



Hartwood Forests

Land Management Plan

2024-2034

Central Region

Plan Reference No: 032/24/03

Plan Approval Date: 10/05/2024

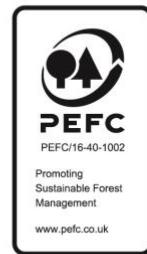
Plan Expiry Date: 09/05/2034

We manage Scotland's national forests and land to the United Kingdom Woodland Assurance Standard – the standard endorsed in the UK by the international Forest Stewardship Council® and the Programme for the Endorsement of Forest Certification. We are independently audited.

Our land management plans bring together key information, enable us to evaluate options and plan responsibly for the future. We welcome comments on these plans at any time.



The mark of
responsible forestry



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(Maps and Appendices II > VII attached separately)

Table 1 - LMP version history

Version	Date	Comments
1.0	09.06.23	First draft for internal consultation
1.1	29.06.23	
2.0	05.10.23	Updated draft for stakeholder consultation
2.1	02.02.2024	Plan updated and checked following consultation
3.0	22.02.2024	Final plan for submission to Scottish Forestry

Land Management Plan section summary:

LMP main document:

Section 1 provides an overall summary of proposals for all interested parties.

Section 2 provides a summary of regulatory issues for Scottish Forestry staff.

Section 3 describes the site context and rationale behind the management proposals.

Section 4 details specific management proposals for the next 10 years.

Section 5 gives a select list of reference materials used in the production of the LMP.

Appendix I details the background site information including physical and social factors.

Appendices II onward contain supporting information and are available as separate documents:

Appendix II – Land Management Plan consultation record

Appendix III – Analysis of the previous plan and LMP monitoring table

Appendix IV – Deer Management Plan

Appendix V – Agricultural impact assessment

Appendix VI – Agricultural management plan

Appendix VII – LMP visualisations

1. Summary

1.1 Introduction and Plan Overview

This Land Management Plan (LMP) covers circa 522 hectares (ha), situated immediately west of Shotts and north of Allanton, surrounding the settlements of Hartwood and Bowhousebog, in North Lanarkshire, Central Scotland. It sets out proposals for circa 184.99ha of woodland creation and circa 99.46ha of peatland restoration over a 10 year period from 2024 to 2034. The site includes the existing Forestry and Land Scotland landholdings at Murdostoun and Mossband, and our new acquisition of Hartwood Home Farm; with peatland restoration and woodland creation being pursued as the primary management activities on each of these areas, respectively. (Refer to maps 01. and 02 ., for further information, see Appendix I.)

For more information on Land Management Planning, visit:
<https://forestryandland.gov.scot/what-we-do/planning>

1.2 Vision and Objectives

The management proposals within this plan have been developed in order to achieve our vision and objectives for this site over the next ten year period, as detailed below.

Our long-term vision for this site is to establish and maintain diverse and resilient woodlands capable of producing a range of ecosystem services, including: timber production, biodiversity value, carbon sequestration and public recreation. Alongside this, we aim to restore former coniferous plantations on peatland habitats to a more natural state, with the intention of improving biodiversity value and securing a long-term carbon sink.

This vision is supported by the following objectives for delivery under this Land Management Plan, in order of priority:

1. Establish stands capable of producing timber for a range of markets, including quality hardwood and softwood sawlogs.
2. Improve biodiversity value through woodland creation and peatland restoration, expanding and connecting with existing habitats.
3. Improve social and recreational value by facilitating informal access, providing amenity and pursuing suitable opportunities for community involvement.
4. Identify and establish areas for long-term agricultural use and agroforestry trials; primarily utilizing areas constrained for woodland creation.
5. Fulfil existing commitments for on-site renewable energy production, where appropriate (i.e. existing windfarm approval).

The following critical success factors will indicate if the stated objectives have been achieved. (For a full analysis of how progress against the LMP objectives will be monitored see Appendix III/2.).

- Successful establishment of 184.99ha of new woodland as per maps 13/13a, with good health and vigour of trees, and good stem form in areas intended for timber production.

- Successful restoration of 99.46ha* to lowland raised/intermediate bog as per map 13, including a suitably high water table and expansion of bog vegetation.
*This figure is an estimate based on 1:10k soil mapping and may be subject to minor changes as the exact boundary of the bog will only be apparent in detail once the existing woodland cover has been removed.
- Successful restocking of 43.85ha of woodland as per maps 13/13b, with good health and vigour of trees, and good stem form in areas intended for timber production.
- Increased use of the site for public recreation, in particular by local communities, schools and other such groups.
- Successful lease of retained agricultural land, development of agroforestry proposals and minimal conflict with woodland establishment.
- Income generation through windfarm lease, if pursued, with minimal conflict between renewables and woodland creation objectives.

1.4 Summary of planned operations

Table 2 - Summary of operations 2024 - 2034

Operation	Area (ha)
Clearfelling*	152ha
Thinning (for Scottish Forestry approval)¹	9.63ha
Low-impact silviculture (LISS final fell)²	7.74ha
Restocking	43.85ha (excluding 2.34ha underplanting)
Afforestation (woodland creation)	184.99ha
Deforestation (woodland removal)*	81.99ha
Forest Roads³	1.28km / 1.28ha
Forest Quarries	0ha

* Clearfelling area includes 81.99ha of deforestation. All deforestation will be compliant with the Scottish Government's Policy on Control of Woodland Removal. Deforestation area is considered an accurate estimate based on sub-compartment information and aerial photography (open areas are not included in the deforestation area).

¹ Gross area of thinning coupes for approval, net area of felling likely to be smaller. Respacing not included.

² Gross area of LISS final fell coupes for approval, net area of felling will be significantly smaller.

³ Includes all new roads, ATV and forwarder tracks within 10 year approval. Does not include existing road upgrades or proposed roads outwith LMP period.



2. Regulatory Requirements

2.1 LMP standards and guidance including UKFS

This land management plan has been produced in accordance with a range of government and industry standards and guidance as well as recent research outputs. A full list of current standards and guidance can be found at <https://forestryandland.gov.scot/what-we-do/planning/links>. In addition, further materials referenced in the production of the plan can be found in section 5.

This plan has been prepared and presented in accordance with UKFS and UKWAS requirements and guidelines at the time of writing and no compliance issues are envisioned.

2.2 Woodland Management

2.2.1 Clearfelling

Table 3 - This shows the scale of felling within the felling phases in the context of the whole Land Management Plan. This includes any areas of 'LISS – Fell' (i.e. removal of final overstorey). N.B the high proportion in Phase 1 is reflective of peatland restoration operations.

SCALE OF PROPOSED FELLING AREAS (including LISS final fell areas)													
Total Forest Plan Area:		522.18		hectares									
Felling	Phase 1	%	Phase 2	%	Phase 3	%	Phase 4	%	Long Term Retention	%	Area out-with 20yr plan period	%	
Area* (Ha)	148.9	28.5	3.1	0.6	0	0	1.2	0.2	0	0	3.4	0.7	

*N.B felling areas are given as gross and include areas of mapped and unmapped open ground.

2.2.2 Low-impact Silviculture/Continuous Cover Forestry

7.74ha single tree selection within coupe 78004 which is to cover non-urgent tree safety works. (Gross area includes mapped and unmapped open ground.)

2.2.3 Thinning

Table 4 - This shows the area of thinning over the first 10 years of the Land Management Plan.

Species ¹	Thinning (ha) ²
Sitka spruce/lodgepole pine	9.43ha
Mixed broadleaves	0.2ha
Total	9.63ha

¹Area of species estimated based on proportion and objectives within each thinning coupe.

²Gross area of thinning coupes for approval, net area of felling will likely be smaller.

2.2.4 Restocking

Table 5 - This table provides information on the restocking proposals for the first 10 years of the Land Management Plan. Restocking is listed on a coupe by coupe basis. N.B these figures do not include the allocation of unmapped open ground which is typically around 10% of each area.

Felling Phase	Coupe(s)	Map identifier(s)	Species to be planted	Area (ha) to be planted
Phase 1 - 2027	78008	78008A	NS	0.72
		78008A	SY	0.18
		78008B	SP	0.15
		78008B	SOK	0.04
		78008C	PBI	0.16
		78008C	POK	0.07
Phase 1 - 2027	78053	78053B	NMB	19.19
		78053C	PBI	4.92
		78053C	ASP	4.92
		78053F	SS	2.06
		78053F	NF	0.51
Phase 1 - 2027	78055	78055A	NMB	6.22
Phase 1 - 2027	78057	78057A	PBI	0.94
		78057A	ASP	0.47
		78057B	NMB	0.71
		78057D	MB	0.31
		78057E	SP	0.13
		78057E	SOK	0.04
		78057E	SBI	0.04
Phase 2 - 2032	78007	78007A	NMB	2.07
Total Restocking area				43.85

2.3 Summary of Current and Future Species

Table 6 - This shows the current and future species composition within the entire Land Management Plan area. Minor inaccuracies may occur due to sub-compartment and rounding errors and have been manually corrected where possible.

Area by species						
Species	Current		Year 10		Year 20	
	Area (ha)	%	Area (ha)	%	Area (ha)	%
Aspen	0	0%	9.8	2%	9.8	2%
Beech	0	0%	0.5	0%	0.5	0%
Birch (downy/silver)*	1.2	0%	0	0%	0	0%
Bird cherry	0	0%	0.3	0%	0.3	0%
Common alder	0	0%	0.5	0%	0.5	0%
Crab apple	0	0%	0.1	0%	0.1	0%
Downy birch	0.2	0%	31.9	6%	31.9	6%
European larch	0.4	0%	0.3	0%	0.2	0%
European silver fir	0	0%	1.4	0%	1.4	0%
Field maple	0	0%	0.6	0%	0.6	0%
Grey willow	0	0%	1.6	0%	1.6	0%
Hawthorn species ¹	0	0%	10.3	2%	10.3	2%
Hazel	0	0%	7.6	1%	7.6	1%
Hornbeam	0	0%	2.1	0%	2.1	0%
Hybrid larch	2.3	0%	0.3	0%	0.2	0%
Japanese larch	6.5	1%	0.3	0%	0.2	0%
Lodgepole pine	10.9	2%	1.2	0%	1.1	0%
Macedonian pine	0	0%	0	0%	0	0%
Mixed broadleaves*	32.4	6%	27	5%	26.1	5%
Mixed conifers	2.7	1%	1.4	0%	1.5	0%

Native Mixed broadleaves ²	13	2%	77.2	15%	80.6	15%
Noble fir	1.9	0%	10.7	2%	10.5	2%
Norway spruce	1.1	0%	17.9	3%	17.9	3%
Pedunculate/common oak	0	0%	4.6	1%	4.6	1%
Rowan	0	0%	0.1	0%	0.1	0%
Scots pine	12.9	2%	14.9	3%	14.5	3%
Sessile oak	0	0%	1.4	0%	1.4	0%
Silver birch	0	0%	0.2	0%	0.2	0%
Sitka spruce	101.6	19%	37.7	7%	36.1	7%
Small-leaved lime	0	0%	2.1	0%	2.1	0%
Sycamore	0	0%	3.8	1%	3.8	1%
Western red cedar	0	0%	5.4	1%	5.4	1%
Wild cherry/gean	0	0%	2.4	0%	2.4	0%
Not Applicable	335.1	64%	246.6	47%	246.6	47%
Total	522.2	100%	522.2	100%	522.2	100%

Notes on Table 6:

* Decreases in areas of birch spp. and mixed broadleaves are due to reclassification of these areas from the current sub-compartment species information to 'native mixed broadleaves' in the land management plan restock areas and are not due to felling.

¹ Numerous hawthorn hedgerows are located throughout the plan area but are not recorded as these are typically too small to be mapped in the sub-compartment database.

² For years 10 and 20, individual native broadleaved species are typically only included in the table where these have a productive objective and/or a specific planting prescription is required.

Otherwise, native broadleaved species are included in the 'native mixed broadleaves' area, and species will be allocated based on the NVC type detailed in the restock description (see Table 11 for indicative species mixtures). For the 'Current' year, the majority of the mixed broadleaf component comprises native species (e.g. birch), alongside introduced species such as beech and sycamore.

2.4 Summary of Current and Future Age Structure

Table 7 , Figure 1 - This shows the woodland area broken down by age class. Figures are given for the current point in time (2024) and year 20 (2044). Minor inaccuracies may occur due to sub-compartment and rounding errors and have been manually corrected where possible.

Age class (years)	Current	Year 20
	Area (ha)	Area (ha)
0-10	0	11.5
11-20	5.5	215.7
21-30	12.4	0
31-40	56.4	3.5
41-60	81.1	13.7
61-80	21.6	12.6
81-100	4.89	14.49
100+	4.11	4.11
N/A	336.2	246.6
Total	522.2	522.2



2.5 Other Tree Felling in exceptional circumstances

FLS will normally seek to map and identify all planned tree felling in advance through the LMP process. However, there are some circumstances requiring small scale tree felling where this may not be possible and where it may be impractical to apply for a separate felling permission due to the risks or impacts of delaying the felling.

Felling permission is therefore sought for the LMP approval period to cover the following circumstances:

- Individual trees, rows of trees or small groups of trees that are impacting on important infrastructure (as defined below*), either because they are now encroaching on or have been destabilised or made unsafe by wind, physical damage, or impeded drainage.

*Infrastructure includes forest roads, footpaths, access (vehicle, cycle, horse walking) routes, buildings, utilities and services, and drains.

The maximum volume of felling in exceptional circumstances covered by this approval is 75 cubic meters per Land Management Plan per calendar year. A record of the volume felled in this way will be maintained and will be considered during the five year Land Management Plan review.

2.6 Woodland Management in Visitor Zones

Visitor Zones have been identified in areas where FLS encourage and manage access or where the woodland managed by FLS interacts with popular visitor sites or access routes. Visitor Zones are mapped on map 16.

In these areas, single trees or small groups of trees will be removed when necessary to protect facilities, infrastructure and trails, or to enhance the setting of features, or to maintain existing views.

Woodland in these zones will also be thinned, or trees re-spaced, for safety reasons (including to increase visibility to ensure that sites are welcoming and feel safe) and where it is necessary to enhance the experience of the forest setting, through the development of large trees, or preferential removal of trees to favour a particular species.

In the context of this LMP, the Visitor Zones on map 16 are mainly proposed for the approval of any non-urgent tree safety management.

2.7 Roads, Quarries, Timber transport

1.28km/1.28ha new roads proposed.

No quarry proposals.

Timber haulage will be via unclassified (consultation) timber transport routes – estimated total of 29938 tonnes. More detail is provided in section 4.3.3 and potential impacts on public access are covered in section 4.6. See also map 12.

2.8 Environmental Impact Assessment and Permitted Development

Table 8, below gives information on the EIA ‘forestry projects’ that require screening under this proposals. A screening opinion request form has been submitted separately.

Please indicate the total area (hectares) for each project type and provide details as requested by sensitive or non-sensitive area.									
Type of Project	Sensitive Area		Non-sensitive Area		Total				
Afforestation*	N/A	N/A	40% Con	60% BL	184.99ha				
Deforestation*	100% Con	0% BL	N/A	N/A	81.99ha				
Forest Roads	0ha		1.28ha		1.28ha				
Quarries	0ha		0ha		0ha				
Provide further details on your project if required.									
*In the event the proposed windfarm is constructed, 81.99ha of deforestation and c.4ha compensatory replanting will be approved via a condition of planning approval (14/01699/FUL) and will not require a forestry EIA determination. An updated SOR will be requested from Scottish Forestry in this instance.									

2.9 Tolerance Table

Table 9 - Land Management Plan tolerances

	Map Required (Y/N)	Adjustment to felling period	Adjustment to felling coupe boundaries	Timing of restocking	Change to species	Wind throw response	Adjustment to road lines	Designed open ground
Scottish Forestry (SF) Approval not normally required (record and notify SF)	N	Fell date can be moved within 5 year period where separation or other constraints are met	<10% of coupe size.	Up to 5 planting seasons after felling (allowing fallow periods for <i>hylobius</i>).	Change within species group E.g. Scots pine to birch, Non-native conifers e.g. Sitka spruce to Douglas fir, Non-native to native species (allowing for changes to facilitate Ancient Woodland policy).			Location of temporary open ground e.g. deer glades if still within overall open ground design Increase by 0.5 ha or 5% of area - whichever is less
Approval by exchange of letters and map	Y		10-15% of coupe size.	5 years +	Change of coupe objective that is likely to be consistent with current policy (e.g. from productive to open, open to native species).	Up to 5 Ha	Departures of greater than 60 m from the centre of the road line	Increase of 0.5 ha to 2 ha or 10% - whichever is less Any reduction in open ground
Approval by formal plan amendment	Y	Felling delayed into second or later 5 year period Advance felling into current or 2 nd 5 year period	>15% of coupe size.		Major change of objective likely to be contrary to policy, E.g. native to non-native species, open to non-native,	More than 5 Ha	As above, depending on sensitivity	More than 2 ha or 10% Any reduction in open ground in sensitive areas Colonisation of open Areas agreed as critical



3. Analysis and Concept

This section describes how the LMP objectives detailed in section 1.2 have been developed and how these inform the current management proposals.

Figure 2 – This shows the process of developing LMP objectives and management proposals.



3.1 Introduction and Land Management Plan context

The Hartwood Forests (maps 01. and 02.) comprise two distinct areas extending to a total of 522ha. The first area (circa 196ha) comprises the existing FLS forests of Murdostoun and Mossband. These sites are located primarily on peaty soil types on the upper exposed plateau and were largely planted between 1960 and 1985. Since these areas were planted, the value of deep peat soils and their associated bog habitats have been better recognized and there are now drivers to remove areas of forestry in order to pursue peatland restoration objectives. The second area (circa 326ha) comprises the former Hartwood Home Farm, latterly managed as an agricultural research facility by the James Hutton Institute. This site is predominantly open pastoral farmland, although there are also numerous small woodlands, with some dating back to the early 1800s (National Library of Scotland). In line with Scottish Government objectives, this area was purchased by Forestry and Land Scotland with the intention of establishing a new multi-purpose woodland. Together, these two areas lie in close proximity to the settlements of Hartwood, Allanton, and Shotts, with about 50% of the Land Management Plan area situated within the WIAT (Woodlands In and Around Towns) zone. In addition, the derelict sites of two former healthcare facilities lie immediately adjacent to the plan area and may be developed by external parties at a future date.

In alignment with the Landscape Character Assessment for this area (Appendix I/2.5), the site falls within the 'farmland' zone of the Clydeplan Forest and Woodland Strategy. At a more detailed level, the site is divided between the 'preferred' and 'urban fringe' categories for woodland creation. In practice this means the entirety of the site can be treated as 'preferred' for woodland creation, but with additional considerations required in relation to its urban proximity within the 'urban fringe' areas (Scottish Forestry staff, pre-application advice).

A full description of the site is given in Appendix I.

3.2 Analysis of previous plan

The Murdostoun and Mossband LMP 2015-2025 was amended in 2021 and the objectives and proposals within this plan and amendment are still considered broadly relevant for the next plan. There are no previous Land Management Plans for Hartwood, although there are some records of small-scale woodland creation under previous owners. A full analysis of the previous plan for Murdostoun and Mossband is given in Appendix III.

3.3 Key issues and challenges

Key issues and challenges which require addressing through this management plan include:

- **Woodland creation on the rural-urban fringe**
The close proximity to existing settlement, infrastructure and potential development sites present both opportunities and challenges. Settlements and transport infrastructure offer opportunities for increasing health and recreation benefits, but challenges in terms of woodland design for views and amenity, and resilience to threats such as fire and anti-social behaviour. The presence of numerous utilities and transport infrastructure routes also creates fragmentation within the site, particularly on the lower slopes, and negatively affects the ability to work at scale, and to establish unified management areas and fully connected green networks.
- **Bog restoration**
Peatland restoration at Murdostoun and Mossband will improve biodiversity value and act as a long-term carbon sink but must be carefully planned and delivered to ensure long-term success and comply with Scottish Government policies on woodland removal.

3.4 Constraints and Opportunities Analysis

The following analysis identifies the opportunities and constraints relative to each management objective described in section 1.2; and the 'concept' for addressing these factors and achieving the stated objective. See also map 11.



Table 10 - LMP objectives; constraints, opportunities and concept.

Objective (for delivery in this LMP)	Constraints (to the delivery of this objective)	Opportunities (for the delivery of this objective)	Concept (how objective can be delivered)
1. Establish stands capable of producing timber for a range of markets, including quality hardwood and softwood sawlogs.	<p>Most of the site is moderately or highly exposed, limiting species choice.</p> <p>The proposed windfarm, numerous existing utilities and other infrastructure reduce the available planting area.</p> <p>More intensive management and better access will be required to produce higher-quality timber.</p> <p>Mammal damage (e.g. deer, grey squirrel) could reduce timber quality, or cause complete mortality in some species.</p>	<p>Relatively good soils provide favorable conditions for tree growth, but are likely to be modified by agricultural use.</p> <p>Greater shelter on the lower slopes – but the available area is limited by fragmentation and settlements.</p> <p>Good potential for operational access in some areas, providing opportunities for more intensive management.</p>	<p>Target species choice to the site conditions of each area, accounting for climatic and soil conditions, including potential changes over time.</p> <p>Focus diversity on the lower slopes and focus areas for more intensive management where the access potential is higher.</p> <p>Design areas which are suitable for ongoing deer control and carry out control as required. Physically protect planting as required using appropriate methods.</p>
2. Improve biodiversity value through new woodland creation and peatland	Limited existing woodland and history of intensive agriculture will limit the ability for native	The presence of long-established (LEPO) woodlands, with some reserves of woodland flora, other	Establish a network of native woodland and open habitats, linking and expanding existing

Objective (for delivery in this LMP)	Constraints (to the delivery of this objective)	Opportunities (for the delivery of this objective)	Concept (how objective can be delivered)
restoration, expanding and connecting with existing habitats.	woodland species (especially flora) to colonise new woodlands. Site fragmentation somewhat limits the potential for habitat connectivity. Presence of Invasive Non-Native Species (INNS) such as Japanese Knotweed and <i>Rhododendron</i> . Threat of natural regeneration on restored peatland, especially of non-native conifers, and the potential for restored peatland areas to be damaged by fire.	(native) woodlands and natural watercourses provide a framework around which to create and expand habitats. Poor tree growth on the modified peatland unit, high water table and continued presence of bog-forming vegetation provides a good opportunity for restoration. Scale of the landholding allows potentially significant areas of new habitat creation and the expansion of existing habitats.	areas, and including sizable areas of 'core' native woodland to act as future refuges for native species. Use soil and hydrological information, growth of existing stands and indicator vegetation to identify bog restoration areas. Control INNS as appropriate, working with neighboring landowners where possible. Ensure forest design and bog restoration techniques minimize the risk of seed-rain and tree regeneration on peatland.
3. Improve social and recreational value by facilitating informal access, providing amenity and pursuing suitable opportunities for community involvement.	Site fragmentation somewhat limits potential for establishing recreation routes and green networks. Steep banking along Curry Burn limits ability to create off-road link between Hartwood and Shotts.	Existing access routes (e.g. core paths) and infrastructure (e.g. railway bridge/underpass) provide a framework of routes to expand. Proximity to local communities and green transport infrastructure (e.g. railway) provide good opportunities for car-free access.	Develop a network of open corridors within the planted areas to facilitate informal access, with the potential to formalise some routes in the future. Integrate amenity value into the wider woodland area, focusing particularly on the lower slopes

Objective (for delivery in this LMP)	Constraints (to the delivery of this objective)	Opportunities (for the delivery of this objective)	Concept (how objective can be delivered)
	<p>Lack of resource to provide built recreational infrastructure (e.g. surfaced paths) at this time.</p> <p>Anti-social behavior is already evident within surrounding area and could negatively impact site condition and user experience.</p>	<p>Proposed windfarm will create new access routes, if constructed.</p> <p>Proximity to local communities provides an opportunity for increased community involvement.</p> <p>Proximity to Green Action Trust's Shotts Nature Park provides an opportunity to expand on existing greenspace and for partnership working.</p>	<p>and enhancing the existing landscape features where possible.</p> <p>Minimize the risk of anti-social behavior by limiting vehicular access points and maintaining appropriate visual settings.</p> <p>Work with partners and community groups to help facilitate community involvement and added value where possible.</p>
4. Identify and establish areas for long-term agricultural use and agroforestry trials; primarily utilizing areas constrained for woodland creation.	<p>Agricultural use could conflict with other uses, especially where livestock are present.</p> <p>Lack of experience of establishing and managing agroforestry systems within Scotland.</p> <p>Areas constrained for woodland creation may also be constrained for agroforestry (e.g. due to local views or utility wayleaves).</p>	<p>Good access/transport links and the site's history make this a good location for a potential demonstration site.</p> <p>High lease potential on areas of improved grassland with potential to diversify income streams.</p> <p>Existing infrastructure of fields provides a basis for developing lease areas for livestock farming.</p>	<p>Locate agricultural land primarily in areas constrained for afforestation and ensure permanent robust boundaries between woodland creation and agriculture.</p> <p>Work with other organisations and partners to implement potential agroforestry designs and increase knowledge and awareness of agroforestry in a Scottish context.</p>

Objective (for delivery in this LMP)	Constraints (to the delivery of this objective)	Opportunities (for the delivery of this objective)	Concept (how objective can be delivered)
<p>5. Fulfil existing commitments for on-site renewable energy production, where appropriate (i.e. existing windfarm approval).</p>	<p>Potential conflicts between windfarm and woodland management objectives, including the potential loss of plantable land and/or restrictions on tree height due to windflow considerations.</p>	<p>Windfarm infrastructure (i.e. access roads) could facilitate improved future access.</p> <p>Windfarm lease offers additional diversity to income streams.</p>	<p>Continue work with windfarm developer to identify mutually-acceptable woodland design and management within the vicinity of turbines. Apply to plant all available land and amend proposals to remove areas of proposed planting based on windfarm requirements.</p>



4. Management Proposals

4.1 Silvicultural prescriptions

Our management interventions over the next 10 year period will follow two broad workstreams: woodland removal with the associated bog restoration; and new woodland creation. In addition, there will be smaller areas of more conventional felling and restocking operations.

The subsequent Land Management Plan period (2034-2044) is likely to focus on addressing any significant woodland establishment or bog restoration issues; constructing further operational access routes, if required; and prescribing early management operations, such as thinning or respacing, for the new woodland.

See collated maps 12 and 13 (management and planting maps).

4.1.1 Clearfelling

Some existing woodlands within the Hartwood area will be felled to rationalize the new planting design and alleviate potential future access issues, particularly where existing stands may be vulnerable to disease (i.e. *Phytophthora ramorum*) and/or windthrow. Where possible, other areas of woodland are being retained for a longer period to provide shelter and improved structural and habitat diversity within the site. No areas of Long-Established of Plantation Origin (LEPO) Woodland are planned for felling within Hartwood.

Within Murdostoun, the majority of the woodland will be clearfelled in order to facilitate the restoration to Lowland Raised/Intermediate Bog. This includes some areas of LEPO currently under Sitka spruce/lodgepole pine/Japanese larch plantation, the majority of which will be restocked with native mixed broadleaves.

At Mossband, the existing stand of Sitka spruce has become unstable due to fire-raising, is encouraging further anti-social behavior, and is presenting an ongoing seed source for colonization of the restored Mossband bog. This area is also identified as LEPO and will subsequently be restocked with native mixed broadleaves.

Stump treatment should be utilized for all felling and thinning operations on or adjacent to sites which are being restocked or planted. All clearfelling is shown on maps 12 and 12a.

4.1.2 Low-impact Silvicultural Systems (LISS)

No actively-managed areas of low-impact silviculture are proposed for the 10 year period of this Land Management Plan, however some of the middle and lower slopes may be suitable for management under Continuous Cover Forestry systems in the future and detailed management prescriptions should be identified in the next LMP.

7.74ha of passive LISS management (single tree selection) is proposed to provide felling approval for non-urgent tree safety work or sporadic windthrow within coupe 78004. See maps 12 and 12a.

4.1.3 Thinning and respacing

Thinning will normally be carried out at, or below, the level of marginal thinning intensity (i.e. removing no more than 70% of the maximum MAI, or YC, per year). Higher intensities (no more than 140 % of maximum MAI, or YC, per year) may be applied where thinning has been delayed, larger tree sizes are being sought or as part of a LISS prescription. Where trees need to be removed to accommodate facilities to support approved thinning and CCF, including stacking areas, ramps and access racks within adjacent management coupes, this should ideally be identified in thinning maps and thinning plans as part of the LMP submission. Where this is not the case, additional felling necessary for reasonable infrastructure can be agreed by exchange of email. In all cases work plans will define the detailed thinning prescription before work is carried out and operations will be monitored by checking pre and post thinning basal areas for the key crop components.

Two areas of thinning have been identified to increase the stability and longevity of a young shelterbelt and remove non-native conifers from native woodland on the upper slopes. As the shelterbelt is a small area of young crop and primarily being managed to improve long-term health and stability, this operation will likely be carried out above marginal thinning intensity. More significant thinning operations are expected to begin 15-20 years post-establishment, depending on growth rates, and will be an essential pre-requisite to initiate any LISS or CCF management. This will be assessed and identified in future LMP revisions.

Stump treatment should be utilised for all felling and thinning operations on or adjacent to sites which are being restocked or planted. All thinning is shown on map 12b.

4.1.4 Long-Term Retentions (LTR)

Two areas of existing Scot's pine plantation have been identified as LTR. These will be revised and may be subsumed into the management of adjacent new planting in a later plan period.

Long-term retentions are shown on map 12.

Total area of Long-Term Retentions = 3.44ha

4.1.5 Minimum Intervention Areas and Natural Reserves

Several new areas of Minimum Intervention (MI) have been identified, some of which may have potential to be developed into Natural Reserves at a future date.

Total area of Minimum Intervention = 37.11ha

Two existing Natural Reserves (NR) at Murdostoun are being retained, with some boundary changes, while a third is being redesignated as Minimum Intervention to allow more active management of existing non-native species within this area. These changes are being incorporated as part of the formal Central Region (Scottish Lowlands) Natural Reserves Review.

Total area of Minimum Intervention (Natural Reserve) = 12.46ha

All areas of MI and NR are shown on map 12.

4.1.6 Regeneration proposals

43.85ha of restocking is proposed across the whole plan area, the majority of which is located at Murdostoun and Mossband. Where relevant, the restocking proposals have been designed to tie in with the adjoining new woodland creation areas. Restocking is shown on maps 13 and 13b.

Native broadleaves will be established at 1600st/ha and should be sourced from seed zone 107/108/109 or 203/204 in order of preference. Sitka spruce will be of QCI provenance established at 2500st/ha. Species and planting prescriptions should follow those outlined in table 11, below.

4.1.7 New woodland creation

184.99ha* of new woodland creation is proposed on the former agricultural land at Hartwood as shown on map 13a. The majority of the woodland creation will be on gleyed soil types, with some areas of brown earths and remediated mining soils (refer to Appendix I/2 and map 06.).

Care has been taken to select species which meet the management objectives, are appropriate within the landscape, and which are suited to both current and potential future site conditions (refer to Appendix I). The Ecological Site Classification Decision Support Software (ESC-DSS) and climate change projections available from the MetOffice have been used as a basis to support species choice, alongside other literature (see section 5). All woodland creation areas are classified as land capability grades F3 and F4 for forestry (Appendix I/2.2).

In order to improve resilience, ecological functioning, and amenity value, the majority of the site will be planted with mixed-species stands. These mixtures have been selected and prescribed based on published guidance (see section 5), with additional input from local and national staff. The proposed planting mixtures are described in table 11, below.

The long-term aim of each area of new planting is described within table 11. Where timber production is a major outcome from the stand, the timeline and management interventions

proposed in the relevant Forest Development Type Flashcard should be considered in order to ensure this objective is realised.

Much of the existing farmland has been heavily modified over several decades through drainage and the repeated application of fertilizer. With regards to drainage, the existing infrastructure is believed to be ineffectual in several locations and is non-compliant with UK Forestry Standard requirements due to several direct discharges into natural watercourses. Therefore, the intention is to purposefully break the current drainage infrastructure through sub-soil ripping, thus returning the site hydrology to a more natural state. Where necessary, any excess runoff as a result of this will be managed via the installation of new surface drainage designed and constructed in compliance with the relevant and current guidance. The new woodland design has also accounted for potential increases in soil wetness and changes to water movement as a result of this disconnection.

Ground preparation techniques for each area will be determined by the local Woodland Creation Forester. In line with the *Guidance on ground cultivation for Forestry and Land Scotland staff* (Forest Research), less-intensive cultivation techniques will be the default option, with sub-soil ripping and/or mounding being the primary methods employed. Typically, there will be a presumption against the use of artificial drainage and application of fertilizer to aid tree establishment. Indicative drainage and ground preparation are shown on maps 14 and 15.

* In the event the proposed windfarm is constructed, the area of woodland creation will be reduced, as and if required, to accommodate the necessary windfarm infrastructure footprint, and the associated keyholes around each turbine, which will be determined by predicted windflow and the operational requirements stipulated by the turbine manufacturers. Within a certain area in the proximity of the turbines there may be an option for the establishment of short-rotation forestry, with productive stands limited to an agreed height in discussion with the windfarm developer/operator. In areas where short rotation forestry is proposed, the species to be established in these areas should be reviewed in order to ensure the maximum benefits are achieved (e.g change of species from SS/NF to SS; SS/Bi; or SS/ASP).



Table 11 – This shows the composition of the woodland creation areas at Hartwood. Species composition values are representative only and intended to convey the area and composition of different mixed-species stands rather than exact figures. Detailed figures on the species composition for the LMP area are given in table 6.

Intended stand type ¹	Species composition (%) ²	Envisioned stand outcome	Comments	Area ³
<i>All productive conifer</i>	<i>Detailed below</i>	<i>Primarily timber, but also biodiversity and amenity</i>	<i>All productive conifers planted at $\geq 2500\text{st/ha}$</i>	67.69ha
1.1.5 SS and shade tolerant conifers (XCST)	Sitka spruce (80) Noble fir (20)	SS and NF sawlogs	Intimate mixture. SS of QCI Provenance	40.47ha
1.2.4 NS and shade tolerant conifers (XCST)	Norway spruce (80) European Silver Fir (20)	NS and ESF sawlogs	Intimate mixture. ESF to be replaced with grand fir or similar species if unavailable.	7.07ha
1.2.6 NS and long-lived broadleaves (XBLL)	Norway spruce (80) Sycamore/beech (20)	NS sawlogs XBLL sawlogs or firewood (optional)	Intimate mixture. XBLL intended to provide enhanced biodiversity, amenity, and forest resilience.	14.74ha
4.8.1 other shade tolerant conifers	Western red cedar (100)	WRC sawlogs	Beat up with NS if significant establishment issues are experienced. If WRC is unavailable replace with 80% NS in mixture with 20% SYC, ESF, or equivalent.	5.41ha

...continued overleaf

Intended stand type ¹	Species composition (%) ²	Envisioned stand outcome	Comments	Area ³
All productive broadleaves	Detailed below	Timber, biodiversity and amenity value	<i>Oak</i> nests planted at 10,000st/ha <i>Birch/aspen/pine</i> at ≥2500st/ha <i>Hornbeam and lime</i> at ≥ 1600st/ha <i>Cherry</i> at 500st/ha	50.91ha
5.1.1 POK and HBM or 5.3.2 OK and long-lived broadleaves (XBLL)	Pedunculate oak (20) Downy birch (80)	POK sawlogs DBi sawlogs or firewood/pulp/biomass	Blocky mixture. Best available UK provenance. DBi intended to provide an interim crop within rotation length of POK, with later underplanting of appropriate XBLL (e.g. HBM) to achieve the final stand type.	16.83ha
5.1.1 POK and HBM or 5.3.2 OK and long-lived broadleaves (XBLL)	Pedunculate oak (20) Small-leaved lime (40) Hornbeam (40)	POK sawlogs XBLL sawlogs or firewood	Blocky mixture. Best available UK provenance. Small experimental area intended to create the final stand type from establishment.	5.28ha
2.1.5 SP and SOK -> 5.2.2 SOK and SP	Scots pine (80) Sessile oak (20)	SOK sawlogs SP sawlogs	Blocky mixture. Best available UK provenance (SOK); Scottish (native) provenance SP. SP provides an interim crop within rotation length of SOK, transitioning to more a oak dominated woodland over the rotation.	6.44ha
7.1.2 Bi and short-lived broadleaves (XBSL)	Downy Birch (70) Aspen (30)	Bi/ASP sawlogs or firewood/pulp/biomass	Blocky mixture. Best available UK provenance.	13.47ha
7.1.1 Bi	Downy birch (100)	Bi sawlogs or firewood/pulp/biomass	Best available UK provenance.	5.92ha
WCH	Wild cherry (100)	WCH sawlogs (+ amenity and biodiversity value)	Best available UK provenance. WCH will require pruning to achieve sawlog material.	2.97ha
<i>...continued overleaf</i>				

Intended stand type ¹	Species composition (%) ²	Envisioned stand outcome	Comments	Area ³
All native woodland	Detailed below	Biodiversity and amenity value	Mapped and recorded as 'native mixed broadleaves'; planted at ≥ 1600 st/ha.	35.84ha
Upland oak/birchwood (W11) (Including select components of W10)	Oak (40) Birch (30) Rowan (20) Holly (10)			11.08ha
Wet Woodland W7 (Including select components of W10)	Common alder (60) Goat Willow (20) Bird cherry (10) Wych elm (10)			22.08ha
Wet Woodland W4	Downy birch (60) Eared willow (20) Goat willow (10) Grey sallow (10)			2.68ha
Other mixed broadleaved and amenity woodland	Mixed broadleaves and native woody shrubs, typically: hawthorn, hazel, grey willow, and other UK native species.	Biodiversity and amenity value	Includes significant elements of hawthorn and hazel for landscaping and buffers around utilities and infrastructure.	30.55ha
Total				184.99ha

Notes on Table 11:

¹ Stand type at maturity based on Forest Development or Native Woodland Type.

² Species composition at planting. Unmapped open ground allocation not included. Species may be changed within the tolerances in Section 2, but should be kept within appropriate allocations according to stand type.

³ Area includes unmapped open ground composition, which is typically around 10% within each woodland creation area.



Sitka and Norway spruce will form the major productive conifer components together with smaller areas of western red cedar and Scots pine, all established at a minimum density of 2500st/ha. Sitka spruce should be of QCI provenance with no VP stock used to reduce the risk of frost damage and maintain genetic diversity. Norway spruce and western red cedar should be of the best available provenance and Scot's pine of native (Scottish) origin.

Oaks and birch will form the major productive broadleaf component. Oak will be established in a blocky mixture at 10,000st/ha primarily with birch or Scots pine at 2500st/ha, depending on the site type (ref. section 4.2.2). Sessile oak forms the minor component situated on drier knolls in mixture with Scots pine. Pedunculate oak forms the major component situated on heavier gleyed soils with downy birch. Downy birch with aspen will also form their own component, established without oak groups in a blocky mixture at 2500st/ha.

Sawlogs will be the preferred output for all species within these areas, however management should focus on securing good growth and form of SOK and POK, which will be the preferred species for sawlog production. For areas of downy birch and aspen, alternative products include firewood, biomass or pulp depending on growth and stem quality. The intention of DBi and SP is to provide an interim harvestable product within the lifetime of the SOK and POK rotations, with POK areas being underplanted with hornbeam and/or small-leaved lime at a later date to provide a permanent understory for management of the POK stands. A smaller self-contained area of POK will also be established with HMB and SLi forming the matrix at 1600st/ha from the outset. For all these areas, oaks should be established in groups of 30 trees at 1m spacing (10,000st/ha) to achieve good stem form. The number of oak groups should correspond with the number of envisioned final crop trees, which is typically 10 per hectare (or 10m spacing between groups).

In addition to oak and birch, a smaller area will be planted with wild cherry with the intention of providing amenity value while producing high-quality timber. Cherry will be planted in pure stands at 500st/ha and will require formative pruning to ensure high-quality timber quality is achieved.

Native broadleaves will be established at 1600st/ha and should be sourced from seed zone 107/108/109 or 203/204 in order of preference. Provenance choice for productive broadleaves should be highest available quality (UK Provenance) or native origin, depending on supply.

All woodland creation is shown on map 13a.

4.1.8 Woodland Removal (Deforestation)

81.99ha of woodland removal is proposed for the purposes of lowland raised/intermediate bog restoration. In order to achieve this objective, the current woodland cover of non-native conifers will be removed through a combination of conventional and/or specialist harvesting and mulching. Wherever ground conditions allow, the existing trees will be harvested and arisings removed from the site in order to provide useable product and establish a more favorable site for peatland restoration. Mulching will only be used where felling and extraction is not considered possible.

All woodland removal will be complaint with the UK Forestry Standard, The Scottish Government's Policy on Control of Woodland Removal, and other associated guidance. Both the quality of the remnant peatland habitats and the generally poor growth of the existing woodland cover support woodland removal under these policies and requirements.

To achieve the objective of peatland restoration, existing artificial drainage will also be blocked and ground-smoothing and stump-flipping utilised to achieve a high water table and more natural hydrology across the restored area. This will ensure optimal conditions for appropriate bog vegetation recovery and sub-optimal conditions for re-colonisation by woodland. In areas directly adjacent to agricultural land, boundary drains may not be blocked to ensure that the neighboring land is not compromised by re-wetting operations and any increased potential for flooding. Following restoration the site will be regularly monitored and any non-native tree regeneration, or native tree regeneration exceeding 20% canopy cover, will be removed from the restored area.

The restored area will be protected in the long-term by buffers of fringe/peatland edge native woodland, with species selected according to the appropriate NVC and ESC classifications, and by restricting the presence of potentially invasive non-native species (e.g. Sitka spruce) to beyond 75m from the edge of the peatland unit.

The woodland removal and bog restoration are shown on maps 12 and 13.

4.2 Forest Protection

4.2.1 Herbivore management

During the establishment period, woodland creation areas will be protected primarily through the use of herbivore control with the addition of physical protection (deer fencing and tree tubes) for some areas and for the most vulnerable species (i.e. oak and wild cherry) (see map 15). All protection measures will have the aim of achieving <10% leader browsing damage for all species across the establishment areas, and in all cases areas will be regularly monitored for damage with protection measures being reviewed as required based on observed levels of damage. If damage presents a significant problem, then additional areas of fencing or tubing may be installed in order to ensure successful establishment.

All deer fencing and tree tubes will be removed once trees have become successfully established. Typically, this is expected to be around ten years post-planting and will be assessed at the 10-year LMP renewal.

In order to facilitate current and future herbivore control, additional open ground comprising forest rides and deer glades have been factored into the woodland design and will be maintained as required by the Wildlife Management team.

A deer management plan has been produced as part of the LMP and is included in Appendix IV and indicative areas of fencing are shown on map 15.

4.2.2 Tree Health Management

As detailed in Appendix I/6, a number of tree health threats may impact this site.

Of primary concern is *Phytophthora ramorum*, which could affect existing larch species. Due to this threat, no larch is proposed within the restocking or woodland creation areas. Some areas of existing woodland containing larch will be removed to reduce risk and better facilitate woodland creation, otherwise there is currently no presumption to pre-emptively remove larch from the plan area.

Due to the threat of *Dothistroma* needle blight, Scots pine is not proposed as a primary species, and only located in areas where exposure and airflow will help to limit inoculum loading. Native origin (Scottish) seed stock may be more resilient and although this is as yet unproven, it is suggested native origin stock are utilised where available. In the longer-term (over c.100 years) the areas dominated by Scot's pine should transition to sessile oak-dominated woodland through active management.

Ash trees infected by the disease *Hymenoscyphus fraxineus* will only be removed where considered necessary for public safety, as per current Scottish Forestry guidance. Any regeneration of ash should be accepted onto the site where this occurs. Ash is not proposed for planting due to this disease.

Acute Oak Decline has to date not been detected in Scotland and Forest Research information currently suggests a low risk of occurrence. However, care should be taken to correctly match oak species with their most suitable site types in order to reduce the future risks of this disease, especially considering future climate change and longer rotation lengths for this species.

The potential risks posed by *Heterobasidion annosum* should be mitigated through the use of appropriate ground cultivation (ensuring good rooting depth), and stump treatment during any felling and thinning operations as appropriate.

Grey squirrel are present and may cause significant damage to broadleaf trees – affecting health, regeneration and timber quality. At this point in time, no grey squirrel control is proposed and species which are especially susceptible to damage (e.g. sycamore and beech) have not been proposed as primary productive broadleaf species.

The use of species mixtures and establishment of a wide range of species should help to mitigate the threats posed by some of these existing threats, and potential future outbreaks.

4.2.3 Invasive species management

A number of invasive non-native species (INNS) are present on-site and in the immediate area, including *Rhododendron ponticum* and Japanese knotweed. These species will be controlled to prevent their spread and with the ultimate aim of eradicating them from the landholding. Where possible, FLS will work in collaboration with neighboring landowners to facilitate control of INNS across multiple landholdings.

4.2.4 Abiotic environmental threats (windthrow, wildfire, drought, frost, flooding and waterlogging)

A climate change risk assessment has been carried out for the site and is recorded within Appendix I/2.4.

The LMP design has taken into account the risks posed by a range of factors, primarily wildfire, winthrow and waterlogging. In order to reduce the risk of fire within the site, in addition to the creation of ponds and fire breaks, the recovery of fiber and removal of brash and residue may also be undertaken where appropriate.

4.3 Roads, Quarries and Timber Haulage

4.3.1 Roads

1.28km/1.28ha of new forest roading is proposed for construction within Phase 1 of the LMP in order to facilitate felling and new planting operations, this includes:

- 1.12km new roads
- 0.16km new ATV track
- 0.1km upgrade to existing track and construction of new turning point/service area

Future access requirements have also been considered and unplanted buffers have been planned along all existing and proposed road lines for future plan periods (see maps 12 and 13).

4.3.2 Quarries

No new quarries are proposed within the LMP area.

4.3.3 Timber haulage

Estimated* 850 tonnes via exit at NS 8518 5946 (Hartwood), 3521 tonnes via exit at NS 8517 6016 (Mossband), 15886¹ tonnes via exit at NS 8516 6044 and 9681 tonnes via exit at NS 8299 6047 (Murdostoun) (see map 12). Haulage via unclassified (consultation) timber transport routes will be discussed with Local Authority prior to haulage operations taking place.

* All figures based on production survey data, except ¹.

¹ Adjusted production forecast data based on production survey for other areas

4.4 Biodiversity

For a full list of biodiversity features see Appendix I/3.1.

4.4.1 Designated sites management and protection

No statutory designated sites are present within or adjacent to the Block. A number of Local Nature Conservation sites are present and have been considered in the management proposals.

The North Foulburn Bog and Strip LNCS has been surveyed for breeding birds and Phase 1 habitat type and was also covered by the Hartwood soil survey. Based on the information from these surveys and the proposed restoration of adjacent habitat at Murdostoun, this area will be left as unplanted successional open habitat.

The Jersay Bog LNCS will benefit from proposed bog restoration at Murdostoun, creating a larger contiguous area of lowland raised/intermediate bog habitat and connecting to the North Foulburn LNCS.

Other LNCS sites will benefit from adjacent areas of new native woodland creation, creating larger areas of contiguous habitat. In particular, care has been taken to protect and enhance key sections of the Pell Hill and Pellhill wood LNCS, which contains some existing woodland flora.

4.4.2 Protected species management

All species protection requirements will be implemented as necessary and all operations will be compliant with the relevant 'wildlife and forest operations' guidance.

Species-specific conservation measures are being implemented as appropriate, including the installation of bat and bird boxes in suitable locations. It is believed the proposals within this LMP will generally improve foraging opportunities for bats, and nesting and foraging opportunities for a number of different bird species, including raptors.

Surveys will be carried out to determine the presence of pine marten, for which there is anecdotal evidence from the surrounding area (Appendix I/3.1). Should pine marten be present, boxes will be installed to support the local population.

An independent breeding bird survey was carried out to help inform the potential impact of woodland creation on existing populations within the site. Of the 16 species recorded, those with the greatest potential to be affected by woodland creation proposals include:

- Grasshopper warbler (UK red-listed, Scottish Biodiversity List; two territories)
- Skylark (UK red-listed, Scottish Biodiversity List; four territories)

- Meadow pipit (UK amber-listed; 18 territories)

The presence of these species has been considered as part of the woodland design and, where appropriate, steps have been taken to retain or enhance suitable habitats for these species.

An independent great-crested newt survey was conducted on local waterbodies and no evidence of great-crested newt presence was recorded.

4.4.3 Ancient and semi-natural woodland management and protection

There are no ancient-semi natural woodlands present on site. Long-established of Plantation Origin (LEPO) woodlands will typically be retained and, where appropriate, enhanced by planting areas of adjacent native woodland. All semi-natural and planted native woodlands will be retained and enhanced as appropriate, for example with the adjacent planting of native woodland. Where areas of productive conifer are proposed adjacent to existing or new native woodlands, a buffer zone has been identified and mapped between the two areas.

4.4.4 Veteran trees and deadwood

All veteran trees and deadwood will be retained where possible, except where safety or biosecurity concerns take precedence. Several areas contain mature field and hedgerow trees which have the potential to develop into future veterans and efforts have been made to enhance veteran tree habitats with adjacent planting of appropriate species where these have been identified.

4.4.5 Riparian and open water management

Riparian corridors will be enhanced with adjacent native woodland planting and all operations adjacent to riparian areas will adhere to the relevant industry standards and guidance. A number of historic watercourses, not currently functioning, have also been identified as part of the planning process and these features have been factored into the woodland design on the basis they may become active again in future as site hydrology returns to a more natural state.

Where appropriate, it is the intention to create a series of new ponds throughout the site which will act as wildlife habitat and provide reservoirs for fire suppression. These areas are depicted on map 14.

A number of Ground-Water Dependent Terrestrial Ecosystems (GWDTEs) are present in various parts of the site, however owing to intensive agricultural modification none of these are considered to be botanically diverse or significant. The majority of these areas have therefore been identified for native woodland creation, with the exception of a relatively less modified area at NS 843 595, which is being retained as successional open habitat (see map 13).

4.4.6 Open habitat management

Only those areas identified for bog restoration and ongoing agricultural use will be actively managed as open ground. Other areas shown as open such as forest rides and wayleaves will typically be treated as ‘successional’ open habitats, with tree regeneration only being managed if and when required (e.g. to facilitate access). Areas where the presumption will be against removing natural regeneration are shown on map 13. In these areas, the gradual expansion of low-density native woodland cover will generally be accepted over the long-term.

99.46ha* of afforested peatland habitat on Murdostoun will be deforested and restored to an active bog habitat. This site is dominated by *Sphagnum* bog (soil group 10) integrating with unflushed blanket bog (soil group 11). The water table is generally high and present at, or close to (<50cm), the surface; and together with remnant bog vegetation on and around the site, this indicates a strong potential for restoration to a functioning (active) bog. Restoration of this site therefore meets the Scottish Government’s Control of Woodland Removal Policy as the deforestation and subsequent restoration will enhance a priority habitat and its (hydrological) connectivity (see table in Appendix VIII). Adjoining areas of existing bog woodland, mainly consisting of birch and Scot’s pine, will be retained and enhanced with adjacent native woodland planting. Once restored, the area will be monitored and managed as appropriate, with removal of any potentially damaging tree regeneration as required.

The site at Mossband still requires work in order to fully achieve the recovery of this area to active bog. This site previously received restoration treatments which have started this recovery, but have not so far resulted in a water table of the preferred depth for this site type. This is believed to be due to early restoration techniques not achieving the expected outcomes resulting in historic forestry drainage continuing to remove water from the site. Going forward, this will be remediated utilizing further restoration techniques not available at the time of the initial works. These will include further blocking the remaining drains using more effective and robust peat dams, reviewing and improving existing dams, and/or by closing the drains up completely – all of which will disperse greater quantities of water across the site. Where necessary, small areas of stunted conifer regeneration will be removed and additional ground-smoothing and stump-flipping undertaken to further aid recovery of the site to active bog.

Appendix IX provides further information about techniques used to restore afforested peatlands.

The deforestation and restoration of Murdostoun will also benefit a number of open habitat species, as well as linking the Jersay Bog and North Foulburn Bog LNCS. The North Foulburn Bog LNCS and surroundings of the restored area of Mossband will be managed as successional open habitat with gradual colonization of native woodland over several decades (see map 13).

*99.46ha is the approximate net area identified for restoration, including some area within unafforested wayleaves and open ground. This will result in 81.99ha of woodland removal when these areas are excluded.

4.5 Historic Environment

For a full list of known historic environment features see Appendix I/3.2

4.5.1 Designated sites and features

There are no designated historic environment features present within LMP area.

4.5.2 Other historical features

Other historical features will be maintained in a state of 'managed decay' as per obligations under the UKFS and UKWAS, with no active management proposed for these sites. Known historic features will either be left unplanted with an appropriate buffer zone, or sensitively planted (with no mechanical cultivation), as recommended by the FLS Environment Team (see maps 09 and 15).

All historic features are recorded on the FLS GIS mapping system and should any previously unknown features be discovered during operations, these will be suitably recorded and advice will be sought from the FLS Environment Team and/or other relevant authorities as appropriate with any mitigation implemented as required.

4.6 Public Access

FLS welcomes responsible public access to the site and encourages use of the area for health, recreation and wellbeing purposes taken in compliance with the Scottish Outdoor Code. As part of the woodland design, potential recreation routes have been identified and open unplanted corridors have been left along these routes to provide opportunities for informal access as the woodland matures. Due to resource constraints, these routes will remain unsurfaced initially but may be upgraded in the future subject to usage and resource availability. Where fences are to be erected, suitable access points will be installed in order to facilitate public access (see map 15).

Woodland management activities such as felling, thinning, and timber haulage and handling may require some limited closure and diversion of access routes, including core paths and/or rights of way. Any such operations will be discussed with the FLS Visitor Services Team and the Local Authority Access Officer and suitable diversions and signage will be implemented as appropriate.

Anti-social behavior will continue to present a potential threat to the woodlands and public enjoyment of these sites. Generally, our management approach to this issue will consist of:

- Restricting the number of entrances potentially available for vehicular access and maintaining suitable security at entrances utilised for vehicular access.
- Maintaining clean entrance points and suitable visibility within these areas.
- Improving the environment and setting of vulnerable sites (e.g. at Mossband).
- Working with local partners such as the Green Action Trust and Police Scotland.

Local FLS staff will seek to challenge and prevent irresponsible access and anti-social behavior on our sites where possible and safe to do so. However, we would also encourage local users and residents to report any irresponsible or anti-social behavior directly to Police Scotland on 101, or 999 in an emergency.

4.7 Agricultural management

Due to the history of the site, landscape considerations, and current drivers for improved land-use integration, it was felt that some residual agricultural use may be appropriate. As such, four areas have been identified for ongoing agricultural lease and potential agroforestry trials. These areas have been situated to function practically as a cohesive agricultural unit, to minimize potential conflicts with the adjoining woodland creation, and to help maintain the open character and views around Hartwood village. Once a tenancy has been secured for these areas it is our intention to work with the tenant to design and implement an appropriate sivopastoral system which delivers benefits such as improved stock health, biodiversity value and potential timber production. More information on these areas is provided in Appendix VI.

5. Additional reference materials

The following list includes a selection of technical reference materials which were consulted in addition to the standards listed in section 2.1.

Forestry and Land Scotland (2022) *FLS Larch Strategy 2022*. (Internal guidance document.)

Forestry Commission Bulletin 112 Establishing New Native Woodlands

Forestry Commission Scotland / Scottish Forestry *Wildlife and forest operations guidance notes*. Available at <https://forestry.gov.scot/publications/forests-and-the-environment/biodiversity/wildlife-forest-operations>

Forest Research (2021) *Forest Development Types* (Guide and Flashcards). Available at <https://www.forestryresearch.gov.uk/tools-and-resources/fthr/forest-development-types/>

Hotchkiss, A. and Herbert, S. (2022) *Tree species handbook* The Woodland Trust (Available from <https://www.woodlandtrust.org.uk/publications/2022/03/tree-species-handbook/>)

Met Office *UK Climate Projections (UKCP)* Available at <https://www.metoffice.gov.uk/research/approach/collaboration/ukcp>

National Library of Scotland *Map images* Available from <https://maps.nls.uk/geo/explore/#zoom=5&lat=56.00000&lon=-4.00000&layers=1&b=1>

Savill, P. (2013) *The Silviculture of Trees Used in British Forestry*. CABI, Oxfordshire, UK

Scottish Forestry (2021) *Guidance on the management of individual ash trees affected by ash dieback in Scotland*. Available at: <https://forestry.gov.scot/sustainable-forestry/tree-health/tree-pests-and-diseases/chalara-ash-dieback>

Scottish Forestry (2021) *Phytophthora ramorum on larch Action Plan*. Available at: <https://forestry.gov.scot/sustainable-forestry/tree-health/tree-pests-and-diseases/phytophthora-ramorum>

UK Forestry Standard Practice Guide (2022) *Adapting forest and woodland management to the changing climate*. Available at: <https://www.forestryresearch.gov.uk/publications/adapting-forest-and-woodland-management-to-the-changing-climate/>

(Further guidance and advice was also provided by staff from Forestry and Land Scotland, Forest Research and Scottish Forestry.)

Appendix I – Background information, survey and analysis

I/1. – Site Description

I/1.1 Location

The Hartwood Forests Land Management Plan area is located entirely within the North Lanarkshire Local Authority area, immediately west of Shotts, north of Allanton, and surrounding the smaller settlements of Hartwood and Bowhousebog. The entire site falls within the Central Scotland Green Network Boundary and approximately half the site falls within the Woodlands in and Around Towns (WIAT) 1km boundary around settlements of over 2000 people (map 01).

The Land Management Plan area comprises an amalgamation of three individual but closely related sites – the former Hartwood Home Farm, and Murdostoun & Mossband forests. These sites have been amalgamated into a single Forestry and Land Scotland ‘Block’ (*Hartwood*) and ‘LMP area’ (*Hartwood Forests*) due to their complex shared boundary, close geographical location and common attributes. However, throughout this document, the names Hartwood, Murdostoun, and Mossband are used together with local placenames as descriptors for certain spatial information (see map 02).

I/1.2 Access

The site is relatively well served by unclassified single carriageway roads providing access south onto the A71 and north onto the M8. Access to the west side of Murdostoun is limited by the public road network while access to the east side of Mossband is restricted by major subsidence of the private access road (‘Deas’ Road’) – which is outwith FLS ownership. Currently, the main access points are off Hartwood Road and Newmill and Canthill Road, with other accesses leading off Rosehall Road and Bowhousebog Road. Current operational access within the site is limited to existing farm tracks, which are of varying quality. The fragmented nature of the site means there are numerous access points serving different areas and rationalizing and improving site access will be a key consideration over the next 20 year period of management. While, in general, Hartwood is bisected by numerous unclassified single carriageways, the most suitable route for future haulage is along Hartwood Road and Newmill and Canthill Road.

Existing main operational access point (Hartwood Home Farm): NS 8494 5916

Proposed main operational access points: NS 8516 6016 and NS 8491 5888.

I/1.3 Utilities, renewable energy and other infrastructure

The site is affected by numerous utilities and transport infrastructure – including the Shotts line railway, running from Glasgow Central to Edinburgh Waverly, which passes through the lower half of the site with a station at Hartwood. As mentioned in I/1.2 above, there are also numerous minor public roads bisecting the site.

Overhead powerlines are the main utility consideration, bisecting several parts of the site and running parallel to several of the public roads. BT communication lines and water mains are also located along the public and private road network. No private water supplies are known to be present, while the remains of a small reservoir (located outwith the FLS boundary at NS 8413 5994) provides a water source for maintenance of the historic local cemetery.

A sewage works are located just outwith the site boundary at NS 8659 5935, on the opposite side of Rosehall Road to the south west of Shotts, and separate sewage infrastructure is located to the west of Bowhousebog, with pipelines running across the site connecting this to Hartwood and Bowhousebog.

All known utilities have been taken into consideration as part of the woodland design and are shown on map 10.

There are currently no renewable energy projects in the immediate vicinity, however planning approval has been granted for seven new windturbines on the edge of the Mossband plateau, all of which are located within the site boundary. This development does not form part of the LMP proposals, however FLS are in ongoing discussions with the developers of this site to ensure the functionality of these turbines are not adversely impacted by woodland creation proposals.

I/1.4 Adjacent land use

Pastoral farmland dominates the surrounding land use, particularly to the north, west and south. Urban and peri-urban land uses are also highly significant, with the town of Shotts being the most significant feature to the east. To the west and the south, there are the smaller but significant settlements of Hartwood and Bowhousebog, both of which are partially enclosed by the site, while Allanton lies less than 300m from the southern boundary. Two significant ‘brownfield’ sites comprising the former Hartwood Mental Hospital (NS 844 591) and associated Nurses Home (NS 847 588), and the former Hill Hospital (NS 860 598) are all located in close proximity to, and share a significant boundary length with, the site. Also of note is the Green Action Trust’s Shotts Nature Park, directly east of Hartwood and Mossband. Another Forestry and Land Scotland holding, Damside, located on a former opencast site, is less than 1km south of the site boundary, on the southern side of the A71.

I/2. Physical Factors

I/2.1 Topography

In general the site is relatively flat, with elevation rising from 150 to 260 meters above sea level over a distance of roughly 2 kilometers. The landform includes two distinct plateaus approximately coinciding with the areas Murdostoun and Mossband, with land sloping down from these to the Tillan Burn, the South Calder Water and the Curry Burn. In general, the topography is relatively simple, although it becomes more complex in certain areas - particularly to the south of Hartwood and Hartwoodhill. The top of the site, at Pell Hill, lies slightly above the level of the Mossband plateau, while the lowest areas are located along the South Calder Water near Bowhousebog. The aspect is mainly southerly, particularly for Harwood, with smaller areas sloping to the southwest and southeast respectively and some northerly aspects to the Murdostoun area. A single small bing is located close to the farm due north of Hartwood, rising to a height of about 15 meters from the surrounding landscape. See also map 4.

I/2.2 Geology and soils, including land capability

I/2.2.1 – soils

The underlying geology is composed of sedimentary bedrock, namely the 'Scottish Lower Coal Measure Formation' and 'Passage Formation' – including sandstone, siltstone and mudstone formed during the Carboniferous Period. There are also deposits of coal within this complex, which were historically exploited through both deep and opencast mining. Where present, superficial deposits are mostly glacial in origin, overlain predominantly by gleyed and/or peaty soils, with some brown earths and areas of mining spoil. Soil moisture ranges from very wet (peats) to fresh (brown earths), with most being moist or very moist. Soil nutrition ranges from very poor (peats) to rich (gleys and brown earths), with most being medium or rich. At lower elevations, gleyed and brown earth soils intergrade, while mining soils are located in distinct areas. At the upper edge, gleyed soils merge into peaty gleys and deep peats on the plateaus of Murdostoun and Mossband (see map 06).

Most of these soil types have been partially or completely altered by the previous land uses. On the Hartwood area, soils have been significantly modified through the frequent application of fertilizer and maintenance of agricultural field drains. Conversion to forestry will reduce this modification and is likely to cause the soils to 'revert to type' – resulting in a potential increase in moisture content and a reduction in fertility. To some extent, the developing woodland could mediate this reversion through increased water uptake and improved nutrient cycling. On Murdostoun and Mossband, the natural peatland soils of the lowland raised and intermediate bogs have been heavily altered by the attempted historic conversion to forestry. This included the installation of significant drainage infrastructure, deep ploughing and likely repeated applications of fertiliser during the establishment phase; resulting in significant modification of peatland it's natural hydrology. Peatland restoration will seek to reverse this modification,

blocking drainage and smoothing plough lines to restore a high water table and hydrological connectivity within the peatland unit which will benefit soil health, biodiversity, carbon storage and water quality.

I/2.2.2 – Land Capability

Land capability for agriculture (1:50k JHI data) ranges from 4.1 – 5.3, with the majority of the site and woodland creation areas classified as 4.1 and 4.2, indicating mixed agricultural land with the ability to produce a narrow range of suitable crops and a tendency towards pastoral uses in class 4.2. This is reflected in the current use of the site primarily as grazing land, with higher-quality fields (class 4.1) being located on the lower slopes (see Appendix V).

Land capability for forestry (1:50k JHI data) ranges from F3 to F5, with the majority of the site and all of the woodland creation areas classified as F3 and F4, indicating good to moderate flexibility for the growth and management of tree crops. As with agriculture, the lower slopes (class F3) offer the greatest flexibility for tree growth.

I/2.3 Hydrology and drainage

I/2.3.1 Natural Hydrology

Several natural watercourses are present – namely the Tillan Burn, the South Calder Water, and the Curry Burn, with smaller tributaries feeding into these. In addition, historical tributaries have been identified through the use of aerial photography, LiDAR, historic mapping, and on-site assessments. These ‘ghost’ watercourses are not currently active but may become so again in the future as agricultural field drainage deteriorates over time, or is purposefully disconnected (maps 04 and 14).

Two SEPA Waterbody Catchments – the Tillan Burn (ID 10750) and the South Calder Water (ID 10074) – are considered to be directly affected by these proposals. In 2021, both catchments were recorded as poor overall status with water quality being moderate. Rural source diffuse pollution is identified as a pressure on water quality and both woodland creation and peatland restoration should have positive outcomes for water quality within these catchments.

There are no significant areas of standing water within the site although two historic reservoirs are located close to the boundary at NS 8402 5929 and NS 8413 5993. In addition, there are numerous small scrapes and seasonal or permanent ponds within the site. Numerous seasonally or permanently waterlogged areas also offer opportunities to create new ponds and wetland habitats, particularly within the agricultural fields.

A significant feature of the upper slopes (comprising the majority of Murdostoun and Mossband) are their peatland units which extend to circa 99 hectares and 13 hectares respectively.

I/2.3.2 Artificial Drainage

Both the agricultural land and forestry plantations have extensive artificial drainage systems. None of the existing drainage is believed to be UKFS compliant with both historic forestry drainage and agricultural field drains being directly connected to watercourses. While in general the extent of these systems are not exactly known, some of the forestry drainage is significant enough to appear on Ordnance Survey mapping, while some areas of field drainage can be seen on aerial photography (see map 14). In general LMP proposals will seek to bring drainage into compliance with the current standards and requirements, otherwise directly connected drainage systems will typically be treated as a watercourse in their own right.

I/2.3.3 Flooding and Flood Risk

This site has not been identified as an area of major consideration for downstream flooding as it occupies an insignificant area of the respective drainage and catchment areas. In general, woodland creation and peatland restoration will help to reduce the rate and quantity of water run-off and should thus lower flooding risk to adjacent land in the long-term.

I/2.4 Climate and climate change

I/2.4.1 Current and future climate

The current climate ranges from warm, moist and moderately exposed on the lower slopes between Hartwood and the South Calder Water; to cool, wet and highly exposed on the upper slopes, including the Murdostoun and Mossband plateaus. Although, in general, there is little topographical shelter, some areas benefit from local shelter provided by microtopography and existing woodlands. DAMS scores range between 14 and 19, with the majority of the lower fields achieving 15-16 and the upper slopes predominantly 17-18. Exposure is therefore a primary limiting factor for the growth of most tree species, particularly where timber production is a major objective (see maps 05 and 11).

Met Office climate change predictions suggest an increase in summer mean temperatures and a probable decrease in summer rainfall, which could lead to increased drought risk. The current climate model of warm and moist conditions on the lower slopes is therefore likely to move uphill and replace the prevailing cool, wet climate on the upper slopes. These potential changes have been factored into the LMP proposals for future species composition/woodland design and peatland restoration – both of which are intended to achieve maximum future resilience to these potential changes. A climate change risk assessment for the site has been carried out and is detailed below.



I/2.4.2 UKFS Climate Change Risk Assessment

The following climate change risk assessment has been carried out based on guidance in the UK Forestry Standard Practice Guide '*Adapting forest and woodland management to the changing climate*'.

Table 12 - Climate Change Risk Assessment

Risk	Rating	Comments	Mitigation
Windthrow	Moderate	Exposure is moderate to high and climate change is likely to result in more frequent storm events. Climate projections for the area also indicate an increase in winter rainfall, which could exacerbate stability issues. Drier mineral soils offer relatively good rooting potential, while wetter soils will be more vulnerable.	Mixed-species and mixed-age stands should increase resilience while forest rides and broadleaved networks can provide windfirm boundaries throughout the site. Mixtures should contain a minimum of 20% 'other species'. Timely thinning in appropriate locations should be conducted to promote long-term stability.
Wildfire	Moderate-high	Some areas are already subject to fire-raising and current emergency access is poor. Young coniferous stands and fine vegetation are especially at risk, whereas mature broadleaved woodland is most resilient. Young broadleaved stands will also be vulnerable where combustible ground vegetation is present. Peatland restoration areas may be vulnerable if insufficiently wet, and peat may be damaged by surface vegetation fires (e.g. heather). Fire risk may increase with increased recreational access, and is greater in	The use of broadleaved species in mixture with conifers and in pure stands will help reduce fire risk/fuel loading and act as fire belts to help contain any outbreaks. Fire breaks and fire belts will be situated in key locations from which a fire could spread to the forest or which are identified as vulnerable/valuable assets which could be damaged in the event of a forest fire outbreak (e.g. settlements). Ensuring bog restoration achieves a high water table will be key to reduce wildfire potential on the peatland unit. In the event of an outbreak, fire

Risk	Rating	Comments	Mitigation
		proximity to existing settlements, brownfield sites, the railway, and overhead utilities. Fertile soils can increase the likelihood of strong weed growth which, combined with summer droughts, may increase fire risk.	control will be aided by the improvement of access across the site and the installation of ponds in key locations. In some situations, woody debris and/or vegetation management may be necessary.
Pests and disease	Moderate	Several treats are already known to be present on-site or in the surrounding area (Appendix I/6). Predicted climate change may increase both the conditions favorable to damaging agents, and the vulnerability of trees and woodlands through increased stress (e.g. drought). In particular, warmer temperatures, especially during the winter months, are likely to favor a range of pathogens, as well as insects and mammalian pests.	The exact threats are unknown, save for those already present on-site or in the local area (Appendix I/6). Key mitigation measures therefore include promoting diversity, biosecurity, and forest monitoring. Ensuring species suitability and matching species to the appropriate site will improve overall tree health and resilience, and ensuring wind stability will better facilitate targeted 'sanitation' felling if required.
Drought	Low	Increased summer temperature and decreased summer rainfall is likely to result in more frequent and more intense droughts. Strong weed growth on fertile soils may exacerbate drought stress at the establishment phase, but in both instances the predominant soil types are not considered to be highly drought vulnerable.	The use of a wide range of species across the site, including more drought-tolerant species and the establishment of mixed species stands will help reduce risk. In the longer-term, timely thinning with the aim of establishing CCF management in appropriate areas is likely to make the forest more resilient to drought.
Frost	Low	While winters will become milder, earlier spring growth may be more vulnerable to late frosts. The risk of frost will be greater on exposed woodland creation and restock sites and lower where CCF management is implemented. The generally south-facing aspect and topography is not considered particularly frost-prone.	Use of mixed species stands and management towards CCF where possible will reduce overall frost risk. More frost-sensitive species will be planted in mixture on more exposed sites and will not be established in potential frost pockets. No VP Sitka spruce, which may be more vulnerable to frost damage, will be planted.
Flooding and waterlogging	Low	Soil types indicate a tendency for higher water content and some areas of existing waterlogging exist despite	Existing areas of waterlogging and historic 'ghost' watercourses (not currently active) have been identified

Risk	Rating	Comments	Mitigation
		extensive agricultural drainage. Likely wetter winters and increase in extreme rain events as a result of climate change, but no major rivers or existing areas are identified as vulnerable to flooding.	and buffered with native woodland. Tree species have been selected to be suitable across a range of current and potential future soil conditions. Where necessary, new drainage will be used to manage excess run-off.



I/2.5 Landscape Character and Visibility

The site is not covered by any landscape designations and is not recognized as having any special landscape qualities. Although predominantly open in terms of area and character, the placement and layout of existing woodlands gives this landscape a more wooded feeling than might otherwise be expected, lessening to some degree the potential impacts of new woodland establishment in the otherwise open landscape.

Nature Scot Landscape Character Types

Two NatureScot Landscape Character Assessment Areas describe the general area; approximately 60% of the site is covered by 'Plateau Farmland – Glasgow and Clyde Valley' while the remaining 40% is covered by 'Plateau Moorlands – Glasgow and Clyde Valley'.

Relevant key characteristics of the landscape identified in the 'Plateau Farmland – Glasgow and Clyde Valley' Landscape Character Type (LCT) include:

- *Extensive, open, flat or gently undulating landform.*
- *Dominance of pastoral farming, but with some mosses surviving.*
- *Visually prominent settlements and activities such as mineral working.*
- *Rural character ... has reduced as tree cover has declined and the visual influence of settlements, transport infrastructure and mineral working has increased.*
 - [Although settlement does have a visual impact on lower areas, this is moderated by quite extensive existing tree cover in this location, and the effect on higher parts of the site is much less significant.]

Relevant key characteristics of the 'Plateau Moorlands – Glasgow and Clyde Valley' LCT include:

- *Large scale landform*
- *Undulating hills and sloping ridges in the western areas; a more even plateau landform in the east.*
- *Distinctive upland character created by the combination of elevation, exposure, smooth plateau landform, moorland vegetation.*
- *Predominant lack of modern development.*
- *Extensive wind turbine development, including one of the largest wind farms in Scotland, Black Law.*
- *Sense of apparent naturalness and remoteness which contrasts with the farmed and settled lowlands, although this has been reduced in places by wind energy development.*

Site Specific Landscape Character assessment

At a more local level, the site can be divided into three broad landscape 'zones', with a major division roughly following the 220m contour (see map 03).

Above the 220m contour (the 'upper slopes'), the 'Plateau Farmland – Glasgow and Clyde Valley' grades into the 'Plateau Moorlands – Glasgow and Clyde Valley'. The landform here is more simple, generally flat or gently sloping. Soils are predominantly gleys with some brown gleys and peaty gleys and areas of deep peat which become extensive in the adjoining ('plateau') areas of Murdostoun and Mossband.

The area is bisected by linear shelterbelts and enclosed by surrounding woodland. As a result, there are no significant views of this zone from external vantage points although extensive views can be had looking out from some areas. There is no settlement and little infrastructure, giving this area a more remote feel, particularly towards the western edge of the site and on the Murdostoun Plateau, although this may be affected by windfarm development in the future. The landscape scale is medium, strongly influenced by shelterbelts, but the simple landform underlying this is larger in scale and more sweeping. Exposure is relatively high (DAMS 17-19), although some local shelter is provided by existing woodland cover.

The 'plateau' zone adjoins the 'upper slopes' to the north and east and consists of extensive existing or historic conifer plantations located on deep peat soils, with little or no visibility, no settlement and little infrastructure. This has a similarly remote feel with a large-scale underlying plateau landforms, although the existing tree cover forces the experience of this landscape to be much smaller in scale.

Below the 220m contour (the 'lower slopes'), the topography becomes more complex with minor but significant undulations of glacial origin, creating a smaller scale landscape which is reinforced by the more intricate pattern of vegetation and habitation. Soils are more variable, with brown earths and brown gleys occurring more frequently on ridges and knolls and gleys and brown gleys in hollows and flats. Tree cover is predominantly composed of small farm woodlands, with a network of old hedgerows in the eastern area, and some scattered riparian woodlands. There are more widespread local views, particularly of the adjacent settlements of Hartwood, Bowhousebog, Allanton, and Shotts. The area is generally visible from these settlements and the surrounding landscape, including from the A71, although some foreshortening is experienced, which is even more apparent where woodland is present. The general nature of the site is more heavily influenced here by existing settlement and utilities and may become more so through future development of adjacent brownfield sites. Exposure is moderately high (DAMS 14-16), with local shelter afforded by existing woodlands and changes in topography.

Implications of the landscape character assessment

The proposed woodland should aim to reflect the scale and key characteristics of the landscape.

In the upper reaches of the site, the woodland should be established at a larger scale – this means larger areas of single or mixed conifer species, or extensive broadleaves, broken by the shelter belts and riparian/ wetland woodland to reflect localized variations.

Lower slopes should become increasingly diverse, with key topographic features – such as low hills – picked out by individual stands of trees. Additional elements, such as agroforestry, open space, and wet woodland, as well as the openness associated with the bing, will add to diversity and enhance the setting of the village – a key aim for the planting proposals.

How the design reflects the landscape character assessment

On the upper slopes and plateau, areas of woodland and open space are generally proposed at a larger scale with significant areas of open ground linking to large networks of native and productive woodland with the main productive conifer species being Sitka spruce and the main broadleaved species being downy birch.

On the lower slopes, areas of woodland and open space are planned at a smaller scale, particularly where utilities bisect the site and where the design interacts with key local views. There is also a greater variety of woodland types and species, more intricately linked, and with areas of more detailed design for amenity purposes where these are located close to existing or future settlements.

Throughout the upper and lower slopes, the existing pattern of LEPO copes and shelterbelts has been preserved with additional areas of planting designed to reflect these features.

I/3 Environment and Heritage

I/3.1 Biodiversity

I/3.1.1 Designated sites and priority habitats

Hartwood is dominated by improved grassland with little existing biodiversity or habitat value. Murdostoun and Mossband are dominated by afforested peatland units, parts of which could be qualified as Annex 1 priority habitats due to the presence of small areas of functioning or degraded lowland raised and intermediate bog. The previous Land Management Plan noted the importance of lowland raised bogs in this area, stating:

'Lowland raised bog is a rare habitat with an estimated 28,000ha in Scotland (over 800 sites), of which only 2,500ha is in a near natural state.'

'North Lanarkshire has about 10% (c3724ha) of all lowland raised/intermediate bog cover in Scotland and 4.6% of all such cover in Great Britain. Since North Lanarkshire is c0.2% of the total land area of Great Britain, it contains a significant area of the remaining and best bog habitat in Scotland and UK.'

There are no Ancient Semi-natural Woodlands (ASNW) within or immediately adjacent to the site, however there are several areas of Long-Established of Plantation Origin (LEPO) woodlands, and native semi-natural woodlands although few of these are likely to qualify as priority habitats (see map 08). Owing to the heavily modified and improved nature of the agricultural fields, there are few areas considered to qualify as botanically rich Ground Water Dependent Terrestrial Ecosystems (GWDTEs), even where springs and flushes are present, with only one site of potential interest identified at NS 8436 5955.

There are no statutory protected sites present, however there are numerous Local Authority designated Local Nature Conservation Sites, the majority of which are listed for woodland or peatland habitats (see map 08). Little information on these sites exists and, to date, none has been provided by the Local Authority. Local Nature Conservation Sites are primarily a Local Authority Planning designation and as such they do not typically carry the same weight as other designated sites.

All of these habitats have been considered as part of the Land Management Plan, with proposals aimed to maintain or enhance biodiversity value where possible.

More information on the woodland habitats is also provided in section I/5, below.

I/3.1.2 Priority and protected species

Although current habitat value is generally low, several priority and protected species are known or likely to be present within the site or the surrounding area, including but not limited to various bat species, badger, otter and goshawk. In general, these species have no specific influence on the LMP proposals. While woodland creation is likely to result in the loss of some habitat for ground nesting bird species, this is not considered significant at a landscape-scale for the number of pairs affected and will likely be offset by proposed deforestation on Murdostoun.



Table 13 - Priority habitats present within the LMP boundary

Habitat type	Legal protection/priority	Comments
Lowland Raised (& intermediate) Bog	Most (>90%) Annex 1, Scottish Biodiversity List	Some degraded and afforested bogs qualify for Annex 1 classification, as do functioning Lowland Raised Bogs. Some open areas within Murdostoun are likely to qualify as Annex 1 habitats given the presence of suitable indicator vegetation.
(Native) Wet Woodland	Most (>90%) Annex 1, Scottish Biodiversity List	Also includes bog woodland which can be an Annex 1 habitat but does not typically include secondary woodland on degraded bogs. Lack of knowledge regarding this habitat type in a UK context.
(Native) Upland Birchwood	Some (<50%) Annex 1, Scottish Biodiversity List	Some W4 community included in definition of wet woodland under the Native Woodland Survey of Scotland. Most of semi-natural origin.
(Native) Lowland Mixed Deciduous Woodland	Scottish Biodiversity List	Minor component of native woodlands in the area, mostly of planted origin.
Long-Established of Plantation Origin (LEPO) Woodland	Standard legal protections on woodland	LEPO may be considered more valuable where ASNW is absent or rare and can have similar attributes. Most on this site is considered low-moderate value, the best site being Pell Hill/Pellhill Wood (see below).
Hedgerows	Scottish Biodiversity List	Existing hedgerows on this site are generally narrow, species poor, and several are in decline.

Table 14 - LNCS present within the LMP boundary

LNCS name	Qualifying features/interests	Comments
North Foulburn Bog and Strip	'Remnant bog and plantation: Includes bird and mammal interest'	Recent surveys indicate no significant interest. Habitat quality is considered to be poor and much modified by agriculture and forestry.
Hartwood Plantation (North)	No records	Existing woodland of birch and Scot's pine; SP of planted (LEPO) origin, some birch regeneration.
Hartwood Plantation (South)		
Pell Hill & Pellhill Wood	'Woodland: Shelterbelts with some good ground flora'	Some of the oldest LEPO woodland on-site (1816); FLS Environment Team confirmed woodland ground flora best along the riparian zone.
South Calder Water: Allanton Mill-Mill Road South Calder Water: Shotts-Allanton Mill	No records	Predominantly young native woodland planted under WGS, with some much older tree cover; fen bog and river habitats.
Allanton Spoil Heaps, Bowhousebog	'Heath, grassland: Locally-valuable remnant heath vegetation'	Currently existing woodland (Scot's pine and larch), likely originating from natural regeneration and <50 years old.



I/3.2 Historic Environment

There are no designated historical remains within the site. Several undesignated historical features have been identified through previous windfarm surveys and by FLS, the majority being associated either with former agricultural use or historic mining activities (see map 09). Some of the older woodlands contain remnants of beech hedge banks, and of pre-industrial rig and furrow systems. All of these features are deemed to be of 'local importance' and therefore have little bearing on the woodland design and management proposals save for the preservation of any remaining features in a state of 'managed decay'.

I/4. Public Access and Recreation

Currently there is little use of the site for public access and recreation although there are several informal walking routes around the site, largely following existing field or woodland boundaries. A core path and right of way runs north to south from Black Wood to Parkfoot, while other core paths follow Rosehall Road, Bowhousebog Road and Newmill and Canthill Road in an east-west direction.

Given the site's location within the WIAT and Central Scotland Green Network zones; its proximity to Shotts, Hartwood and public transport routes; and the adjacent Green Action Trust land at Shotts Nature Park, there is good potential for increased public use compared to the current baseline.

There is evidence of existing anti-social behavior an and around the site – including fly-tipping and illegal motorized access – with the area around Parkfoot and Mossband and laybys along the Newmill and Canthill road currently suffering the most from these activities. The existing stand of Sitka spruce at Mossband also suffers from anti-social behavior and has been destabilised by fire, requiring it's removal as part of the LMP proposals.

I/5. (Existing) Woodland Description

Although predominantly agricultural land, Hartwood does contain small areas of existing woodland, extending to a total of around 18ha. Most of these are composed of mature, locally non-native species such as beech, Scots pine, Sitka spruce, larch and sycamore; although there are also some areas of young (planted) native woodlands, mainly located along the South Calder Water. Areas of LEPO woodland are composed primarily of beech and Scots pine and date back as far as 1816 or earlier (National Library of Scotland).

The woodlands on Murdostoun and Mossband are predominantly non-native coniferous plantations comprising Sitka spruce, lodgepole pine, larch, and Scots pine. These are typically achieving a poor yield class (growth rate) on the core bog area, as depicted on map 07b.. There are also some areas of native and LEPO woodland located around the perimeter, consisting mainly of birch with some Scots pine and beech. The majority of these were established in the 1970s and 1980s but some areas around the edge of the plantation (e.g. at Pell Hill) may date back to 1816 or earlier.

There are few semi-natural native woodlands within the immediate area, with many of these being of planted origin. However, these include a relatively wide-range of woodland types, including (in order of frequency):

- Upland birchwood W11 and W17
- Wet woodland W4 and W7
- Upland oakwood W11
- Lowland mixed deciduous woodland W10

The existing species and woodland types present in the surrounding area have been used to help inform the management proposals in section 4. See maps 07a, 07b and 08.

I/6. Plant Health

A number of pests and diseases could threaten tree populations on this site, and climate change could exacerbate these, or increase the likelihood of new pests and pathogens arriving. This section details those species known to be present and which present the greatest perceived risks. Cross-refer to section 4.2.2.

Phytophthora ramorum has not so far been recorded on this site but presents a potential threat to species of larch which are present in some of the woodlands. Infections of *P. ramorum* eventually result in complete mortality and are subject to Statutory Plant Health Notices (SPHNs), requiring the destruction of infected trees. *P. ramorum* has been detected at two FLS sites within the local area (<10km distance), which were subject SPHNs in 2010 and 2016. Hartwood currently lies within the 'less vulnerable' area of the Scottish Forestry Priority Action Zone and as such there is a presumption against pre-emptive removal of larch. However, this disease essentially precludes the use of larch in long-term retentions, new planting and restocking.

Dothistroma Needle Blight (*Dothistroma septosporum*) has been recorded at Murdostoun and Mossband. The presence of this disease precludes the use of Scots pine as a major species due to the associated risk of reduced growth and possible mortality. Where Scots pine is being used, maintaining good airflow through the canopy may help to reduce inoculum loading.

Ash dieback (*Hymenoscyphus fraxineus*) and Dutch Elm Disease (DED) (*Ophiostoma novo-ulmi* / *Ophiostoma ulmi*) are present throughout the majority of the UK. Ash dieback is likely to cause most infected trees to die, although a small number may be resistant. Some elm may survive DED by growing as shrubs and/or within the understory where they are less likely to be detected by the beetles acting as a disease vector. The presence of these diseases precludes the planting of ash due to the high mortality risk, although a small percentage of elm may be included as a minor species/shrub in native woodland planting.

Grey squirrels are present within the local area. There is therefore a risk of damage to broadleaved trees, particularly for species such as beech and sycamore, through bark stripping. This action can have significant impacts on timber quality, and predispose trees to secondary health issues. Natural regeneration of species such as hazel may also be negatively impacted. No specific design or management has been identified for grey squirrel, save for the absence of sycamore and beech from productive broadleaf planting.

I/7. Invasive Species

Rhododendron ponticum and Japanese knotweed are both present in small populations within the site and the surrounding woodlands, which will require interventions to prevent their spread. Grey squirrels are present throughout the local area and are discussed above.