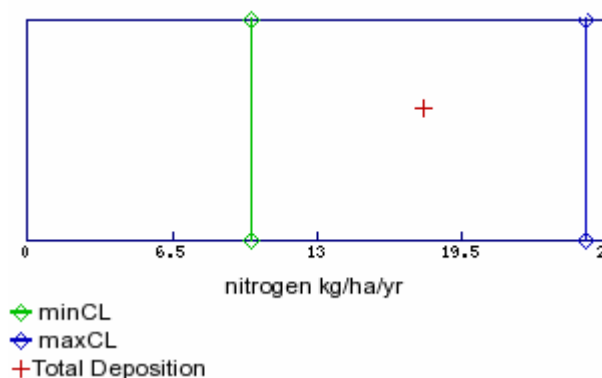


Figure 8.5. Critical Load Function for Nitrogen.

Source; UK Air Pollution Information System (APIS), <http://www.apis.ac.uk>

8.19 The Year 2003 Acid deposition on the Site exceeds both the minimum and maximum critical loads. This is illustrated in Figure 8.6, below.

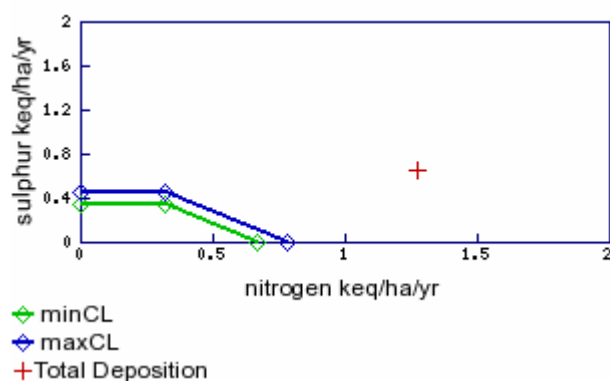


Figure 8.6. Critical Load Function for Acidification

Source; UK Air Pollution Information System (APIS),
<http://www.apis.ac.uk/>

Air Quality Emissions and Impact on Marsh Fritillary Butterfly

8.20 The empirical critical loads above which deterioration of habitat quality is likely have been assigned for nitrification as within the region of 15-25 kg N/ha/yr. This effect is upon the food plant (Devils-bit scabious) rather than a direct effect upon the butterfly.

8.21 This habitat type is also sensitive to acidification, with the critical loads as follows:

| | | |
|------------------------|------------------------|------------------------|
| MaxCLmaxN: 1.38 | MaxCLmaxS: 0.94 | MaxCLminN: 0.44 |
| MinCLmaxN: 0.69 | MinCLmaxS: 0.25 | MinCLminN: 0.22 |

Source; UK Air Pollution Information System (APIS),
<http://www.apis.ac.uk/>

8.22 The Year 2003 Nitrogen deposition on the site is recorded as 17.8 kg/ha/yr, which shows 2.8 kg/ha/yr exceedance of the minimum empirical critical load. This is shown in Figure 8.7, below.

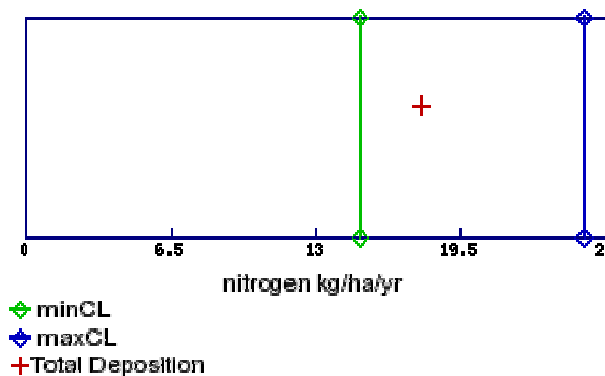


Figure 8.7. Critical Load Function for Nitrogen.

Source; UK Air Pollution Information System (APIS),
<http://www.apis.ac.uk/>

8.23 The Year 2003 Acid deposition on the Site exceeds both the minimum and maximum critical loads. This is illustrated in Figure 8.8, below.

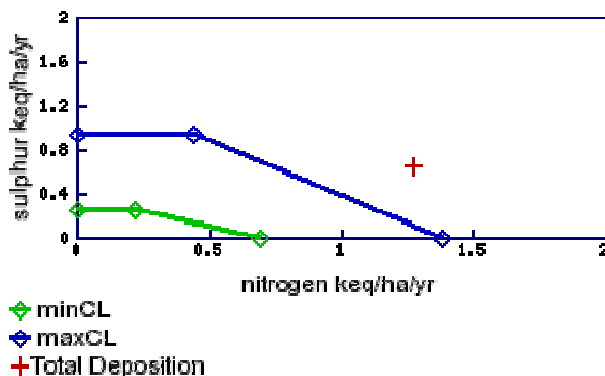


Figure 8.8. Critical Load Function for Acidification

Source; UK Air Pollution Information System (APIS),
<http://www.apis.ac.uk/>

8.24 Both Breney Common and Goss and Tregoss Moors SAC and St Austell Clay Pits SAC are currently classified as being in unfavourable condition during the most recent condition assessments undertaken by Natural England. Both sites are currently experiencing significant exceedances of critical load for both Nitrogen and acid deposition for the majority of designated habitats and species, above which habitat deterioration is likely

to occur. The CERC will add further Nitrogen and acid deposition to both sites and when assessing the in-combination contribution of Penare Farm and the headroom at the Peak Power Plant this contribution is significantly greater. All of this data is summarised in Tables 8.2 – 8.6 inclusive.

Table 8.2 Contribution and sensitivities to Acid Deposition of designated features at Breney Common and Goss and Tregoss Moors SAC

| Site and Feature | Breney Common and Goss and Tregoss Moors SAC | Breney Common and Goss and Tregoss Moors SAC |
|---|---|---|
| | <i>Northern Atlantic wet Heath</i> | <i>European Dry Heath</i> |
| Critical Load | 0.75 keq/ ha/ yr ² | 0.75 keq/ ha/ yr ² |
| Background | 1.61 keq/ ha/ yr ² | 1.61 keq/ ha/ yr ² |
| Current % critical load | 215% | 215% |
| Maximum process contribution from CERC ⁶ | 0.00517 keq/ ha/ yr ⁶ (0.7% of critical load) | 0.00517 keq/ ha/ yr ⁶ (0.7% of critical load) |
| Headroom at Peak Power (process contribution) | 0.041 keq/ ha/ yr ⁴ | 0.041 keq/ ha/ yr ⁴ |
| Process contribution from Penare Farm | not available | not available |
| Total in combination contribution ⁵ | not available | not available |
| Total deposition (excluding non-available data) | 1.6143 keq/ ha/ yr (215%CL) | 1.6143 keq/ ha/ yr (215%CL) |

2 Source: SITA Cornwall Limited, Cornwall Energy Recovery Centre Planning Application ES Chapter 7: Air Quality and Climate

4 Source: PIR (Process Industry Regulations) Assessment for AES Indian Queens (Peak Power Facility)

5 Source: sum of process contribution from CERC, Peak Power and Penare Farm

6 Process contribution from the CERC includes the contribution of road traffic emissions as provided in Cornwall Energy Recovery Centre – The Conservation (Natural Habitats, &c.) Regulations 1994 (as amended 2007). In Combination Assessment. Document reference 1495.12

Table 8.3 Contribution and sensitivities to Acid Deposition of designated features at Breney Common and Goss and Tregoss Moors SAC

| Site | Breney Common and Goss and Tregoss Moors SAC <i>Transition Mire and Quaking Bog</i> | Breney Common and Goss and Tregoss Moors SAC <i>Marsh Fritillary</i> |
|---|--|---|
| Critical Load | 0.66 keq/ ha/ yr ² | 0.47 keq/ ha/ yr ² |
| Background | 1.61 keq/ ha/ yr ² | 1.61 keq/ ha/ yr ² |
| Current % critical load | 244 % | 343 % |
| Maximum process contribution from CERC ⁶ | 0.00517 keq/ ha/ yr ⁶ (0.8% of critical load) | 0.00517 keq/ ha/ yr ⁶ (1.1% of critical load) |
| Headroom at Peak Power (process contribution) | 0.041 keq/ ha/ yr ⁴ | 0.041 keq/ ha/ yr ⁴ |
| Process contribution from Penare Farm | Not available | Not available |
| Total in combination contribution ⁵ | Not available | Not available |
| Total deposition (excluding non-available data) | 1.6553 keq/ ha/ yr (251%CL) | 1.6553 keq/ ha/ yr (352%CL) |

2 Source: SITA Cornwall Limited, Cornwall Energy Recovery Centre Planning Application ES Chapter 7: Air Quality and Climate

4 Source: PIR (Process Industry Regulations) Assessment for AES Indian Queens (Peak Power Facility)

5 Source: sum of process contribution from CERC, Peak Power and Penare Farm

6 Process contribution from the CERC includes the contribution of road traffic emissions as calculated using contour maps provided in Cornwall Energy Recovery Centre – The Conservation (Natural Habitats, &c.) Regulations 1994 (as amended 2007). In Combination Assessment. Document reference 1495.12

Table 8.4: Contribution and sensitivities to Nitrogen Deposition of designated features at Breney Common and Goss and Tregoss Moors SAC

| Site | Breney Common and Goss and Tregoss Moors SAC | Breney Common and Goss and Tregoss Moors SAC |
|---|--|--|
| | <i>Northern Atlantic wet Heath</i> | <i>European Dry Heath</i> |
| Critical Load | 10 kg N/ ha/year ¹ | 10 kg N/ ha/year ¹ |
| Background | 17.8 kg N/ ha/year ¹ | 17.8 kg N/ ha/year ¹ |
| Current % critical load | 176% | 176% |
| Maximum process contribution from CERC ⁶ | 0.037 kg N/ha/year ² (0.4% of critical load) | 0.037 kg N/ha/year ² (0.4% of critical load) |
| Headroom at Peak Power (process contribution) | 0.058 kg N/ha/year ⁴ | 0.058 kg N/ha/year ⁴ |
| Process contribution from Penare Farm | 0.229 kg N/ ha/yr ³ | 0.229 kg N/ ha/yr ³ |
| Total in combination contribution ⁵ | 0.324 kg N/ha/yr | 0.324 kg N/ha/yr |
| Total deposition | 18.124 kg N/ha/year (181%CL) | 18.124 kg N/ha/year (181%CL) |

- 1 Source; UK Air Pollution Information System (APIS), <http://www.apis.ac.uk/>
- 2 Source: SITA Cornwall Limited, Cornwall Energy Recovery Centre Planning Application ES Chapter 7: Air Quality and Climate
- 3 Source: Fraddon Biopower Ltd., Proposed Biogas Plant, Fraddon, Environmental Statement, Chapter 9: Ecology
- 4 Source: PIR (Process Industry Regulations) Assessment for AES Indian Queens (Peak Power Facility)
- 5 Source: sum of process contribution from CERC, Peak Power and Penare Farm
- 6 Process contribution from the CERC does not include the contribution from road traffic emissions associated with the plant operation as this data has not been provided by the applicant

Table 8.5: Contribution and sensitivities to Nitrogen Deposition of designated features at Breney Common and Goss and Tregoss Moors SAC

| Site | Breney Common and Goss and Tregoss Moors SAC <i>Transition Mire and Quaking Bog</i> | Breney Common and Goss and Tregoss Moors SAC <i>Marsh Fritillary</i> |
|---|--|---|
| Critical Load | 10 kg N/ ha/year ¹ | 15 kg N/ ha/year ¹ |
| Background | 17.8 kg N/ ha/year ¹ | 17.8 kg N/ ha/year ¹ |
| Current % critical load | 176% | 117 % |
| Maximum process contribution from CERC ⁶ | 0.037 kg N/ ha/year ² (0.4% of critical load) | 0.037 kg N/ha/year ² (0.3% of critical load) |
| Headroom at Peak Power (process contribution) | 0.058 kg N/ha/year ⁴ | 0.058 kg N/ha/year ⁴ |
| Process contribution from Penare Farm | 0.229 kg N/ ha/yr ³ | 0.229 kg N/ ha/yr ³ |
| Total in combination contribution ⁵ | 0.324 kg N/ha/yr | 0.324 kg N/ha/yr |
| Total deposition | 18.124 kg N/ha/year (181%CL) | 18.124 kg N/ha/year (121%CL) |

¹ Source; UK Air Pollution Information System (APIS), <http://www.apis.ac.uk/>

² Source: SITA Cornwall Limited, Cornwall Energy Recovery Centre Planning Application ES Chapter 7: Air Quality and Climate

³ Source: Fraddon Biopower Ltd., Proposed Biogas Plant, Fraddon, Environmental Statement, Chapter 9: Ecology

⁴ Source: PIR (Process Industry Regulations) Assessment for AES Indian Queens (Peak Power Facility)

⁵ Source: sum of process contribution from CERC, Peak Power and Penare Farm

⁶ Process contribution from the CERC does not include the contribution from road traffic emissions associated with the plant operation as this data has not been provided by the applicant

Effect on designated habitats

- 8.25 In this section I explain the effects of the project on the designated features of Breney Common and Goss and Tregoss Moors SAC. In writing these sections I have been mindful of proposed mitigation measures including the implementation of Condition 13 (f) “Measures to ensure that dust emissions are minimised” to limit the arising of fugitive dust which can be minimised so as to be trivial or controlled completely by the imposition of an appropriate planning condition.
- 8.26 Three habitat types within the SAC are primary reasons for designation and these are all sensitive to Nitrogen deposition. All three habitat types (see Table 8.4 and 8.5) are stated in APIS as being sensitive to Nitrogen deposition above 10kg N /ha/yr. The current background levels of nitrogen deposition averaged across the Site (as provided by APIS) is 17.8kg N/ha/yr which translates to an exceedance of the minimum Nitrogen Critical Load of 176%. A condition assessment, undertaken in 2009 for 8 of 19 of the discrete units by Natural England, found the SAC as a whole to be in ‘unfavourable recovering’ condition (refer to Appendix 2.1) for full details of the condition assessment). The SAC is becoming overgrown and traditional open habitats are being replaced by woody species and grasses are becoming more predominant. This in turn leads towards a loss of species diversity through shading of designated habitats and increased competition to slow growing species. Any further deposition of Nitrogen, and hence nutrient enrichment, is therefore likely to contribute to the continuing decline of these habitats.
- 8.27 An increase in woody species starts to reduce the wetness of bog habitats by increasing the rate of evapotranspiration through the presence of larger species. This succession is difficult to reverse as woody species make a greater contribution to organic matter reaching the ground, which in turn increases available Nitrogen through increased decomposition. A programme of habitat management has been implemented by Natural

England across the SAC which includes scrub removal and grazing to try to encourage the preservation and restoration of the designated habitat characteristics but this process is hampered by continued high levels of Nitrogen deposition across the SAC.

- 8.28 Quaking Bog and Transition Mire is listed on APIS as being sensitive to deposition of Nitrogen above the level of 10kg N /ha/yr. Bogs derive all of their nutrients from the atmosphere and are hence very low nutrient systems which, consequently, support a wide diversity of lower plant species (bryophytes and lichens) which are very slow growing. Sphagnum mosses form the basis of the bog habitat and these mosses thrive in low nutrient systems whereas trees and grasses do not flourish. An increase in Nitrogen supply affects this balance by allowing nutrient loving plants such as grasses and saplings to become established and compete with the lower nutrient loving species.
- 8.29 Bog habitats are therefore affected in three main ways. Direct shading of naturally occurring low growing bog species leads to a decline in these species density and distribution. Once larger plants become established then more organic matter is generated through leaf-fall and seasonal fecundity which increases the available Nitrogen through increased decomposition of organic matter. Larger plants (particularly trees and scrub) use significantly more water than traditional bog species and this over time leads to the desiccation of wet habitats and they become replaced with more stable drier ground of high nutrient content and input. Subsequent management measures to restore bog habitat through the removal of trees are rarely successful because of the fundamental changes to the growing substrate occurring during the succession of habitat types.
- 8.30 Bogs are also very sensitive to acid deposition (quoted as 0.66keq/ha/yr¹⁵) as they do not have a source of soil or bedrock which can potentially neutralise acidic ions. Increased acidification can cause direct plant mortality

¹⁵ UK Air Pollution Information System (APIS), <http://www.apis.ac.uk/>

but also alter the species composition. The effects of acidification are poorly understood owing to the long terms trends and a lack of reliable historic data. Limited field surveys have been undertaken and only on a small scale. The lack of data empirical data however should not mean that potential effects are underestimated. The implementation of a number of emissions targets aimed at reducing emissions leading to acidification are in place including the Oslo Protocol, the Gothenburg Protocol and the National Emission Ceilings Directive which illustrates the serious manner in which this issues is being judged both nationally and internationally.

- 8.31 In view of the current Conservation Objectives for the SAC (see Appendix 3.1) and the unfavourable condition assessment completed by Natural England in 2009 (see Appendix 2.1), it is clear that allowing further deposition will contribute to the deterioration of habitats across the SAC.

Effects on Marsh Fritillary Butterfly

- 8.32 The 'In Combination' report submitted by SITA in February 2009¹⁶ considers the likely impact of the CERC upon the SAC and the marsh fritillary butterfly which is susceptible to acid deposition. Whilst the butterfly itself is not reported to be directly affected by acid deposition, the habitats which support it (notably the foodplant devils-bit scabious) are sensitive.
- 8.33 The process contribution from the CERC although not large will therefore clearly increase the current deposition levels across the SAC. Background levels (Table 8.3) of 1.61keq/ha/yr for acid deposition already exceed the advised critical load for habitats supporting marsh fritillary butterfly by 343%. Further to that the background level and the process contribution from the CERC must be added to the process contribution from Penare Farm and to the headroom from the Peak Power Plant.
- 8.34 Given that Breney Common and Goss and Tregoss Moors SAC are key habitats for the survival of the marsh fritillary meta-populations, it is likely that

¹⁶ Cornwall Energy Recovery Centre – The Conservation (Natural Habitats, &c.) Regulations 1994 (as amended 2007). In Combination Assessment. Document reference 1495.12

any deterioration of this habitat will have a deleterious effect upon the marsh fritillary, leading to a decline of the butterfly populations in this area. The Site as a whole is already considered to be in unfavourable condition (see Appendix 2.1 for full Condition Assessment). Key to the survival of the marsh fritillary is the larval foodplant (devil's-bit scabious) (Vergeer *et al*). March (2003) carried out an experiment to assess the response of devil's-bit scabious to eutrophication and acidification. Results showed the individual plant performance to be negatively affected by both eutrophication and acidification. Although eutrophication was found to have a greater impact upon the plants than acidification, it must be noted that acidification still has a negative effect upon the *Succissa* family. It was also concluded that "the interactions between population size and stress treatments reflected the fact that plants from small populations suffered more from deteriorating soil conditions than those from large populations", indicating that any fragmentation of the habitat could have serious consequences on the populations of devil's-bit scabious, meaning that the acidification (thought to be a lesser impact) could subsequently have a negative impact upon the marsh fritillary.

- 8.35 A second study conducted by Vergeer *et al* (2003) investigated the different environmental conditions affecting the persistence of devils-bit scabious, accounting for factors such as genetic variation, habitat quality and population size. Results consistently found lower levels of NO_3 and NH_4 in the soil where larger populations of the plant occurred. Higher levels of the compounds contributing to nutrient enrichment therefore have been indicated to have a detrimental effect upon populations of devils-bit scabious which is the primary foodplant of the marsh fritillary. Further increase in deposition of nitrogen at Breney Common, Goss and Tregoss Moors will contribute to an already significantly exceeded critical load for nitrogen deposition.

9.0 ASSESSMENT OF ECOLOGICAL EFFECTS UPON ST AUSTELL CLAY PITS SAC

- 9.1 In this section I explain the effects of the project on the designated feature of St Austell Clay Pits SAC. In writing these sections I have been mindful of proposed mitigation measures including the preparation and implementation of a Planning Condition 13 (f) “Measures to ensure that dust emissions are minimised” to limit the arising of fugitive dust which can be minimised so as to be trivial or controlled completely by the imposition of an appropriate planning condition.
- 9.2 St Austell Clay Pits SAC is designated for supporting the Annex I species Western rustwort which is a liverwort. 100% of the site area of St Austell Clay Pits is defined as being in ‘unfavourable declining’ condition (see Appendix 3.2). Population size across all three Units of St Austell Clay Pits has been seen to significantly decrease from a total coverage of 6,400 cm² in 1999, to 2,520 cm² in 2003. This is mainly due to increased shading from birch, gorse and Rhododendron saplings, competition from mosses and other liverworts and some large-scale tipping of china clay waste (Holyoak, 2003). Therefore maintenance is now required to restore the habitat which supports Western rustwort.
- 9.3 The Site Specific Targets and Measures to maintain or restore St Austell Clay Pits in favourable condition include maintaining the existing surfaces that are free from encroachment of over-shading vascular plants, and increasing the availability of habitat that is potentially suitable for colonisation by Western rustwort. Therefore, active management of the site will now be required to restore the site to favourable condition.
- 9.4 Relatively little information regarding the sensitivities of this species are known owing to the rarity of the species in the UK and beyond. For this reason a paucity of data exists as to the range of possible effects on the species caused by an increase in nutrification. No specific entry is to be found on APIS for this species. Table 9.1 below summarises the available data regarding the background levels of nitrogen and acid deposition at the

site and the contribution from the project, peak power plant headroom and Penare Farm.

Table 9.1: Contribution and sensitivities to Nitrogen and acid deposition of designated features at St Austell Clay Pits SAC

| Site | St Austell Clay Pits SAC <i>Marsupella profunda</i> Acid Deposition | St Austell Clay Pits SAC <i>Marsupella profunda</i> Nitrogen Deposition |
|---|---|---|
| Critical Load | Feature not sensitive to acidification | Not stated on APIS but likely to be sensitive at level of 5-10kg N/ha/yr ¹ |
| Background | N/A | 18.8 kg N ha/year |
| Current % critical load | N/A | 376% |
| Process contribution from CERC ² | N/A | Not available |
| Headroom at Peak Power (process contribution) | N/A | Not available |
| Process contribution from Penare Farm | N/A | Not available |
| Total in combination contribution | N/A | Not available |
| Total deposition | N/A | Not available |

¹http://www.apis.ac.uk/cgi_bin/habpollutant_result.pl?pollutant_choice=N+deposition&habResult=Mosses+and+liverworts+%28general%29&choice=Common&haborspec=species&submit.x=14&submit.y=7

² The applicant did not provide details of the deposition levels of acid and Nitrogen at this Site.

- 9.5 In addition concern arises because of the possibility of impacts that arise as a result of atmospheric pollution from the operation of the plant. Various atmospheric pollutants are known to affect bryophytes:
- Sulphur Dioxide, which causes acidification (see e.g. Bates et al, 1997);
 - Nitrogen compounds which can cause direct toxic effects, in addition to indirect impacts arising because a high-nitrogen environment favours competitive vascular plants at the expense of less competitive bryophytes (Bell et al, 1992);
 - Ammonia (e.g. Paulissen et al, 2005) ;
 - Ozone (e.g. Lee et al, 1998) ; and,
 - Various heavy metals, especially copper and lead (e.g. Tyler, 1990).
- 9.6 Further a number of other chemical substances including organic compounds may prove toxic to liverworts and so may have additional effects on the important species of liverwort such as Western rustwort (Holyoak, 2007).
- 9.7 The production of nitrogen oxides (NO_x) from the CERC can have a detrimental effect upon the designated plant communities of the St Austell Clay Pits SAC by altering the vegetation communities through increasing the available nutrients on sites that rely on being very low nutrient systems.
- 9.8 It is likely that the deposition of nitrogen on the site will have a detrimental effect on Western rustwort, as it will encourage the more rapid growth of competing vascular plants which will change the characteristics of the patches within which Western rustwort is found, reducing the time with which it has for dispersal to colonise other patches. It is already apparent that competition from vascular plants is having a detrimental effect on Western rustwort populations, and that current management operations carried out by Natural England are not sufficient to prevent loss of suitable habitat. Therefore inputs of nitrogen to the site are likely to put further survival pressure on Western rustwort and the management operations of Natural England.

10.0 CONCLUSION

- 10.1 In this section I have considered the potential for the project to have an effect upon the integrity of Breney Common and Goss and Tregoss Moors SAC and St Austell Clay Pits SAC. The conclusions mirror those produced in the report to inform Appropriate Assessment.
- 10.2 Regulation 48 (5) of the Conservation (Natural Habitats & c.) Regulations 1994 (amended 2006) states that (subject to Regulation 49) projects may only receive consent if the competent authority has ascertained that the project will not adversely effect the integrity of the European Site. Although, on appeal, the Secretary of State is the competent authority, with the lodging of the appeal, the impact, if any, on European Sites again becomes relevant.

Breney Common and Goss and Tregoss Moors SAC

- 10.3 In respect of the Annex II species, marsh fritillary butterfly, I cannot ascertain that the CERC would not have an adverse effect upon the integrity of this designated feature either alone or in combination with other projects through changes in nitrogen and acid deposition.
- 10.4 In respect of the Annex I habitat European Dry Heath I cannot ascertain that the CERC would not have an adverse effect upon the integrity of this designated feature either alone or in combination with other projects through changes in nitrogen and acid deposition.
- 10.5 In respect of the Annex I habitat Northern Atlantic wet heath with *Erica tetralix* I cannot ascertain that the CERC would not have an adverse effect upon the integrity of this designated feature either alone or in combination with other projects through changes in nitrogen and acid deposition.
- 10.6 In respect of the Annex I habitat Transition Mires and Quaking Bogs, I cannot ascertain that the CERC would not have an adverse effect upon the integrity of this designated feature either alone or in combination with other projects through changes in nitrogen and acid deposition.

St Austell Clay Pits SAC

- 10.7 In respect of the Annex II species, Western rustwort, I cannot ascertain that the CERC would not have an adverse effect upon the integrity of this designated feature either alone or in combination with other projects through changes in nitrogen deposition.

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