

Environmental Statement

for

Threestoneburn Forest

Deforestation and Habitat Restoration Proposals



Prepared by

Scottish Woodlands Ltd
Greensfield Court
Alnwick
Northumberland
NE66 2DE

Tel: 01665 602790

Fax: 01665 605089

VOLUME 1 : TEXT

CONTENTS

		PAGE NO.
1.	INTRODUCTION	8
1.1	Terminology	8
1.2	Project Team	10
2	SCOPING	10
2.1	Introduction	10
2.2	Formal Scoping	11
2.2.1	Scoping Meeting	11
2.2.2	Issues Raised	11
2.2.3	Additional Scoping	11
2.2.4	Summary	12
3.	SITE SELECTION & ALTERNATIVE PRESCRIPTIONS	12
3.1	Introduction	12
3.2	Alternative Proposals	12
3.2.1	Conifer Forest	12
3.2.2	Moorland Restoration & Riparian Native Broadleaves	14
3.3	Summary and Conclusions	16
4	THE PROPOSALS	16
4.1	Location	16
4.2	Description of Proposals	17
4.3	Forestry Operations	17
4.4	Forest Road Construction & Upgrading	19
4.4.1	Site Access	19
4.4.2	Layout Design	19
4.4.3	Construction Methodology	20
4.4.4	Stone Requirement	20
4.4.5	Source of Roadstone	20
4.4.6	Construction Plant	20
4.5	Habitat Management & Enhancement	21

	PAGE NO.
5.	GEOLOGY, HYDROLOGY, SOILS AND DRAINAGE 22
5.1	Introduction 22
5.1.1	Methodology 22
5.2	Baseline Description 22
5.2.1	Existing Situation 22
5.2.2	Climate, Rainfall and the Possible Impact of Climate Change 22
5.2.3	Geology & Soils 23
5.2.4	Elevation & Aspect 24
5.2.5	Hydrology 24
5.2.6	Water Quality 24
5.3	Mitigation and Enhancement 25
5.3.1	Road Construction & Quarrying 25
5.3.2	Forestry Operations 25
5.4	Post Deforestation Phase 28
5.4.1	Access Tracks 28
5.4.2	Landuse Changes 28
5.4.3	Enhancement Measures 29
5.5	Predicted Impacts & Effects 29
5.5.1	Introduction 29
5.5.2	Access Tracks 29
5.5.3	Forest Operations 30
5.6	Summary of Key Findings and Conclusions 30
6.	ECOLOGY & NATURE CONSERVATION 32
6.1	Introduction 32
6.2	Methodology 32
6.2.1	The Scoping Process 32
6.2.2	Field Surveys 34
6.3	Baseline Description 36
6.3.1	Vegetation 36
6.3.2	Mammals 39
6.3.3	Reptiles & Amphibians 40
6.4	Evaluation 41
6.4.1	Blanket Bog 41
6.4.2	Grassland 42
6.4.3	Heathland 42
6.4.4	Plantation Woodland 43
6.5	Predicted Trends 44
6.5.1	Blanket Bog 44
6.5.2	Grassland 44
6.5.3	Heathland 44
6.5.4	Plantation Woodland 45

	PAGE NO.
6.6	Mitigation & Enhancement 45
6.6.1	Operational Phase 45
6.6.2	Road Construction & Quarrying 45
6.6.3	Forestry Operations 45
6.6.4	Enhancement Measures 48
6.7	Predicted Impacts & Effects 48
6.8	Evaluation of Effects 49
6.9	Summary of Key Findings & Conclusions 50
7.	BIRDS 51
7.1	Introduction 51
7.2	Methods 52
7.3	Field Survey 52
7.4	Evaluation of Ornithological Interest 54
7.5	Findings 55
7.6	Predicted Trends 55
7.7	Mitigation, Compensation & Enhancement 56
7.8	Predicted Impacts & Effects 57
7.9	Summary of Key Findings & Conclusions 61
8	RED SQUIRRELS 62
8.1	Introduction 62
8.2	Methods 63
8.2.1	Scope 63
8.2.2	Field Survey 63
8.3	Significance Assessment 64
8.4	Evaluation of Interest 64
8.5	Predicted Trends 65
8.6	Mitigation & Compensation 66
8.6.1	Operations 66
8.7	Predicted Impacts & Effects 67
8.8	Evaluation of Effects 67
8.9	Monitoring 67
8.10	Summary of Findings & Conclusions 68
9.	SOCIAL & ECONOMIC ISSUES 68
9.1	Introduction 68
9.2	Employment and Landuse Change 68
9.2.1	Current Situation 68
9.2.2	Operational Phase 69
9.2.3	Post Deforestation 69
9.2.4	Conclusions 70

		PAGE NO.
9.3	Timber Marketing	70
9.3.1	Roundwood	70
9.3.2	Chips/Brash	71
9.3.3	Conclusions	72
9.4	Public Access Provision & Recreation	72
9.4.1	Current Situation	72
9.4.2	Operational Phase	72
9.4.3	Post Deforestation	72
9.4.4	Conclusions	73
10	LANDSCAPE	73
10.1	Introduction	73
10.2	Scope of assessment	73
10.2.1	Methodology	73
10.3	Assessment of visual effects of deforestation	74
10.4	Mitigation & Enhancement	74
10.5	Significant Visual Effects	75
10.6	Summary of Visual Effects	76
10.7	Summary & conclusions	76
11.	CULTURAL HERITAGE	77
11.1	Introduction	77
11.2	Existing Situation	77
11.3	Mitigation & Safeguarding	78
11.4	Predicted Impacts and Effects	78
11.5	Summary & Conclusions	78
12.	TRAFFIC & TRANSPORT	79
12.1	Introduction	79
12.2	Current Situation	79
12.3	Alternative Proposals	79
12.3.1	Alternative 1	80
12.3.2	Alternative 2	80
12.3.3	Alternative 3	80
12.4	Mitigation & Enhancement	80
12.5	Predicted Impacts & Effects	81
12.6	Evaluation of Effects	82
12.7	Summary and Conclusions	82

	PAGE NO.	
13.	CARBON	82
13.1	Introduction	82
13.2	Current Situation	83
13.3	Implication of Deforestation	84
13.3.1	Tree Felling	84
13.3.2	Soils	84
13.4	Mitigation	84
13.4.1	Onsite Tree Planting	85
13.4.2	Offsite Tree Planting	85
13.5	Summary and Conclusions	85
14.	SUMMARY OF MITIGATION & ENHANCEMENT MEASURES	85
14.1	Introduction	85
14.2	Geology, Hydrology, Soils and Drainage	85
14.2.1	Ecology & Nature Conservation	86
14.2.2	Habitat Restoration	86
14.2.3	Mammals	86
14.2.4	Reptiles & Amphibians	86
14.3	Birds	87
14.4	Red Squirrels	87
14.5	Social & Economic Impacts	87
14.6	Landscape	88
14.7	Cultural Heritage	88
14.8	Traffic & Transport	88
14.9	Carbon Sequestration	88
14.10	Summary and Conclusions	89

LIST OF TABLES

Table 1 - Current species composition of Forest	17
Table 2 - Ecology & Nature Conservation – mitigation incorporated into the deforestation	47
Table 3 - Ecology & Nature Conservation – effects and Valuation of significance	49
Table 4 - Birdlife – Schedule I & Red/Amber list species Seen during course of survey	53
Table 5 - Timber markets	71
Table 6 - Landscape – Summary of visual effects	76

VOLUME 2 : MAPS AND REPORTS

MAPS

Map	1	Rights of way and access
Map	2	Geology of the Cheviots
Map	3	Soil types of the Cheviots
Map	4	Geology at Threestoneburn
Map	5	Soil types at Threestoneburn
Map	6	Hydrology
Map	7	Species Map
Map	8	Surrounding land-use
Map	9	Proposed riparian planting in forest
Map	10	Proposed planting in Langleeford Valley
Map	11	Proposed planting at Earle Hill & Brownslaw
Map	12	Proposed planting at Kirknewton Torrs

APPENDICES

Appendix 1	Location map
Appendix 2	SSSI citation & Phase I Vegetation survey
Appendix 3	Botanical Survey
Appendix 4	Breeding Birds Survey
Appendix 5	Mammal Survey
Appendix 6	Reptile & Amphibian Survey
Appendix 7	Red squirrel Survey
Appendix 8	Archaeological Report
Appendix 9	Landscape Report Landform Appraisal Design Concept Assessment of Significant Views 1-5 Photomontage & Viewpoint directions map Replacement Planting Proposals
Appendix 10	Carbon Sequestration Report
Appendix 11	Outline Habitat Management Plan
Appendix 12	Forestry Commission and Consultees' Letters
Appendix 13	Northumberland/National Park BAP
Appendix 14	Wooler Common Habitat Restoration Project
Appendix 15	Black grouse conservation in the North Cheviots
Appendix 16	Scoping Report
Appendix 17	FC Restructuring Proposals
Appendix 18	Forest Roads & Quarrying
Appendix 19	Deforestation Method Statement
Appendix 20	Deer Management
Appendix 21	Hydrology Survey
Appendix 22	EU Habitat regulations – Guidance and Checklist
Appendix 23	Climate Change Information

1. INTRODUCTION

The purpose of an Environmental Statement is to assist the Felling Licence Application (FLA) consultation process. An Environmental Statement provides information on the likely environmental effects of a development. This facilitates objective assessment of the proposals by the Forestry Commission, the consultee`s and other interested parties.

This Environmental Statement has been prepared in accordance with the Environmental Impact Assessment (Forestry) (England & Wales) Regulations 1999 (SI 1999/2228), developed from the European Community Directive No. 97/11EC.

An Environmental Impact Assessment was called by the Forestry Commission because;

- The project contains proposals for large scale deforestation, with associated road construction and quarrying.
- The area contains three scheduled monuments.
- The project abuts an area of special scientific interest.

These key issues to be addressed within the assessment were identified and agreed as;

- The effect on landscape and wildlife
- The release of carbon from deforestation and associated work
- The effect on head water quality and quantity

Please see the Scoping Meeting minutes and consultee`s correspondence in Appendix 12

1.1 Terminology

The terms ‘impact’ and ‘effect’ are often used synonymously and this can lead to confusion. For this assessment they have been defined as follows:

- **Impacts:** any changes attributable to the proposed development that have the potential to have environmental effects (i.e. they are the causes of the effects);
- **Effects:** the results of the changes for specific environmental resources or receptors;
- **Mitigation** is categorised as follows:

- **Avoidance:** measures taken to avoid impacts which could have adverse effects, such as locating the main development and its working areas and access routes away from areas of high nature conservation interest, fencing off sensitive areas during the construction period, or timing works to avoid sensitive periods;
- **Reduction:** measures taken to reduce impacts that could have adverse effects e.g. modifications or additions to the design of the proposals, such as the creation of silt traps to prevent polluted water from running directly into important water courses;
- **Compensation:** measures taken to offset/compensate for residual adverse effects that cannot be entirely mitigated. These usually take the form of replacing what will be lost e.g. the translocation of existing vegetation to another site, the restoration of damaged or badly managed habitats, or the creation of new habitats.
- **Enhancement:** the genuine enhancement of environmental interest e.g. improved management of established habitats, or the creation of new habitats over and above what is required for mitigation and compensation.

Some disciplines adopt slightly different terminology and/or definitions e.g. landscape assessment, and where this departs from that given above this is noted in the relevant technical chapter.

1.2 Project Team

- John Steele
Environmental Consultant specialising in bird and mammal surveys
- Dr Peter Lurz, from Newcastle University
Red squirrel population modelling and translocation feasibility study
- JBA Consultancy – Hydrology surveys
- NRM Laboratories – soil and water sampling
- Liz MacIntosh – Landscape architect
- ECCM;
UK leading experts in field of carbon sequestration in trees and related topics
- STS Surveys;
Environmental consultants specialising in red squirrel surveys and monitoring
- Doug McCutcheon
Environmental consultant specialising in botanical surveys.
- Ian Robinson (MICFor)
Senior manager with Scottish Woodlands Ltd, responsible for preparation of this Environmental Statement.
- Tim Matthewson (BSc(hons) Agriculture)
Technical manager working for Lilburn Estates, assisted in the preparation of this ES and prepared all maps.

2. SCOPING

2.1 Introduction

Scoping is the process of identifying those aspects of the environment and the issues that need to be considered when assessing the effects of a particular development proposal. There is formal requirement to consult as part of any Environmental Impact Assessment (EIA), but it is also good practice to engage in informal scoping with consultees in parallel with the formal process. This invariably has the effect of the scope evolving during the process.

2.2 Formal Scoping

Under the Environmental Impact Assessment (Forestry) (England and Wales) Regulations 1999 a formal opinion was sought from the Forestry Commission in February 2007 in order to ensure that this Environmental Statement (ES) was necessary. Once the requirement for an ES was confirmed on 9 February 2007 a list was collated of interested parties to be invited to a scoping meeting (Appendix 16).

2.2.1 Scoping Meeting

A formal scoping meeting was held on Tuesday 6 March 2007 at Ilderton Village Hall, Wooler, Northumberland. At this meeting 19 individuals were present including representatives of Lilburn Estates, Scottish Woodlands, Forestry Commission, Ilderton Parish Council, Ingram Parish Council, Northumberland Wildlife Trust, Northumberland National Park Authority, and Game Conservancy Trust as well as three neighbouring land owners.

2.2.2 Issues Raised

The following issues were raised at the scoping meeting by either those attending or invitees who had sent a written response to the invitation (See Appendix 16).

- Access routes to site for timber haulage
- Traffic impact and disturbance
- Red squirrel conservation
- Breeding birds
- Botanical interest of site
- Landscaping effect of proposals
- Future public access provision
- Restoration methodology
- Deer management
- Archaeology

The scoping meeting was minuted and copies of the minutes were circulated to all attendees and invitees who could not attend (See Appendix 16 Scoping Report)

2.2.3 Additional Scoping

After the scoping meeting minutes were circulated to all attendees, the Forestry Commission then wrote to all of the people who had originally been asked to consult to give them a further opportunity to raise issues of concern that could be addressed in the ES.

This solicited additional responses from the RSPB, Natural England, Environment Agency and the Forestry Commission themselves.

The following additional issues were identified to be addressed in the ES>

- Carbon sequestration
- Hydrological Impact of Proposals
- Timber marketing implications
- Schedule I bird conservation measures
- Emergency planning provision

2.2.4 Summary

It was agreed that the items raised at the scoping meeting as well as those listed above would be the main points of concern to be addressed by the ES.

3. SITE SELECTION AND ALTERNATIVE PRESCRIPTIONS

3.1 Introduction

The client has considered two possible alternative land uses for the property after its acquisition and prior to the preparation of these proposals. Both of these options could potentially be viable alternatives in terms of economic and environmental criteria.

3.2 Alternative Proposals

The two options under consideration are described in detail below and the arguments for and against described.

3.2.1 Conifer Forest

The first option considered was in effect the “No Project” option. This would see the retention of the forest as a predominantly conifer plantation. Currently the property consists of 568 ha of conifer plantation, 129 ha of unplanted hill ground, largely consisting of blanket bog and heath-land as well as 13 ha of unimproved pasture and 2 ha of native broadleaves, planted by the Forestry Commission (FC) 6 years ago.

The conifers, which predominantly consist of Sitka spruce, were planted between 1967 and 1982 and many of the older crops are ready for felling now with the majority of the remainder being felled in the next 10-15 years.

If the forest was to be maintained as conifer plantation it would be restructured over the course of the next 20 years, as all of the present crops would be ready for felling. A Forest Design Plan, including a description of the restructuring was prepared by the FC in 1999 showing the proposed felling plans, replanting incorporating landscape improvements and new species proportions in the second rotation (See Appendix 17 for details).

This plan can be summarised as follows:

Begin felling in the period 2007-11 and over the course of the next 20 years all of the conifers in the forest would be clear felled. The felling was to be phased with similar sized areas being felled in each 5 year period.

The restocking proposals showed the area of conifers being reduced significantly as the tree line was moved further down the hill, riparian corridors opened up and planted with native broadleaves and a mosaic of black grouse habitat created on the northern fringe of the forest.

At the time of preparation this re-design of the forest was thought to provide significant landscape and conservation benefits, however when the proposals were presented for consultation they were rejected by the Northumberland National Park Authority (NNPA) who felt that Threestoneburn Forest should be considered as a one rotation forest. This was in keeping with the NNPA policy at the time who wished there to be a reduction in the amount of isolated conifer blocks in the northern part of the park.

Due to changes in guidance and based on current ecological and landscape considerations if the forest was restructured beginning in 2008 it is likely that significant additional open space, beyond that proposed in the original Forest Design Plan would have to be created, as all of the areas of blanket bog originally planted by the Forestry Commission would be restored to open ground and wider riparian zones and increased open space around archaeological features created. An indicative restocking map, following this model has been prepared and this can be seen and further described in Appendix 17 – Forest Design Plan. In summation however this would have meant that the area available for replanting would have been reduced to ca. 275 hectares.

The benefits of choosing this option can be summarised as follows:

- The operational phase of the work would be spread over approximately 20 years. This would mean a reduced short-term impact on local residents and potentially less disruption to the wildlife currently inhabiting the forest.
- The majority of the most valuable conservation habitats in the forest, such as the blanket bog would be restored.
- Forest design issues, such as landscaping improvements would be partially addressed.

However there would be disadvantages in choosing this option that can be summarised as follows:

- The long-term viability of a 275 ha commercial conifer forest at the end of a 5km access road would be questionable. A considerable amount of money would have to be spent on maintaining the external access road and internal access roads in the longer term to facilitate lorries being able to remove timber from the forest.

- The environmental benefits of this option would be reduced as a reduced area would be restored to moor-land. This would have the knock-on effect of limiting the realisation of HAP and SAP targets, both nationally and locally in respect of species such as black grouse, grey partridge and upland waders and habitats such as heather moor-land.
- As the felling of the first rotation would take place over 20 years there would be a sustained period of disruption to local residents and road users.
- It may well be more difficult to restore the most valuable habitat on the site as part of a partial restoration process. This would be particularly relevant concerning drainage system disruption to heighten the water table as part of the blanket bog habitat restoration process.
- One of the key issues regarding landscape design was the need to rationalise the grazing regime either side of the current property boundary to eliminate the vegetation type “tide mark” This would prove more difficult to achieve if this option was preferred.
- The adjacent land surrounding the forest is all intensively managed grouse moor, with resultant high conservation value. If the forest was to be retained, even at half the current area it would be impossible to fully integrate its` management with the surrounding land-use, as it would harbour predatory species such as crows and foxes which would have a severe impact on the moor-land bird species.

3.2.2 Moorland Restoration and Riparian Native Broadleaves

This alternative would see the forest be converted to a mosaic of open moor-land and riparian native broadleaves take place over 3-4 years. As areas of conifers were felled and the timber and brash removed, drains would be blocked to raise the water table and re-wet the peat bogs and where possible the stumps would be mulched to help speed up the process of conversion to modified blanket bog and dry/wet heathland. This procedure was used to great effect at Wooler Common (See Appendix 14) where 158 ha of pole and thicket stage conifer plantation was converted to heath-land between 1999 and 2001. The heather re-growth was very rapid and the area is now a productive grouse moor with all of the associated conservation benefits to upland waders, black grouse and other moor-land birds.

Riparian zones would be replanted with Native broadleaves both within the former forest area and on adjoining land to compliment the existing and increase the conservation and landscape benefits of the area.

The process of conversion to moor-land and riparian broadleaves and the after use of the site are described in detail in Appendix 11-Outline Habitat Management Plan.

The habitat restoration and enhancement and the benefits to the species on conservation concern would help achieve both regional and local Habitat and Species Biodiversity Action Plan targets.

The benefits of choosing this option can be summarised as follows:

- The process of habitat restoration is both complete and speeded up. A significant contribution can be made to the meeting of HAP and SAP targets in respect of black grouse and upland waders as well as blanket bog re-instatement.
- The short time frame of the operation (3-4 years) would see disruption over a short period of time and in the longer term no timber lorry traffic on the access road again.
- The minimum amount of infrastructure required can be employed as the harvesting would be a “once –off” operation. The post harvesting infrastructure would not have to be maintained to facilitate lorry traffic and in due course could be allowed to “green-over”.
- It would be possible to fully integrate the land management of the site after deforestation with the surrounding land-uses.
- The landscape design mistakes of the past can be fully addressed and the grazing regimes either side of the boundary running up Hedgehope Hill can be managed to eliminate the distinctive vegetation “tide line” (See appendix 9).
- This option offers the opportunity to replace the current forest, whose sole primary function is timber production with well designed multi-purpose woodlands that can offer significant conservation, recreational and landscaping improvements. These woodlands which would be similarly sized to the proposed replanting area in option 3.2.1 would be partly onsite, on adjacent land and elsewhere to offer a fuller compliment of objectives.

The disadvantages of choosing this option can be summarised as follows:

- The 3-4 year operational phase would see localised disruption to local residents, particularly on the access route.
- Species such as red squirrel would be adversely affected by the proposals.

3.3 Summary and Conclusions

The preferred option which is described in greater detail in the remainder of this document and the accompanying appendices is option 3.2.2 which sees the rapid deforestation of the site and its` conversion to moorland and riparian native species planting. Whilst option 3.2.1 would have facilitated some increase in conservation benefits they would have been limited and would not have contributed fully to Habitat and Species action plans. In particular the longer time frame would have meant that the restoration of the peat bog habitat would have taken much longer with a resultant possible loss in biodiversity on the site. Bearing these factors in mind it is felt that option 3.2.3 the more rapid transformation of the site to moor-land best suits the objectives of the client, with greater environmental gain in the short term.

Therefore this is the preferred option with due consideration being given to the environmental impacts of this proposal in further chapters of this document.

4. THE PROPOSALS

4.1 Location

The forest is situated 10km to the south-west of Wooler in North Northumberland on the eastern flank of the Cheviot Hills.

Please see location map in Appendix 1 for the location of the property.

The access to the Site is via the unclassified minor public road from Brandon Whitehouse on the A697 leading up the Breamish valley via the hamlets of Brandon and Reaveley to Calder Farm. From here a private access track leads west to the forest over land belonging to Roddam Estates and Ilderton Dodd Farm.

4.2 Description of the Proposals

The site comprises 712 ha of Threestoneburn Forest, which is situated 10km south-west of Wooler in North Northumberland.

Analysis of the current forest composition is set out in Table 1 below:

Table 1

Current Species Composition of Forest

Species	Area (ha)	%
Sitka spruce	521.9	73.3
Lodgepole pine	35.2	4.9
Japanese larch	10.7	1.5
Native broadleaves	2.0	0.4
Open ground	128.9	18.1
Agricultural land	13.3	1.8
Total	712	100

The species map Ref. Number 7 illustrates the current forest composition.

4.3 Forestry Operations

At Threestoneburn it is intended to deforest approximately 568 ha of land currently supporting forestry plantations (Table 1). The oldest areas to be felled were planted in 1967 with the balance planted between 1971 and 1982. With the exception of an area of Lodgepole pine and some localised pockets of Sitka spruce that has been suffering from heather check all of the conifers have grown well with many of the Sitka stands approaching terminal height.

There are approximately 150,000 tonnes of merchantable timber in Threestoneburn Forest and approximately 50,000 tonnes of brash will be produced during felling. The predicted rate at which timber could be harvested is 500 tonnes/week for each of the three harvester/forwarder units it is intended to use, resulting in an approximate 36 month duration of felling and brash recovery operations.

Harvesting operations would be carried out to the UKWAS (UK Woodland Assurance Scheme), with all works compliant with the Forestry Commission's Forests and Water Guidelines. Across the site a combination of harvesting methods will be employed. On the drier areas a whole tree harvesting system will be employed, with the timber and brash being further processed at roadside. On the wetter areas wheeled or tracked harvesting machinery with a low ground pressure will be used to avoid undue compaction of the peat surface. Trees will be felled to a low stump which will be left *in situ*, and brash will be deposited in front of the forwarders to act as mats to protect the peat surface. This brash matt will protect the peat from disturbance and help with flotation. After completion of the harvesting operations those brash mats that are not possible to retrieve will be mulched along with the stumps.

It is proposed to upgrade the existing road formations so that they can be utilised for timber lorry access as well as carrying out some new road building. Most of the new sections of road will be situated on existing forest rides but some short sections will necessitate tree felling and timber recovery. Merchantable timber will generally be extracted to the nearest existing roadway. Forwarders running on brash mats will remove harvested material from the forest to the forest road network. From here, harvested material will be uplifted by timber lorries, and dispatched to market.

(See Method Statement in Appendix 19)

One of the principal nature conservation opportunities offered by the proposed removal of conifers from the site is the restoration of the deforested land to modified blanket bog and upland heath-land vegetation. This is a major theme in the Outline Habitat Management Plan, and because it has rarely been tried on such a large scale before, it is intended to take the opportunity to explore the benefits of different harvesting methods and post-harvest management techniques.

The techniques chosen will depend on site conditions, weather conditions and the time of the year that the work takes place. Monitoring the results of these differing techniques will provide important data to inform future deforestation and restoration projects. Methods of blocking drains in order to assist rewetting of the peat soils will be determined with experts in peat land restoration on site after felling has finished.

In the relatively small areas where the trees are not of merchantable size (Cpts 3056a) they will be chipped to waste. There are only approximately 22 ha of non-merchantable trees to be treated in this way, comprising poorly grown Lodgepole pine and Sitka spruce suffering from heather check.. The estimated volume of chippings is less than 30m³ ha and the chippings will be spread across the site avoiding areas with sensitive ground vegetation.

The timber from Threestoneburn Forest could exit from the forest onto the hill road leading to the east and meeting the council road at Calder and from there head south via Reaveley and Brandon joining the A697 at Brandon White House. The destinations for processing timber may include Lockerbie, Middlesborough, Hexham, Durham and the nearest local sawmill at Wooperton. The hill road leading to the forest will in parts require upgrading prior to commencement of the operations and some improvements to the short stretch of county road between Calder and the old sand quarry at Reaveley Greens would also be required.

Further information on the treatment of the deforested land following harvesting is outlined in Section 5 and in Appendix 19

4.4 Forest Road Construction and Upgrading

4.4.1 Site Access

At present access to the site is from the minor county road at Calder (See location Map) using the access road heading west to the forest via Calder and Ilderton Dodd farms. Further details relating to the movement of traffic on and off the site can be obtained in Chapter 11 Traffic and Transport.

4.4.2 Layout Design

There are various constraints which have influenced the track layout design, some generic and some site-specific.

- Track length should be kept to a minimum to reduce construction time, roadstone requirement and environmental impact.
- Gradients must be kept to less than 1:8 to allow construction plant and timber lorries to move safely round the site.
- Track layout should be designed to reflect contours and avoid cross slopes and deep cuts into existing terrain.
- Tracks should be routed to avoid sensitive ecological and archaeological features.
- The number of new crossing points over the watercourses should be kept to a minimum.

The final track design, that is shown on the map in Appendix 18, resulted from optimisation of these criteria.

Within the forest itself an estimated 6.4 km of track will need to be upgraded and 1.6 km of new access tracks be created to facilitate the proposed felling operations. This is very similar to the proposals drawn up by FC in their assessment of the improvements required to allow the harvesting and restructuring of the forest over the next 20 years.

4.4.3 Construction Methodology

The tracks will be primarily of a conventional forest road type design (See Appendix 18) for specification. Where the existing roads need upgrading the roadside drains will be cleaned out and silt traps added as required. Additional stone will be quarried on site and the depth of stone increased to improve the bearing capacity of the road (See photographs in Appendix 18).

Where new roads are required this is predominantly on areas of heath, where a `Terram` mat will be layed , road side drains created and stone imported from the quarry to create a suitable Forest road.

The access track leading from the council road to the forest gate also requires improvement. This includes widening, creation of passing places and bridge strengthening (See Appendix 18). The tracks have been designed to cope with articulated timber lorries with a gross vehicle weight of 44 tonnes and will give a minimum depth of 0.6 m and a width of 4 m.

4.4.4 Stone Requirement

The roads to be upgraded will require 15000 tonnes of roadstone and the new roads will require 12500 tonnes. Therefore approximately 27500 tonnes of stone is required to carry out the necessary road improvements to facilitate the operations. This stone requirement will be a combination of sub-base and Type 1 for surfacing.

4.4.5 Source of Roadstone

It is conventional to open borrow pits to win stone for track construction in forests. At Threestoneburn the FC opened up two borrow pits when they constructed the existing forest roads in the late 1960`s and early 70`s. The location of these borrow pits is identified in Appendix 18.

Within the sites of these old borrow pits there are ample supplies of suitable rock to carry out the proposed roading. The underlying geology is andesite which is ideal for road building. Once all of the necessary stone has been sourced from the quarries they will be decommissioned. This will involve landscaping and re-profiling where required.

4.4.6 Construction Plant

It is the intention of Lilburn Estate to undertake the quarrying and road upgrading/ creation themselves using their own men and machinery. Roadstone will be quarried using tracked excavators and put into an onsite crushing plant within the existing borrow pit area where it will be crushed and stockpiled. Plant for forest construction will consist of excavators, tractor and trailers, bulldozers and road rollers.

4.5 Habitat Management and Enhancement

The proposed conifer removal and subsequent native broadleaf planting and blanket bog and heath-land restoration proposed at Threestoneburn can offer significant opportunities for the conservation and enhancement of biodiversity.

A number of national and regional bio-diversity action plan targets can be subject to a positive gain. In particular the habitat action plans in respect of blanket bog, heather moorland and native woodland as well as species action plans in respect of black grouse and upland wading birds.

An Outline Habitat Management Plan (OHMP) has therefore been prepared to guide the development and management of the site. The main nature conservation objectives of the OHMP are:

- to maintain the existing open blanket bog and moorland habitats;
- to extend the area of blanket bog and heathland
- to create new habitats of nature conservation value

The main opportunities for the creation of new habitats of nature conservation value are provided by the deforestation of the forestry plantations and by the planting of native broadleaves, primarily in the riparian zones.

In general, the aspirations for the existing areas of forestry are to:

- remove all of the conifer plantations;
- encourage natural regeneration of ground vegetation and scrub;
- increase the area of broad-leaved woodland;
- retain features of nature conservation interest e.g. ponds.

The precise recommendations for each area of the forest depend on the vegetation present before afforestation, the current vegetation, the soil type and the existing and intended use of the land by the owner. These recommendations are detailed in the Outline Habitat Management Plan (OHMP).

As noted in previously, there is great potential for habitat creation following deforestation. The general objective is to create modified blanket bog/heath land/wet grassland with careful control of grazing and water levels to ensure that flooding is controlled. This will grade into the existing blanket bog, heathland and wet grassland vegetation which were never drained and afforested.

5. GEOLOGY, HYDROLOGY, SOILS AND DRAINAGE

5.1 Introduction

This section describes the water environment at Threestoneburn and assesses the effects of the proposals, considering the groundwater and surface water features within and surrounding the site. It also considers the impacts on soil and geological resources within the site, since these are significant on the sites hydrological regime as well as being important in terms of the environment.

The assessment considers impacts through the phases of the operation and within the context of the study land use changes are investigated.

5.1.1 Methodology

This is primarily based on collection of a wide range of data and published material, as well as consultation with statutory bodies such as the Environment Agency (EA).

Guidance material includes the following:

- Met Office records
- Soils of the Eastern Cheviots
- Planning and Flooding NPPG7
- Groundwater regulations 1988
- Geology of the Eastern Cheviots (British Geological survey)
- Environment Act 1990
- EA Pollution Prevention Guidance Notes
- EC Fisheries Directive
- Forestry Commission ` Forests and Water Guidelines`

In addition in April 2008 JBA Consulting were commissioned to undertake a hydrology survey of the Threestoneburn Forest site and to assess the impacts of the proposed deforestation on stream water quality and on the downstream flood risk. Extracts from the report are noted in the following section and the full report can be seen in Appendix 21.

5.2 Baseline Description

5.2.1 Existing Situation

This section describes the existing hydrological and soil baseline conditions at the site at present.

5.2.2 Climate, Rainfall and the Possible Impact of Climate Change

Based on current (2007) published reference data the site is classified as having a climatic type which is defined as `exposed with rather severe winters`. This largely relates to the elevation of the site in comparison with the surrounding area.

The 8 year average annual rainfall is 828 mm and this combined with the annual evaporation loss reflects a relatively wet climate.

It is unlikely that evaporation would be significantly limited by water availability since rainfall is expected to exceed evapo-transpiration during

most of the year. The outcome of this would be that ground conditions would remain wet in an average year providing a constant base flow to the tributaries on the site.

Climate change may have an impact on the site after deforestation. Recent scientific research estimates a possible increase in the average temperature in the North-east of England by 1.5 – 4 degrees C by 2080. There is also likely to be lower summer and higher winter rainfall. The combined effect of this could be the growing season being lengthened by up to 100 days.

In the longer term how this increase in temperature and annual rainfall will effect the proposed deforestation and restoration of the peat lands at Threestoneburn can best be summarised as follows.

The water balance of an intact peat bog (input=output) may be simply described as follows:

Precipitation = Evapotranspiration + surficial runoff + lateral discharge + vertical

In 2002 English Nature published a report on Climate Change Impacts on Raised Bogs (CHIRP). This was a case study of the heavily modified Thorne and Hatfield Moors SSSI located in South Yorkshire/Humberside.

The full report can be found in Appendix 23 but in summation it is thought that the predicted climate change will not adversely affect blanket and raised bog formation and the indicative plant communities found on them. Although the higher mean temperature and lower summer rainfall will cause summer drying, this will be mitigated by the higher autumn and winter rainfall ensuring that there is no moisture deficit. The report also concludes that management systems can also be utilised to maintain a high water table where bog land restoration is underway.

(See CHIRP report in Appendix 23)

5.2.3 Geology and Soils

The site lies over acid volcanic rocks from the Upper and Lower Devonian period ca. 380 million years ago.

The western portion of the forest is predominantly granite formed by volcanic activity and the eastern part is andesite a volcanic rock formed from lava flows. (See maps 2, 3, 4 & 5).

There are small pockets of Glacial Till located in parts of the site. This largely consists of unconsolidated sand and gravel.

The soils range from unflushed deep peats between the hilltops through shallower flushed peaty gleys over a podsolic subsoil, to shallow podsolic

(gleys and loamy) soils. On the lower reaches of the burns the soils are upland brown earths. Soil nutrients (SNR) range from very poor to rich, and soil moisture (SMR) from very wet to slightly dry (as defined by Ecological Site Classification: Technical Paper 20, Forestry Commission, 1997).

5.2.4 Elevation and Aspect

The Forest has a predominantly north-easterly aspect and sits to the east of Hedgehope and Dunmoor Hills, partly in a bowl.

The highest elevation is the summit of Hedgehope on the extreme western edge of the property at 714m with the lowest elevation in the north-east corner adjacent to the Threestoneburn at 305m

The tree line on the slopes of Hedgehope and Dunmoor hills is at ca. 550m.

5.2.5 Hydrology

The Site is solely within the catchment of the Lilburn Burn, which in turn is a tributary of the River Till. There are several small burns draining the property the most notable being the Threestone burn, from which the property is named. These burns all flow to the east.

When the forest was planted by the FC it was ploughed and drained in accordance with the standard guidelines at the time. Although most of the drains feed into the natural water courses the passage of time has meant that many of the drains are now vegetated reducing peak flows into the watercourses. In addition the main watercourse has a considerable buffer zone of unplanted land along side it which is fully vegetated with grass, heather and rushes further reducing the flow of water from the man made ditches before it reaches the water courses.

5.2.6 Water Quality

No information is currently held by the EA on water quality for the site or within a 2km radius.

There is however a concern expressed by the EA regarding an increase of Phosphorus levels in the River Till catchment. This is part of a wider problem within the whole river catchment and in particular where riverbanks are being eroded and lowland soils rich in Phosphorus are dissolving into the river. The soils at Threestoneburn are generally upland soils likely to be deficient in Phosphorus so this should not be a particular problem.

However as a result of discussions with the EA prior to the commencement of the felling operations a baseline survey will be carried out to ascertain the present quality of surface waters to include the analysis of Ammonia(NH₃), Phosphorus (P), as well as pH, colour and suspended solids.

The Hydrology survey (See Appendix 21) contains water sampling data on pH, Biochemical Oxygen demand, Dissolved Oxygen, Suspended solids,

Ammonial-nitrogen, Phosphate, Aluminium, Iron and Potassium. In general it was found that at present the watercourses in the property is of good quality.

5.3 Mitigation and Enhancement

Potential impacts on the ground and water environment were identified in the JBA report. They arise in relation to the construction of access roads and associated quarries, forestry operations and habitat management/restoration. This section describes the mitigation and enhancement measures proposed in relation to these operations.

5.3.1 Road Construction & Quarrying

Approximately 6.4km of existing roads are to be upgraded and 1.6km of new road created, necessitating the extension of 2 existing quarries.

The roads will be of a design suitable for the ground conditions and expected timber lorry loads. Provision of roadside ditches and lateral drains will be limited to those areas where tracks run across slopes and there is a risk of water ponding on their uphill sides. Access roads will be constructed with a camber so that water is quickly shed from them. This is especially important on peat soils to keep them wet and to ensure that water flow is not channelled along tracks, thus leading to erosion of their surfaces. Where access roads are over mineral soils, sustainable roadside drainage measures will be incorporated to provide temporary runoff storage and reduce rates.

Where new roads need to cross watercourses permission will be sought from the EA and a standard construction using concrete culverts will be used. Limited bank stabilisation will be undertaken on either side of the crossing point to prevent bank erosion.

5.3.2 Forestry Operations

Approximately 5.6 km² (568 hectares) of forestry plantation will be felled to restore the site to moorland/native broadleaves. This will result in changes in the runoff regime at the site. In particular, the removal of trees will reduce rainfall interception and evapo-transpiration rates leading to possible increase in runoff and consequently stream flow. The precise effects of tree removal on runoff in upland areas are still not certain due, amongst other things, to land management practices within forestry plantations which can increase runoff, as discussed in Section 7.2.1.

The Forestry Commission and the Environment Agency have indicated that there are possible flooding issues downstream of the site. As a result these organisations would not wish to see significant increases in stream flow exacerbating flooding risks downstream. This is supported by guidance in the form of NNPPG7: *Planning and Flooding* which states that developments leading to increases in flooding risks should be managed in an environmentally sustainable manner.

Whilst one development alone may not lead to significant increases in runoff, the EA and the local authorities need to consider the cumulative impacts of

proposed developments within a catchment which, collectively, could have a significant impact on flows. Consequently mitigation measures need to be implemented to ensure that increases in runoff from the site can be controlled.

Research into changes in runoff due to deforestation of forestry plantations does not currently provide sufficient information to accurately predict increases in downstream flood flows.

However, there is general consensus within the hydrological literature that the presence of forestry plantations has little effect on floods with a higher return period, such as the 50 year (*a flood with a return period of 50 years, known as a 50 year flood, is one of a magnitude that has a 1 in 50 chance of occurring in any particular year*) or 100 year flood, or even the 10 year flood. Under such conditions it is considered that the interception capacity of the forest canopy will become exhausted (McCulloch et al 1993, Maitland et al 1990). Forestry plantations are likely to influence only smaller magnitude floods, and Robinson and Newson (1986) suggested that flood-producing storms which exceeded the mean annual flood would be too intense for forestry to have any appreciable influence on runoff. This perhaps explains why the Flood Studies Report (Institute of Hydrology 1975), and the recent revision of the Flood Estimation Handbook (Institute of Hydrology 1999), which represent a major UK wide review of floods, found that forest cover on catchments was not a significant variable in explaining regional variability in flooding (Maitland et al 1990).

There are no direct studies of the short term impacts of clear felling of forestry plantations on flood flows that can be readily applied to this site. However, the Forest and Water Guidelines (Forestry Commission 2000) indicate that the presence of a mature forest can decrease flood flows by 10% in comparison with an area with ground vegetation only. In this case, clear felling means that the ground surface will be temporarily without vegetation and hence there could be a short term increase in peak flows greater than 10%.

Prior to the commencement of the deforestation, a drainage management plan for the site will be developed and this will identify the available storage provision to be provided through a range of measures. Firstly it is proposed to restore much of the felled area to wet modified bog, with the aim of regenerating the peat soils and holding as much water as possible within the site. Further details for the restoration of the site are discussed in the Ecology chapter (Chapter 6). The Outline Habitat Management Plan proposes, where it would serve to retain water on site, to block drains on the deforested area in order to create a flood storage capacity, and maximise the potential for peat re-wetting.

Should additional storage be required, this would be provided through the incorporation of appropriate measure identified in the latest guidance from

Environment Agency and the CIRIA Design Manual for SUDS (CIRIA 2000), and could include shallow depressions and infiltration drains or even flood balancing ponds.

Best forestry working practices will be adopted, as described in the following Forestry Commission documents, to reduce soil erosion and minimise effects on water quality:

- Forests and Water Guidelines 2000:
- Forests and Soil Conservation 1991:

With the adoption of these measures it is envisaged that sediment erosion and entrainment in runoff can be controlled at least to a level comparable with existing rates of erosion occurring beneath the forest canopy.

The removal of the forestry plantations will result in the removal of the aerodynamic resistance of the trees, and thus there will be reduced deposition of atmospheric pollutants through wet (e.g. cloud and mist droplets) and dry deposition. This will reduce the likely acidification of watercourses in the long term though may result in a short term increase as not all of the brash is not removed off site (Maitland et al 1990). The distribution of brash over felled areas could lead to the leaching of nutrients, stored in the brash material through nitrification.

This could lead to nitrate increases in watercourses and, depending on the buffering capacity of soils and near surface geology, short term increases in acidification may be experienced. Increases in acidification may lead to an increase in aluminium leaching of metals held in the soil and near-surface geology.

However, in the long term a reduction in acidification should occur as the deposition of pollutants will be reduced due to the loss of the forestry cover. Mitigation to control water quality changes will be based on best working practice as advised by the Forestry Commission in the Forests and Water Guidelines (Forestry Commission 1991).

Any water quality changes are unlikely to present a risk to the private water supply for Threestoneburn House. This source is from groundwater and any surface water changes in water quality are likely to be buffered by the underlying strata, so that changes in the quality of these private water supplies are very unlikely. The predicted changes in runoff regime are also not expected to affect the quantity of supplies.

5.4 Post Deforestation Phase

The restored site has the potential to affect the water environment beyond the deforestation phase resulting in the need to develop longer term sustainable mitigation strategy.

5.4.1 Access Tracks

The proposed mitigation for the potential impacts of the access tracks on hydrology and soils was described under the construction phase, and will continue to function throughout the operational phase of the site. Methods incorporated into the scheme are designed to be sustainable and to cope with very large storm events. Therefore only routine maintenance is envisaged for the track and drainage network within the site after the operational phase. All of the proposed new roads and upgraded roads are to become permanent features. There are no plans to decommission any of the infrastructure once the deforestation process is completed, although the quarries will be landscaped where necessary. The road infrastructure will be used for agricultural and sporting/conservation management of the area in the future.

5.4.2 Land Use Changes

The potential impacts and proposed mitigation to control adverse effects of the forestry plantation removal have been discussed under the operational phase. The mitigation measures adopted during this phase will continue through to operation. It is expected that the increases in runoff following the clear felling of trees will reduce as the site re-vegetates and the peat soils being to regenerate. This will happen because although the peat soils, the structure of which will have been changed while under forestry plantations, are likely to revert back to pristine blanket bog, they should in due course develop an increased water holding capacity. In addition, as vegetation re-establishes there will be a progressive increase in evapotranspiration rate across the site. Nevertheless, peak flows are likely to remain higher than they are from site under forestry.

In the growing season following clear felling, an increase in vegetation growth across the site will lead to an increase in interception, infiltration and evapotranspiration, and this will decrease the runoff. Specific studies comprise peak flows under forestry plantations with, say, heather (which could cover much of the site after 10 years), are few and far between and there are few conclusions that have been drawn from these studies. The Forest and Water Guidelines (Forestry Commission 2000) indicates that the presence of mature forest as opposed to heather can lead to a decrease of 10% in peak flows, although this is a relatively crude assessment. Other studies confirm that the initial increase in peak flows decrease progressively following clear felling (Caissie et al 2002).

If these predicted reductions in peak flow are realistic then, conversely, increases in flood flows following deforestation and the establishment of a heather/grassland cover, could also be in the order of 10%. No further mitigation measure would be necessary during the post operational phase of the site, since sufficient storage capacity will have been provided on-site following the operational phase. Limited maintenance of any water storage features as they become overgrown with vegetation may be required over time, and this will be monitored throughout the operational phase.

Water quality is likely to improve as the absence of trees will lead to reduced atmospheric deposition of acidic pollutants and therefore reduced potential for acidification. In addition, leaching of metals, such as aluminium and manganese, could also reduce as a result of forestry removal. It is envisaged that total organic carbon loading will remain high since most of this is contributed by the peat.

5.4.3 Enhancement Measures

The hydrological regime will be modified in such a way as to ensure that the habitat restoration objectives can be achieved. This will primarily result in the increased storage of water to re-wet and regenerate the peat soils within felled areas. Keeping water levels constant through damming will provide a key role in restoration. Further details regarding the restoration of the felled areas to modified blanket bog are presented in the Outline Habitat Management Plan.

5.5 Predicted Impacts and Effects

5.5.1 Introduction

This section describes the likely impacts and effects following the mitigation and enhancement measures.

5.5.2 Access tracks

The track construction has been designed to ensure that compaction of the peat is avoided. The track construction will result in unavoidable changes to the hydrological regime, and in particular the way surface water runoff occurs over the site. These changes will, however, be limited in extent to places where access tracks run parallel to contours, and will be addressed by the construction of simple filter drains that will divert this runoff to open watercourses. During heavy rainfall events there is the potential for the erosion of track surfaces, which could lead to sediment input into watercourses having a slight adverse effect on water quality.

The construction of stream crossings will result in short term impacts on watercourses. The inclusion of culverts and the construction of tracks over watercourses will almost certainly result in the input of small quantities of sediment. In places this could consist of silt if channel banks are forced to slump. This sediment input is likely to have very little impact on water quality, if the preventative measures described previously are applied and maintained as necessary.

5.5.3 Forestry Operations

The felling operations will cause an increase in runoff but this increase will be mitigated by effective preventative measures to intercept silt by provision of silt traps and wide buffer zones between the drain outfalls and the water courses.

The predicted increase will increase stream flows under non-flood conditions and this will have a beneficial effect on the local watercourses during the summer months when flows are reduced. The benefits of this will be support of fresh water ecology.

During the forestry operations the quality of the water is to be monitored on a weekly basis. This monitoring will both assess the chemical composition of the water, particularly changes and also the amount of silt being carried in suspension (See JBA Consulting report in Appendix 21). Best working practices such as FC Guidelines will be followed at all times to ensure that the soil erosion potential is kept to a minimum and to prevent an increase of sediments into the water courses.

However if due to extreme weather conditions there is a risk of excess silt reaching the watercourses then operations will be suspended until the situation improves. Lilburn Estate staff will be undertaking the water sampling and monitoring the work site on a daily basis.

It is possible that in the short term levels of nitrate and acidification could increase. However these would be short term changes, since the removal of forestry cover would lead to long-term water quality improvements, as there would be reduced potential for atmospheric deposition of pollutants after deforestation.

The short term changes are not likely to affect the quality of private supplies.

5.6 Summary of Key Findings and Conclusions

This assessment highlights potential impacts, mitigation measures and residual impacts and assesses their significance on the water and soil environment. It considers impacts and their effects during the road construction phases and throughout the deforestation operation at Threestoneburn.

Most of the issues during the road construction and the operational phase have been evaluated to be of relatively minor significance or of no significance. This is as a result of the implementation of mitigation measures and other measures which will result in the enhancement of the site's environment.

There will be minimal disturbance to peat soils within the site, but all peat will be handled according to best practice.

The operations on the site will lead to changes in the hydrological regime. Most significant will be the removal of approximately 5.6 km² of forestry plantation. Under normal clear felling forestry this can lead to an overall increase in runoff. Within this scheme the proposals to restore vegetation to wet modified bog allow for an increased storage capacity of water within the site. Other measures such as shallow depressions and SUDS techniques will ensure peak runoff rates are not increased. However it is expected that increased yield will lead to increased base flow and this will support stream flows during average and low flow conditions, having a positive effect on freshwater ecology.

The possibility of short-term changes in water quality have been described in Appendix 21, though in the long term an improvement in water quality is expected. The flooding risks to downstream water courses, and private water supplies are predicted to be relatively minor.

Similarly erosion of soils and entrainment of sediment in stream flow is expected to occur in limited quantities during the operational phase of the project. The risk to water users, primarily the residents of Threestoneburn house is also expected to be minor since loading increases will be small. Private water supplies will be protected from these increases in sediment loading since they are predominantly from groundwater sources.

The inclusion of access tracks on site will also lead to slight changes in the hydrological regime. The tracks will be of a conventional forest road design that, by avoiding the cutting and compaction of soils, ensures that impacts and effects on peat soils and hydrology are kept to a minimum.

Drainage in peat areas will be kept to a minimum, and where access tracks are constructed over mineral soils, sustainable roadside drainage measures will be incorporated to provide temporary storage for runoff.

The critical factor in minimising the hydrological impacts of the proposals will be adherence to best practice (FC Forest and Water Guidelines) during the operational phase and stringent site monitoring by contract managers, supervisors and estate staff. In addition an ongoing programme of formal water quality monitoring will be instigated as described in the report contained in Appendix 21. Ultimately if there are freak weather conditions then the operations will be suspended until weather conditions improve.

6. ECOLOGY AND NATURE CONSERVATION

6.1 Introduction

This section describes the effects of the proposed development on the ecological and nature conservation interests of the site, with respect to vegetation, birds and mammals. Most of the proposed deforestation site consists of blanket bog and conifer plantation. Other habitats include acid grassland, neutral grassland, heathland, broadleaved woodland and marshland. The activities that will have most effect on the flora and fauna are felling of the coniferous plantation, access track construction and quarrying. This section describes and evaluates the current nature conservation interest of the site, presents the mitigation measures incorporated in the scheme design, and assesses the predicted residual effects of the proposed deforestation.

(PLEASE NOTE THAT THE ENVIRONMENTAL IMPACTS WITH REFERENCE TO BIRDS AND RED SQUIRRELS ARE IDENTIFIED IN CHAPTERS 7 AND 8 RESPECTIVELY)

6.2 Methodology

6.2.1 The Scoping Process

The scope of this assessment was derived from a general knowledge of the issues and the potential for nature conservation receptors to be significantly affected, combined with a consultation exercise. In addition to the formal response to the scoping report from the Forestry Commission, which incorporated comments on nature conservation, issues from several consultees, baseline data and opinions on the scope of the assessment and the methodologies to be employed were sought and received informally from a range of organisations. These included Natural England (NE), Northumberland Wildlife Trust (NWT), the Royal Society for the Protection of Birds, (RSPB), Northumberland National Park Authority (NNPA), Environment Agency (EA), Game Conservancy Trust (GCT) and the Vincent Wildlife Trust (VWT). Further information relevant for both the scoping process and the evaluation of the site was obtained through Internet searches, database searches and the Countryside Information System (CIS) (*Countryside Information System, version 6.0 (1999). Department of the Environment, Transport and the Regions.*

The net result was a scope that encompassed the following:

- a description of the habitats and vegetation, how it is proposed to manage these and an assessment of how they will be affected by the development;
- consideration of how the development would affect nearby sites with statutory and non-statutory designations;
-

- an assessment of the presence, numbers and distribution of specially protected species and other species of conservation concern, and how they will be affected;
- consideration of how the development would affect National and Local Biodiversity Action Plan (LBAP) priority habitats and species.

Statutory and non-statutory nature conservation sites

There are two statutory nature conservation sites, both Site of Special Scientific Interest (SSSI) within 5km of Threestoneburn Forest: The Cheviot SSSI to the west (NT908205), and the Allers & Lilburn Valley Junipers to the east (NT998206).

These areas were designated under Section 28 of the Wildlife and Countryside Act 1981.

Part of the forest area amounting to 35.16 ha is included in the `The Cheviot` SSSI area. This area consists of blanket bog and wet heath, which when surveyed by the NNPA in 2002 was deemed to be in a favourable condition, due to lack of previous drainage and light grazing.

Neither of these sites are likely to be affected by the proposed deforestation on account of distance and the lack of any hydrological linkages, and they are not considered further in the ES. (See Appendices 2 for further information and map showing location of SSSI's).

Within the boundaries of Threestoneburn Forest there are no further areas with a specific conservation designation although there are species of high conservation value present and sites of botanical interest. These sites were covered in the field survey described below.

Specially Protected Species

Consultations with Natural England, the Northumberland Wildlife Trust, RSPB and the National Park Authority produced several records within the site or within 2km of its boundary for species afforded special protection under the Wildlife and Countryside Act or the Habitats Regulations. This in turn led to the commissioning of several surveys.

Local Biodiversity Action Plan (LBAP) Priorities

Local Biodiversity Action Plans (LBAPs) have been published for two of the local authority areas in which the development falls (Northumberland and National Park). Although varying somewhat in structure and approach, each of these LBAPs identifies habitats and species deemed to be of significance in the locality.

Although they all tend to place emphasis on rarity on the national or local scale, the criteria used to assess significance are not standardised across the different LBAPs, and some species are included not because they are rare or declining, but because they are typical of a particular habitat or are valued by the public. Thus, in this EIA LBAP habitats and species have been evaluated on the basis of their individual status and nature conservation value rather than on the fact that they are included in the LBAP.

6.2.2 Field Surveys

Habitats and Vegetation

The type 1 vegetation survey of Threestoneburn was carried out by the Northumberland National Park Authority. It covered all of the surrounding land and those parts of the forest area not planted with conifers, including the main riparian zones and rides. This survey was carried out in 1999. Three main approaches were used:

Identification and Mapping of Habitat Type

Standard Phase I Methodology (*Handbook for Phase 1 Habitat survey. Nature Conservancy Council (1990)*) was used to map the habitats present on the site. Target notes were made to describe features of nature conservation value and sightings/evidence of animal species notes.

More Detailed Description of the Main Vegetation Types

National Vegetation Classification (NVC) methodology was employed to describe the distinct vegetation types identified on the site. A sample of no less than 5 quadrats was taken from each vegetation type recognised during the survey. The depth of peat (if present) was measured at each quadrat. Grid references of quadrats were noted using a Global Positioning System (GPS), so that they can be re-located.

Assessment of Vegetation Condition and Land Management Impacts

Methodology described in 'A Guide to Upland Habitats: Surveying Land Management Impacts' (SNH, 1998) was used to assess the condition and response of the different habitat types to impacts such as drainage, sheep grazing, burning and insect attack. Information from this study helped to evaluate the conservation importance of the habitats present, to identify future trends and provided information for the Outline Habitat Management Plan.

Based on the results and with reference to the soil types present within the forest it was possible to extrapolate the information thus preparing a vegetation map for the whole forest area (See map 9 and OHMP)

Botanical Interest Survey

In 1999 the FC commissioned a botanical survey of the forest on a compartment basis to identifying rare plants. This survey was undertaken by Gordon Simpson.

As part of the scoping process we received a copy of this report from the FC and it was agreed that an expert be contracted to review the findings of the 1999 survey. This would involve inspecting the locations of the plants identified in the previous survey, marking the locations through signage and GPS as well as identifying new locations.

On the recommendation of Gordon Simpson, Doug McCutcheon was commissioned to undertake the survey. The field work was carried out in May 2007 and the findings can be found in Appendix 3.

The findings can be summarised as follows:

- All the sites with the exception of one found in the 1999 survey were re-found and their position recorded using GPS.
- Additional sites for all previously noted species were found and recorded by GPS.
- Three new significant species were found and their locations recorded.
- Where the above species were located adjacent to roads, rides and quarries and could be detrimentally affected by the proposed operations their position were also identified by marker posts. This will enable these areas to be protected during the operational phase.

Mammal Surveys

The site was surveyed in April, May and June 2007 using standard methodologies for badgers, otters and water voles. These methods are detailed in the report *Threestoneburn Plantation: Mammal Survey 2007*. The general habitat was assessed for its potential to host bat roosts and provide forage resource. During the surveys, the site was scanned for signs of red squirrels and notes were made of sightings of brown hares.

Reptile and Amphibian Surveys

The site was surveyed in April, May & June 2007. The methodology is described in the report *Threestoneburn Plantation Reptile and Amphibian survey 2007*.

The report was undertaken to specifically address the following points:

- undertaking a presence/absence survey
- to assess the potential for re-colonisation once the felling is complete.

6.3 Baseline Description

The site occupies the summits of three hills in the eastern Cheviots, the ridges connecting the summits and the basin of land to the east of the summits. The highest point is 714m above sea level . The lower slopes of the three hills and the basin have been extensively converted to commercial forestry. The original rough grazing and moorland habitats persist on the upper slopes and summits and within the riparian zones on the lower ground. The Threestoneburn Forest site itself currently comprises the following principal habitats:

- Blanket bog (approximately 64 ha)
- Conifer plantation (approximately 568 ha)
- Heathland (approximately 60 ha)
- Riparian zone grass/bracken (18 ha)

There are also small areas of exposed rock outcrops, marsh and ponds. The main current land use has been commercial forestry, with a small area of sheep grazing. Full descriptions of the flora and fauna present on the site are given in the Technical Reports (Vegetation, Reptiles & Amphibians, Birds and Mammals), but are summarised below:

6.3.1 Vegetation

The habitats mapped as part of the Phase 1 Habitat Survey are illustrated in Map 9 and described further in Appendix 2.

Blanket Bog

Blanket bog forms approximately 40% of the Threestoneburn site, occurring on the higher ground on the summits and slopes of Hedgehope and Dunmoor hills as well as the ridge between them and part of the basin to the east. Much of this area of blanket bog has been planted with commercial conifers (Lodgepole pine and Sitka spruce)

Where the bog has been planted with conifers it has been extensively drained in the past, with deep ploughing and drainage channels (grips) cut into the peat.

The unplanted bog area has not been extensively grazed and has developed a vegetation typical of blanket bog and has been classified as being in a favourable condition by Natural England (Surveyed in 2002). The blanket bog vegetation typical of much of the upland areas is illustrated in the OHMP.

Blanket bog is characterised by abundant *Sphagnum*, although at Threestoneburn *Sphagnum* species do not occur at high cover throughout the blanket bog community. The vegetation is dominated by heather (*Calluna vulgaris*, *with*) with scattered tussocks of hare's-tail cottongrass (*Eriophorum vaginatum*), which themselves support growths of wavy hair-grass (*Deschampsia flexuosa*), and scattered small bushes of cross-leaved heath (*Erica tetralix*). The mosses *Polytrichum commune* and *Sphagnum* species cover the ground between the tussocks. Analysis of the vegetation gives closer agreement with the NVC community M19a *Calluna vulgaris* – *Eriophorum vaginatum* blanket mire (Rodwell, J.S. (1991) *British Plant Communities. Volume 2: Mores and Heaths. Cambridge University Press*).

The streams and drainage ditches throughout the site have been colonised by *Sphagnum* species, hare's-tail cottongrass and white sedge (*Carex curta*). The other common species such as wavy-hair grass, *Polytrichum commune* and tormentil (*Potentilla erecta*) occur at the edges. This vegetation type agrees most closely with the NVC community M6c, *Sphagnum recurvum*-*Juncus effusus* mire, *Juncus effusus* sub-community. Areas of seepage and bog pools are scattered throughout the blanket bog; and are dominated by *Sphagnum* species and sedges. These communities agree most closely with the NVC communities M1 *Sphagnum auriculatum* bog pool and M2 *Sphagnum cuspidatum/recurvum* bog pool.

Other species present include soft rush (*Juncus effusus*), marsh bedstraw (*Galium palustre*) and marsh willowherb (*Epilobium palustre*). This vegetation agrees most closely with the NVC community S9 *Carex rostrata* swamp.

Grasslands

Grassland forms a minor component of Threestoneburn and mainly consists of the small areas of unimproved pasture either side of Threestoneburn House, amounting to 13.3 ha.

These patches of unimproved acid grassland on more freely-draining soils are characterised by a high cover of sheep's fescue (*Festuca ovina*), usually accompanied by wavy hare-grass, heath wood-rush (*Luzula multiflora ssp.congesta*) and sweet vernal-grass (*Anthoxanthum odoratum*). Clover and perennial rye grass (*Lolium perenne*) are noticeably absent, and are replaced by forbs such as tormentil and heath bedstraw (*Galium saxatile*).

This vegetation type shows quite close agreement with the NVC community U4d *Festuca ovina* – *Agrostis capillaries* – *Galium saxatile* grassland – *Rhytidiadelphus loreus* sub-community.

In addition to the grass species in these areas there are dense patches of bracken.

Heathlands

According to the Handbook for Phase 1 Habitat Survey, dry and wet dwarf shrub heath categories are defined as supporting more than 25% cover of Ericaceous species on peat less than 0.5m thick. At Threestoneburn there are significant areas amounting to approximately 60 ha of the site of both wet and dry heathland. The dominant species is heather, and in the driest parts it is only accompanied by wavy-hair grass and hummocks of pleurocarpous mosses (principally *Pleurozium schreberi*). Where the ground is wetter, hare's-tail cottongrass and the moss *Polytrichum commune* become more frequent and *Sphagnum* species begin to appear at low cover. The heathland areas vary in their composition, and showed general agreement with recognised NVC communities, the three closest being: H9 *Calluna vulgaris* – *Deschampsia flexuosa* heath, H10 *Calluna vulgaris* – *Erica cinerea* heath and H12, *Calluna vulgaris* – *Vaccinium myrtillus* heath.

Plantation Woodland

There are approximately 568 ha of plantation conifer woodland within the Threestoneburn site. The predominant species is sitka spruce (*Picea sitchensis*), with some lodgepole pine (*Pinus contorta*) and larch (*Larix sp.*). There are also small areas of mixed broadleaves, especially towards the north-eastern corner of the site, near to Threestoneburn House. Most of the plantation has been planted on blanket peat, peaty podsols or peaty gleys, and the vegetation in the forest rides contains remnants of blanket bog vegetation, with hare's-tail cottongrass and *Sphagnum* species being the most common species (Figure 8.2C). In drier areas, the vegetation is more heathy in character, and is dominated by heather, wavy hair-grass, and large hummocks of pleurocarpous mosses. There are large stands of soft rush and tufted hair-grass near burns and drainage ditches.

Most of the coniferous compartments are semi-mature and there is very little in the way of ground flora. There are occasional mature trees scattered through the property. The principal species are Scots pine (*Pinus sylvestris*), ash and rowan, which are survivors of when the area was a sheep farm.

Some small areas of conifer were felled six years ago as part of a habitat improvement programme instigated by the National Park Authority. These areas were subject to a section 12 management agreement the original vegetation has recovered and is characterised by heather and rushes.

Vegetation History

Reference to historical Ordnance Survey Maps, local knowledge and old photographs of the property revealed that most of the existing conifer plantation was planted on land that was formerly blanket bog or heathland. The eastern half of the area was reputedly one of the best sheep farms in the area prior to afforestation.

6.3.2 Mammals

Badgers

Although not rare, both badgers and their setts are protected under The Protection of Badgers Act 1992, because of their long history of persecution. Badgers were thought to be present within the plantation but the survey did not find any signs of presence. However due to the density of the trees in the conifer plantations, not all compartments were surveyed in detail. It is possible that there are setts within the property that will not become evident until the plantation is cleared. Additional surveys will be carried out prior to the commencement of operations and if any setts are found they will be safeguarded. The nearest setts which are known to be occupied are found on Ilderton Dodd farm 2 km to the east.

Otters

Otters and their resting places are protected through inclusion in the European Protected Species regulations, Annex II and Annex IV of the Habitats Regulations 1994, and inclusion on Schedule 5 of the Wildlife and Countryside Act 1981. The Regulations were amended in August 2007, and this removed the “incidental result” defence under which many forestry operations were carried out. Otters are present at Threestoneburn and are utilising it for foraging and lying up. Signs including footprints and spraints were found in seven locations along 400m of the burn and beside the man made ponds. (See map in Appendix 5) An artificial holt built by NNPA volunteers is located beside one of the ponds.

Reading the guidelines for the new EU Habits Directive it seems clear that due to the occasional presence of otters on the site, the scale of the operations and the timescale involved that it will be necessary to apply for a licence for certain elements of the proposed operations. Best practice as noted in the guidance leaflet will be adopted and in addition a survey will be carried out prior to work commencing and then annually to ascertain whether otters continue to use the site. (See Appendix 22 for Guidance and Checklist)

Water Voles

Water Voles were not found to be present at Threestoneburn during the mammal survey. The nearest known location is 10km away.

Bats

Bats and their roosts are protected under the European Protected Species Regulations, Habitats Regulations 1994 and through inclusion on Schedule 5 of the Wildlife and Countryside Act 1981. The regulations were amended in August 2007 and this removed the “incidental result” defence under which many forestry operations were carried out. Two concrete bat boxes erected in 2003 were inspected and found not to be in use. No bats roosts were found during the survey, although it is difficult to conclusively prove absence of bat roosts, particularly in mature trees.

Two Pipistrelle bats were recorded feeding and interacting near to the large pond and a single Myotis species (Whiskered or Brandts bat) was identified foraging on the eastern boundary of the forest. The habitat is not the most suitable for bats, being open, windy and, as a result, cold. Since the forest does not contain appropriate roosting sites for bats it is unlikely that it will be a requirement under the new amended regulations to apply for a licence. However additional bat surveys will be carried out prior to any operations commencing and then on an ongoing basis to ensure that no roosts are present and liable to be disturbed. (See Appendix 22 for Guidance and Checklist).

Pine Marten

There is anecdotal evidence of pine martens in the Cheviot Hills. The Vincent Wildlife Trust (VWT) was consulted and they had 4 records in the last 7 years. None were in the immediate area of the forest but all were in a 15km radius. During the course of the mammal survey no evidence of pine martens were found.

6.3.3 Reptiles and Amphibians

Two species of reptile and three amphibians were found during the course of the survey.

Adder

Three individuals were found in sheltered open areas. Bearing in mind this species retiring nature it is likely to be under recorded.

Viviparous Lizard

Seven animals were encountered sunning themselves on vegetation in rides and open areas. This common species is likely to be found at all elevations.

Frog

Five individuals were found in various wetland locations. Tadpoles were found in only the middle of the three ponds.

Toad

Two individuals were found alive during the survey. One was close to a pond, but the other was on the summit of Hedgehope Hill!

Three individuals were found dead, having been eaten by a predator.

Tadpoles were found in large numbers at the outflow of the main pond and in the adjacent burn.

Palmate Newt

This species was found at two locations. 8 adults were seen in the middle pond and another 3 adults were seen in a blocked drain near the northern boundary of the forest.

No other species of reptile or amphibian were seen during the survey but based on local knowledge it is suspected that slow worms may also be present in the forest.

6.4 Evaluation

This section evaluates the nature conservation interest of the site with respect to the habitats present and their importance for reptiles, amphibians and mammals. The value of the site is determined in terms of its importance in regional, national and international contexts. The evaluation of the ornithological interest of the site is described in Chapter 9.

6.4.1 Blanket Bog

There are approximately 2 million ha of blanket bog in Britain, which constitute around 17-20% of the world resource (Tallis, 1995). In Northumberland, blanket peat occupies 34700 ha, (2.4% of the UK and 16% of the English resource) although not all of this still supports blanket bog vegetation. The Northumberland National Park Authority Commissioned a survey in 1992 to ascertain the amount of Blanket Bog in the park and this was updated to take account of the area out with the park as part of the Northumberland BAP, launched in spring 2007.

There are approximately 64 ha of bog vegetation at Threestoneburn, comprising much of the non-forested area on the upper ground on the western boundary of the property. It is important to remember that much of the conifer plantation immediately to the east of this higher ground and in the basin below the main area of bog is on peat that is continuous with the current bog vegetation, and was therefore part of the same system.

Blanket bog habitat is listed on Annex 1 to the EC Habitats Directive and as such is a priority habitat type. It has also been identified as a key habitat in the UK Biodiversity Action Plan.

The publication '*Guidelines for Selection of Biological SSSIs: Bogs (Sites of Special Scientific Interest, Criteria for selection are described in: Joint Nature Conservation Committee (1994). Guidelines for selection of biological SSSIs: bogs)*'. (JNCC, 1994) states that areas of blanket mire vegetation over 25 ha that show peat-forming capability should be considered for selection as SSSIs. Most of the 64 ha of blanket bog at Threestoneburn is active, due to the widespread presence of peat-forming species such as *Sphagnum* moss and hare's-tail cottongrass. The most pristine vegetation is on the deepest peat, and supports a high cover of *Sphagnum* moss.

Because of its size and peat-forming capability, much of the blanket bog vegetation at Threestoneburn is included in the Cheviot SSSI. The former extent of blanket bog vegetation has been reduced by planting conifers in the northern and western parts of the site.

6.4.2 Grasslands

The only areas of significant grassland currently found at Threestoneburn are the 13.3 ha of unimproved pasture to the east and west of Threestoneburn House. Although part of the area previously owned by the Forestry Commission these small fields were let for grazing to a neighbouring farmer. They have been lightly grazed in the past and the vegetation is typical of unimproved acid pasture in this area. This area of grassland is structurally quite diverse due to the light grazing regime and patches of rushes, and supports relatively high numbers of invertebrates.

These areas of un-improved grassland are of conservation value because they have traditionally been the site of a black grouse lek (See appendix 15 – Black Grouse in the Cheviot Hills).

6.4.3 Heathlands

Approximately 400000 ha of upland heath (including heath and acid grassland mosaics) occur in Northumberland. This is about 1% of the UK and 10.1% of the total for England and Wales.

Upland heathland is limited in extent at Threestoneburn, occupying only 60 ha of the site. However the vegetation and soil surveys would suggest that a large proportion of the area currently occupied by plantation woodland could be converted to modified heathland habitat.

A number of types of heath found in Northumberland are listed on Annex 1 of the EC Habitats Directive, Northern Atlantic wet heaths with cross-leaved heath, dry heaths, and juniper formations on heath. Upland heathland is also a UK Biodiversity Steering Group key habitat.

6.4.4 Plantation Woodland

Mature conifer plantation casts dense shade and there is little vegetation beneath the canopy. The peat surface has been disturbed by planting and drainage ditches have been dug which have caused drying of the peat surface. Remnants of blanket bog vegetation occur in rides and at the edges of forest tracks, but there is evidence of drying out, indicated by the absence of *Sphagnum* moss in places. In rides and clearings, the edges of burns and drains are usually vegetated by tussocky marshy grassland, dominated by soft rush and tufted hair-grass. However, the areas encompassed by the plantations include a number of ponds, riparian zones and bare ground which are of some nature conservation value, particularly for invertebrates. Furthermore, there are a number of watercourses that are used by otters.

The small areas of native broadleaf planting are of greater interest for nature conservation, because they consist largely of native species planted at relatively wide spacings on species-poor neutral grassland and heathland. The wildlife interest of the broadleaved plantations is expected to increase as the trees mature. The diversity and abundance of the invertebrate fauna associated with native trees should generally increase over time, due to an increase in the structural diversity. For the same reason, the diversity and abundance of other groups such as birds and mammals are also expected to increase.

On balance, although the conifer plantations do have value as habitats for a wide range of animal species, their nature conservation value is lower than that of the semi-natural blanket bog and moorland habitats that they have replaced.

The UK blanket bog Habitat Action Plan describes four conditions classes: favourable, degraded but readily restored; degraded but less readily restored; and degraded and probably beyond restoration. There are no definitions for these classes, and therefore, classification of vegetation is somewhat subjective. The remaining area of blanket bog vegetation at Threestoneburn is in a good condition as it has never been drained and has not been grazed for over 30 years. Therefore, this area can be classified as 'favourable'.

The ease of restoration of the area of blanket bog that has been planted with conifers depends on factors such as the age of the conifers, the degree of ground disturbance and the distance from a seed source. Most of the blanket peat beneath the conifer plantation can therefore be classified as degraded but less readily restored. Some of the area is probably beyond restoration to blanket bog (although not beyond restoration to other habitats beneficial to wildlife).

The botanical interest survey identified a small (1.1 ha) area of *Sphagnum magellanicum* bog which is of local nature conservation value due to its rarity in the Cheviots. (See Appendix 3 for details).

The blanket bog is unlikely to support a diverse invertebrate fauna, but it provides suitable habitat for the large heath butterfly, a species threatened in the European context. The area of blanket bog at Threestoneburn is little used by mammals.

The value of the blanket bog for bird populations is discussed in Chapter 9.

As part of the larger Cheviot SSSI the blanket bog at Threestoneburn is considered to be of significant regional importance.

6.5 Predicted Trends

6.5.1 Blanket Bog

The main factors affecting vegetation change in the blanket bog are grazing and drainage.

The current grazing levels at the site are very low as no sheep are present and grazing is primarily by roe deer. Drainage of the blanket bog has occurred in localised areas, although this is limited to the lower elevations adjacent to the conifer plantations. Many of the grips were cut about 35 years ago and have been colonised by vegetation. As a result their continuing function as drainage conduits is doubtful, suggesting that future trends will be towards an improvement in the quality of the blanket bog. This lack of drainage has allowed the Sphagnum and heather to persist and although hare's-tail cottongrass is present it has not become the dominant vegetation across much of the site. If the current grazing levels were to continue, it is predicted that the blanket bog vegetation will persist in its present condition (English Nature Survey 25 September 2002).

6.5.2 Grassland

Grassland vegetation dynamics depend on management, principally by grazing. The current grazing pressure is relatively light on the acid grassland and if that is sustained, it may be expected that unpalatable species such as mat-grass and soft rush will not increase in cover. Most of the acid grassland is not overgrazed and vegetation changes are not expected.

If grazing ceases entirely, all grassland types would undergo succession to other vegetation types. The species most likely to colonise at first are dwarf shrubs such as heather, but it may also be expected that trees will gradually invade (possibly birch (*Betula sp.*) and willow (*Salix sp.*)).

6.5.3 Heathland

Heathland vegetation types are also subject to succession to woodland if there is no form of management. However, under current light grazing pressure by roe deer it is predicted that heather will remain dominant.

6.5.4 Plantation Woodland

If the proposed development did not proceed, the forest compartments would be felled at some point in the future; exactly when depends on the time of planting and the yield class of each compartment. Under current arrangements, felled areas would normally be restocked, although it is difficult to predict whether the compartments would be replanted because this would depend very much on future countryside policy and financial incentives.

6.6 Mitigation and Enhancement

6.6.1 Operational Phase

This section describes the mitigation measures that will be incorporated into the development during the operational phase to reduce impacts on flora and fauna.

6.6.2 Road Construction & Quarrying

Damage to the blanket bog vegetation may occur through changes in hydrology. Therefore the mitigation measures are proposed to avoid or reduce effects by locating the proposed new roads on the mineral soil areas and avoiding the blanket bogs.

The proposed road layout is designed to avoid any known features of nature conservation value, such as those identified in the Botanical Interest survey and the use of GPS has allowed these features to be accurately marked on the ground where they are in vulnerable locations. This is particularly relevant where they are in the proximity of roads and quarries.

Given the narrowness of the roads and the relative light traffic it is considered unlikely that there will be a risk to otters or red squirrels or inhibits their movements.

6.6.3 Forestry Operations

Approximately 568 ha of forest will be felled during the deforestation process. Harvesting operations will be carried out to the UK Forestry Standard, under the Forests and Water Guidelines. This includes ensuring that all running watercourses are kept clear of debris caused by the harvesting operations. Where conventional harvesting methods are used forest machinery will travel on brash mats to minimise disturbance of the underlying soil. Whole tree harvesting will only be employed on freely draining mineral soils in appropriate weather conditions to minimise ground damage.

Where brash cannot be recovered and in the areas containing trees that are not of merchantable size (approximately 22 ha) the brash and trees will be chipped to waste. The estimated volume of chippings is less than 30m³ ha⁻¹ and the chippings will be removed from areas with sensitive ground vegetation because decomposition of chippings will cause nutrient inputs to the peat, which could encourage grasses to colonise at the expense of mosses and dwarf-shrubs.

To encourage reversion to modified bog habitat, it is important to re-wet the peat following tree harvest. Method of blocking drains in order to assist rewetting of soils will be determined with experts in peat-land restoration on site after felling has finished. These methods could include damming drains with plastic-piling, or the sandwiching of peat between plastic dams.

Where necessary, plough furrows could be blocked at intervals with plastic dams. The precise positioning of dams in order to maximise rewetting effectiveness and cost-efficiency will be determined immediately after tree removal.

Guidelines in the *Forest Practice Guide 9: Forest Operations and Badger Setts (published by Forestry Practice Division, on behalf of The Forestry Commission, 1995)* will be adhered to. It is possible that badger setts are present beneath the dense plantations, and the felling contractors will therefore proceed with caution and stop felling an area if a possible sett is identified. The area will then be checked by a badger expert before felling recommences. If any setts are found, licences may be obtained from DEFRA for carrying out construction work within 30m of the setts, but this work will avoid the breeding season (December – June).

Otters are also likely to avoid using the area for resting during felling, but work will not prevent them using the watercourses, as long as these are kept clean, clear and free flowing

Site Working Practices

The recommendations for minimising disturbance to mammals during felling operations also apply to other construction activities such as track construction and quarrying. During micro-siting of the access tracks and quarries, specialist advice will be sought on avoiding and reducing impacts on badgers, otters and red squirrels.

Operational activity will be limited to clearly defined working areas, and storage of timber, arisings and fuel will avoid sensitive vegetation and the edges of burns. Where possible, storage will be confined to areas of hard standing. The mitigation measures to prevent spillages of pollutants into watercourses (described in Chapter 7) will also prevent spillages onto sensitive vegetation.

Table 2 : Mitigation Incorporated into the Deforestation Proposals

Impact	Mitigation Measures	Extent to which measures are effective
1. Disturbance of hydrological regime of blanket peat and consequent changes in vegetation composition construction of access tracks,	<ul style="list-style-type: none"> New roads to be situated in areas of mineral soils 	Substantially
2. Direct and indirect disturbance of mammals due to forestry operations and construction of access tracks.	<ul style="list-style-type: none"> Layout avoids badger setts and areas with signs of otters Watercourse crossing points will be checked again for use as otter and water vole shelters immediately prior to constructions Adhere to Forest and Water Guidelines so that watercourses are kept clean and free-flowing to avoid adverse impacts on otters and riparian wildlife. Minimise disturbance to badgers by adhering to Forest Practice Guide 9. 	Substantially
3. Removal of conifer plantation habitat	<ul style="list-style-type: none"> Diversify the area by planting native broadleaves in riparian zones and allow regeneration of vegetation of similar type to that present before planting (wet modified bog and heathland). 	Substantially
4. Damage to peat surface during forest operations and subsequent hindrance of regeneration of vegetation	<ul style="list-style-type: none"> Construct access tracks prior to clear-felling. Run machinery on brash mats to minimise damage to peat surface. Following harvest, block or dam drains in the deforested area to rewet the peat surface and encourage reversion to modified bog habitat. 	Partially
5. Damage to sensitive vegetation and water courses due to spillages of pollutants	<ul style="list-style-type: none"> Spillages will be contained, preventing impacts on flora and fauna. Avoid storage of surplus materials on vegetation or beside watercourses. 	Fully

6.6.4 Enhancement Measures

Details of the measures taken to enhance the nature conservation of the site are detailed in the Outline Habitat Management Plan (Appendix 11), the main features are;

- Conversion of approximately 232 ha of conifer plantation to modified blanket bog habitat
- Conversion of approximately 232 ha of conifer plantation to modified heath-land habitat
- Expansion of native broadleaf woodland through additional planting in riparian zones within the forest and on neighbouring land
- Enhancement of habitat for species of key conservation value, whilst helping to achieve targets for national and local BAPS (Species and Habitat).

6.7 Predicted Impacts and Effects

Road Construction & Quarrying

The proposals to upgrade 6.4km of existing forest road and build 1.6km of new forest road and the associated quarrying will have an impact on and effect the environment at Threestoneburn. Approximately 4 ha of ground will be lost to road widening and new build combined with the proposed quarry extensions required to facilitate these works.

However as described in the mitigation above the impacts and effects can be minimised.

The avoidance of road construction on areas of blanket bog will alleviate many of the potential problems.

Effects on riparian habitats and species will be reduced by restricting the number of crossing points to existing bridges.

Deforestation

The process of conifer removal is expected to take 36 months, although it may be possible to cover the ground more quickly. There will be an effect on environmental issues, however by the adoption of best working practices and industry guidelines any adverse effects on disturbance to wildlife and habitat can be minimised.

The Outline Habitat Management Plan (See Appendix 11) describes the envisaged vegetation post felling. There is expected to be approximately 230 ha of modified blanket bog habitat restored and a similar area of modified heathland (wet & dry). In addition 67 ha of riparian native woodland will be established along the main watercourses. This combination will provide suitable habitat for moorland and deciduous woodland bird species, bats, badgers and otters.

6.8 Evaluation of Effects

Table 3 Effects and Evaluation of Significance

Effect	Type Of Effect	Probability Importance Occurring or Sensitivity	Policy of Effect Level	Magnitude Rationale	Significance
Track Construction					
1. Disturbance to peat Whilst constructing Access tracks	-ve	Unlikely	Regional	Up to 1m either side of track	Minor
2. Disturbance to Badger setts due To track construction Follow industry Guidelines	-ve	Likely	Local	Low	Minor
3. Disturbance To otters due To track Construction Adhere to guidelines	-ve	Likely	Local	Low	Minor
Deforestation					
1. Land take due To required access Improvements Effect can be Minimised	-ve	Certain	Regional	Approx. 4 ha (all habitats)	Minor
2. Gradual Drying of blanket Bog due to roadside Drainage	-ve	Unlikely	Regional	Estimated	Minor
3. Creation of Modified blanket Bog habitat which Will be of higher Conservation value Than conifers it will Replace in terms of Meeting species and Habitat action plan Targets	+ve	Certain	Regional	Approx. 232 ha	Major

6.8 Evaluation of Effects (cont'd)

Table 3 Effects and Evaluation of Significance

Effect	Type Of Effect	Probability Importance Occurring or Sensitivity	Policy of Effect Level	Magnitude Rationale	Significance
Deforestation (cont'd)					
4. Creation of Modified heathland Habitat will be of higher nature conservation value than conifer plantation it replaces in terms of meeting species and habitat action plan targets	+ve	Certain	Regional	Approx 232 ha	Major
5. Creation of Native broadleaved Habitat will be of higher nature conservation value than conifer plantation it replaces in terms of meeting species and habitat action plan targets	+ve	Certain	Regional	Approx. 90 ha	Major
Key:	Type	Probability	Policy Importance	Magnitude	Significance
Major	- = Neg	Certain	International	High	
	+ =Pos	Likely	National (UK)	Medium	Minor
	Neutral	Unlikely	Regional	Low	Not Significant

6.9 Summary of Key Findings and Conclusions

The Outline Habitat Management Plan (OHMP) is integral to the proposals and sets out the plans for enhancing the nature conservation value of the site and should be read in conjunction with this section of the ES.

However the findings can be summarised as follows;

- The most sensitive habitat liable to be affected by the proposals is the blanket bog.
- Felling 568 ha of conifers provides an opportunity for habitat reversion to modified bog and modified heath. This habitat will ultimately be of higher nature conservation value than the conifer plantation, with specific reference to black grouse and waders.

- The area of native broadleaf woodland will also be increased as part of the OHMP.
- The habitat management proposals offer an opportunity for substantial enhancement of the nature conservation interest of the Threestoneburn site.

7. BIRDS

7.1 Introduction

This section described the methods used to evaluate the bird interest at Threestoneburn and determine its nature conservation importance. It explains the ways in which birds may be affected by the proposed deforestation and conversion of the areas currently consisting of plantation conifers to modified blanket bog/heathland habitat with additional new riparian native broadleaf planting.

The key issues relating to birds are as follows:

- The effects of direct habitat loss due to the felling of approximately 586 ha of plantation conifers.
- The effects of indirect habitat loss, i.e. the displacement of birds due to disturbance while the tree clearance operations are taking place.
- The positive contribution made by the proposed habitat changes.

All wild birds have a level of protection under the 1981 Wildlife and Countryside Act and, in principle, the assessment of the effects should cover all bird species present at Threestoneburn. However this assessment has concentrated on those species with the highest levels of conservation value, summarised as follows:

- Species listed on Annex 1 of the EU Birds Directive as requiring special conservation measures.
- Species protected under Schedule 1 of the 1981 Wildlife and Countryside Act.
- Species occurring at the site in regionally or nationally important numbers (>1% of the resource).
- Other species are included if there are special concentration of that species at the site or any other factors which would give rise to an exceptional risk for that species.

The possible effects of the operations, including forestry and habitat management activities, are assessed on the species population, range and distribution.

The bird survey was undertaken by John Steele and is described as follows;

7.2 Methods

Scope

The scoping opinion from the RSPB, Natural England, Northumberland National Park Authority and Game Conservancy recommended that, with respect to birds, the following points (amongst others) should be addressed in the Environmental Statement.

- Reference to the LBAPs of Northumberland and Northumberland National Park;
- Identification of schedule I species currently using the site;
- Identification of red and amber list species using the site;
- Assessment of methods that could be used to minimise interference to protected species during the duration of the operations;
- Assessment of how habitat changes will provide positive benefits for species currently not using the site;

The Threestoneburn area does include two Sites of Special Scientific Interest (SSSI), although due to their location out with the proposed work areas on the site neither will be affected by the proposed operations.

7.3 Field Survey

The baseline ornithological survey was undertaken with the following objectives, as advised by the consultees listed above.

- A survey of the site to identify the visiting and breeding birds present within the proposed operational area, with special reference to Schedule I and red/amber listed species.
- To assess the potential re-colonisation of other moorland species once the felling is completed.

Field surveys were completed during the period April – June 2007.

Most rides and roads were walked and all species seen and heard were recorded on 1:10000 scale maps. In the more open stands of larch & pine regular point counts were used in assessing occupation.

Large open areas were walked at 200 m interval on transects and the forest perimeter was walked, where it was possible to record moorland species. The bird's potential breeding status was also assessed by noting territorial behaviour, nests, fledged young etc.

It was also possible to use data obtained from the Northumberland National Park breeding bird survey of Ilderton Dodd Farm (immediately adjacent to forest) to ascertain the typical moorland birds to be found in the locality and likely to re-colonise the forest once the proposed felling is carried out.

Table 4 Schedule I (I) and Red (R) / Amber (A) List species seen during the course of the survey.

Species		Present	Notes
Goshawk	(I)	Y	1 Pair present since 1999 Breeding suspected, but Not confirmed
Common crossbill	(I)	Y	21 birds seen, including 6 parties
Hen harrier	(I)	Y	1 immature male
Peregrine	(I)	Y	1 immature bird
Merlin	(I)	Y	1 adult male seen. Have bred regularly in past
Barn owl	(I)	Y	1 bird found dead, possibly predated by goshawk
Song thrush	(R)	Y	26 seen
Reed bunting	(R)	Y	1 seen
Grey partridge	(R)	Y	1 pair seen
Black grouse	(R)	Y	1 lekking male
Skylark	(R)	Y	1 bird singing
Bullfinch	(R)	Y	1 female seen
Buzzard	(A)	Y	6 individuals, 2 nesting territories
Sparrowhawk	(A)	Y	3 individuals, 2 nesting territories
Kestrel	(A)	Y	1 seen

Table 4 Schedule I (I) and Red (R) / Amber (A) List species seen during the course of the survey (cont'd)

Species		Present	Notes
Short eared owl	(A)	Y	1 seen carrying food
Long eared owl	(A)	Y	evidence of presence seen
Tawny owl	(A)	Y	evidence of presence seen
Red grouse	(A)	Y	7 birds on western hills
Golden plover	(A)	Y	1 heard calling, west edge
Snipe	(A)	Y	3 seen on boundary

In addition to the species listed in Table 4 above the following bird species were either seen in the survey or known to be present from previous work undertaken in the locality;

Grey heron, mallard, pheasant, woodcock, woodpigeon, cuckoo, tree pipit, meadow pipit, wren, dipper, dunnoek, robin, redstart, mistle thrush, goldcrest, carrion crow, chaffinch, goldfinch, siskin.

The site has breeding populations of many common woodland species as well as 2 schedule I species, 4 red list species and 5 Amber list species. The surrounding moorland and hill hosts several other species of high conservation value as noted in the Regional Species action plans, most notably black grouse and grey partridge.

7.4 Evaluation of Ornithological Interest

The moorland part of the site supports breeding skylark, reed bunting, grey partridge red grouse and golden plover. Song thrush, common crossbill and goshawk breed within the afforested part of the site. These birds are listed as priority species on the UK BAP list. It is unlikely that the site would be ranked as internationally or nationally important for any of these species at present.

The crossbills and goshawk are listed on Schedule 1 of the WCA (1981), although again it is unlikely that the site would be ranked as internationally or nationally important for these species.

The survey suggests that hen harrier, peregrine falcon, short-eared owl and merlin use the site for hunting, either as immature adults or as part of a wider home range. Golden plover were also found on the survey, possibly nesting on adjacent moorland. Hen harrier, merlin, peregrine and golden plover are listed in Annex 1 of the EC Birds Directive. Based on the number of birds observed in 2007, there is no possibility that the site would be ranked as internationally or nationally important for these species.

Species such as redstart use the site during migration a bullfinch was also seen. These species are listed on Schedule 1 of the WCA (1981), but again based on the survey results there is no possibility that the site would be ranked as internationally or nationally important for these species.

The site might be considered of regional importance for birds if it supported breeding populations of nationally scarce, declining or threatened species, or birds that are key species within a regional context. Three groups of birds were considered in this respect: (1) priority species listed in the UK Government's Biodiversity Action Plan (BAP); (2) species listed in Table 4 of Birds of Conservation Importance (JNCC 1996); and (3) species listed in the Local Biodiversity Action Plan for Northumberland and the National Park.

7.5 Findings

The site supports the following breeding species considered to be of nature conservation importance . These are:

- Goshawk
- Skylark
- Common crossbill
- Reed bunting
- Grey partridge
- Black grouse
- Song thrush
- Bullfinch

Four species of high nature conservation importance (hen harrier, peregrine, merlin, barn owl) either use the site for hunting or are suspected to breed on neighbouring land.

7.6 Predicted Trends

Open Ground

Assuming that existing land management continues over the open ground, few changes in moorland bird populations are predicted during the medium to long-term (up to 25 years).

Plantation Woodland

Incremental forest restructuring as plantations are felled and replanted will lead to a very small increase in the amount of open ground and broadleaved woodland in the medium to long terms. The extent of pre-thicket stage forest will stabilise at around 15%. In the meantime, there will be a shift towards canopy dwelling species. These trends will lead to a modest increase in site biodiversity in the long term.

Information Gaps

No significant information gaps have been identified.

7.7 Mitigation, Compensation and Enhancement Incorporated into the Proposed Development

This section describes the mitigation measures to reduce impacts on birds that will be incorporated into the proposals during operational phases. Where impacts cannot be adequately mitigated, appropriate compensation measures are proposed. Finally, the enhancement of the nature conservation of the site, occurring as a result of the proposed development, is outlined. The Outline Habitat Management Plan (OHMP) contains a full description of the nature conservation objectives and enhancement of the site.

The habitat creation, management and enhancement detailed in the OHMP have been formulated in collaboration with Northumberland National Park, RSPB, Natural England, Game Conservancy and Environment Agency and has been discussed with land agents and land owners.

Mitigation

Forestry Operations and Road building

It is proposed to deforest approximately 568 ha of coniferous planting within the development area. This area is dominated by Sitka spruce with small areas of larch and Lodgepole pine. The small areas of broadleaves currently on site are to be retained. To facilitate this deforestation it is proposed to upgrade 6.4 km of existing forest road and to construct 1.6 km of new road. This will necessitate quarrying stone for road construction on site and it is proposed to extend the existing quarries for this purpose. The forest is all between 25-40 years old and the younger areas in particular have grown very well.

Small areas of the forest have suffered from heather check and there are additional areas where the Lodgepole pine has grown poorly and no produce is recoverable.

Merchantable trees will be clear-felled and removed, whereas the checked areas will be felled to waste. It is also intended to recover brash from the sites wherever possible to aid the process of moor-land regeneration. Areas of smaller trees (< 30m³ ha⁻¹) will mostly be chipped *in situ*. Any existing broadleaved trees will be retained.

On the most sensitive areas of deep peat and in the experimental felling area (see Outline Habitat Management Plan) brash and harvesting debris will be cleared as far as practicable. In the wetter parts drainage ditches will be dammed in order to impede drainage and encourage the restoration of blanket bog. This will have a small beneficial effect on the existing population of moorland birds, particularly curlew, snipe and skylark.

Enhancement Measures

Measures to enhance the nature conservation value of the site during construction and operation are detailed in the Outline Habitat Management Plan. The main features are

- Conversion of approximately 232 ha of conifer plantation to modified blanket bog habitat.
- Conversion of approximately 232 ha of conifer plantation to modified wet/dry heathland habitat.
- Expansion of broadleaved woodland area through additional planting and natural regeneration, approximately an additional 65 ha in riparian zones within the current forest area and a further 25 ha on adjacent land under the same ownership. This will benefit birds of woodland and scrub habitats, and in particular increase the area of habitat suitable for black grouse.
- Measures will be taken to prevent significant regeneration of conifer crops. Restoration of grazing on some of the deforested area will benefit moorland waders.

7.8 Predicted Impacts and Effects

Potential impacts are assessed in relation to birds of moderate or high nature conservation importance.

Impacts during the Operational Phase

Deforestation

Potential adverse impacts

Forestry clearance operations will take approximately 36-48 months, including 3-4 breeding seasons. Disturbance from forestry operations is likely to displace breeding populations which can be summarised as follows;

Goshawk; single pair thought to be present. In the longer term this species will be negatively affected by the proposals but they could relocate to apparently suitable, unoccupied territory within 10km. During the duration of the operations it is intended to locate the nesting site(s) of this species and allow no felling within an appropriate buffer zone during the critical nesting period of March-July. To comply with legal requirements work in and around the nest site will take place during the period August-January when the nest site is abandoned. It will be necessary to monitor the forest for goshawk occurrence during the whole duration of the operational phase.

Common Crossbill; This is a very mobile species which responds to cone productivity and could utilise numerous alternative plantations in the locality in the longer term. Surveys will be undertaken annually to assess the site for this species and to try to locate nest sites. If a nest is found an appropriate buffer zone will be enforced to protect it during the breeding season.

Song Thrush; Proposals will in short term significantly affect this species, however replacement broadleaf planting will mitigate.

Bullfinch; small numbers present. Short term habitat loss will be mitigated by long-term improvements.

Sparrowhawk; 2 pairs thought to be present. Numerous adjacent conifer woods could be utilised. Nest sites to be identified during operational phase to minimise disturbance.

Buzzard; 2 nesting pairs thought to be resident. Provision as for sparrowhawk.

Long-Eared Owl; breeding suspected, future survey to be carried out to confirm presence/absence.

Siskin; likely to be displaced to adjacent conifer woods.

The felling of the pole stage conifer crops may have a localised effect on populations of song thrush and common crossbill. However, it is considered that the area of habitat lost (approx. 568 ha) is insufficient to have a measurable effect on the population of these species at regional or higher levels.

A small amount of growth checked/failed forest will be cleared. This habitat provides open yet sheltered conditions suitable for a number of species characteristic of scrub habitats, including reed bunting. Failed/checked areas are more valuable than establishing and thicket stage crops because they provide suitable habitat over long terms. However, patches of naturally regenerating scrub within the deforested area are likely to provide a greater (and more sustainable) area of suitable habitat within the medium and long terms.

It is considered unlikely that forest operations will have an adverse impact on moorland bird populations.

Potential positive impacts

The nature of the soils and the vegetation in unplanted areas and along the tracks and rides suggest that much of the site was formerly blanket bog, wet heath/bog, with areas of tussocky grassland and dry heath i.e. vegetation communities similar to the existing moorland area on the western fringes of Threestoneburn. Most of the deforested habitat is likely to develop into a mosaic of grassland, heath and mire vegetation suitable for snipe, golden plover, curlew and skylark. Dwarf shrubs, particularly heather (*Calluna vulgaris*), and hare's-tail cottongrass (*Eriophorum vaginatum*) are likely to increase in extent during the next 20 years and ultimately cover a substantial proportion of the area. Due to variation in site wetness, a mosaic of sward heights is likely to develop, with patches of short vegetation where black grouse chicks can feed. These patches are likely to form attractive lek sites for black grouse and will also benefit skylark.

The site is to be managed as grouse moor and extensive sheep grazing after the removal of the conifer crops and stump mulching. A combination of periodic burning and swiping (cutting) will maintain the structural diversity of the habitat. Sheep grazing will also be an important factor in maintaining the vegetation and preventing any unwanted conifer natural regeneration from developing. This combination has been shown to be extremely effective elsewhere on the estate where large scale conifer deforestation has taken place and heath-land vegetation has regenerated within 3-4 years of the conifer removal (Appendix 14 –Wooler Common Habitat restoration).

Past experience on similar sites in the locality have shown that beneficial habitat changes will take effect in the short term and persist in the longer term. It is considered that deforestation will increase the current small numbers of black grouse and grey partridge in the locality, allow the red grouse population to expand further and to increase the number of moorland birds currently breeding at Threestoneburn in line with Species action Plan (SAP) targets. It is specifically hoped that waders such as curlew, dunlin, golden plover, lapwing, redshank, snipe and possibly oystercatcher.

The proposals are also likely to benefit species such as hen harrier, peregrine, merlin and short-eared owl which are known to frequent the locality and even if they do not become regular breeders their hunting range will increase.

The deforestation scheme will also benefit birds of open and deciduous woodland. The proposals for extensive riparian native broadleaf planting will continue the trend for this type of planting in the locality (Appendix 15 Black Grouse). As well as providing additional habitat for black grouse due to a diversification of the structure and species composition, species such as song thrush, redstart, ring ouzel as well as other species typical of broadleaf woodland will colonise these areas in the longer term.

Construction

The total land taken by upgraded and new access tracks loading areas and quarries will result in the permanent loss of a small proportion of the current forest area. The likely level of impact on birds as a result of habitat lost to the necessary infrastructure improvements is considered to be low.

The current quarries on site are small and even though they will need to be extended the impact will not be great and it may be possible to establish new opportunities for nest sites after quarrying is completed (See Appendix 18).

The road improvements will begin immediately before the deforestation commences and will be completed within the first 12 months. Surveys will take place prior to the breeding season so that sensitive species will be subject to minimal disturbance.

Habitat Management

It is intended to convert 232 ha of coniferous plantations to modified bog habitat. This will have a range of effects on bird populations which, on balance, are beneficial. This will potentially create additional habitat for skylark, black grouse, red grouse and the wader species mentioned previously. A further 336 ha of forest will be converted to wet and dry heath-land habitat neutral grassland and scattered deciduous woodland/scrub. This will potentially create habitat for black and red grouse. Furthermore, grazing management will seek to create a mosaic of grassland, heathland and deciduous scrub suitable for foraging hen harrier and merlin.

Diversifications of the new forest edge will create conditions suitable for black grouse. It is predicted that the number and diversity of farmland birds, such as grey partridge also will increase in where grassland habitat is restored.

Conclusion

Deforestation will have a long-term adverse impact on goshawk, common crossbill and possibly long-eared owls. Some species such as song thrush, buzzard and sparrowhawk which are known to be resident will be adversely affected in the short term, but this can be mitigated by habitat improvements and alternative nesting sites in neighbouring areas. No adverse impacts are predicted in respect of populations of other species of moderate or high nature conservation importance. Overall, deforestation and the associated riparian broadleaf planting are likely to significantly enhance the ecological value of the bird community at Threestoneburn. It is predicted that these changes will benefit the following species of nature conservation importance black grouse, red grouse, grey partridge, skylark, reed bunting, hen harrier, merlin, golden plover, curlew snipe, dunlin, lapwing, redshank, oystercatcher and ring ouzel.

Monitoring

Surveys will be undertaken prior to the breeding season every year during the operational phase of the proposals to identify the presence/absence of Schedule I breeding birds. If they are found to be present, efforts will be made to identify the location of their nest sites so that disturbance can be avoided during the critical March-July period.

In addition to these surveys monitoring will be carried out to ascertain the recolonisation of the restored bog/heathland habitat by the species expected to be the colonisers.

7.9 Summary of Key Findings and Conclusions

- The species most sensitive to deforestation is goshawk and common crossbill. No specific mitigation can be provided, but there is available alternative habitat in the vicinity.
- Forest operations and construction activities are predicted to temporarily displace song thrush, buzzard and sparrowhawk from the site.
- The operational effects on the regional goshawk and crossbill populations are not thought to be significant.
- Felling of approximately 568 ha of conifer plantation provides opportunity to create modified blanket bog and heathland habitats with riparian native broadleaf woodland. These habitats will be of higher nature conservation value than the conifer plantation, being of particular benefit for moorland breeding birds such as skylark, red grouse, black grouse, ring ouzel, curlew, dunlin, golden plover, lapwing, redshank, snipe and, and moorland foraging birds such as short-eared owl, merlin, peregrine and hen harrier.

Populations of birds associated with broadleaved woodland will be increased as part of the Outline Habitat Management Plan (OHMP).

8. RED SQUIRRELS

8.1 Introduction

The red squirrel is a protected species by way of its inclusion on schedules 5 and 6 of the Wildlife & Countryside Act 1981. It is also identified as a species on high conservation value by way of National and Local Bio-diversity Species Action Plans (SAP).

As part of the Scoping Process for the proposals at Threestoneburn the `Save our Squirrels` group (c/o Northumberland Wildlife Trust) requested a red squirrel survey to be undertaken on the property.

During the bird and mammal surveys, although no red squirrels were seen numerous feeding signs were found. It was therefore decided to commission a dedicated squirrel survey.

SFA Surveys were commissioned to carry out the survey in July 2007.

The key issues in relation to red squirrels are as follows:

- The effects of direct habitat loss due to the felling of approximately 568 ha of Conifers
- The effects of disturbance during the proposed tree felling operations

The full survey results can be found in Appendix 7

After the completion of the aforementioned red squirrel survey the Forestry Commission requested the commissioning of a red squirrel survey to determine how the current population would be affected by the proposals and how the population would change if the forest was to be restructured as originally proposed by Forest Enterprise.

The second assessment and accompanying population modelling was carried out by Doctor Peter Lurz, from Newcastle University in March 2008 and the findings are summarised below, but the full report can also be found in Appendix 7.

8.2 Methods

8.2.1 Scope

The scoping opinion from Save our Squirrels, National Park Authority and Environment Agency recommended that the following points should be addressed in the Environmental Statement.

- Reference to National and Local Species Action Plans
- Assessment of methods to minimise interference to squirrels during the proposed operations.

Red squirrels are protected through inclusion on Schedule 5 of the Wildlife and Countryside Act 1981

8.2.2 Field Survey

A specific red squirrel survey was also undertaken in July 2007. The methodology is described in the report Red Squirrel Survey of Threestoneburn Forest, Northumberland.

The report was undertaken to specifically address the following points:

- confirm the presence of red squirrels
- undertake a population assessment if they were present
- identify key habitat areas within the forest
- assess the suitability of surrounding habitats as a corridor for egress

To ascertain whether red squirrels were present organisations such as NWT were contacted for sightings reports, feeding signs were noted and any sightings recorded.

Population assessment was assessed by cone transect analysis per single species stand of conifer. These transects were randomly, but evenly distributed across the forest block.

The habitat assessment was judged on the cone transect results and inspection of adjoining woodland habitat was carried out to ascertain the likelihood of viable migration routes.

8.3 Significance Assessment

During the course of the squirrel survey the presence of red squirrels was confirmed. Two red squirrels were seen during the survey and feeding signs were found at a low density throughout the forest wherever the trees were old enough to be coning. No grey squirrels were seen and consultations with the Northumberland Wildlife Trust have confirmed that the area is considered to be red squirrel-only at present, although occasional grey squirrels have been seen to the North and East (Wooler 7km & Morpeth 30km) recently.

Feeding signs (nibbled cones) were observed in 25 of the 30 cone transects. Transects with no nibbled cones were in areas of poor conifer coning. The results indicated a relatively even distribution of squirrels through out the forest in all areas with conifers of coning age.

The adjoining native broadleaf habitat alongside the Lilburn burn, to the east of the forest was inspected to ascertain its potential as habitat and migration routes (this is the most likely route for the original pioneers).

This corridor consists of mature alder alongside the burn, supplemented by 6 year old broadleaves. This additional planting widens the corridor from 20 – 100 metres.

It is not thought that this habitat is currently suitable for a population of squirrels and would need improvement to encourage a migration route.

8.4 Evaluation of Interest

Within the North of England the Save Our Squirrels/Red Alert Project have identified 16 priority areas to be classed as `Red Squirrel Reserves` where resources and funding are to be targeted to improve forest habitat for red squirrels and control the influx of grey squirrels in to the area. The reserve areas were selected on a basis woodland type and size, suitability of habitat, defendability, buffer size, surrounding woodland, landowner support. Of the 16 reserves the majority are situated in Northumberland, but Threestoneburn was not chosen as one of the eventual reserves due to poor buffer zone (Native broadleaves corridor leading from Lilburn Dene to forest boundary, financial constraints and lack of landowner support (Forestry Commission)).

The survey confirmed that a modest population of red squirrels (60-80) do inhabit the forest at present and due to the age of the trees and the fact that large scale coning has only begun in the last few years it is likely that the population has only become established in the last 5-10 years.

The most likely migration route would be via the broadleaf corridor to the east, although this corridor is not ideal habitat and it is approximately 3 km to the nearest conifer woodland. It is also possible that the area was colonised from the Langleeford valley to the North. It is only 1 ½ km from the forest edge to the nearest habitat in this direction, but the animals would have had to traverse tree-less heather moorland.

8.5 Predicted Trends

If the forest was to remain as a conifer plantation it is likely that the red squirrel would survive and possibly increase in population size over the next 5-10 years as more of the conifers began to bear cones. However two factors would in all likelihood combine to cause a decrease in population in the longer term. The FC felling design plan for the forest, which would in all likelihood be adopted if the forest was to continue envisages large scale felling and replanting to commence in the next 5 years.

This assumption has been confirmed by the findings of the population modelling contained in Appendix 7.

The plan envisages all of the conifers being felled by 2030. During this restructuring period the area of forest consisting of coning aged conifers would be reduced, potentially reducing the squirrel population. The plans would also include a reduction in the area of conifer in the second rotation for wider environmental and landscaping reasons.

This would also have a detrimental effect of the forests potential for retaining a viable population of red squirrels.

These factors in isolation may not however mean that red squirrels could not survive at Threestoneburn in the longer term, however the fact that the property was not identified as a reserve area means that no resources of funding would be available for co-ordinated grey squirrel control in and around the forest.

Grey squirrels have now been sited within 7 km of the forest and the broadleaved corridors to the east connect the forest with the lowland, mixed woodland habitat 4 km away which would provide perfect habitat for grey squirrels when they colonise it.

Based on current distribution of grey squirrels it is likely that they will be well established in the locality within the next 3-4 years.

With its current species composition the forest does not provide suitable habitat for grey squirrels at present, but large numbers of native broadleaves have been planted in riparian corridors to the North, South and East over the last 10 years, primarily for enhancement of black grouse habitat.

These areas contain large seeded broadleaves, such as oak and hazel and eventually will provide ideal habitat for grey squirrels, bolstering the existing alder, oak and hazel.

The grey squirrels migrating from the south are known to be carriers of the poly-pox virus, which is fatal to red squirrels, therefore they would not have to colonise all of Threestoneburn forest to infect the resident reds but merely come into contact with them to pass on the infection, via the riparian zones broadleaf corridors.

8.6 Mitigation and Compensation

This section describes the mitigation and compensatory measures that will be incorporated into the proposals during the programme of works.

8.6.1 Operations

The felling plans will be designed to ensure that red squirrels do not become isolated, by maintaining connectivity through the remaining mature conifer habitat to facilitate red squirrel movement.

Felling will commence in the eastern portion of the forest and work clockwise, so that the final area to be felled will be in the north-eastern portion of the forest, to the north of Threestoneburn house. This area amounts to 60 ha and consists of a Sitka spruce/Lodgepole pine mixture.

The squirrel survey confirmed the presence of red squirrels in this portion of the wood and this area provides the best connectivity to the riparian migration route to the east.

This area will in effect become a safe haven for the red squirrels during the duration of the felling elsewhere in the wood and no felling will take place in this section during the February to September breeding season. Supplementary feeding will take place in this area to ensure that the squirrels have a dependable food supply.

Once the remainder of the forest is felled this section will be felled in the following Autumn (probably 2012).

Various measures will be undertaken to encourage the red squirrels which will have retreated to this area to evacuate via the riparian zone to the east. These can be summarised as follows:

- Between the forest boundary and the existing wooded riparian zone there is a gap of 400m with no tree cover at present. Red squirrels would be able to disperse across this area but to encourage them further it is intended to plant fast growing native tree species such as alder, willow and rowan. If these trees are planted in Autumn 2007, they should at least be giving ground cover by the time this section is felled.

- Surveys have revealed that the riparian zone to the east, while in the main well wooded does not provide much food for squirrels. Most of the mature trees providing continuous canopy cover are alder and the younger trees are not yet bearing fruit. Supplementary feeding will be instigated in this area, so that dispersing squirrels will have food available to them. This supplementary feeding will take place in the 3km of riparian zone as far as the confluence of the Threestone burn and the Lilburn burn.
- Translocation of red squirrels which have retreated in to the `reserve area will be considered. This will involve consultation with the Wildlife Trust and permission from Natural England. Translocation will only be considered if a suitable donor location can be identified.

The Red Squirrel Conservation Assessment carried out by Dr Lurz also investigated the viability of a translocation exercise. The findings can be found in the report contained in Appendix 7 but in summation he thought that it would be difficult, costly and overly bureaucratic in obtaining the necessary licences and permissions.

8.7 Predicted Impacts and Effects

In terms of red squirrels the proposals will have a definite negative impact. The felling of the forest over 3-4 years and its conversion to blanket bog, heath-land and native broadleaf planting will cause the extinction of red squirrels on the site, until hopefully it can be re-colonised in the future as the broadleaved woodlands develop and mature.

However if the measures listed above are put into effect it should be possible to manage the transformation in land use and give the squirrels the opportunity to disperse to alternative habitat in the vicinity.

8.8 Evaluation of Effects

The proposed deforestation of Threestoneburn will have serious negative effects on the population of red squirrels currently inhabiting the property. The initial survey results showed a population estimate of 69 animals and the population modelling showed a theoretical population of between 10-113 animals depending on the amount of food available.

8.9 Monitoring

During the course of the deforestation operations surveys will be undertaken to ascertain the areas of the forest being frequented by red squirrels. Efforts will be made to locate breeding dreys to avoid disturbance in the breeding season (February to September).

These monitoring surveys will take place every year during the operational phase with surveys in early spring (April), late spring (June) and in the autumn (November).

As it is unlikely that it will be possible to identify the location of all of the dreys then areas showing peak activity will also be avoided during the breeding season.

Surveys will also encompass the adjacent woodland habitat and in particular the riparian corridor to the east to ascertain whether these areas are being utilised by the resident squirrels and also to check on whether grey squirrels are migrating along these same routes.

8.10 Summary of Findings and Conclusions

- Red squirrels will be seriously detrimentally affected by the proposed deforestation.
- No specific mitigation can be provided to account for this habitat loss but it will be possible to provide a viable dispersal route for the squirrels.
- Operational safeguards will be put into place to mitigate against accidental damage to nesting sites during the February to September period.
- The forest is not a designated red squirrel reserve area, therefore no funding is available for red squirrel conservation measures in this locality.
- Translocation would theoretically be possible but would be difficult, costly and the necessary permissions and licences may prove to be impossible to obtain.

9. SOCIAL AND ECONOMIC ISSUES

9.1 Introduction

This section examines the socio-economic impact of the deforestation proposals in terms of its effects on employment, economic activity and landuse.

9.2 Employment and Landuse Change

9.2.1 Current Situation

The area surrounding Threestoneburn Forest (See Surrounding Landuse Map 8) predominantly consists open moor-land which is utilised for upland sheep rearing and grouse moor.

The neighbouring landownership and management regimes are as follows:

- North - Lilburn Estates, Langleeford Farm

- inhand sheep rearing and grouse moor
- South & West - Linhope Estates, tenanted hill farm and inhand grouse moor
- East - Ilderton Dodd Farm, inhand hill farm and let grouse moor

The land immediately surrounding the forest area currently employs 4 shepherds and 3 gamekeepers.

9.2.2 Operational Phase

During the deforestation operational phase it is likely that between 15-20 contractors and estate employees will be employed carrying out the operations.

This will consist of the following:

- Harvesting/Brash recovery operations - 8-10 individuals
- Timber haulage - 4-6 individuals
- Road construction/maintenance - 3-4 individuals

It may be necessary during the operational phase of the project for caravans and a site cabin to be located on the site. If this is necessary then they will be located in the quarry at grid reference NT967204. Appropriate precautions will be made to ensure that there are no negative effects on the environment in terms of litter and pollution and that appropriate sanitation in the form of portaloos are provided.

This site will also be the designated first aid point, with first aid materials, emergency telephone and at least two trained personnel on site at all times.

9.2.3 Post Deforestation

Once the area has been deforested it will be managed as moorland, which will be utilised for sheep grazing and grouse shooting. Currently the landowner employs 2 upland shepherds and 4 gamekeepers on the adjacent moorland. In addition a further 25-30 people are employed on a part-time basis during the shooting season helping with the shooting and looking after guests.

The young trees that are to be planted as part of the mitigation in the riparian zones will also need to be maintained and this will provide work for local self employed contractors.

9.2.4 Conclusions

During the process of deforestation the number of people working on the site, both contractors and estate staff could be in excess of 20 people at any one time.

Once the area of forest is restored to moorland it will be managed in conjunction with the surrounding moorland for grouse shooting and sheep grazing. The number of full-time employees required is likely to be 1-2 people, but this does not take into account additional part-time labour required during the shooting season.

9.3 Timber Marketing

The felling of the 568 ha of conifer plantation area over a three year period will produce approximately 150000 tonnes of timber and possibly 50000 tonnes of brash.

This equates to an annual production of 50000 tonnes of timber and 16600 tonnes of brash.

9.3.1 Roundwood

The timber element will be produced at a rate of ca. 1000 tonnes per week (40 articulated lorries). Due to the average tree sizes and the fact that much of the conifer crop areas are being felled prematurely a large proportion of the production would be small roundwood. The approximate breakdown of the production can be described as follows:

Sawlogs	- 400 t (40%)	20000t/annum
Palletwood	- 200 t (20%)	10000t/annum
Small roundwood	- 400 t (40%)	20000t/annum

This level of production in the locality will cause issues in respect of timber marketing on a local scale but a combination of forward planning and close market liaison should minimise the disruption.

The location of Threestoneburn lends itself well to supplying a wide range of wood processing outlets. It can be seen from the table below that the markets are large enough to absorb the likely production from the property over the 3 year felling phase.

The figures in the following table are based on splitting the production of the three categories of produce evenly amongst the markets listed below. It is a rather crude illustration of the point but does highlight that although approximately 50000tonnes of round-wood will be marketed from the forest per annum for 3 years it does not pose a significant problem when taking into

account the location of the property and the numerous marketing options mentioned below.

Table 5

Product	Market	Distance (miles)	Annual Production (tonnes)	% From Threestoneburn
Sawlogs	A&J Scott	8	120000	8.3%
	Taylor-made	65	275000	1.8%
	Windymains	62	120000	8.3%
	BSW	100	340000	1.4%
Palletwood	James Jones	112	180000	1.3%
	Forest Garden	112	200000	1.2%
	Anglian Timber	39	22000	11.3%
	A Mounter	68	15000	16.6%
SRW	Egger	53	180000	2.7%
	Export (Blyth)	40	40000	12.5%
	Eon	112	150000	3.0%
	Sembcorp	73	100000	5.0%

9.3.2 Chips/Brash

As mentioned above the annual production of chips arising from brash could be as much as 16600 tonnes. This is a theoretical quantity that would be achievable if the majority of the site to be deforested were to be whole tree extracted so that the brash could be dealt with at roadside.

In all likelihood this will not be the case as due to the site conditions prevailing on a significant part of the site where the brash will have to be utilised in brash mats and will not be recoverable post harvesting and will be mulched.

A more realistic figure for the annual production of brash chips would be 8000 tonnes (160 t/week), which equates to ca. 6 lorries per week on average over the 36 months.

New markets for brash are developing all of the time but currently the nearest markets are Sembcorp at Teesside (73 miles) and Eon at Lockerbie (112 miles). These markets have a combined annual intake of over 250000 tonnes so it can therefore be seen that the potential production from the Threestoneburn Project will have no significant impact on the existing market for brash chips.

9.3.3 Conclusions

It can be seen from the above figures that although the proposed deforestation works at Threestoneburn are of a very large scale in the context of `normal` forestry works, in the locality the local timber processing markets are of a large enough scale and there are enough of them for the felling over a 3 year period not to have a detrimental effect on the market.

There are implications regarding timber haulage, but these are addressed in Chapter 12 Traffic & Transportation.

9.4 Public Access Provision & Recreation

9.4.1 Current Situation

At present there is very little public access within the boundaries of Threestoneburn forest. Although the forest has been dedicated as open access land because of the dense pole stage tree crops access is restricted to the roads and rides, which are covered with rank vegetation and tree regeneration making them virtually un-passable.

There are 2 public rights of way passing through the property. A public footpath enters from the south at point NT 984181 and heads towards Threestoneburn House where it meets a bridleway heading in from the access road to the east and leaving the property at point NT 969210. Neither of these routes are well used although the former land owners the Forestry Commission have carried out significant improvements to the surface of the public bridleway (See Map 1 Rights of Way and Access).

9.4.2 Operational Phase

During the deforestation process every effort will be made to keep the public rights of way open during the duration of the operations. For health and safety reasons it will be necessary to temporarily close sections of the paths, but when this is necessary temporary diversions will be instigated after approval from the Northumberland National Park Authority.

9.4.3 Post Deforestation

After the felling operations are completed it is intended to mulch the stumps on as much of the site as possible. The current 2 public rights of way will be re-instated so that they can be utilised by the public. All of the area will then become `Access Land` in the truest sense and will be able to be utilised by walkers in the same way that the surrounding moor-land can already be used.

As part of the overall public access improvements the bridleway which leaves the forest boundary to the north heading for Langleeford will also be re-routed on to grass track which will provide a better surface for horse riders and avoid an area of blanket bog.

9.4.4 Conclusions

Although the property at present is `Access Land` it cannot be utilised as such due to the current landuse and vegetation types. The deforestation process and change of landuse will result in significant improvements in access provision as visitors will be able to roam across the whole of the site and provide new routes for the climbing Hedgehope and Dunmoor hills which have previously not been available.

10 LANDSCAPE AND VISUAL ASSESSMENT

10.1 Introduction

This section of the Environmental Statement should be read in conjunction with the documents, computer generated images and photomontages in Appendix 9 Landscape Assessment and Appendix 17 FC Forest Design Plan.

This section focuses on the current appearance of the forest in the landscape, the issues raised regarding landscaping by the scope`s and the appearance of the property post deforestation, once the proposed riparian native broadleaf plantings have become established.

A landscape analysis was carried out by the Forestry Commission as part of a previous forest design plan and this has been utilised to give a representation of the forests appearance at present. In addition Liz MacIntosh was commissioned to carry out a landscape assessment to determine the appearance of the area post deforestation.

10.2 Scope of Assessment

The proposed deforestation at Threestoneburn has potential to affect the landscape of its surroundings. This assessment attempts to evaluate these effects.

10.2.1 Methodology

The initial phase of the assessment is based on the FC forest design plan. Photographic montages of the properties appearance in the landscape were taken from 2 vantage points (See Appendix 17), one from the access road leading to the property via Ilderton Dodd Farm to the east and the other from the Summit of Hedgehope Hill looking east.

In addition photographs were taken of the forest from a distance. Three locations were chosen (See Appendix 9) at the side of the A 697 at Powburn, from the public footpath to the North of Ilderton Dodd and from the B6346 road at Harehope.

10.3 Assessment of Visual Effects of Deforestation

The forest is most visible from a distance. The photomontages taken from the 2 locations to the east show that the most significant features in the landscape are the profiles of Hedgehope Hill to the North, Dunmoor Hill in the centre and the Cunyan Crags at the southern end of the property.

Only in the saddle between Hedgehope and Dunmoor Hills does the tree-line reach the western boundary of the property. Because the tree-line is below the horizon it is not particularly visible in the landscape.

Appendix 9 contains a photograph of the area taken in 1972, before most of the conifers were planted. This clearly shows the landforms, previous vegetation patterns and re-enforces the point that it is the profile of the hills rather than the position of the forest in the landscape that is the most significant factor in determining the appearance of the area in the wider landscape.

The only issue regarding landscape that was raised by the scopee`s during the scoping process was raised by the National Park Authority. This concerned the Summit of Hedgehope Hill. As can be seen from the photographs contained in Appendix 9 when viewed from the east it is readily apparent that a fence line runs up the side of the hill and there are distinctly different vegetation patterns either side of this fence line. The area to the north is on Langleeford Farm. It is extensively grazed by sheep and is recovering moorland. This area was bought by Lilburn estates 12 years ago and the stocking rates have been reduced to encourage the heather to return and supersede the Matt grass (*Nardus stricta*) that was the previous dominant vegetation when the area was more intensively grazed.

The area to the south of the boundary fence is within the forest boundary and consists of ungrazed heather which has never been burnt for the last 40 years. When viewed from a distance it is not the trees that can be seen causing the stark contrast in appearance, but rather the recovering heather/grass when compared to the rank, tall heather.

10.4 Mitigation & Enhancement

Post deforestation the landscape changes when viewed from the distant vantage points, where the majority of people will see the results will not be dramatically different. The profiles of the summits of the 3 hills will be identical and the loss of the tree-line will not be particularly apparent (See Photographs in Appendix 9).

There will be a more dramatic effect in terms of landscape appearance from the view points nearer the forest, however with the proposals for new riparian native broadleaf woodlands to supersede the conifers the landscape

appearance of the area will ultimately be enhanced (see computer generated images showing established broadleaves in the riparian zones in Appendix 9).

It will also be possible to address the issue of the appearance of Hedgehope Hill post deforestation. The current boundary fence could be re-aligned and a grazing regime will be instigated within the current forest area as part of an integrated approach to moorland management. Based on experience gleaned from the deforestation carried out at Commonburn and Fredden Hill light sheep grazing and controlled burning of the heather will be gradually introduced. It may take up to 5 years but there should be a gradual transformation on the Hedgehope slopes so that the vegetation patterns will merge and the current stark contrast is lost.

10.5 Significant Visual Effects

As previously mentioned in the text 5 views were identified and the assessment of these is reviewed below.

3 of the views are close to the forest, whilst the other 2 are more distant views taken from roadside viewpoints 5-8 miles to the east.

View 1

Taken from access road leading to forest from point just to the west of Calder, 3 km from forest boundary.

View 2

Taken from access road to east of Ilderton Dodd Farm, 1.5km from forest edge.

View 3

Taken from Middleton Craggs showing the vegetation 'line' on Hedgehope Hill.

View 4

Long distance view taken from A 697 at Powburn looking at southern flank of forest, showing Cunyan Craggs and Dunmoor Hill, 6 km from forest boundary.

View 5

Long distance view taken from B6346 at Harehope looking at forest 12 km away from the east.

10.6 Table 6 : Summary of Visual Effects

No.	View Point Significance of Effect	Importance Location	Magnitude or Sensitivity of Effect
1.	Calder Slight/Moderate Adverse	Moderate	Roads : Negligible Deforestation : Medium
2.	Ilderton Dodd Slight/Moderate Adverse	Moderate	Roads : Negligible Deforestation : Medium
3.	Middleton Craggs Moderate/ Beneficial	Moderate	Roads : Negligible Deforestation : Medium
4.	Powburn A697 Neutral	Low	Roads, Negligible Deforestation : Negligible
5.	Harehope B6346 Neutral	Low	Roads : Low Deforestation : Low

10.7 Summary & Conclusions

Because of the scale of the landscape in the eastern Cheviots and the forests location to the east of the Hedgehope, Dunmoor and Cunyan Craggs the removal of the forest will not be immediately apparent in the landscape. The various photomontages clearly demonstrate that the most distinctive feature in the landscape is the profile of the 3 hills and the deforestation will not alter this appearance.

The views closer to the forest will be altered, but in a positive manner, especially with the new riparian broadleaf planting.

The contrasting vegetation patterns either side of the fence line up to the summit of Hedgehope will also be addressed by the changing land use, fence re-alignment and introduction of a similar management regime either side of the previous fence line.

The design of the riparian broadleaf planting within the forest footprint should achieve a more natural appearance in the landscape (See Appendix 9).

11 CULTURAL HERITAGE

11.1 Introduction

Cultural heritage is represented by a range of features that have resulted from mans past use of the landscape. These would include buildings, earthworks, archaeological remains and old field boundaries.

The majority of such remains are protected by legislation and certain features are given legal protection through Ancient Monuments and Archaeological Areas Act 1979 (Scheduled Ancient Monuments).

This section was compiled using published information regarding known sites of significance within the property and consultation with the Forestry Commission, National Park Authority, Northumberland County Council and English Heritage.

11.2 Existing situation

Based on published information there are 3 Scheduled sites and a further 4 non-scheduled sites within the current forest boundary (See Appendix 8).

These sites can be described as follows:

- | | | | |
|----|----------------|---|---|
| 1. | SAM N1756 | - | Remains of stone circle |
| 2. | SAM N1771 | - | Remains of Bronze Age cairn field |
| 3. | SAM N1722 | - | Prehistoric hut circle |
| 4. | Monument N1308 | - | Possible stone circle site |
| 5. | Monument N1786 | - | Fragments of Neolithic/Bronze Age pottery & flint |

- | | | | |
|----|----------------|---|-------------------------|
| 6. | Monument N1312 | - | Remains of cairn field |
| 7. | Monument N1773 | - | Single Bronze Age cairn |

In addition to the above there is a crash site of a World War II Bristol Beaufort fighter bomber recorded at grid reference NT956199.

There are no further known features within the boundaries of the forest and therefore within the scope of this Environmental Statement (ES).

At present the only site that visitors are readily able to see is the stone circle, as the other sites are either surrounded by trees or in remote locations with poor access and therefore not visited.

11.3 Mitigation/Safeguarding

Most of the features are located in areas of open space that have never been planted with trees and are therefore well away from the operational areas in terms of tree felling and new roading proposals. Where the features are in close proximity to afforested areas prior to the commencement of any operations the locations of the above sites will be clearly demarcated on the ground to prevent any damage caused by the proposed felling activities.

Where trees have been planted close to the sites (Sites 5&6), expert advice will be sought during the operations and buffer zones will be put in place to prevent machinery damaging the site.

If during the course of the operations any unknown locations of interest are found then expert advice will be sought and the remains safeguarded for future investigation.

11.4 Predicted Impacts and Effects

Impacts will be mitigated by avoidance of all known features of interest. Where necessary areas will be clearly demarcated and buffer zones instigated to prevent accidental damage. All of the new roading proposals will avoid the features.

11.5 Summary & Conclusions

The cultural heritage assessment has involved a review of existing information and scoping with the National Park Authority and English Heritage. It should be possible to carry out the proposed deforestation without any detrimental effect on the known sites.

Post deforestation all of the sites will be visible and visitors will be able to access them all much more easily.

12. TRAFFIC AND TRANSPORTATION

12.1 Introduction

This section details the assessment of traffic and transportation associated with the proposed deforestation at Threestoneburn. Bearing in mind that it is the estates intention to extend the existing quarries within the forest to undertake the road improvements the main impacts of traffic will be the removal of round timber and wood chips from the forest to markets by lorry. Once the work is completed the traffic will be no more than occasional agricultural vehicles.

Consideration has been given to the proposed access route to the site, the alternatives, changes to traffic numbers and opportunities for adopting procedures to minimise the effects.

12.2 Current Situation

The current route that is used to access the forest is from the minor county road at Calder NU018199. From this point there are 2 alternative routes to the main A697 road, the first of these routes is via Roddam joining the main road at Roseden and the second route is via Reaveley and Brandon joining the main road at Brandon Whitehouse (See Map1 & maps in Appendix 18 Roads & Quarrying)

From the minor county road at Calder access to the forest is via a private gravel track leading through farmland on Roddam Estate and Ilderton Dodd. It is 3 km from Calder to the forest gate.

As well as serving as the access route to the forest this track also serves Ilderton Dodd cottage, where an estate keeper resides and Threestoneburn House, which although enclosed by the forest is privately owned.

This current access route is in good condition and only requires modest upgrading to serve as a viable access route for timber lorries.

12.3 Alternative Proposals

At the scoping meeting held in March 2007 the representatives of Ingram Parish Council as well as landowners on the route leading through Reaveley and Brandon Farms expressed their concerns regarding this being the preferred route. It was agreed that alternative routes be considered.

Please find below a summary of the 3 possible alternative routes (See Map 1 Rights of Way and Access).

12.3.1 Alternative 1

This route leads from the forest to the County road at Calder. It then goes right and heads south via Reaveley Greens, Reaveley and Brandon farms before joining the A697 at Brandon Whitehouse.

From the junction of the forest track and county road at Calder it is 500m to the site of the former sand and gravel quarry at Roddam Bog. From this point the minor county road has been improved by widening and the creation of passing places. The 500m before the old quarry does require some improvements to facilitate lorries negotiating the tight junction and it would be possible to re-instate a former by-pass where lorry traffic could run on a track for 100m at the former quarry thus avoiding a narrow section of road.

12.3.2 Alternative 2

This route leads from the forest to Calder and accesses the A697 via Roddam. It is physically possible to travel this route in a lorry but it has never been subject to any widening unlike Alternative 1 and there is no current provision for passing places.

12.3.3 Alternative 3

This possible route was highlighted at the scoping meeting. There is an access track leading from South Middleton on land owned by Lilburn estates running in a south-western direction towards the forest. The first mile of this track would be negotiable by lorry, but the next mile is no more than a narrow 4 wheel drive vehicle track. The track goes to within 400m of the forest boundary before turning away to the north in the direction of Langlee in the Harthope valley.

A considerable amount of work would be required to enable this track to link up with the forest road network. This would involve upgrading 1 mile of hill track, building 1 mile of new road within the forest and linking the 2 together by building a further 400m of new road through undisturbed ground that is part of the Cheviot SSSI.

12.4 Mitigation & Enhancement

Based on the facts stated above and discussions with statutory bodies such as the Highways Agency and National Park Authority, `Alternative 1` has been chosen as the preferred access route.

In mitigation it is intended to carry out improvements to this preferred route for operational efficiency and general road safety improvements.

This can be summarised as follows:

- Access track widening, construct 3 lorry passing places and upgrade 2 cattle grids and 2 stream crossings. (Improvements agreed with neighbouring landowners and permission to be sought from National Park Authority and Environment Agency).
- Calder to former quarry site, re-alignment of corner so vehicles can turn south, minor road widening and re-establishment of by-pass.
- Instigation of speed restrictions on route via the 3 farms. This would involve the imposition of a 30 mph speed restriction within the contract for the haulage works whereby any haulier found to be in breach of contract would be banned from the site for a set period of time and the main contractor subject to a financial penalty.

This would be monitored by means of a portable speed camera. Appropriate signage would be erected after consultation with the County Councils Highways Dept.

(See Map 1 for details & Appendix 18)

12.5 Predicted Impacts & Effects

It is predicted that for the deforestation operations to be completed within a period of 36 months the following weekly lorry movements would be required;

Roundwood despatches	- 1000 tonnes/week	= 40 lorries
Brash/Chip despatches	- 160-330 tonnes/week	= 6-13 lorries

From the above figures it can be extrapolated that on average a maximum of 9 lorries per day would leave the site, based on a six day working week (Monday – Saturday).

Although it is likely that the deforestation process would take 36 months the marketing of the brash/chips would take longer so the average number of lorries per day would in all likelihood be slightly reduced.

Additional transport movements would also be required moving machinery to site by low-loader and there would obviously be workers coming to work each day. It is expected however that at least some of the expected 8-10 machine operators would live in caravans on site during the week.

To put this level of operations into perspective it was confirmed at the scoping meeting that during the operation of the sand and gravel quarry over 20 lorries per day were leaving the quarry.

It must also be remembered that if the forest had been maintained in public ownership or sold to a forestry investor the disruption caused by timber traffic would still have been realised and there would have been no requirement for scoping or consultation. Although the felling would have been phased over a longer time frame more timber would have been produced and up to 8000 lorry movements would have been required to transport round timber, let alone residues such as brash and chips.

Felling would have commenced within the next 2-3 years and continued until 2031 based on the published Forest Design Plan.

12.6 Evaluation of Effects

There is no doubt that the increased traffic movements on the preferred route will have an effect on the people living along and using this route. The effect will however be localised as once the lorries reach the A 697 their effect will be negligible considering the amount of traffic already using this road.

However the preferred route has been previously improved to facilitate the sand quarry and the levels of maximum usage will be less than 50% of the previous use when the quarry was in operation 4 years ago.

12.7 Summary & Conclusions

The traffic and transport assessment has involved identifying the various alternative routes by which the timber from the forest can be extracted. Once the preferred route was identified and the reasons for choosing this route explained the mitigation measures that can be utilised to help minimise the adverse effects of this choice are stated. Overall we believe that `Alternative 1` is the only viable choice.

13 CARBON

13.1 Introduction

Carbon was raised as an issue to be addressed as part of the Environmental Impact assessment after the scoping meeting. Climate change is widely regarded as a the major challenge facing the world today and there is general consensus that it is due to concentrations of so called greenhouse gases (GHGs) such as Carbon dioxide (CO₂). The two main causes of rise in GHG globally are burning of fossil fuels and changes in land use, including deforestation.

This is the first time in the UK that an ES has been asked to address the issue of carbon loss and relevant mitigation.

(See Appendix 10 for more background on Carbon Issues in UK Forestry and references).

The Forestry Commission asked for a survey to be commissioned to ascertain the amount of carbon currently sequestered in the growing trees at Threestoneburn, the likely effects of the deforestation on the carbon locked up in the soils on the site and the appropriateness of carrying out replacement tree planting to compensate for the carbon to be lost.

To ascertain this information ECCM were commissioned to carry out a survey and report. This report titled `An assessment of carbon balances associated with activities by Scottish Woodlands Ltd 2007` can be found in Appendix 10.

The key objectives of the assessment were as follows:

- To estimate the carbon losses that may occur as a result of the deforestation proposals.
- Review potential soil carbon emissions, with reference to tree harvesting techniques to be employed.
- Estimate potential average carbon storage if the forest had been restructured as per the proposed FC Forest Design Plan.
- Estimate potential carbon uptake that might be achieved by proposed on-site replanting of native broadleaves within the riparian zones.
- Estimate potential carbon uptake that might be achieved by new planting proposals elsewhere.

13.2 Current Situation

ECCM were provided with data regarding species composition, species areas and yield classes. Based on the information provided, the carbon sequestration potential was calculated separately for each species.

Assumptions were also made for the purpose of modelling CO₂ emissions that any timber will be used for either pulp, fuel-wood or packaging.

These assumptions are likely to result in an overestimation of the CO₂ emissions and therefore considered to be conservative when calculating carbon balance.

Using the assumptions and data provided the report calculates that the total amount of carbon sequestered at Threestoneburn at the moment is ca. 150000tCO₂.

Based on the Forest Design Plan (FDP) prepared by the Forestry Commission in 1997 it was possible to calculate how much carbon would be sequestered in the forest if it were to remain as a commercial conifer plantation.

The plan described how over the period 1997-2031 the conifers within the forest would be felled and replanted. Because of landscaping and conservation improvements the proportions of conifers would be reduced and the areas of native broadleaf and open space proportions would be increased. Based on the information gleaned from the FDP it was possible to extrapolate that the potential average CO₂ storage over 100 years post restructuring would be ca. 130000tCO₂.

13.3 Implications of Deforestation

13.3.1 Tree Felling

If Threestoneburn Forest is felled on the 3 year timetable proposed then the loss of carbon from tree felling would be in the region of 150000tCO₂.

13.3.2 Soils

Loss of carbon from soil disturbance is a significant risk during the proposed harvesting operations at Threestoneburn. No measurement of soil organic carbon has been carried out, but it is intended to mitigate against any possible adverse effects by the following proposals:

- Root plates will remain in ground in order to minimise ground disturbance
- Phased felling, brash recovery and mulching
- Use of low impact technologies and controlled access of machinery in order to minimise soil disturbance.
- Blocking drains in order to raise water table.
- Encourage rapid re-vegetation of the entire site.

As part of the habitat restoration process, as the restoration of blanket bog and heath-land habitat progresses it is likely that aeration brought about by the rising of the water table will result in lower oxidation rates in the peat/organic soil layer and hence reduce soil carbon emissions.

13.4 Mitigation

As well as carrying out the preventative measures described above to reduce the amount of carbon emitted from the soils as part of the harvesting works and the raising of the water table to restore modified bog habitat, it is proposed to carry out new tree planting to sequester carbon. This proposed tree planting and the amount of CO₂ it will store is described below.

13.4.1 Onsite Tree Planting

Riparian zone native broadleaf planting, comprising birch, alder, willow, ash, oak and woody shrubs. This planting will take place both within existing forest boundary of the forest and in adjoining land owned by the estate.

Based on the data provided it is estimated that approximately 10000t CO₂ would be secured by this planting.

13.4.2 Offsite Tree Planting

A potential area for new planting had been identified at Helensburgh, on the west coast of Scotland. This area comprises some 267.33 ha and includes 193 ha of mixed conifers, the balance being mixed broadleaves and woody shrubs. It was estimated that the long-term average CO₂ storage from these proposals is forecast to secure approximately 90000 tonnes of CO₂. Although this area was not secured as replacement planting in respect of the proposed deforestation at Threestoneburn it is a good example of the scale of new planting that would be appropriate. It is the intention of Lilburn estates to secure an area of land approximately the same size as the area at Helensburgh to secure ca. 90000 tonnes of CO₂.

13.5 Summary & Conclusions

It can be seen from the above text that the proposed mitigation planting to replace the carbon lost from the deforestation at Threestoneburn does not fully compensate for the loss. However it is important to remember that if the forest was to remain as a conifer plantation then it would have been restructured in a similar fashion to that described in the FC FDP. Taking this into account then the shortfall in CO₂ replacement is significantly reduced and when taking into account the habitat restoration described in Chapter 6, with particular relevance to the bog habitat we feel that the mitigation is appropriate.

14 SUMMARY OF MITIGATION AND ENHANCEMENT MEASURES

14.1 Introduction

This section of the Environmental Statement summarises the findings of each relevant section and describes how the mitigation and enhancement measures will be instigated to alleviate or reduce potential damaging effects of the proposals on the environment.

14.2 Geology, Hydrology, Soils & Drainage

By the instigation of good design and the adherence to industry best practice it has been evaluated that the road construction and associated quarrying will have minimal significance on the environment.

The deforestation itself will have an effect on the hydrological regime, but the effects can be minimised by appropriate mitigation as described previously. In the longer term as the water table rises and the blanket bog habitat recovers this will have an overall positive effect on the hydrological regime, by slowing down runoff and acting as a reservoir in times of drought.

To ensure that all of the above are achieved it is imperative that operational control is tight, industry guidelines are adhered to and an appropriate monitoring regime is put into place.

14.2.1 Ecology & Nature Conservation

As mentioned above it is important that guidelines are adhered to ensure that the proposed works have an overall positive benefit to the environment.

14.2.2 Habitat Restoration

Work will be carried out ensuring minimal disturbance to peat soils during road works and felling operations, buffer zones will be established around riparian zones and measures put in place to avoid silt reaching the watercourses. Brash mats will be utilised to protect the soil structure where required.

The most sensitive habitat is the blanket bog area. The existing area is out with the operational area so no disturbance is envisaged. A large area of blanket bog has been planted with trees and as part of this scheme it is to be restored.

The habitat will also be improved by the restoration of extensive areas of heathland after deforestation as well as the planting of 90 ha of new native woodland.

14.2.3 Mammals

During the course of the operations every effort will be made to avoid undue disturbance to mammals such as otters and badgers. Otters are known to frequent the site and the provision of buffer zones around the watercourse should minimise disturbance. No badgers were found in the mammal survey but additional work will be carried out to ensure any setts within the property are not subjected to disturbance and all guidelines will be followed.

14.2.4 Reptiles & Amphibians

Two species of reptile and three amphibians were found during the survey. All were found in the riparian zones or areas of open space that will be unaffected by the operational activities. The use of buffer zones should

provide adequate mitigation and the habitat will be enhanced by the felling, allowing range expansion.

14.3 Birds

The evaluation confirmed that two species of schedule 1 bird will be displaced by the proposals (goshawk & Common crossbill) and it is not possible to provide specific mitigation other than protection of known nest sites during the operational phase. Several other species such as song thrush, buzzard and sparrowhawk will be temporarily displaced as breeders, although alternative sites are available close by.

In the longer term the proposed deforestation and enhancement by recovery of moorland habitat will have a positive benefit. Schedule 1 species such as peregrine, merlin, hen harrier and barn owl will be able to utilise the site and Red list species such as black grouse, grey partridge, skylark as well as numerous waders will be able to recolonise the area from neighbouring habitats.

14.4 Red Squirrels

The surveys have revealed that red squirrels are present in the forest in modest numbers. They will be adversely affected by the proposals as they will lose 568 ha of habitat. It is not possible to mitigate against this directly but it is possible to design the phasing of the felling to avoid squirrels becoming isolated in small pockets and leave the felling of the North-east corner of the forest to last as this area has the best connectivity to the nearest suitable habitat. An escape corridor can be created by additional tree planting and supplementary feeding to allow the squirrels to migrate to neighbouring suitable habitat.

14.5 Social & Economic Impacts

The proposals will have an immediate beneficial impact on employment as up to 20 people, many local, will be working on the project. In the longer term as part of the estates grouse shooting and farming business additional labour will be employed.

The amount of timber to be harvested over a 3 year time frame will have a ripple effect on local timber markets however there is enough market capacity within a 100 mile radius of the site for this timber to be absorbed without significant disruption to normal supply patterns.

Access to the forest during the operations will be maintained for pedestrians but some temporary diversions may be required for health and safety reasons. Post operations access provision will be greatly enhanced allowing new routes to be established to the summits of Hedgehope, Dunmoor Hill and the Cunyan Crags as the former forest will become `Access` land.

Access for horse riders will also be improved by the provision of permissive routes.

14.6 Landscape

The landscape appraisal shows how the removal of the conifers at Threestoneburn will not have a detrimental effect in terms of landscape appearance as due to the landform they are not readily visible. From almost every conceivable viewpoint the most overriding feature in the landform is the profile of the hills. The forest is in effect in the shadow of the hills and therefore not distinct. Indeed old photographs taken before afforestation confirm this.

In terms of enhancement the planting of the riparian zones within the forest with native woodland will achieve `local` landscape improvement, although they will not be visible from any of the distant view points either.

14.7 Cultural Heritage

The effects of the proposed deforestation on archaeology can be fully mitigated by the safe guarding of the sites during the operations. Most of the sites are within areas of existing open ground and therefore not part of the operational area. Where this is not the case they will be demarcated and buffer zones established to prevent machinery encroaching on the sites.

In terms of enhancement once the trees are gone all of the sites will be more visible to and more accessible to the public.

14.8 Traffic & Transport

The various options for the despatch of timber from the property have been explored. Option 1 the route via Reaveley and Brandon has been chosen as this is the most suitable. In terms of mitigation and enhancement this route has already been upgraded by the council to service the sand and gravel quarry and additional improvements are proposed.

It is also proposed to introduce speed limits for the lorries while passing through the farms to reduce disturbance to residents and visitors.

14.9 Carbon Sequestration

The proposed felling of 568 ha of conifer will release ca. 150000tCO₂ and the proposed riparian planting will only replace 6% of this.

Mitigation and enhancement can be achieved by the restoration of the 232 ha of blanket bog, where the raising of the water table will reduce the amount of CO₂ lost naturally from the peat as it dries out as well as the planting of an off-site carbon sink forest.

14.10 Summary & Conclusions

In the main it can be seen that there are significant environmental benefits arising from the proposed deforestation at Threestoneburn and that the appropriate mitigation and enhancement can be put in place to safeguard against detrimental effects.

Red squirrels are the major species detrimentally affected by the proposals and it is not possible to fully mitigate against this.

On balance however the proposals benefit the following habitats and species subject to local and national action plans;

Habitat Action Plans (HAPS)

- Blanket Bog
- Rivers & Streams
- Heather Moorland
- Native Woodland

Species Action Plans (SAPS)

- Otters
- Black grouse
- Upland waders
- Bats
- Water voles