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**Sent:** 08 February 2019 21:04  
**To:** Hornsea Project Three  
**Subject:** Deadline 6 NNDC submission

Dear Examining Authority,

Please find attached the Hornsea Project Three Deadline 6 response from North Norfolk District Council (INTERESTED PARTY REF: 20010749).

Please could you confirm receipt of this document.

Kind Regards

Geoff Lyon  
Major Projects Manager

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\*\*\*\*\*  
North Norfolk District Council

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**NORTH  
NORFOLK  
DISTRICT  
COUNCIL**

# Hornsea Project Three Offshore Wind Farm

## **REPRESENTATIONS FOLLOWING ISSUE SPECIFIC HEARING ON 30 JANUARY 2019**

**NORTH NORFOLK DISTRICT COUNCIL**  
(INTERESTED PARTY REF: 20010749)

FEB 2019

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## 1. Introduction

1.1. These are North Norfolk District Council's written submissions following Issue Specific Hearing 6 on the Draft Development Consent Order. They do not cover in writing all the matters on which oral submissions were made, but expand or elucidate where required.

1.2. The following material is provided with these submissions:

- Draft Landscape Plan (Joint submission by relevant Local Planning Authorities);
- Examples from Establishment Management Information System (EMIS) decision tool;
- Ecological Site Classification Manual; and
- Examples of Planning Applications in North Norfolk where a Ten Year replacement planting condition has been applied

## 2. HVDC vs HVAC

- 2.1. For the reasons previously set out by North Norfolk District Council (“**NNDC**”) in response to the Examining Authority’s question 2.1.11 (provided on 15 January 2019), NNDC asks that Requirement 6 be amended to require the Applicant to provide a transparent explanation and justification for the choice of transmission system. This does not diminish the flexibility given to the Applicant within the design envelope. It assures the Local Planning Authority that a genuine choice has been exercised. Given the very significant differences in impact to which that choice leads, such assurance is necessary.
- 2.2. Such a requirement is necessary not to set out what the choice of technology is (which is the way in which the Applicant characterised the requirement at the hearing). Rather, it concerns the reasons why the choice of technology has been made. It is well accepted that the need to give written justification for a decision is one way to ensure that the decision has been made conscientiously.
- 2.3. NNDC suggests that the appropriate time for the information to be provided to the Local Planning Authority is when the written scheme setting out the phases of construction is provided, as the choice of HVDC or HVAC will have a significant effect on the phasing scheme. The following wording is suggested:
- “(4) The authorised development may not be commenced until detailed reasons explaining and justifying the choice of HDVC or HDAC have been provided in writing to the relevant planning authority, either before, or at the same time as, the written scheme referred to in paragraph (1).”
- 2.4. This wording differs from that put forward at the hearing in two ways. Firstly, it ties the timing of the submission more clearly to the submission of the phasing scheme, but allows the Applicant to submit the reasons earlier than the phasing scheme if it so wishes. Secondly, it secures the requisite level of detail to show that a genuine choice has been exercised by requiring “reasons” which both “explain” – ie make clear by giving a description – and “justify” – ie show as warranted. This avoids the lawyerly debate alluded to at the hearing.

### 3. Landscaping Matters

#### Requirement 8

3.1. Requirement 8, dealing with the provision of landscaping, differs from other such requirements in previous DCOs (eg Hornsea 1, made December 2014; Hornsea 2, made September 2016; East Anglia 3, made August 2017) and from that proposed for the Norfolk Vanguard scheme in that it does not set out a list of details in the landscape plan that will be required.

3.2. During the Issue Specific Hearing, the local authorities met to discuss the suggested wording for Requirement 8. The agreed suggested wording was provided to the Applicant on 31 January 2019. It is:

- (1) *As is*
- (2) *As is*
- (3) The landscape plan must include details of—
  - (a) surveys, assessments and method statements as guided by BS 5837 and the Hedgerows Regulations;
  - (b) the location, number, species, size and planting density of any proposed planting;
  - (c) cultivation, importing of materials and other operations to ensure plant establishment;
  - (d) existing trees and hedgerows to be retained with measures for their protection during the construction period;
  - (e) implementation timetables for all landscaping works.
- (4) The landscape plan must be carried out as approved.

3.3. The list is shorter than in some of the previous DCOs or than is proposed for Norfolk Vanguard, and is in a par with other previous DCOs. The justification for the list is as follows: (e) is already in the draft DCO, but was run together with the requirement for the plan to be carried out as approved; (a) is required because this information has been requested by the planning authorities on a number of occasions but has not yet been provided (the authorities understand because of access difficulties);

however in order to understand whether the Landscape Plan is workable and addresses what is required, the initial information needs to be obtained by survey and provided; (b) – (d) should not be controversial given they are basic requirements of the Landscape Plan and the authorities cannot envisage how any material amendment might be required for any of them.

- 3.4. The Applicant has suggested that the current drafting is justified by the need for flexibility for both parties. If a “shopping list” of requirements were set out, the Applicant contended a danger arose that a non-material amendment application would be needed if either of the parties thought that one of the elements in the list was not actually required in the final Landscape Plan. Details “locked down” in the order may not serve the parties two to three years hence.
- 3.5. NNDC disagrees that the list will minimise flexibility or will heighten the risk that a non-material amendment will be required. The Applicant has not provided any evidence that such amendments have been caused by the lists in the requirements in previous DCOs.
- 3.6. Focusing on the wording suggested for this DCO, as already stated, (b)-(e) should not be controversial, either now or in the future, as they are basic requirements for the Landscape Plan. In relation to (a), surveys, assessments and method statements are crucial to understanding the baseline and justifying the proposed landscape measures. They are a key part of the ES process. The need for further surveys is already referred to in the draft plan. (a) is worded broadly, such that the only reason for a non-material amendment would be if either the Applicant or the planning authorities felt that no surveys, assessments or method statements need be referred to in the Landscape Plan, which is unlikely.

#### The Draft Landscape Plan

- 3.7. As a result of the discussion between the local authorities, a joint suggested amended draft landscape plan has been produced for consideration of the applicant and the ExA. It is enclosed at **Appendix 1**. Further discussion between the relevant parties on this matter is welcomed.

### 10 Year Replacement Period

3.8. The evidential basis for the 10 year period was given by Cathy Batchelar, Landscape Officer at NNDC, during Issue Specific Hearing 4, setting out the climatic condition in North Norfolk and their impact on growth rates which justify the 10 year period. This was addressed further in NNDC's Deadline 3 Representations, in particular at §§3.3-3.4.

3.9. The Forestry Commission Ecological Site Classification Decision Support System (ESC-DSS) is a PC-based system to help guide forest managers and planners to select ecologically suited species to sites, instead of selecting a species and trying to modify the site to suit. The system is designed to match key site factors with the ecological requirements of different tree species and woodland communities, as defined in the National Vegetation Classification (NVC) for Great Britain.

3.10. Results from two sample sites along the cable route have been included at **Appendix 2**, using the Establishment Management Information System (EMIS) decision tool option to demonstrate that the prevailing site conditions will result in slow establishment. The following data was required to be inputted:

Grid references and soil types:

- Cable route location at Kelling (Grid ref: TG 104 409)  
Soil Type: Freely draining slightly acidic sandy soil. (Brown Earth under the EMIS classification); and
- Booster Station location at Edgefield (Grid ref: TG 112 331)  
Soil Type: Freely draining slightly acidic loamy soil. (Brown Earth under the EMIS classification)

3.11. The sample sheets indicate there are limited species that are suitable for the site conditions and, given the site conditions, yields are not expected to be high. A copy of the Ecological Site Classification Manual is attached at **Appendix 3**.



- 3.12. NNDC are aware that the Forestry Commission specify a standard 10-year replacement period for all new planting that is subject to a Replanting Notice.
- 3.13. A period of 10 years aftercare and replacement provides for greater formal protection when establishing tree stock. At 10 years growth, a tree will have reached a size where it would be subject to Forestry Commission Felling Licence Regulations (i.e. 8cm girth at 1.3m above ground level). After only 5 years, as proposed by the Applicant, trees would not have reached sufficient maturity to be protected by these Regulations and so could be removed without requiring formal consent.
- 3.14. In respect of soils, other than in the main river valleys, the Hornsea 3 onshore cable is to be routed through freely draining, slightly acid, sandy to loamy soils, with a small section routed through a shallow lime-rich soil over a glacial chalk outcrop. The principle characteristics of the majority of soil types the cable route passes through are that of a free-draining nature and of low fertility as they are vulnerable to the leaching of nutrients. In general, the principle soil characteristics will have a negative impact on vegetation establishment which will require additional and longer term maintenance to ensure that planting receives sufficient nutrients to thrive and outcompete other undesirable vegetation and does not succumb to drought conditions. The local soil characteristics together with the local climatic stresses (salt tolerance, wind exposure and drought) placed on any new planting in the District means that the additional care and longer term maintenance is crucial to the success of the planting. Soil data for the District has been derived from Cranfield University's free to use Soilscales dataset.
- 3.15. In respect of landscaping schemes, it is standard practice within North Norfolk District Council to impose a ten year replacement planting period condition on major developments where landscape planting is an important element of the proposal. Examples of a number of planning decisions in which NNDC has imposed a 10 year period is enclosed at **Appendix 4** including for a number of onshore solar farms (50MW). Copies of the actual decision notices can be provided if necessary for the ExA.

## 4. Other Matters

### Requirement 23

4.1. NNDC suggests the following wording, which was aired at the hearing. Amendments are shown in red:

- 23.—**(1) Within three months of the cessation of commercial operation of the connection works an onshore decommissioning plan must be submitted to and approved by the relevant planning authority.
- (2) The relevant planning authority must provide its decision on the plan within three months of its submission, ~~of such plan~~ unless otherwise agreed in writing by the relevant planning authority.
- (3) The decommissioning plan must be implemented as approved unless otherwise agreed in writing by the relevant planning authority.

### Code of Construction Practice

4.2. **Communication Plan** – Section 4.2.5 sets out the Communication Plan under the CoCP, and §4.2.5.2 describes the complaints procedure. NNDC welcomes the Applicant's proactive approach and agrees that a complaints procedure is needed. In order for that to be fully effective, however, a mechanism needs to be in place for the relevant local authority to be made aware of complaints and also for the relevant local authority to make the contractor aware of any complaints that come direct to the local authority.

4.3. In respect of Appendix A - Communication Plan (A1.1.3), the final two bullet points regarding the 24 hour helpline and complaints log need to be expanded to include procedures to engage in a two way process with the relevant Environmental Health Department regarding the location of complaints, any contact details of person reporting (if they have been provided and consent given for them to be shared), a description of complaint, any actions taken by the contractor and if resolution has been achieved.

- 4.4. **Mechanism for Approval** – as indicated by the Applicant, it may be sensible for an annex to the CoCP to be provided, setting out the mechanism for approval of matters within the CoCP. That mechanism needs to be flexible, such that it allows for sufficient time for the relevant planning authority to consider the matters submitted, otherwise the oversight function on which the CoCP rests will not function appropriately.
- 4.5. In respect of Construction Mitigation measures. 6.2.1.3 concerning noise and vibration management measures, this outlines good general principles on noise and vibration management. There are potential benefits for all parties in submitting details of control measures for approval well in advance of works and in advance of the 28 day timescale included in the COPA 1974 legislation. Pre-application consultation and advance discussion of documents or control measures could assist greatly with progressing the project and developing suitable mitigation and control measures. The Applicant's comments on this matter are sought.
- 4.6. The legislative process in the section 61 of the Control of Pollution Act 1974 does provide a prior approval process for works within a 28 day timescale, with the option of additional conditions or requirements to be added by the local authority and for applicant appeals to the magistrates court.
- 4.7. In respect of Site Compounds 4.1.7.5 - The provision of secure Heras type fencing is noted. However, the addition of further fencing, screening or enclosures may be required for noise control purposes.

- 4.8. Regarding generators, (section 4.1.1.5 on continuous working hours), whilst it is acknowledged that generators may be required to be operated during continuous hours, NNDC requests that details of noise levels and mitigation measures are submitted for approval in advance, given that there is potential for adverse impact on residential amenity, depending on location. This is to ensure low noise plant is selected and suitable screening and other measures are provided. The wording used in the subsequent section (4.1.1.6) is more acceptable, in that there is consultation with the Environmental Health Department on mitigation and requirement for approval of details.

08 February 2019

## **Appendix 1 – Draft Landscape Plan**

# OUTLINE LANDSCAPE ~~MANAGEMENT~~ PLAN

## 1. INTRODUCTION

1.1.1.1 This Outline Landscape ~~Management~~ Plan (Outline LP) has been prepared on behalf of Ørsted in support of the application for a Development Consent Order (DCO) for Hornsea Three.

1.1.1.2 This Outline ~~LMP~~ sets out the framework within which the following information will subsequently be produced as part of a detailed written Landscape Plan to be agreed under Requirement 8 of the DCO. The detailed landscape plan shall comprise the following elements:

- a) detailed hedgerow and tree surveys and assessments within the DCO consent area;
- b) detailed soft landscape design proposals for replacement, mitigation, compensation and enhancement (including heritage, landscape and ecological mitigation),
- c) implementation and establishment details of all planting
- d) future management and monitoring.

This will apply to the following elements of the project:

- a) the onshore HVAC booster station (if required)
- b) the onshore HVDC converter/HVAC substation,
- c) all soft landscape works in association with the onshore cable route.

1.1.1.3 This Outline ~~LMP~~ applies to all land temporarily and permanently impacted or acquired by the Applicant or its agents or contractors.

1.1.1.4 Each detailed ~~LMP~~ will be submitted to and agreed with the relevant planning authorities prior to commencement of a relevant phase or any onshore site preparation works relating to a relevant phase..

1.1.1.6 This Outline ~~LMP~~ should be read in conjunction with the Outline Ecological Management Plan (Outline EMP) (document reference A8.6) and the Outline Code of Construction Practice (Outline CoCP). The Outline EMP accompanies the DCO application, and describes the ecology and nature conservation mitigation measures that will be implemented prior to, during and post construction of the onshore elements of Hornsea Three, and the long-term management measures to be set in place for reinstated and enhanced habitats. The CoCP sets out the management measures that the Applicant and its construction contractors will be required to adopt and implement for all construction activities associated with Hornsea Three.

## 2. EXISTING LANDSCAPE CONTEXT

2.1.1.1 Onshore export cables will be buried underground in up to 6 trenches, running in a south / south westerly direction from the proposed landfall area at Weybourne in north Norfolk within the Norfolk Coast AONB for approximately 55 km (6km of which is within the AONB), before connecting into the national grid at the Norwich main substation, south of Norwich. The final corridor will be up to 80 m in width, of which up to 20 m will be used for temporary working areas. It runs across a primarily rural landscape incorporating farmland with fields and roads frequently enclosed by hedgerows, areas of woodland, river valleys and frequent small settlements.

2.1.1.2 The site of the onshore HVAC booster station is west of the village of Edgefield, adjacent to an area of woodland to the east and arable fields enclosed by hedgerows to the west. The landscape within 5 km of the onshore HVAC booster station encompasses the village of Edgefield and a largely rural area primarily given over to agriculture with frequent small blocks of woodland and contains a number of small settlements. The landform is undulating with some shallow valleys.

2.1.1.3 The site of the onshore HVDC converter/HVAC substation lies south of Norwich south of the A47 and east of the B1113. Arable fields enclosed by hedgerows lie to the west and south of the site, and a sand and gravel quarry under restoration lies to the east. Two lines of pylons and overhead electricity cables cross the landscape immediately south west of the site. North of the A47 lies the southern edge of Norwich and its suburbs which are cut through by the River Yare valley and surrounded by wetlands and parkland. To the south of the A47 the landscape becomes more rural and primarily in agricultural use. There are numerous settlements within this rural landscape ranging from hamlets to large villages and the area is scattered with small woodlands. Landform within 5 km of the site of the onshore HVDC converter/HVAC substation gently undulates with two distinct river valleys, those of the Yare and the Tas, cutting through it.

2.1.1.4 The purpose of this Outline LP is to minimise impacts to the landscape as a result of and during construction and to provide proportionate mitigation and compensation in the long-term to maintain and reinstate the prevailing landscape character.

### 3. SURVEY AND ASSESSMENT

3.1.1.1 Each detailed LP shall be informed by a detailed survey of all pre-existing trees and hedges along the onshore cable corridor including trees and hedges affected by the onshore booster station and onshore converter/substation. The surveys shall be carried out in accordance with BS5837:2012 and the Hedgerows Regulations 1997 and shall be undertaken at an early enough stage to inform the detailed design of the onshore cable corridor, onshore booster station and onshore converter/substation

The full survey will identify important hedgerows (to capture all criteria for importance within the definitions of the Hedgerows Regulations 1997) and veteran and ancient trees which are important for ecological or historic reasons or are important features in the landscape.

3.1.1.2 Section 2.2.7 of the Outline EMP describes that approximately 14.35 km of hedgerows occur within the Hornsea Three onshore cable corridor, many of these would be retained by methods including crossing using trenchless techniques such as HDD and, in total, up to approximately 7.39 km of existing hedgerows would be removed to allow construction of Hornsea Three. Some of these hedges contain trees which will also be removed.

3.1.1.3. Where hedgerows and tree lines are crossed using open cut trenching techniques, measures will be taken to minimise vegetation removal and damage. These measures are likely to include reducing the length of hedgerow removed at crossing points, where this is possible. This is particularly relevant should Hornsea Three be delivered in two phases. Under this scenario, the contractor would seek to minimise the area which would be disturbed twice, once during the construction of each phase. In practice, only the area which is required to construct both phases (e.g. the haul road) would be disturbed during the construction of both phases. Thus, the majority of hedgerows across the onshore cable corridor would only be removed and replaced once regardless of whether Hornsea Three is delivered in one or two phases.

3.1.1.4 In association with Article 34 of the Development Consent Order (DCO), the survey findings and assessment of the trees and hedgerows to be removed and retained as part of the onshore works, together with justifications for each hedgerow or tree that is considered to be reasonably necessary to be removed, shall be submitted to and approved in writing by the relevant planning authority. Where reasonably practicable, all Category A and Category B trees (as set out in BS5837:2012) and Important Hedgerows shall be retained. Where retention is not possible, removal should be justified in writing to the relevant planning authority. The relevant planning authority will expect the following hierarchy to be used except in exceptional circumstances:



- Tree or hedgerow to be retained by:
  - rerouting of the cable corridor or
  - horizontal directional drilling
- Tree or hedgerow to be removed and the loss mitigated or compensated by replanting (species, location to be agreed by the relevant planning authority).

3.1.1.5 The full survey and assessment will be submitted to the relevant planning authority together with the proposed design for the cable route or Works No 9 or 10 as appropriate.

No phase of the connection works or onsite preparation works will commence until the relevant planning authority has confirmed in writing that the connection works have been designed to protect or mitigate or compensate for loss to affected hedgerows and/or trees as far as is reasonable.

The protection, mitigation or compensation will include horizontal directional drilling or an adjustment to the route of the cable corridor where achievable and where the relevant planning authority has requested it due to the importance of a hedgerow or tree.

3.1.1.6 The approved surveys and assessments shall inform the detailed landscape plan proposals in Section 4.

## 4. DETAILED SOFT LANDSCAPE DESIGN PROPOSALS

4.1.1.1. The detailed Landscape Plan shall include detailed soft landscape design proposals for replacement, reinstatement, mitigation, compensation and enhancement (including heritage mitigation) that shall be informed by the survey and assessment as detailed in Section 3.

4.1.1.2. The detailed proposals shall include the following elements:

- a) Precise location and canopy spread of all trees, hedgerows and other significant areas of vegetation on or adjoining the site to be removed;
- b) Precise location and canopy spread of all trees, hedgerows and other significant areas of vegetation on or adjoining the site to be retained (including species and canopy spread), together with measures for their protection during the course of the development to BS 5837:2012;
- c) Details of all new planting including (though not necessarily limited to): species, seed mixes, location, size, planting density, number and protection measures during establishment;
- d) Earthworks and ground profiling (including proposed finish levels and contours) if they are to be different to the existing;
- e) Full details of the operations and activities that will be undertaken to ensure successful establishment of the new planting to independence in the landscape including, but not limited to: ground preparation, planting methods, irrigation, weed control, monitoring, replacement, and removal of sundries. The details should include reference to BS8545 in respect of new trees);
- f) Full details of long-term management aims, operations and responsibilities. The details are to include, but are not necessarily limited to: height and width parameters for hedges, thinning and coppicing regimes, timings of operations, removal and appropriate reuse/recycling/disposal of redundant planting sundries;
- g) With regard to Work Areas 9 and 10 only - details of the implementation timetable for all soft landscape works, including any planting that is to be undertaken prior to and/or during the construction works for the booster/converter/sub stations.

## 5. IMPLEMENTATION AND ESTABLISHMENT

5.1.1.1 Unless otherwise agreed with the relevant planning authority, all approved tree and hedgerow protection measures for pre-existing trees and hedgerows are to be installed prior to the commencement of any on-site preparation and/or construction works within any stage of any phase. Thereafter the tree and hedgerow protection measures are to be maintained in good condition and observed throughout the construction period in that particular Stage/Phase.

5.1.1.2 Unless otherwise agreed in writing with the relevant planning authority, all other soft landscape works are to be implemented within nine months of the completion of construction/installation works within a Stage (as set out under Requirement 6 , except in the case of work areas 9 and 10 which are to be undertaken in accordance with the approved implementation timetable.

5.1.1.3 All planting and soft landscape works are to be established in accordance with the operations and activities agreed under 4.1.1.2

5.1.1.4 Unless otherwise agreed in writing with the relevant planning authority, if within a period of FIVE [or TEN] years from the date of planting, any tree or plant, or any tree or plant planted in replacement for it, is removed, uprooted or is destroyed or dies, [or becomes in the opinion of the relevant planning authority, seriously damaged or defective] another tree or plant of the same species and size as that originally planted shall be planted at the same place, unless the relevant planning authority gives its written consent to any variation.

## 6. FUTURE MANAGEMENT AND MONITORING

6.1.1.1 The landscape scheme is to be managed in accordance with the approved details, with the aims of:

- a) Re-instating removed landscape features to a similar or enhanced condition to those that were removed for the purposes of the development,
- b) Mitigating and compensating for the effects of the development,
- c) Realising the long-term landscape and visual effects as anticipated by the viewpoint visualisations,
- d) Maximising the wildlife benefits and opportunities,
- e) Ensuring the maintenance and longevity of the features provided in association with the development (and for the development within Work Areas 9 and 10, at least until the development is decommissioned).

## 7. APPENDICES

DRAWINGS

## 8. REFERENCES

## **Appendix 2 – Examples from Establishment Management Information System (EMIS) decision tool**

Site on cable route at Kelling: Grid Ref TG104409

[illegible]

Site at Booster Station, Edgefield: Grid Ref: TG 112 331

Ecological Site Classification Report																
Eastings(m)	Northings(m)		Grid Reference		Climate Scenario		Site Class		Filter		Brash		Drainage		Fertiliser/Nurse	
611200	333100		TG112331		Medium-High 2050 (A1b/3q0)		Very warm - Sheltered - Moderately dry		All species		No brash present		No drainage installed		No fertiliser	
Site Description and Variables																
The site has a very warm, moderately exposed and moderately dry climate. The soils are fresh moisture status and medium nutrient status. The site exposure is anticipated to be higher than modelled values.																
Modifications		AT		CT		DAMS		MD		SMR		SNR				
Default		2628.0		10.0		12.0		269.0		5.0(Fresh)		3.0(Medium)				
Dams Modifier						2										
Final		2628.0		10.0		14.0		269.0		5.0(Fresh)		3.0(Medium)				
Species		Abbr.	Suit(Ecol)	Suit(Timber)	Yield	Limiting	AT		CT	DAMS	MD	SMR	SNR	Version		
Lodgepole pine		LP	<div></div>	<div></div>	8	MD	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	3.1(A)	
Scots pine		SP	<div></div>	<div></div>	8	MD	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	3.3(A)	
Norway spruce		NS	<div></div>	<div></div>	4	MD	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	3.3(A)	
Sitka spruce		SS	<div></div>	<div></div>	1	MD	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	3.4(A)	
Douglas fir		DF	<div></div>	<div></div>	8	MD	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	3.1(A)	
Hybrid larch		HL	<div></div>	<div></div>	0	MD	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	3(A)	
Japanese larch		JL	<div></div>	<div></div>	0	MD	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	3(A)	
European larch		EL	<div></div>	<div></div>	0	MD	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	3(A)	
Grand fir		GF	<div></div>	<div></div>	0	MD	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	3(A)	
Noble Fir		NF	<div></div>	<div></div>	0	AT5	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	3(A)	
Downy birch		PBI	<div></div>	<div></div>	0	MD	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	3.2(A)	
Silver birch		SBI	<div></div>	<div></div>	2	MD	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	3.2(A)	
Sycamore		SY	<div></div>	<div></div>	3	MD	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	3.3(A)	
Pedunculate oak		POK	<div></div>	<div></div>	3	MD	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	3.1(A)	
Sessile oak		SOK	<div></div>	<div></div>	2	MD	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	3.2(A)	
Aspen		ASP	<div></div>	<div></div>	3	MD	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	3.2(A)	

## **Appendix 3 – Ecological Site Classification Manual**



## Ecological Site Classification Version 4

### Draft Quickstart Guidance for Site Assessment

#### 1 Overview

The current system is structured to provide an interface organised as follows :

	Resource links
Quick navigation	Tool selector <i>Changing the option will change the contents of the tool options window.</i>
Tool options	Map view + legend
Results window	

- Resource links – the terms of use, update history, case studies, manual, contact email.
- Quick navigation – enter a six figure Ordnance Survey GB grid reference, the map will zoom into the region of interest.
- Tool selector – Ecological Site Classification and related decision support tools can be selected from a list.
- Maps of species suitability alongside climatic and topographic data can be accessed using Forest Maps.
- Tree species suitability can be evaluated using Ecological Site Classification (Tree Species).
- Native Woodland suitability can be evaluated using Ecological Site Classification (NVC Woodland).
- If ESC base data is required for sample sites, this can be obtained by uploading a file containing a list of Ordnance Survey GB grid references (i.e. two letters followed by six digits e.g. NT090950), this will return a comma separated value file containing the four ESC climate variables and the modelled soil properties for the given site.
- Data is entered via the Tool Options window pane (e.g. soil properties and management options).
- The outcomes of an analysis are displayed in the Results Window, alongside options to save the data where applicable as a csv or pdf file.

## 2 Forest Maps Data Browser Options

The Forest Maps data browser contains folders which can be expanded by clicking on them to reveal a number of datasets. Clicking on the map will reveal metadata about the map currently being viewed alongside the option to download the data as a file (usually a geotiff).

### a) Climatic Data

This option contains the baseline climatic data (accumulated temperature, continentality, days (exposure) and moisture deficit for the period 1961-1990 at a resolution of 250 metres. Rainfall is provided at 5km resolution for the same period.

### b) Topographic Data

These are data derived from 250m Ordnance Survey open data digital elevation models and publicly available methods for calculating topographic shelter (topex) and topographic wetness (compound topographic index). Aspect and slope were derived from models in QGIS.

### c) Broadleaf Species

Climatic timber suitability maps for a range of broadleaved species.

### d) Conifer Species

Climatic timber suitability maps for a range of conifer species. In some cases such as Douglas fir, Scots pine and Sitka spruce additional information is available on provenance and soils suitability.

The species climatic suitability maps show the theoretical maximum planting extent of a selected species assuming optimal soil (edaphic) conditions within GB. However in practice the range will be considerably reduced due to other factors, particularly the site soil type. Like many aspects of decision support tools the maps are intended to complement site level assessments, expert judgement and local knowledge.

### e) Native woodland maps (Baseline)

Native woodland maps combine the climatic species suitability of the main component species with the **climatic** NVC suitability guidelines published in Ecological Site Classification Bulletin 124. Information on soil type will inform the actual NVC woodland type suitable for a given location.

### f) Climate Zones and Modelled Soil Data

These are the broad ESC climate zones for GB alongside ESC soil properties data (SMR/SNR) which has been modelled to 250x250 metre pixel resolution based on FC soil maps and national scale data. While the soil data indicates trends it is not intended for site level planning, users are recommended to use their own data in site analyses if possible.

### g) Establishment

Maps are included for bareroot planting windows according to FC Bulletin 121 and GB Seed Zones.

## **h) In Development**

Those are provided for evaluation and are part of ongoing work which is yet to be finalised. A map is included that provides an estimate of site fertility according to underlying solid geology (based on an old, and now superseded BGS 1:625k dataset).

In addition two new maps are in development that describe the climatic potential of broadleaved or conifer species according to the potential of various key species. Those climatic zone maps are intended to help users quickly identify the species and objectives that are likely to be supported in a given location.

For the broadleaved map the key is as follows:

Zone	Interpretation
OK/BE/SY/WCH	The site is climatically very suitable for one or more of Oak, Beech, Sycamore or Wild Cherry.
PBI/SBI	The site is climatically very suitable for Birch, or suitable for other broadleaved species. Good production is still possible.
OK/SY/Native	The site is climatically suitable for Birch, Oak and Sycamore, though there may be climatic constraints. Site may also be suitable for other native woodland (NVC) types where production is not an objective.
PBI/SBI	The site is only suitable for Birch, as a low yield species.
PBI/ROW	The site is possibly suitable for Birch and Rowan as native woodland habitat.

### **3 Map View**

The map displays the dataset currently selected. The following actions are available

- a) zoom in/out using mouse wheel or the +/- control on the map. Pinch to zoom may work on devices with touch interfaces.
- b) pan by holding mouse down and dragging the map
- c) zoom to region of interest by holding down shift key then pressing left mouse button to draw a box, on release of the mouse button the system zooms in to the selected region.
- d) click to analyse – if the left mouse button is clicked the system analyses the site with the user selected (or default) site variables and query parameters.

## 4 Site and Query Parameters

The input panel for Ecological Site Classification includes the options to amend site level data on soil type, operations and query parameters.

### a) Soil Moisture Regime

Select the appropriate soil moisture regime for the site. We assume that this data is obtained through a formal soil survey.

### b) Soil Nutrient Regime

Select the appropriate soil moisture regime for the site. We assume that this data is obtained through a formal soil survey. Note there are now three categories of very poor site (VP1, VP2 and VP3). VP1 is the most impoverished (e.g. FC deep peat soil type 10a), VP2 the intermediate grade (e.g. FC deep peat soil type 11a) and VP3 is the richest (e.g. FC podzolic peaty gley soil type 6z).

Soil data for common FC soil types are included in appendix A.

### c) Brash Management

If new planting ignore this option. If restock indicate if the site will replanted quickly to take advantage of nutrients from decomposing brash.

### d) Drainage

Wet sites (soil moisture regimes very wet, wet, very moist and moist) can benefit from drainage, which has the effect of drying the site and slightly improving the nutrient availability on very poor sites.

### e) Fertiliser/Nursing mixture

The application of fertiliser can raise the site nutrient regime, however this is only warranted on very poor and occasionally poor soil nutrient regimes. Depending upon the site type some species may require several applications and/or a unique fertiliser prescription based upon specific site/species issues (e.g. imbalance in NPK ratios).

There is evidence that pines planted in mixture with other species can ameliorate nitrogen deficiencies on certain sites, but not PK or other limitations. The favoured mixture species for use with Sitka spruce is Alaskan Lodgepole pine, as this will grow more slowly and the stand is therefore more likely to self thin.

Larch, birch and alder may also confer nurse benefits though they may not be suitable in some situations due to site requirements, or their tendency on exposed sites to damage leaders of adjacent trees through crown whipping.

### f) Results Filter

This list provides options to constrain the results list to suitable species only, native only and so on. When looking at native woodland creation remember that NVC types have different niches to the suitability ranges of component species. For example Scots Pine is suitable on a wide range of soil types (very poor to rich), but the related W18 native woodland only tends to occur where the soil nutrient regime is very poor or poor (see pages 48-49 of bulletin 124).

**g) Climate Scenarios**

The ESC model can be run against different climate scenarios. For current operational use we recommend the baseline scenario with some thought given to the consequences for selected species should the site become drier in the future.

**h) Update button**

Assuming a site has been identified on the map, the update button allows the same site to be re-analysed but with different soil or management options.

## 5 Results View

### a) Site Data

The first table lists all the site data and the user inputs. Sometimes SMR and SNR will be amended according to the impact of a site operation (e.g. drainage).

### b) Results

Species suitability results are displayed for all 57 species available unless the user subsets the list via option 4(f). Suitability scores are presented in the classic coloured chart on the right hand side and complemented with the underlying model outputs on the left hand side.

There is a link at the top of the table that allows the results to be saved in CSV or PDF format.

ESC Score	Description	Interpretation
0.75+	Very suitable	Factors will not significantly constrain growth
0.5 – 0.74	Suitable	Some impact upon growth, for example lower yielding Sitka spruce on a peaty gley (YC 14-16).
0.3 – 0.49	Marginal	Species in this category may have significantly reduced growth, high risk of check or absolute failure. Examples -Sitka spruce on certain deep peats without fertiliser exhibiting wide variation in growth rates(YC 0-10). -Downy birch on very poor sites forming a scrub woodland .
0 – 0.29	Unsuitable	In this category the species will usually fail to establish extensive tree cover.

The species suitability scores operate on the basis that a higher value means a particular factor (AT, SMR etc) is unlikely to prevent tree growth. Values above 0.75 are very suitable and have the lowest risk, but the incidence of failure or significantly reduced growth is usually much higher when one or more factors is below 0.5.

The numeric outputs give a little more information about how marginal or suitable a species may be on a given site. For example a species with a suitability score of 0.50 in reality may be close in performance to another with a score of 0.49.

## ESC Species Symptoms by Climatic/Edaphic(Soil) Variables and Suitability Classes

Variable	Suitability Class	Effects
Accumulated Temperature (AT)	Unsuitable	- High mortality due to winter cold. - Very slow growth. - Potentially death at any age.
	Marginal	- Significantly reduced growth rate.
	Suitable	- Growth reduction of 25-50%
	Very Suitable	- No warmth constraints
Continentality	Unsuitable	
	Marginal	
	Suitable	
	Very Suitable	
DAMS	Unsuitable	- High mortality due to wind exposure
	Marginal	- Significantly reduced growth rate. - Severe stem form problems
	Suitable	- Possible stem form problems
	Very Suitable	- No exposure constraints
Moisture deficit	Unsuitable	- High mortality due to drought. - Limited growth due to excessive rainfall
	Marginal	- Severe growth constraints - Stem damage risk from drought cracks
	Suitable	- Some growth constraints - Possible drought cracks(Grand/Noble fir)
	Very Suitable	- No constraints
Soil Moisture Regime	Unsuitable	- Mortality due to anaerobic conditions (wet sites) - Mortality due to dry conditions (very dry sites)
	Marginal	- Severe growth constraints due to limited rooting in wet soil. - Difficulty sustaining growth of larger trees due to limited water availability on dry soils.
	Suitable	- Some growth constraints due to limited water availability on dry soils. - Wet conditions inhibit uptake of nutrients.
	Very Suitable	- No constraints
Soil Nutrient Regime	Unsuitable	- High mortality due to acid soil conditions. - Check, trees unable to grow due to



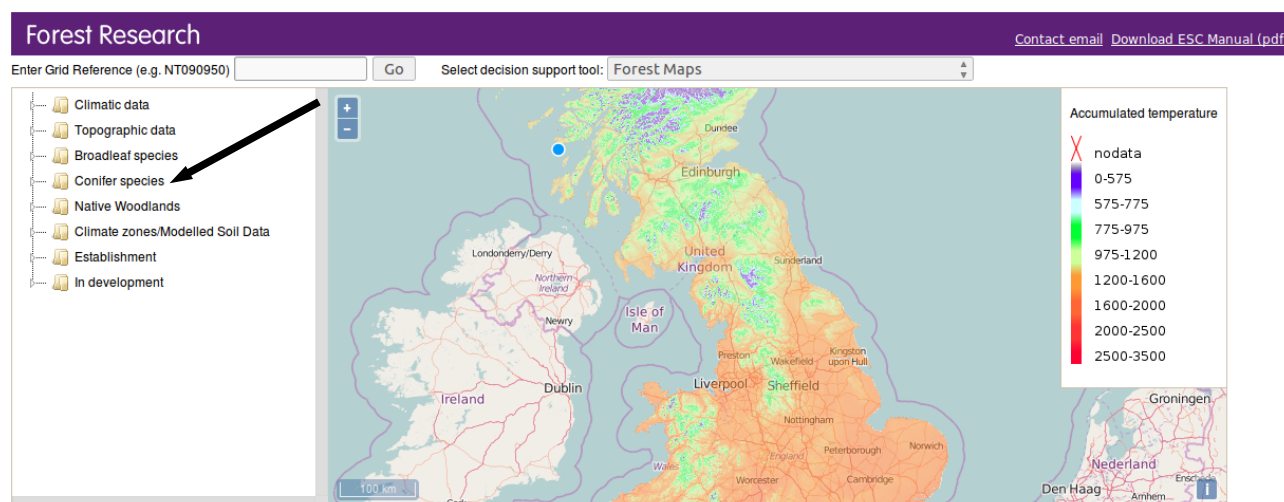
		nutrient deficiencies. - Mortality associated with carbonate soils.
	Marginal	- Uneven and limited growth due to lack of nutrients. - Stunted stems.
	Suitable	- Some reduction in growth potential.
	Very Suitable	- Good growth. - Coarse branching on richer soils (Scots pine, birch)

## 6. ESC Examples

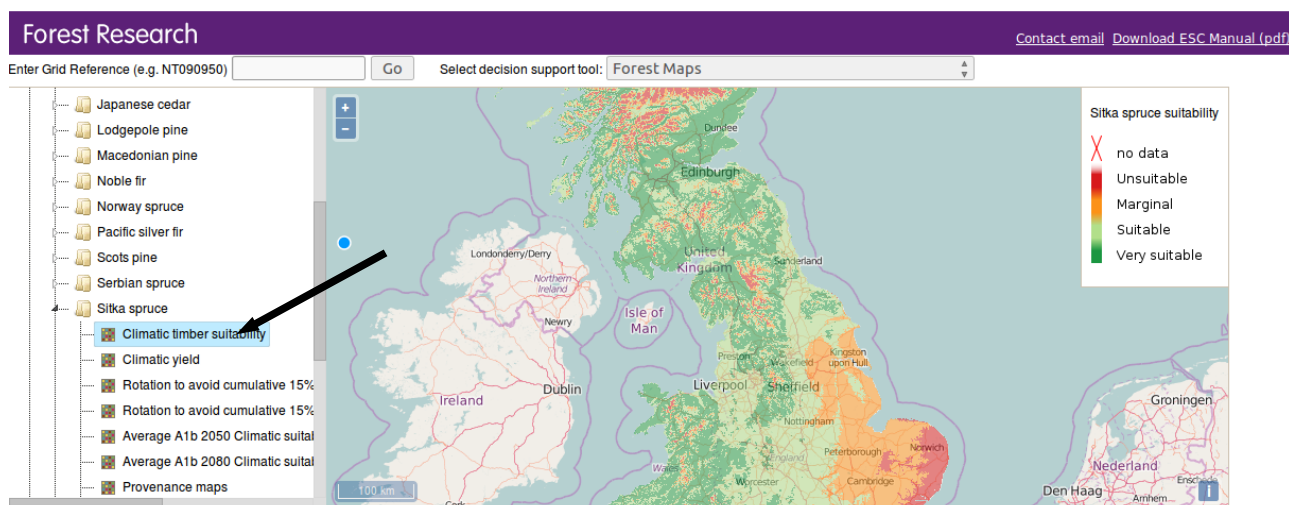
### Case Study One – Restock of poor wet site type with Sitka spruce.

1. On the layer view expand the conifer species folder by clicking on it

This will allow you to select the map for the species of interest.



2. Select the map for climatic suitability of Sitka spruce in baseline climates

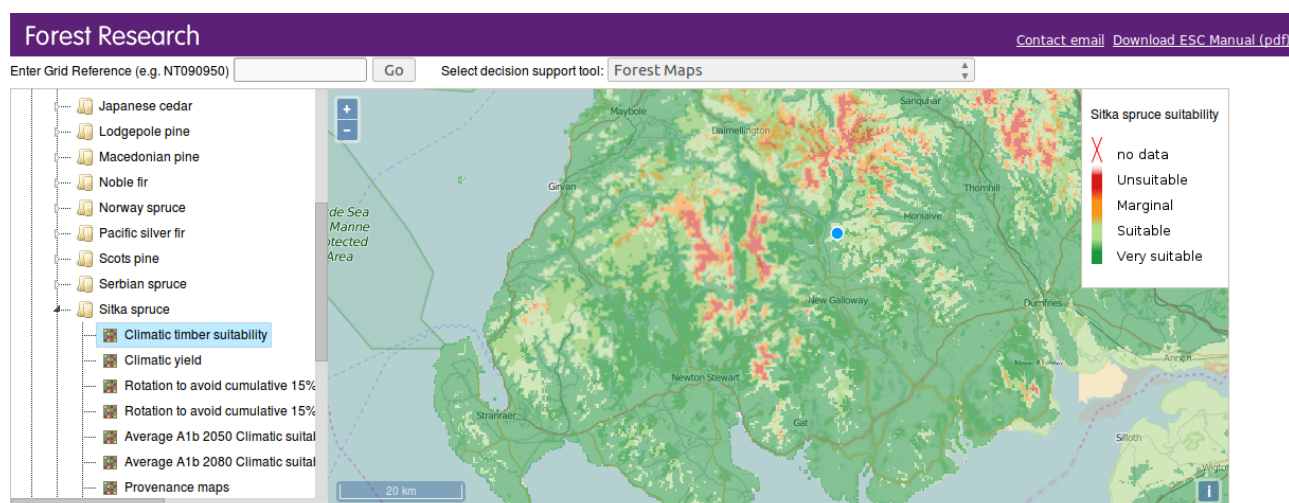


This map gives an overview of yield potential for the selected species, considering ESC climatic factors only ( i.e. AT, CT, DAMS and MD). Darker green indicates increasing suitability while regions in red are unsuitable.

ESC assumes adverse climatic factors cannot be compensated by ideal soil conditions, so those maps can be viewed as the maximum areas of land suitable for a given species. However there is evidence that some climatic constraints can be compensated by local site properties, for example high climatic moisture deficits/dry regions may be offset by wet soils. Those issues require foresters to make on the ground adjustments based on their own experience and history of the site.

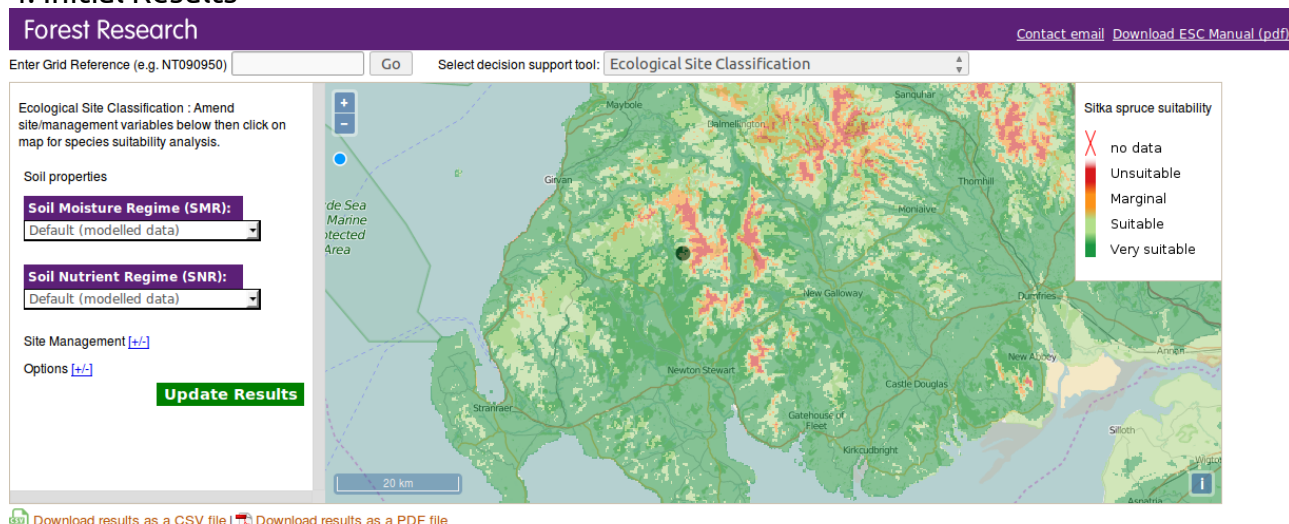
### 3. Locate Site of interest

The map has various functions such as pan/zoom. Use those to locate the site of interest. In this example we have zoomed into Galloway.



Now to obtain a site assessment from ESC we simply select Ecological Site Classification in the drop down menu and click on the site of interest indicated by the cursor (blue dot). A set of results is added below the map and a black circle indicates the location.

### 4. Initial Results



Adjustments	Eastings(m)	Northings(m)	Site Grid Reference	Climate Scenario	Site Class	Filter	Brash	Drainage	Fertiliser
Site defaults	238745	584975	NX387849	Baseline climate 1961-1990	Cool - Moderately exposed - Wet	All species	No brash present	No drainage installed	No fertiliser

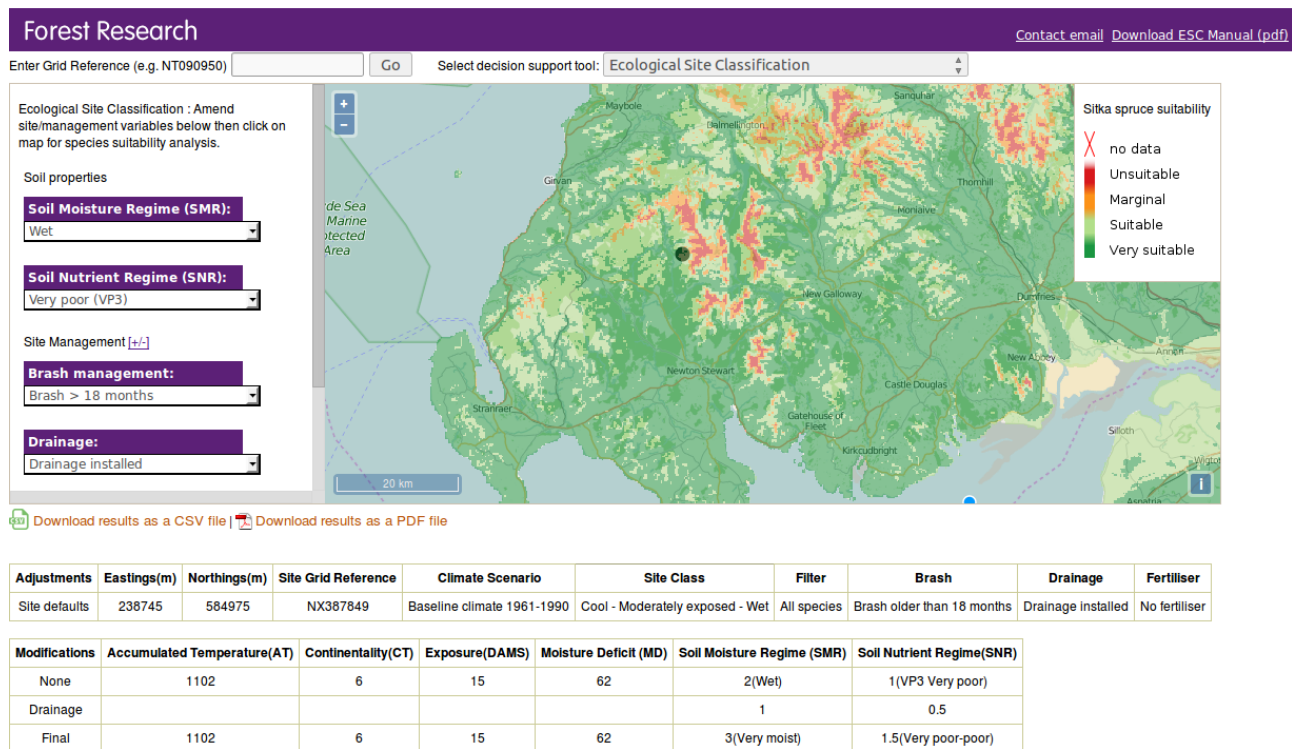
Modifications	Accumulated Temperature(AT)	Continentality(CT)	Exposure(DAMS)	Moisture Deficit (MD)	Soil Moisture Regime (SMR)	Soil Nutrient Regime(SNR)
None	1102	6	15	62	2(Wet)	0.5(VP2 Very poor)

The analysis at this stage is based upon default settings, such as a soil type of SMR Wet and SNR VP2 Very poor.

The site we wish to test is a restocking site with soil conditions SMR=Wet, SNR=VP3 determined by a site visit. Brash will be retained on the site but it will not be restocked

for 4 years after felling due to the risk of damage from *hylobius*. To minimise site costs we wish to avoid the investment in fertiliser if possible.

## 5. Site Data Input



The site data is amended using the drop down options on the right hand side. Click update results to change the site analysis to reflect the new data. Drainage has altered the soil wetness class from wet to very moist and improved the site soil nutrient regime by half a class.

## 6. Results

Suitability key  Very Suitable (0.75-1.00)  Suitable (0.50-0.74)  Marginal (0.30-0.49)  Unsuitable (0.0-0.29)

Common name	Species Code	Suitability		YC	Lim	AT	CT	DAMS	MD	SMR	SNR	Suit.	AT	CT	DAMS	MD	SMR	SNR	Version (Rating)	Suit. Charts
		Ecological	Timber																	
Corsican pine	CP	0.49	0.33	7	AT5	0.49	1	0.78	0.97	0.75	0.67								3.3(A)	<a href="#">download chart(csv)</a>
Lodgepole pine	LP	0.67	0.62	9	SNR	0.92	1	0.89	0.72	1	0.67								3.1(A)	<a href="#">download chart(csv)</a>
Macedonian pine	MCP	0.64	0.64	9	MD	1	1	0.87	0.64	1	0.67								3.1(C)	<a href="#">download chart(csv)</a>
Maritime pine	MAP	0.18	0.07	1	MD	0.37	1	0.61	0.18	0.35	0.67								3.1(C)	<a href="#">download chart(csv)</a>
Monterey/Radiata pine	RAP	0	0	0	MD	0.21	0.83	0.85	0	0.58	0.72								3(C)	<a href="#">download chart(csv)</a>
Scots pine	SP	0.63	0.61	8	SMR	0.96	1	0.77	0.98	0.63	0.67								3.3(A)	<a href="#">download chart(csv)</a>
Weymouth pine	WEP	0	0	0	SMR	0.78	0.74	0.6	0.94	0	0.47								3(B)	<a href="#">download chart(csv)</a>
Norway spruce	NS	0.56	0.51	12	SNR	0.91	1	0.62	0.93	0.82	0.56								3.1(A)	<a href="#">download chart(csv)</a>
Oriental spruce	ORS	0.25	0.15	3	SNR	0.62	0.87	0.59	0.49	0.6	0.25								3(C)	<a href="#">download chart(csv)</a>
Serbian spruce	OMS	0.46	0.4	9	SNR	0.88	0.9	0.64	0.49	0.8	0.46								3(B)	<a href="#">download chart(csv)</a>
Sitka spruce	SS	0.53	0.45	13	SNR	0.86	1	0.87	1	0.99	0.53								3.1(A)	<a href="#">download chart(csv)</a>
Sitka spruce(VP)	VPSS	0.53	0.45	14	SNR	0.86	1	0.87	1	0.99	0.53								3.1(A)	<a href="#">download chart(csv)</a>
Douglas fir	DF	0	0	0	SMR	0.74	1	0.49	0.66	0	0.46								3.1(A)	<a href="#">download chart(csv)</a>

The results for Sitka spruce are highlighted. For discussion the results are tabulated below.

Field	Value	Explanation
Common Name	Sitka spruce	
Species Code	SS	
Ecological suitability	0.53	The ecological suitability based on the most limiting factor, in this case SNR. Indicates suitable.
Timber suitability	0.45	The timber suitability based on AT and SNR in this case, the growth potential is just below 50% of potential. Indicates marginal.
Yield Class	13	The predicted yield class. $YC = ATFactor * LimitingFactor * Species\ Max\ YC\ in\ GB$ $0.86 * 0.53 * 28 = 13$
Limiting factor	SNR	The factor with the lowest response.
AT	0.86	AT value (1099) Very Suitable ( $\geq 0.75$ )
CT	1	CT value (6) Very Suitable ( $\geq 0.75$ )
DAMS	0.87	DAMS value (16) Very Suitable ( $\geq 0.75$ )
MD	1	MD value (61) Very Suitable ( $\geq 0.75$ )
SMR	0.99	SMR value (3/Very moist ) Very Suitable ( $\geq 0.75$ )
SNR	0.53	SNR value (1.5/Very Poor-Poor) Suitable ( $\geq 0.5$ and $< 0.75$ )

So currently the site is predicted to be suitable ecologically and therefore likely to

establish. Sitka Spruce has the potential to achieve YC 13.

The conclusion of the ESC analysis is that the site is suited for restocking with Sitka Spruce provided drainage operations can improve soil conditions. Without drainage operations Lodgepole pine may be a better option for lower yield timber production or Downy birch for native woodland habitat.

## **7. Other ESC Terms**

### **Suitability**

Ecological Site Classification uses the term suitability to describe the likely success of a particular tree species establishing and growing to maturity on a given site. There are two measures of suitability, one broadly considers timber in terms of yield potential, the other the ecological suitability of the site. It is possible for situations to arise where a species is ecologically suited to a given site despite being unsuitable for timber production.

### **Timber Suitability**

In ESC4 the definition of very suitable is the potential to achieve 75% or more of the maximum general yield class for the given species in British conditions. The threshold for suitable is 50% or more and marginal is 30% or more. Unsuitable conditions for timber production are defined as those where the predicted yield is less than 30% of the maximum possible in British conditions.

Marginally suitable species are usually only recommended where no other options exist or when production goals are of lesser importance as a site objective.

### **Ecological Suitability**

The ecological suitability of a site describes the suitability of a species in terms of the most limiting factor. A species is ecologically suited to a site if the species response to each of the climatic and edaphic(soil) variables is greater than 0.5.

Note it is possible for a species to be suitable for a site ecologically, but unsuitable for timber production. This reflects the distribution of some native species and the occurrence of low density woodlands.

In most cases productive goals are met when a species is at least suitable for timber production and is ecologically suitable for a given site. When woodland habitat is an objective an ecological suitable or marginal species may be a valid option, assuming that establishment goals (e.g. stocking density can be achieved).

### **Model Version**

ESC models are assigned a version. Models are revised and tested as the system changes to ensure consistent outputs. The 3.1 series models onwards are revisions associated with the introduction of additional classes of very poor soil nutrient regime.

### **Model Class**

Species suitability models are assigned a class according to the amount of evidence available to support the model.

Class A – the species is well understood in British conditions, with widespread historical

planting and trials.

Class B – the species has been trialled in British conditions on a limited scale.

Class C – the species has very limited or no trials in British conditions, e.g. individual planting or experimental use in limited geographic extents.

Therefore a species recommended as suitable in class B is a safer option than an equivalent species in class C.



## Appendix A

### 1. The ESC Soil properties of common Forestry Commission Soil Types

The ESC properties for the main Forestry Commission soil types are tabulated below. The values applied are typical observed mean attributes, and it is common for soil moisture and nutrient regime values to vary depending upon local factors. For example mineral soils in higher rainfall areas are more likely to be wetter and soils overlying richer bedrock may be more fertile.

Soil Moisture Regime (SMR) and Soil Nutrient Regime (SNR) are modelled as continuous variables though for convenience they are often referred to as the following classes described in tables A.1 and A.2 respectively.

Soil Moisture Regime	Numeric value	Example
Very wet (VW)	1	Deep peat
Wet (W)	2	Peaty gley
Very moist (VM)	3	Surface water gley
Moist (M)	4	Gleyed brown earth
Fresh (F)	5	Freely draining mineral soil
Slightly dry (SD)	6	Sandy mineral soil
Moderately dry (MD)	7	Shallow sandy mineral soil
Very dry (VD)	8	Rankers, shingle, rendzinas

**Table A.1:** Soil Moisture Regimes

Soil Nutrient Regime	Numeric value	Example
Very poor (VP1)	0	Unflushed deep peat
Very poor (VP2)	0.5	Podzols
Very poor (VP3)	1.0	Podzolic ironpans
Very poor-Poor (VP-P)	1.5	Ironpans
Poor (P)	2.0	Peaty gleys, upland brown earth
Medium (M)	3	Brown earth and surface water gleys
Rich (R)	4	Brown earths with high base status
Very rich (VR)	5	Calcareous brown earths
Carbonate	6	Rendzinas

**Table A.2:** Soil Nutrient Regimes

When using ESC the following tables allow users to enter default values for common soil types as described by the Forestry Commission Soil Classification. The table is not exhaustive because many mineral/organo mineral soils have a wide range of potential phase interactions.

## 2. ESC Properties of Mineral and Organo-Mineral Soils

Tables A.3 and A.4 describe the default ESC properties of the most common mineral and organo-mineral forest soil types according to the Forestry Commission soil classification system. Note that significant variation around the default properties can be expected due to local factors such as underlying geology.

In the case of Ironpan soils two sets of information are provided, one assumes establishment will occur with the pan unbroken; the other assumes site preparation techniques will break the pan and drain the perched water table.

FC Soil Code	Description	Soil Moisture Regime (SMR)		Soil Nutrient Regime (SNR)	
		Text	Value	Text	Value
1	Typical brown earth	Fresh	5	Medium	3
1u	Upland brown earth	Fresh	5	Poor	2
1z	Podzolic brown earth	Fresh	5	Poor	2
3	Podzol	Fresh	5	Very poor (VP2)	0.5
5	Ground water gley	Very moist	3	Rich	4
6	Peaty gley	Wet	2	Poor	2
6l	Peaty gley (loamy)	Very moist	3	Poor	2
6z	Podzolic Peaty gley	Very moist	2	Very poor (VP3)	1
7	Surface water gley	Very moist	3	Medium	3
7z	Podzolic Surface water gley	Very moist	3	Poor	2

**Table A.3:** Mineral and organo-mineral soil properties without perched water tables.

FC Soil Code	Description	Soil Moisture Regime (SMR)		Soil Nutrient Regime (SNR)	
		Text	Value	Text	Value
4*	Ironpan	Very moist	3	Very poor (VP3)	1
4z*	Podzolic Ironpan	Very moist	3	Very poor (VP2)	0.5
4	Ironpan	Fresh	5	Very poor-Poor	1.5
4z	Podzolic Ironpan	Fresh	5	Very poor (VP3)	1
4b	Ironpan intergrade	Fresh	5	Poor	2

**Table A.4:** Mineral soil properties with perched water tables . \*=assumes the ironpan is not broken through ground preparation

## 3. Organic soils

Table A.5 describes the properties of deep peats according to the FC soil classification system and ESC. Many of those soils would have been afforested with the assistance of drainage systems which may need to be maintained if such sites are to be restocked.

FC Soil Code	Description	Soil Moisture Regime (SMR)		Soil Nutrient Regime (SNR)	
		Text	Value	Text	Value
8a	Phragmites fen	Very wet	1	Rich	4
8b	Juncus articulatus/acutifloris	Very wet	1	Medium	3
8c	Juncus effusus	Very wet	1	Medium	3
8d	Carex	Very wet	1	Rich	4
9a	Molinia, Myrica, Salix	Very wet	1	Medium	3
9b	Tussocky Molinia/Calluna	Very wet	1	Poor	2
9c	Tussocky Molinia Eriophorum vaginatum	Wet	2	Poor	2
9d	Non Tussocky Molinia, Eriophorum vaginatum, Trichophorum	Very wet	1	Very poor (VP3)	1
9e	Trichophorum, Calluna, Molinia	Wet	2	Very poor (VP2)	0.5
10a	Lowland Sphagnum	Very wet	1	Very poor (VP1)	0
10b	Upland Sphagnum	Very wet	1	Very poor (VP1)	0
11a	Calluna	Very moist	3	Very poor (VP2)	0.5
11b	Calluna, Eriophorum vaginatum	Wet	2	Very poor (VP2)	0.5
11c	Trichophorum, Calluna	Wet	2	Very poor (VP1)	0
11d	Eriophorum	Wet	2	Very poor (VP1)	0

**Table A.5:** Properties associated with organic soils.

## Document Change History

Version	Date Changed	Changed By	Comments
4.2	23 May 2016	Stephen Bathgate	Revised introduction to match latest user interface. Minor text edits to table labelling. Revised text describing of suitability. Corrected case study to indicate use of drainage.
4.1	15 April 2016	Stephen Bathgate	Included default soil properties as appendix.

## **Appendix 4 - Examples of Planning Applications in North Norfolk where a Ten Year replacement planting condition has been applied**

## Examples of Planning Applications in North Norfolk where a Ten Year replacement planting condition has been applied

Application Number	Proposal	Location	Relevant Condition Number	Comments
<b>PF/13/0007</b>	Erection of 123 dwellings with public park and open space and associated landscaping, drainage and highway infrastructure	Land off Two Furlong Hill and Market Lane, Wells-next-the-Sea	Condition 17	Site located with Norfolk Coast AONB
<b>PF/13/0168</b>	Construction of 20 mw solar photovoltaic farm with associated works including inverter housing	Land at North Creake Airfield, Egmore, Walsingham	Condition 7	Site located near to Norfolk Coast AONB
<b>PF/13/1166</b>	Installation of 49.9MW solar farm with plant housing and perimeter fence	Former Airfield, West Raynham	Condition 7	Large scale solar farm
<b>PF/14/1334</b>	Installation and operation of a ground mounted solar photovoltaic array to generate electricity of up to 50MW capacity comprising photovoltaic panels, inverters, security fencing, cameras and other associated infrastructure	Former RAF Coltishall, Lamas Road, Scottow NR10 5LR	Condition 9	Large scale solar farm
<b>PF/14/1559</b>	Demolition of buildings and erection of forty dwellings, refurbishment of existing dwelling, contouring site, alterations of the existing access and off-site highway improvements	Former Cherryridge Poultry Site, Church Street, Northrepps, Cromer, NR27 0AA	Condition 14	Site Located in Norfolk Coast AONB