SECTION A - WOODLAND DESCRIPTION

Property Details

Name	Kinneil Woods
Owner	Falkirk Council
Long-Term Management Responsibility	Falkirk Community Trust
Business Reference Number	162122
Main Location Code	841/0019
RDC Case Number	4663707 (Long Term Forest Plan)
Agent	Central Scotland Forest Trust Hillhouseridge Shottskirk Road Shotts Lanarkshire ML7 4JS

Location and Setting

Kinneil Estate is located on the western edge of Bo'ness, within Falkirk. The Estate occupies a section of the scarp slope above the foreshore of the Forth estuary, and part of the gently sloping plateau above the escarpment. The residential areas of Kinneil and Castleloan lie immediately to the west of the site, with Bo'ness Town Centre being roughly 1.5km from the Estate. Grangemouth is located some 4km to the west.

The A904 Bo'ness-Grangemouth road lies to the north, and its continuation northwards (as Snab Brae) forms a short stretch of the Estates north-east boundary. Provost Road/Crawfield Road forms the eastern boundary to the Estate, which also has a short boundary with a minor public road on its north-western point. The Bo'ness and Kinneil Railway Line forms much of the Estate's northern boundary.

Agricultural land lies to the south and west of the Estate, with residential areas to the east, and with largely industrial land lying to the north, on the foreshore.

The Estate was estabslihed around Kinneil House, which lies in the north-east of the Estate. There are roughly ten residential properties in close proximity to Kinneil House, while Falkirk Council's horticultural unit occupies the walled garden and ancillary buildings. The ruins of Kinneil Church lie to the west of the House, on the far side of the Gil Burn, while the north of the Estate is dissected by the Antonine Wall.

Kinneil Woods fall neatly into two discrete sections, separated by an access track that splits the Estate in two on a largely east-west axis. Nearly all of the area south of the track comprises of conifer-dominated woodlands, while the woodlands to the north are concentrated on the scarp slopes, with a narrow strip extending up the gully occupied by the Gil Burn, leaving a two large open areas; one to the east of Kinneil House, and one west of the Gil Burn.

The House is accessed off Provost Road at OS grid ref. NS 98658072, while the aforementioned track is also accessed off Provost Road, at NS 98368047. Kinneil House is located at NS 98218058. (see Map 1 – Location and Context).

Area

The Estate covers 76.0 ha in total, and includes 54.9 ha of woodland habitats. Roughly 40 ha of the woodland lies in the southern section, and 15 ha in the northern section.

The remaining land is primarily in amenity grassland, together with extensive areas associated with the aforementioned buildings. There are small areas of more natural habitat in the north of the Estate. There are two artificial ponds; one in the west, extending to 1.64 ha, and a smaller one, extending in part across the Antonine Wall, covering 0.29 ha. The open area to the west of Kinneil House is largely bereft of tree cover, save for occasional patches of scrub and young woodlands established on the margins, but the area to the east of the House contains a range of parkland trees, both mature and young, laid out in an avenues and other patterns, as well as a narrow strip of amenity woodland by the public road.

The scope of the Long Term Forest Plan is largely confined to the woodlands, and to woodland and recreational access related matters.

IACS Details

The property is IACS registered, with the total registered area being 76.81. This excludes the Walled Garden and some of the buildings, as well as the two ponds, but erroneously includes land to the north of the Estate, outwith the site. Details are contained in Table 1.

Table 1 - IACS Details

Cpt no.	Area (ha)	Location/Land Use	IACS Field No.
1-10	41.25	southern section/woodland	NS/98088/80104
11-12	17.18*	northern section/woodland	NS/98095/80661
13	11.08	west of Gil Burn/ grassland with small area of woodland	NS/98095/80661
14-15	7.30	east of House/ parkland and shelterbelt	NS/98446/80661

*- The IACS map shows Field 3 as including an area outwith of the Estate, and consequently its given area is larger than is actually the case.

Historic Background

Kinneil Estate first came into being in 1323, when Robert the Bruce granted the lands to the Duke of Hamilton. The Estate remained in the ownership of the Dukes of Hamilton until 1922 when Bo'ness Town Council purchased the property to form a Public Park. Falkirk Council assumed ownership of the Estate in 1975. Full management responsibility for Kinneil passed

from Falkirk Council to Falkirk Community Trust in July, 2011, although the Council remain the landowner.

The Estate has a rich historical legacy. A section of the Antonine Wall bisects the Estate, with the remains including a fortlet dating form 142 AD. Kinneil House, located almost on the Wall, was constructed in the 16th century, and then was heavily modified in the following century. While largely extant, and wind and watertight, much of the interior of the House has been gutted. The House is now managed by Historic Scotland, but public access is only available on special occasions. Kinneil was used as a base for James Watt's early works on steam engines, with a prototype steam engine cylinder being present just to the south of the House. There are numerous building associated with the House, with one of the residences at Duchess Anne Cottages having been converted into Kinneil Museum.

Kinneil Church predates Kinneil House and Estate, probably dating from the mid-12th century, and it is thought that there was a medieval village associated with the church, although no signs remain of any settlement. The church was largely destroyed by fire in 1745, but a gable wall and graveyard remain.

Woodland Description

As noted above the bulk of Kinneil's woodland can be placed into one of two categories; the mature, conifer dominated woods in the southern sections, and the mature, primarily broadleaved woods on the northern scarp slope and around the Dean, Gil, and Deil's burns.

Southern Woods - The coniferous woods contain a limited range of species (mainly Sitka spruce, with larch, Scots pine and Norway spruce) which are planted in uniform stands and are generally at or beyond maturity. The uniformity of the woodland is reinforced by the linear network of paths that bisect the woods. However the on-set of severe windblow in the past 15 years has introduced a degree of visual and structural diversity. The trees are notably tall, being drawn up through intensive competition, with some trees reaching in excess of 35 m in height.

Northern Woods - The northern woods have a wider, but still restricted, range of species. These species include sycamore, which is dominant in places, together with ash, birch, oak, beech, gean, rowan, and elm. A limited range of coniferous species are also present. The northern woods contain greater age-class and structural diversity than the northern woods. Due in part to their location on steep ground, they are less well-used for recreational purposes than the southern woods.

Other Woods -The presence of younger and more fragmented woods, notably around the ponds, the car park, and main access tracks provides a degree of differentiation, as does the extensive areas of windblow within the southern woods, most of which are developing primarily broadleaved woodland character, although cover is patchy in places.

Woodland Origin - The large majority of the woodlands are of plantation origin, although small parts of the northern woods are of ancient semi-natural origin, while larger parts contain self-sown trees (see Map 2 – Designations)

Woodland Type - Table 2 sets out a summary of the woodlands by type. Over half of the woodlands are predominately coniferous, and almost a third largely broadleaved, with almost 8% of the woodland area being classed as un-cleared windblow, and a similar

amount as mixed. However, the simplistic division into coniferous, broadleaved, and mixed woodland obscures the complex distribution of species over most of the site. For instance, there are broadleaf trees scattered on the margins, path edges, and clearings within the coniferous woodlands in the south, and similarly there are numerous conifers distributed through the broadleaf dominated woods in the north. It is also simplistic to assign the developing woods within the cleared areas in the southern woods entirely to the broadleaf category, as there are significant patches of coniferous regeneration, while other cleared areas bear only limited woodland cover. Map 3 – Compartments and Map 4 – Habitats and Woodland Types give an indication of the distribution of dominant species and woodland type.

Table 2 – Summary of Woodland Area by Type

	Broadleaf Dominated	**Conifer Dominated**	**Mixed Woodland**	**Windblown**	**Total**
Area	17.0 ha	29.3 ha	4.4 ha	4.2 ha	**54.9 ha**
% of total site	23%	38%	6%	5%	72%
% of woodland	**31%**	**53%**	**8%**	**8%**	**100%**

Age Class - Table 3 sets out a summary of the various age-classes within Kinneil Woods. Almost two-thirds of the woods at Kinneil can be placed in the mature category. Indeed, given that large sections of the coniferous woodland are nearer the end of the lifespan, it could be argued that these woods could be classed as being over-mature in economic if not ecological terms. Significantly smaller amounts of the woods fall into the semi-mature and young categories, while almost 10% of the woodland is still at the establishment phase (with not all of these areas guaranteed to become true woodland), and a slightly smaller area comprises of standing and fallen deadwood (again with no guarantee that it will develop into true woodland).

The northern woodlands display a healthier age class range, although the sycamore-dominated woods in the west exhibit limited age class diversity.

Table 3 - Summary of Woodland Area by Age Class

	Establishing	**Young**	**Semi-Mature**	**Mature**	**Windblown**
Area (ha)	4.7 ha	3.5 ha	6.8 ha	35.7 ha	4.2 ha
% of woodland	9%	6%	12%	65%	8%

Structure – Structural diversity is generally limited, most notably within the coniferous stands. Here stands of tall, mature to over-mature trees dominate, although where light has been allowed to penetrate (where windblow or felling has occurred) a limited understorey has developed. The broadleaved woodlands generally contain a greater structural and age-class diversity, but a true understory and shrub layer is rarely found. Regeneration is occurring in many locations throughout the woodland where light conditions allow, most

notably following clearance of windblow. However, some cleared areas lack sufficient levels of estabslihed regeneration to permit healthy woodland cover. Species are restricted, being primarily birch and rowan in the coniferous areas, and sycamore, ash, and beech in the primarily broadleaved woodlands.

The southern woods contain numerous stands of tall trees, with some specimens being in excess of 35m in height. There are also tall specimen broadleaf trees in the northern woods, notably in gullies and at the foot of the scarp slope, where the trees have been drawn up through competition for light. Stocking densities among the coniferous stands are markedly high for trees of their age; this reflects the lack of past thinning.

Woodland Condition – The coniferous woodlands have suffered badly from windblow over the last 15 years. To date, around almost a fifth of the coniferous woodland has suffered devastating windblow, and most of the remaining woods have been by sporadic damage. While sections of these woods appear to be in healthy condition, and have suffered only limited wind damage, all areas are vulnerable to further windblow. The broadleaf woodlands are generally in good condition, although some areas still show the signs of Dutch elm disease.

Productivity - The calculated yield class of the coniferous species ranges from Yield Class 8-20, with an average of Yield Class 14 (see Table 10). The Macaulay Land Use Research Institute record the Land Capability for Forestry at Kinneil as being F2 (land with very good flexibility for the growth and management of tree crops). The Wind Hazard Classification for Kinneil is relatively low, at 4, and in theory there are opportunities for long-term retention, although the heavy soils and open location of the site imposes some limitations.

Further information on the woodlands is contained in Section D and In Appendix 1.

Management Compartments

The whole of Kinneil Estate, including non-wooded areas, has been is divided into 15 compartments (see Map 3 – Compartments). The numbering largely adopts the system used in the 2002 Management Plan for the southern woods (cpts 1 to 9), and uses a different numbering system for the northern woods than the one used in the WGS which covered these woods, and from the CSFT WIAT application which re-compartmentalised the southern woodlands.

The compartments are briefly summarised in Table 1 below. Individual woodlands within each compartment have been given a sub compartment reference letter.

Table 4 – Compartment Summary

Cpt.	Sub-Cpt.	Area (ha)	Woodland Type	Stage	Condition/notes
1	a	1.35	coniferous	mature	reasonable, minor windblow
1	b	1.56	coniferous	mature	reasonable, minor windblow
1	c	1.31	coniferous	mature	moderate windblow
1	d	0.88	coniferous	mature/w'blown	severe windblow
S. total		**5.10**			
2	a	1.08	coniferous	mature	moderate windblow
2	b	1.92	coniferous	mature	minor windblow
S. total		**3.00**			

Table 4 – Compartment Summary (continued)

Cpt.	Sub-Cpt.	Area (ha)	Woodland Type	Stage	Condition/notes
3	a	2.42	coniferous	mature	minor windblow
3	b	1.24	coniferous	mature	moderate windblow
S. total		**3.66**			
4	a	1.10	coniferous	mature	minor windblow
4	b	1.76	coniferous	windblown	severe windblow
4	c	0.79	coniferous	mature	minor windblow
S. total		**3.65**			
5	a	2.54	coniferous	mature	moderate windblow
S. total		**2.54**			
6	a	2.61	broadleaved	establishing	densely stocked
6	b	0.58	coniferous	mature	moderate windblow
S. total		**3.19**			
7	a	1.70	coniferous	mature	moderate windblow
7	b	3.72	coniferous	mature	moderate windblow
7	c	2.36	broadleaved	young	densely stocked
7	d	2.13	broadleaved	establishing	poorly stocked
7	e	0.14	open	-	-
S. total		**10.05**			
8	a	0.88	coniferous	mature	reasonable, minor windblow
8	b	2.00	coniferous	mature	reasonable, minor windblow
8	c	0.83	coniferous	mature/w'blown	severe windblow
S. total		**3.71**			
9	a	0.33	mixed	mature/w'blown	windblown conifers
9	b	0.16	broadleaved	semi-mature	
9	c	0.49	broadleaved	semi-mature	widely spaced
9	d	1.65	open water	-	-
S. total		**2.63**			
10	a	2.86	coniferous	mature	moderate windblow
10	b	1.96	coniferous	mature	minor windblow
10	c	1.02	mixed	mature	densely stocked
S. total		**5.84**			
11	a	0.53	coniferous	mature	part on Antonine Wall
11	b	0.74	mixed	semi-mature	part on Antonine Wall
11	c	2.43	broadleaved	semi-mature	
11	d	0.31	broadleaved	young	
11	e	0.09	coniferous	semi-mature	
11	f	0.37	broadleaved	semi-mature	low stocking
11	g	0.30	mixed	semi-mature	
S. total		**4.77**			
12	a	0.60	broadleaved	mature	densely stocked
12	b	0.49	broadleaved	mature	densely stocked
12	c	2.50	broadleaved	mature	diverse species and age class
12	d	1.04	broadleaved	semi-mature	some marshy grassland in cpt.
12	e	1.00	open	-	-
12	f	0.53	open	-	-
S. total		**6.16**			

Table 4 – Compartment Summary (continued)

Cpt.	Sub-Cpt.	Area (ha)	Woodland Type	Stage	Condition/notes
13	a	0.30	Scrub	semi-mature	Scattered woodland
13	b	0.32	broadleaved	semi-mature	Scattered woodland
13	c	0.86	scrub	young	Low stocking
13	d	9.06	open	-	-
13	e	0.46	open water	-	scrub fringe within cpt.
S. total		**11.00**			
14	a	1.55	broadleaved	mature	diverse species and age class
14	b	0.58	broadleaved	semi-mature	
S. total		**2.13**			
15	a	8.58	open	-	-
S. total		**8.58**			
Total		**76.0**			

Past Management

The scarp slope is, in the main, thought to have been historically wooded, and the existing woods are largely of semi-natural origin, although parts bear signs of significant intervention in the form of felling and re-planting, having being manipulated as part of the overall landscape design associated with Kinneil House.

Most of the southern section of the Estate was also historically wooded as part of the Estate's designed landscape, but their current appearance owes much to extensive planting undertaken in the decades before and after World War II. This dramatic change in character undoubtedly followed on from the felling of most of the original designed woodland, although the trees may have already been in decline by this time. A few relic trees from the original planting still form partial lines by some of the paths.

The clearance of the original cover in the southern woods and subsequent re-planting was largely undertaken in 1929, following Bo'ness Town Council's acquisition of the Estate in 1922, although some plantings appear to date from the late 1940's. It is likely that the trees that now dominate the southern woods were estabslihed for commercial objectives, with a narrow range of productive coniferous species being planted. These woodlands appear to have been effectively managed for the early part of their life, but management input may have declined though time, possibly around the time that Bo'ness Town Council was subsumed into Falkirk Council in 1975.

There are no records of management works between World War II the end of the 20th centuray. However it appears that thinning works were undertaken, and path routes maintained. The nature of path network in the northern woods, and its attendant structures, bears the hallmark of being upgraded through a job creation type project in the 1980's.

In the early 2000's, perhaps prompted by the onset of windblow, Falkirk Council appear to have sought to improve the management of the woods and to this end they engaged the Central Scotland Forest Trust (CSFT) to act as managing agents. This resulted in the production of a Management Plan covering most of the southern woods (and possibly a 'sister' Plan covering the northern woods, and the woods around the Gill Burn), and the

subsequent Woodland Grant Scheme (WGS) applications that resulted in two Forestry Commission schemes, which were implemented between 2002 and 2005.

The application which covered most of the southern woods was designed to address management issues relating to over-stocking, a lack of structural diversity, and incipient windthrow. Works involved thinning, small scale group felling, and windblow clearance (see details of works in Table 5 below). Most, if not all of the works detailed were implemented.

The application which covered the northern and Gil Burn woods included for silvicultural works, including thinning and selective felling appear to have been designed to improve tree quality and to increase the extent of native woodland.

Both grant contacts included for some path upgrading and signage installation, albeit on a limited scale.

In recognition that the recent works had not fully addressed the management requirements, and in the light of further windblow (notably adjacent to previously felled areas) CSFT prepared and submitted a funding bid in 2008, under the 'Woodlands In and Around Towns' initiative. The application, while including for large scale restructuring in the southern woods, was rejected by the Forestry Commission Scotland, on the basis that it did not cover all of the woodlands, and that it focused primarily on immediate silvicultural issues rather than on addressing long-term structural problems.

Most recently, efforts have been almost exclusively focused on clearance of windblow and of dangerous trees, including extensive clearance of windblow from path routes following the severe gales in early January, 2012.

Table 5 – Grant Scheme and Implementation Details

Scheme/Date	Works	Cpts (current nos.).	Extent (approx.)
WGS Mk III 033000886 2001	New planting	12e, 12f	0.6 ha
	Selective felling/restocking	10b, 11d, 12c, 14a	0.8 ha
	Selective thinning (broadleaf)	11b-c, e- f, 12a, b, d-f, 14 a	5.8 ha
	Selective thinning (conifer)	11a, 11d	0.9 ha
	Re-spacing	10a (part)	0.3 ha
	Path upgrades	Cpt. 10 –all routes, C2 and E2 to M1, S1 to N1	2,800 m
WGS Mk III 033002055 2003	Thinning –year 1	3b, 3c, 4a-c, 8a, 8b	8.0 ha
	Thinning –year 4	1d, 2a-c, 6b, 7a, 8c	8.0 ha
	Small coupe felling	3a, 5, 7c	0.8 ha
	Clear felling	6c	1.8 ha
	Re-spacing	7b	1.0 ha
	Windblow clearance	7d	0.5 ha
	Restocking – year 1	5a, 6b, 6c, 7a-d	1.8 ha
	Path upgrades	J-V, K-V, O-Q, Q-R (part)	1,300 m

Current Management

General maintenance of the landscape at Kinneil Estate is managed by Falkirk Community Trust (FCT) on behalf of Falkirk Council, with management being the responsibility of the

Team Leader – Parks and Sustainability Officer. Guidance and support for developments and activities taking place within the Estate are provided by The Friends of Kinneil, a local charity set up to promote the Estate. There are no FCT staff based on-site; general maintenance, such as mowing, is undertaken by a team of Council workers based in the Walled Garden, while the Council's Arboricultural Team has undertaken tree works when required.

Over the past year, a project to deliver a wide range of work has been undertaken at the Estate by Falkirk Community Trust and Falkirk Council's Employment and Training Unit working in partnership with core funding from the Coalfields Regeneration Trust. The project has focused on creating training opportunities for unemployed young people and has concentrated on providing skills training and practical experience in landscape-based construction activities.

Works completed by the Project has included the cleaning of the historic James Watt's cottage and general litter-picking around Estate. Over 5km of drainage ditches have been cleared. Work within the woodlands has involved lopping and pruning trees along path corridors, along with the removal and chipping of storm-damaged trees. Path works included the construction of new paths around the ponds, adding a fresh whindust topping to several paths and verge management of around 5km of paths together with the installation of new directional signage.

Management Plans

A Woodland Management Plan was produced in May, 2002, by Eamonn Wall and Co. The Plan covered most of the southern woods, but omitted most of the woodlands around the Gil Burn. The Plan was used to guide management works included in WGS ref: 033002055, which included thinning, small-scale felling, and restocking, as well as some access works.

It is thought that a similar Management Plan may have been produced to cover the WGS contract and resulting works undertaken in the northern woods in 2001, which were managed on behalf of CSFT by Langton-Vaughan Associates. However, if such a Plan was produced, no copies are now available.

Falkirk Council produced an Outline Management Plan for Kinneil Estate (2010-2015). The Plan covers the entire Estate, and includes an indicative work programme, although neither the Plan nor the programme contains much of relevance to woodland management.

SECTION B – SITE DESCRIPTION AND CONTEXT

Topography

In broad terms, the Estate is centred on a scarp slope and plateau above the foreshore of the Forth estuary. The north-facing scarp slope extends as a significant feature from the River Avon in the west to Muirhouses in the east. Within Kinneil the scarp slope rises no more than 30m in height, but with a 1 in 4 gradient the slope forms a dominant topographical feature. Above the break of slope the plateau rises another 40m in altitude, but with a gradient around 1 in 20. The high point of the site, in the southernmost point, is ~80m above sea level, with the low point, at less than 10 m above sea level, being in the north-eastern part of the Estate. Beyond the southern boundary the land continues to rise up to a height of around 120m, to a simple east-west orientated ridge known locally as the Flints.

While the scarp and plateau slopes are relatively smooth, they are broken by the incised gullies occupied by the Dean Burn (in the north-east); Gil Burn (east) and to a lesser extent, the Deil's Burn (in the west). The Gil Burn gully is particularly impressive around Kinneil House, but its steepness is masked in the southern woods.

The two ponds occupy what are generally shallow and man-made depressions. The presence of the Antonine Wall is marked in places by a faint raised embankment.

Soils

The soils are generally poorly drained gleys, but with more freely draining draining brown earths being located on parts of the scarp slope and in raised knowes on the plateau.

There has been some disturbance of soils through historic and localised mining activity, notably on the northern edge of the southern woods.

Drainage

The Estate is characterised by a series of small-scale natural watercourses which generally flow from south to north, emptying directly into the Forth Estuary. From east to west the watercourses are:-

Dean Burn – this is the largest watercourse within Kinneil, but it only passes through a short section of the north-eats of the Estate. It occupies a deeply incised and heavily wooded part of the Estate.

Gil Burn – this small burn runs through the eastern part of the southern woods, before passing directly beneath the west side Kinneil House. The lowest section passes across level ground, and consequently there is an area of adjoining wetland; however upstream the burn flows through a deeply incised gully. The lower parts of the gully are encased in broadleaf woodland but the upper parts are contained within coniferous woodland cover. A small tributary of the Gil Burn flows parallel, and close to, Crawfield Road, also within an incised channel

Deil's Burn –this very small watercourse flows though the western part of the Estate. It has a couple of very small canalised tributaries within the southern woods, with the main channel being less incised than the other watercourses, and on leaving the woods it is culverted for a short distance before flowing into the smaller pond.

Un-named Watercourses –two very small/seasonal watercourses in the westernmost part of the southern woods feed the larger of the ponds. The outflow of the pond is culverted and feeds into the smaller pond.

Ponds - The two ponds are man-made and a thought to be shallow. Water levels fluctuate significantly (particularly in the smaller pond) partly due to problems relating to leaks and outflows, and vegetation encroachment is an issue facing both waterbodies.

Biodiversity

There are no statutorily designated sites of conservation interest on or adjacent to Kinneil Estate. However, the Estate, excepting the Parkland east the House' is designated as a 'Wildlife Site' (see Map 2 – Designations). This designation affirms that the Estate meets certain ecological criteria at a local level, and is consequently afforded a degree of protection through Local Plan Policy EQ24. Policy EQ25 – Biodiversity encourages the promotion of the Falkirk Area Biodiversity Action Plan.

Historic survey reports include:-

- An Ecological Survey of the entire site, undertaken in 1992 by SWT Environmental Services Ltd, which includes an extensive species list
- A Conservation Assessment of Kinneil Ponds, undertaken in 2005 by Heritage Environmental Ltd. The Report was commissioned by Bo'ness Community Council, and included management recommendations for enhancement, focused on the smaller, eastern, pond.
- A Phase 1 Habitat survey, undertaken in the summer of 2008 by CSFT's Heritage Officer. The survey covered only the southern woods, and recorded broad habitat type, with target notes, together with a non-exhaustive species list.

The habitat survey was expanded to cover the entire estate as part of the recent woodland survey, but as this was undertaken by non-specialist surveyors, the results can only be detailed at a broad level. Map 4 - Habitats and Woodland Types sets out these broad habitat types. The habitats present on site are detailed in Table 6 below.

Woodlands of some form cover over 70% of the Estate's 76 ha, with amenity (maintained) grassland covering almost a fifth of the Estate. The habitat classification is somewhat confused by variations in the age-class and structure within the woodland, and particularly by the significant extent of windblow and its partial clearance. This has resulted in the creation of what can perhaps be best described as pioneer woodland, together with areas of deadwood and ruderal vegetation.

The primary habitat interest within Kinneil Woods lies in the northern woods, most notably around the Dean Burn and Gil Burn, and on the connecting scarp slope. In addition to a reasonably diverse range of tree species, age classes and structure, the woodland ground flora is reasonably diverse and well developed. Species present which indicate a long history of woodland cover include bluebells, wild garlic, dog's mercury, wood sorrel, wood millet, and herb Robert. Species held to be of local importance include hard shield fern and giant bellflower. There is less diversity in the other broadleaf dominated, and mixed, woodlands, where sycamore is a dominant species.

The ecological value of the southern woods is severely restricted by what has been historically dense cover of conifers, with very limited species, structural and age class diversity. Ground flora has been limited by dense and prolonged tree canopy coverage, even in the Gil Burn gully, although ground flora has developed to a greater extent under scots pine and larch than it has under spruce. Species of note include wood sorrel and bluebells. The relatively recent advent of windblow has delivered some biodiversity gains

through the provision of dead wood and through the development of ground flora and saplings in the openings created. There are also a few remnant broadleaf trees dating to the original landscape planting, but their value is now being diminished through time.

Table 6 – Habitats Present within Kinneil Estate:-

Habitat Type	Notes	Extent	Percent. of Estate
Coniferous Plantation Woodland	Largely in southern section	29.3 ha	38%
Broadleaf Planation Woodland	Largely in northern section; includes semi-natural woodland	9.6 ha	13%
Mixed Plantation Woodland	Mainly younger woodland on internal edges	4.4 ha	6%
Young Broadleaf/Mixed Woodland	Both planted and naturally regenerated, some sparse	6.7 ha	9%
Scrub	Pond fringes and developing woodland	0.7 ha	1%
Windblow Woodland	In southern section; largely un-cleared	4.2 ha	5%
Woodland habitat sub total		**54.9**	**72%**
Open Water	Two ponds; includes margin vegetation	1.9 ha	2%
Marshy Grassland	On Gil Burn; includes some willow scrub	0.3 ha	<1%
Ruderal Vegetation	In north east corner; includes some small individual trees	0.5 ha	<1%
Amenity Grassland	In core; includes both high and low maintenance grass, parkland trees and buildings)	18.5 ha	24%
Total Area		**76.1 ha**	
Watercourses	As shown on 1:10,000 scale map	3,130 m	

Both the 2008 Habitat Survey and the recent woodland survey recorded signs of badger activity, but neither survey recorded badger setts. However historic records exist of a badger sett in the northwest of the southern woods (within an area now badly affected by windblow) and in the field to the south of the woods, and the likelihood remains that there are setts within the Estate.

No evidence of the presence of other European Protected Species is available, but bats will undoubtedly be present. Roe deer and rabbits are present within the Estate.

The Falkirk Area Biodiversity Action Plan (20011-2014) includes Action Plans for 'Woodland' and for 'Inland Water and Wetland'.

Kinneil Woods, being a 'Wildlife Site', is thought to be one of the key sites within the Woodland Action Plan, and relevant targets set in the Plan include commitments to 'undertake woodland management at at least one currently unmanaged Council owned woodland site', and to 'Identify and map all Council owned woodland sites and establish

their current ecological condition and management status'. The most relevant target within the Inland Water' Action Plan is a commitment to 'undertake a survey of ponds within the Falkirk Council area'.

A number of BAP Faunal Priority Species have been recorded in Kinneil Estate, including badger, kestrel, bullfinch, and frogs although only two Floral Priority Species are present (bluebells and wych elm).

Kinneil Estate has a long history of woodland cover, and the majority of the area currently covered by woodlands are listed in the 'Ancient and Semi-natural woodland Inventory, as noted in Table 7 below, and as shown on Map 2 - Designations. However, while the location and layout of today's woods, even down to the path systems, bears a strong relationship to the landscape design implanted by the Estate's owners, it is important to note that the composition of the woods is now, particularly in the case of the southern woods, radically different from that of the original design. It appears that little remains in terms of records of the original planting composition,

Table 7 – Ancient and Semi Natural Woodland Inventory Sites

Category	Location	Cpts.	Extent	Type
Ancient Semi-natural Woodland - 1750	Eastern end of scarp slope woods, and part of Dean Burn Glen	12b-12d, 14a (part)	4.5 ha	Broadleaf woodland (mixed native/non-native)
Long-Established Woodland of Plantation Origin - 1750	Small area of scarp slope woodland below Church	11c	40.0 ha	Broadleaf woodland (mixed native/non-native)
Long-Established Woodland of Plantation Origin - 1860	Most of southern woods, excluding car park and corner of northern edge, and including Gil Burn gorge	1 to 10, 12a (ex. 1a and 10c)	0.6 ha	Predominately coniferous planation, with broadleaf plantation around Gil Burn

The biodiversity value of Kinneil Woods is limited by the lack of linkage to other woods of biodiversity value. The northern woods on the Estate form the eastern terminus of the scarp slope woods which extend down the Avon gorge and along the ridge above the foreshore. While predominately broadleaved in character, the scarp slopes woods are limited in their biodiversity value by their narrow width and by the surrounding intensive land uses. Broadleaf woodlands extend outwith the site, up the Dean Burn Glen but this woodland is of limited extent. A significant extent of woodland and scrub cover is developing on Kinneil Kerse, which lies to the north of the A904 and the Railway. However the presence of these transport routes limits the ecological connectivity between Kinneil Kerse and Woods

Elsewhere Kinneil Estate is enclosed by arable farmland, roads, and houses, which offer little in the way of semi-natural habitat linkage.

Landscape

Kinneil Estate lies within the Bo'ness South 'Area of Great Landscape Value', which stretches from the Avon Valley to the Council boundary east of Blackness, and from the southern edge of Bo'ness to the top of the Flints. This designation provides an addition measure of

protection against inappropriate development as well as indicating that the area is regarded as having a high quality landscape.

According to the 'Stirling to Grangemouth landscape assessment' (David Tyldesley and Associates, 1999), Kinneil is located within the 'Bo'ness Coastal Hills' landscape character area (LCA). The LCA is characterised by small-scale, gently rolling hills, and the landscape is generally open, with few medium of large woods, and a restricted network of shelterbelts, field trees and hedges. The urban character of Bo'ness is visually dominant. Given this overall description of the LCA the presence of Kinneil Woods is somewhat anomalous.

The more recently produced 'Inner Forth Landscape Study', prepared for the Inner Forth Landscape Initiative (LUC, 2012), places the northern part of the Estate (generally north of the Antonine Wall) in the 'Raised Beach' landscape type, with the remainder of the Estate being placed within the 'Coastward Margin' landscape type.

The northern woods form part of a continuous woodland strip located on the scarp slope extending for almost 4km between Bo'ness and Inveravon, where the woodland merges with the gorge woodlands associated with the River Avon. These woods are almost exclusively broadleaf in character. The southern woods comprise of a large, but isolated block, and are predominately coniferous in character. Between the two woodland dominated parts of the Estate, the open area west of the Gil Burn appears as an open 'oasis', while the land to the east of Kinneil House is characterised by well-maintained parkland, albeit with a degree of fragmentation arising from the presence of houses, other buildings, and roads.

In terms of visibility, Kinneil Woods, despite their size and location by Bo'ness, are not particularly prominent.

Views from the north are limited by the proximity of the available viewpoints (mainly from the A904) to the site, combined with the presence of woodland along the intervening embankments of the Bo'ness-Kinneil railway line. The woods on the scarp slope are more prominent from the north-east, and at a distance of 5km or more, from Fife. The broadleaf woodlands on the scarp slope form a very attractive feature, well-integrated with surrounding woods which help to soften the impact of Bo'ness and Grangemouth Refinery. The woods also prevent any views of the core of Kinneil Woods.

The visibility of Kinneil Woods from the west and south is greatly restricted by the surrounding topography, and by the virtual absence of accessible viewpoints. The limited views available from the minor public road which crosses the Flints, and from Woodhead Farm, are limited to that of the conifer-dominated woodland edges.

The eastern edges of the Estate border public roads, and are adjacent to large housing estates of Kinneil and Deanfield. The boundary is largely marked by dense woodland cover; primarily coniferous in the southeast and primarily broadleaved in the north-east. The combination of the wooded edge and heavily built up land, coupled with a lack of topographic variation means that there are no views into the interior of the Estate, and that even the woodland edge is only visible from a narrow corridor along the public roads.

In summary, in terms of landscape impact, visibility of the Woods is largely restricted to the woodland edges, and only the northern and eastern edges could be classed as being visually sensitive.

In terms of amenity considerations from within the Estate, there are currently very limited views out from the Estate. If the scarp slope was not wooded, clear views from the core of the Estate would be available across the Forth to Fife, and also onto Grangemouth Refinery. Similar views would be available from the upper parts of the Estate if the southern slopes were not wooded.

The internal visual character of the Estate is fairly simple. The southern half of the Estate is dominated by mature coniferous woodland, with both internal and external edges being linear. The occasional presence of remnant broadleaf trees, the recent restructuring, and extensive windblow, provides a degree of visually diversity. The northern woods are more visually diverse, if not in terms of land use, then at least in terms of species and structural diversity. However, their limited size and location on steep ground means that recreational use is focused on other parts of the Estate. The open area to the west of the Gil Burn is of limited visual diversity comprising of a large area of uniform grassland cover. The open area is broken up to a limited degree by small woods, and by the presence of Kinneil Church. Views out are heavily restricted by the surrounding woodlands. While the broadleaf woods on the scarp slope are intrinsically attractive, the margin of the southern woods is uniform, harsh, and abrupt. The two ponds, and particularly the larger one, provide a degree of visual diversity, although this value is diminished by the effects of fluctuating water levels, by the poor quality of the surrounding woodlands and trees, and by littering

Within the 'Stirling to Grangemouth landscape character assessment' the key strategic aim for the Bo'ness Coastal Hills LCA is given as 'Conserve and enhance existing character', and the two relevant guidelines are 'encourage ecologically and visually appropriate management of all woodlands and encourage more public access where appropriate' and 'encourage additional broadleaved woodland planting of native species'.

The 'Inner Forth Landscape Study' identifies that the decline in management of policy woodlands and scarp woodlands and deterioration and loss of landscape features associated with designed landscapes are local threats to the landscape types which Kinneil lies.

Cultural Heritage

Kinneil Estate contains three features of outstanding cultural heritage value, namely Kinneil House and its ancillary buildings and associations, Kinneil Church, and a section of Antonine Wall, including a fortlet. All are designated as Scheduled Ancient Monuments (SAM). The Antonine Wall has recently obtained designation as a World Heritage Site, and the whole estate lies within the World Heritage Site Buffer Zone.

There are roughly 20 features recorded in the National Monuments Records for Scotland (NMRS) within the estate. However, some these features overlap with the SAM's, while many of the remainder relate to buildings around Kinneil House. Many of the built features have listed building status. The features of direct relevance to the Long Term Forest Plan are listed in Table 8 below, and their location is shown on Map 2 - Designations.

Other, non-designated or recorded features of interest include a ~250m long stretch of walled ha-ha, on the boundary between cpts. 1a and 1b; the remains of bell pits on the northern edge of the southern woods; and the rectangular glade in the centre of the southern woods, which was at some stage the location of the Estate's kennels.

Table 8 - Features of Historic Interest

No.	Description	Status	ID	Location/Notes
1	Kinneil House	SAM	90189	The scheduled area includes the 16th centuary tower and associated palace block (remodelled in the 17th centuary), as well as James Watt's cottage, and the House Gardens. The House sits immediately to the north of the Antonine Wall
2	Antonine Wall	SAM	2210	Designation covers a discontinuous 1.1km stretch of the wall, with breaks around Kinneil House (covered by another SAM); to the west of the Gil Burn; and around the smaller pond. The physical remains of the Wall features are more evident to the west of Kinneil House, where they include the recently discovered Kinneil Fortlet.
3	Kinneil Church	SAM	4970	Ruined remains of medieval church, together with its graveyard. Church originally associated with the village of Kinneil, but became a private church in 1669.
4	Witch Association	NMRS	48203	Cited for the burning of six people for witchcraft 1679. Location only given as west end of Bo'ness
5	Village	NMRS	48130	Given as west of Kinneil House – no evidence on the ground
6	Gil Bridge	NMRS	48206	Given location is existing vehicular bridge, but text refers to a former bridge located to the north to the north
7	Deer Park	NMRS	48136	Refers to a record of a park at Kinneil
8	Roman Fort (possible)	NMRS	48207	Excavations revealed no trace – hypothesis thought to be wrong

Management Access

Vehicular access is available off Provost Road at the end of the Kinneil House's driveway and via two entrances connecting to the car park, just to the south of the Walled Garden. A historic access point in the south-east of the site, which connects to the main track through the southern woods, is no longer accessible off the public road. Vehicle access can also be obtained off the A904 via a tunnel beneath the railway, where a tarred road leads

up the Kinneil House, with a connecting road to the car park. This latter entrance is gated to prevent unauthorised vehicular access.

There is a well-developed network of tracks throughout the southern woods; much of the network is capable of being used by four wheeled drive vehicles and tractors, but currently at least, only the track along the internal edge of the woods is capable of supporting heavier or larger vehicles. There is no vehicular access to the southern half of the southern woods.

Management access to and through the northern woods is much poorer, due to the steep terrain, woodland cover, and the lack of historic routes.

Access within the Estate as a whole is restricted by:-

- Limited number of access points onto the public road
- Steep terrain in the north
- The presence of Antonine wall, which in practice restricts access to current established crossings points
- The presence of steep sided gullies; most notably the Gil Burn and Dean Burn Glens
- Poor or insufficient surfacing on existing tracks

Timber output can be removed from the site via the car park and onto Provost Road, and from the road beneath the railway and onto the A904. From there the roads link easily to wider public road network.

Management access points are shown on Map 7 Access Network and Issues.

Public Access and Public Use

Kinneil Estate is readily accessible both at the local level and at a regional level. The Estate has a well-developed path system, notably within the southern woods, while open access is available over the entire central core of the Estate. The northern woods are less accessible, due in part to the steep terrain and the limited extent of historic path routes. The path network comprises of a wide range of path types ranging from little used informal paths through the woods to wide, tarred, roads.

Path Network - A detailed survey of the path routes within Kinneil Estate has been undertaken, with the results contained in Appendix 2, and summarised in Section D. In total there are almost 11,000 m of estabslihed path routes. For the purposes of the survey, the various paths have been split into sections, with entrances and junctions (or nodes) assigned letters to assist in path descriptions. The path routes and nodes, together with information on their type, and the location of other recreational infrastructure, are shown on Map 7 – Access Network and Issues.

While the Long Term Forest Plan is primarily concerned with the management of the Estate's woods, visitors make no distinction between the open grasslands and formal formal parts of the Estate and the woodlands, and accordingly, recreational aspects of the Plan are considered on an Estate wide basis.

Recreational Infrastructure - There is a car park set within the woodland in cpt 10. The car park has convoluted design and a gloomy appearance, and offers a very limited amount of

parking; however it connects to another car park, just east of Gil Bridge, which has space for ~15 cars. Parking is also available at the Museum courtyard.

Aside from the car parks, which are accessed off Provost Road, pedestrian access is available at a further two locations off Provost Road, via the tunnel under the railway off the A904, and via a section of steps, off the minor public road in the western corner of the site. Open access is also available from the frontage of Snab Brae, but fast-moving traffic make crossing the road to and from Bo'ness hazardous.

There is very limited provision of interpretative and on-site promotional materials and signage. The presence of the Estate and in particular its woodlands rarely indicated, and there are no maps or markers to direct visitors within the Estate. Entrances are generally low-key and unwelcoming.

Recreational infrastructure provision includes wooden bridges sections of boardwalk to facilitate burn and wetland crossings, and timber steps to negotiate steep sections of path in the northern woods. Many of these structures were constructed in the 1980's, and are showing signs of deterioration. The provision of seating is limited, perhaps due to concerns over their apparent function as magnets for anti-social activity.

Core Paths - Much of the path network within Kinneil is designated as part of the Falkirk Core Path network, including most of the firm tracks through the southern woods, and a notional route through the central grasslands (where no formal constructed path exists). None of the routes through the southern woods, nor the tarred road leading up from the railway bridge, are designated as Core Paths (see Map 2 – Designations).

Recreational Linkages - The National Cycle Route 76 bisects the Estate as part of the 'Round the Forth Route'. The route, which is signposted, largely lies on a constructed or firm route, but users have to negotiate a series of steps and rough ground towards its western end, where the path enters onto the public road just to the south of the railway bridge.

Aside from the cycle route there are no existing recreational linkages. However, there are two or three potential initiatives which offer the potential to establish functional recreational linkages.

Firstly, the John Muir Trail, between Dunbar and Helensburgh, is a key project being advanced by the Central Scotland Green Network. It is intended that the route follows a line though Bo'ness, before heading southwards towards Linlithgow. The route will largely utilize existing roads and paths. The current proposals for the Kinneil area have identified the route as extending along the A904, crossing beneath the road via the railway line, and following the tarred road to reach Kinneil House. The proposed route then exits the Estate, and follows the pavement by Provost Road/Crawfield Road, by-passing the internal path which runs by the Gil Burn.

Secondly, Kinneil Kerse, which lies to the north of Kinneil Estate on the far side of the A904, is currently used as a landfill and recycling centre. However, the potential to enhance the Kerse's wildlife value and to increase its recreational use is being investigated, with the potential to link the Estate to the Kerse via the railway tunnel under the A904.

Thirdly, and most speculatively, the potential exists to create a stop on the Bo'ness and Kinneil Railway, which would provide users the opportunity to visit Kinneil House and Estate as part of their rail journey.

Recreational Usage - The Estate experiences high levels of recreational usage, although there are no firm statistics to confirm the exact level of usage. From anecdotal evidence, and from information procured during the community consultation undertaken as part of this Plan's development, the large majority of visitors to the Estate to participate in informal recreational activities, primarily walking or dog walking. The specific purposes behind such usage is varied, with users identifying health and fitness benefits, social benefits, and a desire to experience natural environments among the reasons for their visit's. The presence of Kinneil House, Church and Museum and the Antonine Wall provide an attraction for visitors from outwith the immediate area, but the large majority of users appear to be local residents who frequently make use of the Estate. (See Scoping Report in Appendix 3).

Other pursuits undertaken within the setting of the woods (i.e. not directly related to Kinneil House or the open grasslands) including jogging, cycling, and fishing (mainly on the western pond). There appears to be only very low level use made by horseriders, although many of the routes are eminently suitable for such use.

Mountain biking is a very popular activity within the southern woods. Such use is currently on an informal basis, but there are a series of estabslihed trails across the woods. The White Lady Mountain Bike Group (a local organisation estabslihed to promote mountain biking) has long-held and well-supported aspirations to see the development of formal, constructed and promoted mountain bike trails within Kinneil Estate. Historically the construction of the informal trails, and the active use of them, has resulted in conflict with other users, notably through drain blockage and resultant path erosion, and in safety concerns raised by pedestrians in the vicinity of the informal trails. Latterly however, greater understanding between the Estates various users, and drainage improvement works, appears to have reduced the levels of conflict.

Kinneil Estate is used for orienteering, notably by Forth Valley Orienteers, although they haven't held a formal event at Kinneil since 2010. The woods traditionally provided a suitable variety of conditions, but concern has been expressed at the extent of windblown trees, which greatly diminishes the accessibility of the affected woodlands.

Kinneil Estate is home to the renowned Bo'ness Hill Climb, which is a motor car event which has been held intermittently from 1932 onwards. The route ascends the scarp slope following the tarred road to reach the finish line near the walled garden.

Anti-Social Activity - The Woods suffer from a degree of anti-social use, including minor vandalism and littering. More seriously there is an estabslihed tradition of fire setting within the woodlands. This includes both small-scale camp fires, often utilizing fallen dead wood, and the deliberate setting of fires by the boles of mature trees. Litter is noticeably prevalent around the main pond, and concern has been expressed about the dumping of fishing lines and hooks. There doesn't seem to be a major problem with illicit use of trail and quad bikes currently but the Estate is open to such abuse.

Recent Works - Works to maintain and upgrade the path network, and to provide furniture, signage, and interpretation, have largely been undertaken on an ad hoc basis rather than as part of strategic, Estate-wide, approach to recreational management. However, recently a more concerted and co-ordinated effort has been made to improve path surfaces, following on from the works in Spring 2012 to clear the windblown trees

Community Issues

As noted, Kinneil Estate is a very well–used asset, and is held in very high regard by the local community. This is exemplified by the establishment of 'The Friends of Kinneil' in 2006. The role of the Friends is to safeguard, promote and develop Kinneil Estate, and they play an active role in policy and decision making. Bo'ness Community Council also have a high level of interest in the Estate as a whole, while the general public have historically paid close attention to proposals for woodland management.

Bo'ness has a population in the region of 15,000. The majority the population live in areas below 40% of the average in terms of the Scottish Index of Multiple Deprivation, with the two main housing estates near Kinneil Woods, Castleloan and Kinneil, being below 30% of the Scottish average.

Kinneil Estate is the only park of any size within walking distance of most of Bo'ness, and its significant extent and its wide range of features has led to it being classified as a Strategic Park; one of only three such parks within Falkirk (Parks Development Plan, 2008). Sizeable towns within 10 kilometres of Kinneil include Falkirk (population of 35,000), Grangemouth (18,000), and Linlithgow (13,000).

Strategic Context

- **Falkirk Council Local Plan**

The Local Plan was adopted in December, 2010. The Plan contains a number of relevant policies, some of which have already been mentioned. Policies including EQ17 – Antonine Wall and EQ18 Historic Gardens and Designed Landscape provide a degree of protection against development, and encourage sensitive management. Kinneil Estate lies within designated Greenbelt, and policy EQ20, provides a high degree of protection against inappropriate development. Policy EQ21 – Falkirk Greenspace encourages appropriate woodland management, including connectivity in terms of biodiversity and access, reflecting Falkirk's location with the Central Scotland Forest and Central Scotland Green Network areas. Policy EQ26 – Trees, Woodland and Hedgerows also encourages positive woodland management, and underlines the protection provided by Tree Preservation Orders; the southern tip of cpt 14 (by the Dean Burn) is the only area within Kinneil which has a Tree Preservation Order in place.

The Local Plan is supported by Technical Report 7: The Green Network. This document reviews historic and current strategies, policies, and initiatives in the light of the CSGN, and examines how it can be expressed within the Local Plan in terms of objectives and priority projects. Priorities for the South Bo'ness area include improving nature conservation values, improving access networks to Kinneil, and in the longer term, exploring opportunities to expand the green network to the Avon and Falkirk/Grangemouth areas. Developing Kinneil Estate's visitor attractions and appropriate management of the woodlands for natural heritage benefits is listed as a key proposal.

- The Falkirk Open Space Strategy 2009-2014

Falkirk Council's Open Space Strategy was written in compliance with planning policy requirement for all Councils across Scotland to take a strategic, long-term approach to managing the open space within their area.

The vision of Falkirk Councils open space strategy is '*to secure the long-term improvement to the quality of Falkirk's open spaces, so that they can provide a truly sustainable and diverse resource for the benefit of the communities they serve.'*

The strategy relates to a number of other strategies and policy documents including the following:

- Countryside Access Strategy 2005-2010 (Consultative Draft)
- Culture and Leisure Strategy 2001
- Falkirk Area Biodiversity Action Plan
- Falkirk Urban Woodland Strategy (Consultative Draft 2006)
- Health Improvement Plan – Feel Good Falkirk 2005-2008
- Sustainable Falkirk Action Plan 2006

- The Parks Development Plan 2008

Falkirk Councils Community Services' Parks Development Plan encompasses a total of 86 parks throughout the Falkirk Council area with Kinneil Estate being categorised as one of only three 'Strategic Parks.' The other Strategic Parks are Callendar Park and the new Central Park (Helix Project), which is currently under development.

This category has the highest importance within the Parks Development Plan and is reserved for sites which '*attract people from outwith of the Falkirk Council area and that are promoted as tourist attractions.'* These are the larger sites that are varied in character and have a high level of facilities.

The Development Plan states that '*if Strategic Parks are to maximise their role as tourism assets, they will require to be fit for purpose and be able to respond to the changing aspirations and interests of visitors in an ever competitive marketplace*.'

The Parks Development Plan lists the 'influencing factors' for management of the 'Strategic Parks' as:

- Tourism
- Heritage
- Events

The plan states that the Objectives for Kinneil are to:

"***Prepare proposal for a 10 year development plan for Kinneil by 2010.***
Continue to liaise and consult with the Friends of Kinneil Park Group on this initiative."

This objective has the rationale that '*World Heritage Site status needs to be capitalised on* '

SECTION C – PURPOSE, VISION, AIMS AND OBJECTIVES

Plan Purpose

The Long Term Forest Plan for Kinneil Woods is intended to provide strategic guidance for the Estate's owner and managers and re-assurance to the various stakeholders that identified management issues and opportunities have been addressed. It is also intended that the LTFP will be used to obtain permissions for management works and to support grant applications and funding bids.

Vision

The overall vision is for '*the development of multi-purpose, structurally diverse, woodlands, primarily managed to deliver recreational, amenity and biodiversity benefits to the local community and visitors, within the overall framework of Kinneil Estate'*.

Long-Term Aims

a) To restructure the coniferous woodlands to create a more sustainable woodland, through implementing a phased programme of felling and replanting.
b) To significantly enhance the standards of recreational provision, through upgrading of path routes and the creation of settings appropriate to a range of recreational activities.
c) To improve the biodiversity value of all of the woodlands by increasing structural, age class and species diversity; through selective felling; replanting of native species, and by the control of invasive species.
d) To undertake woodland management works in a cost effective manner by seeking markets for timber, achieving economies of scale in operations, and by improving the value of the retained trees.

Management Objectives

Silvicultural – *Improve woodland quality and value by-*

- Restructuring the coniferous woodland to create a more sustainable woodland. This will involve a phased programme of felling and replanting to create a diverse range of woodland types
- Managing the property in line with UKWAS and the UK Forestry Standard
- Managing selected woodland areas for long-term retention
- Improving woodland quality within the mixed and broadleaf areas through a programme of thinning and selective felling.

Biodiversity - *Increase the biodiversity of the woodlands and the Estate as a whole by-*

- Following felling of coniferous woodland, increasing the extent of native woodland, focused on the watercourses
- Increasing species, age class, and structural diversity of all woodlands
- Retaining woodland areas with limited public access to minimise disturbance levels
- Retaining standing and fallen deadwood where safe and practical to do so
- Increasing the proportion of native species within the broadleaved woodland through a programme of selective felling of sycamore, and enrichment planting of native species.

- Controlling the presence of exotic invasive species
- Working in adherence to all relevant environmental guidelines.

Landscape and Amenity – *Improve the landscape and amenity value of the woods by*

- Increasing the visual diversity within the coniferous woodland, through phased felling and replanting with a wider range of species
- Clearance of windblow and management arisings where feasible
- Resurrecting some of the historic landscape design elements through the planting of mixed broadleaf/conifer woodland.
- Re-establishment of coniferous woodlands for long term retention.
- Implementing an on-going maintenance programme covering the woodland areas.

Recreation – *Improve the access and recreational infrastructure by*

- Undertaking management operations in a planned and phased manner, upgrading recreational routes on completion of intensive management works
- Encouraging the establishment of improved links to other recreational facilities and initiatives
- Implementing an agreed recreational plan for upgrading recreational infrastructure, including signage, interpretation, and entrance enhancements
- Undertaking tree safety work through an organised programme of inspections and treatments
- Working with user groups to identify suitable locations for specific recreational activities.

Cultural Heritage – *Retain and enhance features of cultural interest by*

- Protecting all scheduled, recorded, and noted features during woodland management and access works, in adherence with the 'Forests and Archaeology' Guidelines
- Undertaking tree safety work in proximity to Kinneil House
- Removing trees from the Antonine Wall subject to Historic Scotland approval
- Replanting of specimen trees on historic design lines
- Establishing' policy type' woodlands in key locations.

Sustainability – *Ensure that woodlands are managed sustainably within the confines set by the other objectives by*

- Utilizing felled trees and management arisings to produce timber and woodfuel where feasible
- Improving woodland condition and management access to make future management more efficient.
- Within the confines of the woodlands current condition, phase works to limit large-scale disturbance and landscape change
- Including productive woodland elements in the re-stocking of felled areas
- Investigate opportunities for establishing a dedicated and staffed management system
- Ensuring that stakeholders, including the local community are involved in future decision-making processes

Stakeholder Engagement

A fundamental element of the LTFP production process is the completion of a scoping process to ensure that the Plan considers all of the management issues, addresses the identified constraints, and takes into account the views and aspirations of identified stakeholders.

Although not of any great size Kinneil Woods are of very significant value and interest. There is a diverse range of organisations and individuals with a keen interest in their management, and a very very high level of public interest in their future. This level of interest reflects the woodlands situation on the edge of Bo'ness, their condition, their past management, and their potential to deliver wide ranging benefits. The role of the woodlands has been the subject of investigation and debate for a number of years and there has already been considerable consultation with a wide range of interested parties and individuals, or 'stakeholders' in recent years.

Following agreement with the Forestry Commission Scotland, the scoping exercise used to inform the LTFP was conducted largely by written communication. In addition informal meetings and conversations were held with interested stakeholders, and a public display event was held in Bo'ness Town Hall.

The scoping was undertaken from mid-April to early July, 2012.

Six groups of stakeholders were identified:-

1) Owner/Managers – in essence, Falkirk Council, Falkirk Community Trust, and Central Scotland Forest Trust
2) Approval Authorities
3) Statutory Agencies
4) Formal Consultees – Bo'ness Community Council. The 'Friends of Kinneil', and landowning neighbours
5) Interest Groups
6) Site Users

A Scoping Document was prepared and issued to consultees within groups 2 to 4. The document included:-

- The background to Forest Design Plan
- Information on Kinneil Woods
- Proposed management aims, objectives, and issues
- An explanation of the scoping process.
- An invitation to attend the display event'

A covering letter was also included, setting out the purpose of the scoping exercise and detailing how consultees could respond.

The input from stakeholders was generally positive, although many statutory agencies provided limited responses.

In addition, Informal input was received through meetings and communications with Bo'ness Community Council and the Friends of Kinneil, and with Falkirk Council Officers.

A display event was held in an attempt to reach other interested parties and individuals, including site users and residents around the periphery of Kinneil Woods (groups 5 and 6)

The display event comprised of a display mounted in Bo'ness Town Hall between 12.00 noon and 8.00 pm. The display was staffed at all times. The display included copies of a wide range of maps, together with supporting text and photographs. The White Lady Mountain Bike Club displayed material relating to the proposed development of mountain bike trails. Attendees were encouraged to complete a short questionnaire.

Awareness of the display event was raised through the erection of notices within and near to the Woods and in public locations within Bo'ness, through writing to interest groups, and through leaflet drops to houses on the peripheries of the Woods.

The event was moderately attended (roughly 60 people in total) but feedback levels were very high, and responses were overwhelmingly positive.

The scoping material was also made available on Falkirk Community Trust's website, with viewers being encouraged to provide responses by e-mail.

Key Issues

Tables showing all of the issues either newly identified or previously identified ones refined during the scoping process are contained in Section E, together with the proposed measures that will be taken to address them. The key issues identified during the the full range of the the scoping process were as follows:-

Landscape/ Silvicultural Issues

- The very poor and unsustainable condition of the coniferous woodlands, with their over-maturity and limited age class greatly limiting management options.
- The predominance of exotic species throughout the woodlands
- The general acceptance that large-scale intervention is required to address the issues with the coniferous woodlands
- The desirability of diversifying the woodlands in terms of composition and structure
- The general desire for the woods to have a neat appearance, notably in areas of high public visibility

Recreational/ Community Issues

- High level of existing and latent demand for functional and accessible recreational routes
- High levels of concern about the current condition of the paths, and the woodlands as a whole.
- A strong desire for the woodlands to provide a setting for a high quality mountain biking facility
- A desire for signage and interpretation provision to add value to the recreational routes
- The potential for conflict between public expectations and management limitations
- The need to balance recreational use with the Woods inherent amenity and biodiversity values
- The potential for conflict between various types of recreational uses

	o The need to address various types of anti-social activity through sound management and maintenance
Biodiversity	o The general approval for an increased broadleaf/native component in the woodlands o The requirements for pre-implementation protected species surveys o The desirability of improving the pond for biodiversity and amenity reasons.
Archaeology	o The presence of SAM's and the sites inclusion within a World Heritage Site buffer zone

A copy of the Scoping Report is contained in Appendix 3. The key issues raised and proposed measures proposed are included in Section E and some key issues are illustrated on Maps 5, 7, and 8.

SECTION D – SURVEY DATA

Survey Data

There is a limited amount of historic survey data of direct relevance to the LTFP, with the most useful documents being the Management Plan produced by Eamonn Wall in 2002 (which covered only the majority of the southern woods), and, in terms of biodiversity, the SWT Habitat Survey Data, which is now 20 years out of date.

The LTFP process has gathered survey data on a variety of facets, including woodland composition and condition, path location and condition, soils and habitats. In addition, mensuration and wind damage risk calculations have been undertaken. Much of this information is summarised below; detailed information is contained in the appendices.

Woodland Survey

The full details of the woodland survey are contained in Appendix 1, and is summarised in Section A – 'Woodland Description'. A summary of the woodlands is contained in Table 9 below, while woodland types and issues are shown on Maps 4 and 5.

Table 9 – Woodland Survey Summary Table

Cpt.	Sub-Cpt.	Area (ha)	Wood. Type/ Dom. Species	Stage	Main Issues
1	a	1.35	Coniferous Norway spruce	mature	Very dense canopy, recent small-scale damage.
	b	1.56	Coniferous Sitka spruce	mature	Mainly Sitka spruce, very little ground vegetation.
	c	1.31	Coniferous Scots pine	mature	Mixed conifers, with windblow damage.
	d	0.88	Coniferous Sitka spruce	mature/ w'blown	Significant windblow damage at western end.
		5.10			
2	a	1.08	Coniferous Scots Pine	mature	Also D. Fir and Larch. Partial windblow damage.
	b	1.92	Coniferous Sitka spruce	mature	Dense stand. Recent minor wind-blow damage.
		3.00			
3	a	2.42	Coniferous Scots pine	mature	Partial windblow damage now cleared. Small coupes felled.
	b	1.24	Coniferous Sitka spruce	mature	Even-aged with very little ground vegetation.
		3.66			
4	a	1.10	Coniferous Scots pine	mature	Recent small-scale windblow damage. Now open to wind
	b	1.76	Coniferous (originally)	windblown	Large areas of windblow damage. Birch becoming established
	c	0.79	Coniferous Norway spruce	mature	Tall trees, densely stocked. Partial windblow damage.
		3.65			

Table 9 – Woodland Survey Summary Table (continued)

Cpt.	Sub-Cpt.	Area (ha)	Wood. Type/ Dom. Species	Stage	Main Issues
5	a	2.54	Coniferous Sitka spruce	mature	Small scale coupe restocked to broadleaves, otherwise dense Sitka.
		2.54			
6	a	2.61	Broadleaved Birch	establishing	Cleared of windblow. Now dense thicket of restocked broadleaves
	b	0.58	Coniferous Sitka spruce	mature	Tall, even-aged stand of spruce with very little ground vegetation.
		3.19			
7	a	1.70	Coniferous Scots pine	mature	Recent small-scale windblow damage.
	b	3.72	Coniferous Sitka spruce	mature	Partial windblow damage
	c	2.36	Broadleaved Mixed broadleaf	young	Dense thicket of restocked/ Regenerated broadleaves
	d	2.13	Broadleaved Mixed broadleaf	establishing	Occ. mature conifers vulnerable to windthrow , sparse broadleaves
	e	0.14	Open	-	
		10.05			
8	a	0.88	Coniferous Sitka spruce	mature	Dense stand, vulnerable to future windblow damage.
	b	2.00	Coniferous Scots pine	mature	Vulnerable to future windblow damage.
	c	0.83	Coniferous Sitka spruce	mature/ w'blown	Severe windblow, but little regeneration as yet
		3.71			
9	a	0.33	Mixed Woodland Pine/Spruce/Ash	mature/ w'blown	Mixture of mature conifers and semi-mature broadleaves
	b	0.16	Broadleaved Ash	semi-mature	Narrow strip of amenity value woodland by pond.
	c	0.49	Broadleaved Mixed broadleaf	semi-mature	Amenity value woodland by pond.
	d	1.65	Open water	-	
		2.63			
10	a	2.86	Coniferous Sitka spruce	mature	Dense stand in gully. Recent small-scale windblow damage.
	b	1.96	Coniferous Sitka spruce	mature	Prominent location; densely stocked woods around burn
	c	1.02	Mixed Mixed con/ b'leaf	mature	Densely stocked woods around car park
		5.84			
11	a	0.53	Coniferous Scots pine	mature	Dense stand of pine located on Antonine Wall.
	b	0.74	Mixed Broadleaves/larch	semi-mature	Located on steep slopes above road
	c	2.43	Broadleaved Sycamore	semi-mature	Large area of broadleaves on slopes above railway

Table 9 – Woodland Survey Summary Table (continued)

Cpt.	Sub-Cpt.	Area (ha)	Wood. Type/ Dom. Species	Stage	Main Issues
11	d	0.31	Broadleaved Ash	young	Small stand of young mixed broadleaves.
	e	0.09	Coniferous Scots pine	semi-mature	Small stand of pine, with some beech.
	f	0.37	Broadleaved Sycamore	semi-mature	Amenity woodland at wide spacing
	g	0.30	Broadleaved Sycamore	semi-mature	Dense stand of sycamore on slopes above burn
		4.77			
12	a	0.60	Broadleaved Sycamore	mature	Dense, even aged broadleaves around burn
	b	0.49	Broadleaved Sycamore	mature	Dense, even aged broadleaves around burn
	c	2.50	Broadleaved Oak/Sycamore	mature	Large area of estabslihed woodland on prominent slopes.
	d	1.04	Broadleaved Ash/Alder	semi-mature	Wet woodland, with patchy cover.
	e	1.00	Open	-	
	f	0.53	Open	-	
		6.16			
13	a	0.30	Broadleaved Gean	semi-mature	Scattered woodland by Church
	b	0.32	Broadleaved Ash/Sycamore	semi-mature	Scattered mixed species woodland value woodland.
	c	0.86	Broadleaved Mixed con/ b'leaf	young	Young woodland estabslihed to soften coniferous edge
	d	9.06	Open	-	
	e	0.46	Open water	-	
		11.00			
14	a	1.55	Broadleaved Mixed broadleaf	mature	Centred on Dean Burn, with restricted management access.
	b	0.58	Broadleaved Mixed broadleaf	semi-mature	Screening buffer between Estate and Provost Road
		2.13			
15	a	8.58	Open	-	Open ground with scattered parkland trees.
		8.58			
Total Area		**76.01**			

Mensuration

A mensuration exercise was undertaken on the main coniferous woodlands in the south of Kinneil Estate (most of cpts 1 to 5, 7, 8 and 10, excluding cpt. 6 being largely windblown). Minor stands of conifers, and severely windblow areas, were not included. Table 10 below contains a summary of the results. Some standard data columns are not shown, as the factors were constant (all cpts had rooting depth between 40-80 cm, all stands had been

thinned (with intensity and date unknown), and no ground preparation was undertaken in any area).

Table 10 – Mensuration Data

Sub cpt	Species	Soil type	Yield Class	Age (est.)	stems/ ha	top height (m)	Diameter (cm)	Basal area (cm 2)	Volume /ha m 3
1a	N spruce	Gley	10	65	950	22	27	55	**552**
1b	Sitka/larch	Gley	12	80	720	28	29	49	**625**
1c	Pine	Gley	10	80	900	23	25	41	**420**
1d	Sitka	Gley	14	80	733	29	33	62	**825**
2a	Pine	Gley	8	65	625	22	32	51	**475**
2b	Sitka	Gley	16	65	950	29	26	53	**620**
3a	Pine	Gley	8	65	1660	18	18	45	**380**
3b	Sitka	Gley	14	65	740	28	30	52	**610**
4a	Pine	Gley	8	80	940	21	27	54	**440**
4c	Sitka	Gley	20	80	1060	28	29	50	**650**
5a	Sitka	Gley	16	65	940	27	25	48	**570**
7a	Mixed Con.	Gley	14	80	900	28	30	66	**700**
6b	Sitka	Gley	16	80	1060	28	29	50	**650**
7b	Sitka	Gley	16	80	1060	30	27	68	**775**
8a	Sitka	Gley	14	80	850	30	30	64	**800**
8b	Pine	Gley	8	80	950	22	24	47	**460**
8c	Sitka	Gley	18	80	850	34	33	60	**850**
10a	Sitka	B. earth	16	80	1000	28	28	56	**620**
10b	Sitka	B. earth	16	80	430	31	40	58	**720**

Stand volumes are significant, and are in line with what might be expected given the tree species, age, and generally favourable growing conditions. Particular aspects to be considered when investigating management options and potential returns are that some of the trees are 'over-sized', and consequently may be more difficult to harvest; that butt rot is present; and that some stands, notably those of scots pine and larch, exhibit poor form (although most stands have good form). There is also a considerable volume of timber present in the form of windblow, although deterioration through time means that the timber is of very limited value.

Another aspect of tree form to note is that due to their dense stocking and old age the woods contain relatively little in the way of branches. This facet requires consideration in terms of harvesting and extraction methods (as there may be limited brash to facilitate vehicle movement in wet areas), and in terms of site clearance requirements following any

felling operations (which may be less onerous than would normally be the case due to the limited amount of brash arising).

Wind Damage Risk Assessment

As noted in the 'Woodland Condition' (in Section A) wind damage has been a significant issue within the southern woods for the last 15 years. Sporadic damage has occurred throughout, but large areas in the western and southern section of the Woods have been devastated between 2003 and 2010. Further damaging windthrow occurred in January, 2012.

An assessment of wind damage risk was undertaken using the Forest Gales programme, as developed by Forest Research. The assessment concentrated on the coniferous woodlands as this is the area at greatest risk.

A copy of the assessment is contained in Appendix 4, but in brief the Forest Gales programme provides an estimate of the probability of windthrow and steam breakage occurring by estimating the return period within which winds sufficient to cause damage will occur.

The analysis involved the insertion of desktop and field mensuration data into the programme. Various scenarios were run, with potential felling programmes and phases being factored in on the basis that the felling of parts of the woodland will have an impact on the remaining stands, while the length of time over which woodlands are retained also have an impact on wind damage risk

The Forest Gales analysis places stands into categories ranging from 1 – low risk to 6 – very high risk. The six sub-compartments which have been most severely affected by wind damage in the past were not included in the assessment, nor was the one stand of mixed woodland. Of the remaining 17 sub-compartments, in terms of overall wind damage risk, 11 appear to be category 6 – very high risk and 2 appear to be category 5 – high risk. Only 2 sub-compartments appear to be in category 1 – low risk. Map 6 – Wind Damage Risk Assessment provides a pictorial interpretation of the Forest gales analysis, while details of the current level of wind damage risk for each compartment is set out below in Table 11. Figures are given for both the risk of windthrow (i.e. trees being uprooted|) and windsnap (i.e. tree trunks being broken)

Table 11 - Current Assessment of Wind Damage Risk

Cpt.	Woodland Type	Windthrow	Windsnap
1a	mature conifer	1	1
1b	windblow	6	6
1c	mature conifer	5	4
1d	mature conifer	n/a	n/a
2a	mature conifer	1	1
2b	mature conifer	6	6
3a	mature conifer	6	6
3b	mature conifer	6	6
4a	mature conifer	3	1
4b	windblow	n/a	n/a

Table 11 - Current Assessment of Wind Damage Risk (continued)

Cpt.	Woodland Type	Windthrow	Windsnap
4c	mature conifer	6	6
5a	mature conifer	6	6
6a	young broadleaf (ex. windblow)	n/a	n/a
6b	mature conifer	6	6
7a	mature conifer	5	6
7b	mature conifer	6	6
7c	young broadleaf (ex. windblow)	n/a	n/a
7d	windblow	n/a	n/a
7e	open ground	n/a	n/a
8a	mature conifer	6	6
8b	mature conifer	6	6
8c	windblow	n/a	n/a
10a	mature conifer	6	6
10b	mature conifer	1	1
10c	Semi-mature mixed woodland	n/a	n/a

The results from the assessment of the current wind damage risk indicate that the large majority of the coniferous woodland is at high or very high risk of severe wind damage in the next 5-10 years. This reflects the current woodland situation, and will remain the case over any proposed restructuring period, with few areas indicated as windfirm and safe. In part this is due to the absence of any 'green' or windfirm edges within the southern woods.

Running various silvicultural scenarios through the Forest Gales modelling exercise would seem to indicate that both thinning and phased felling may exacerbate the levels of wind damage which suggests that the safest option would be to fell most of the sub-compartments in a controlled manner though clear-felling in one single major operation.

This option however is unlikely to viewed favourably interested parties, and a phased approach to restructuring is more likely to be the one adopted.

It should be noted that owing to the large number of variables present in the real world which have an influence on tree stability, there are a number of limitations in using the Forest Gales Model to predict actual events affecting stands of trees. However the model does provide at least some objective information on the wind damage risk faced by the woodland areas at Kinneil.

Recreational Network

As noted above, a full path condition survey was undertaken as part of the Long Term Forest Plan. The results are contained in Appendix 2, while the summary results are contained in table 12 below.

Kinneil Estate as a whole contains almost 11 km of recognised paths routes, including over 6.5 km of Core Paths. The large majority of the routes are designed for recreational use, with shorter stretches being capable, or potentially capable, of use for management purposes. There is a wide variety of path types, both in terms of path construction and surface, and in path widths. Due to the lack of historic maintenance, the original path construction and surface type is often obscured.

There are other informal or 'preference' paths throughout the site, while due to tits open nature and amenity grass cover, the land between the northern and southern woods have few identifiable or worn routes, but are heavily used for recreational purposes.

The southern woods are heavily used by mountain bikers. The rough locations of a number of ad-hoc mountain bike routes have been identified, and are recorded on Map 7.

The condition of the paths is varied, with extensive stretches of sound, good quality paths contrasting with paths in moderate or poor condition. On many stretches of previously sound path, the current poor condition may be due to damage by falling trees, encroaching vegetation, drainage problems, and a lack of maintenance. Some paths, notably in the northern woods, are, by dint of their location on steep and wet ground and their lack of surfacing, are likely to be intrinsically poor.

Path infrastructure and signage was not surveyed in detail; however it is fair to record that there is almost a complete dearth of appropriate signage and interpretation, and very little infrastructure aside from culverts and bridges.

Table 12 - Path Routes Summary Table

Main Route	Sub-section	Length m	Surface	Core Path	Notes
Southern Woods					
B-J-U	B-J J-U **595**	100 495	red shale red shale	yes yes	Major route in reasonable condition, part of cycle route
B-M	B-K K-W-L L-M **465**	145 130 190	red shale red shale red shale	yes yes yes	Generally good condition, but with erosion issues
J-A	J-V V-A **340**	155 185	red shale red shale	yes yes	Good condition, but may be required for timber extraction
E-R (direct)	E-M M-A A-S S-R **1,035**	150 445 285 155	red shale red shale red shale red shale	yes yes yes no	Main spinal path through southern woods; generally good condition but deteriorates to the west
E-R (edge)	E-P P-Q Q-R **1,240**	420 165 655	earth/h'core earth/h'core beaten earth	no yes yes	Path around southern boundary; generally poor condition and prone to blockage
M-N-O-A	M-N M-O O-A **560**	80 160 320	hardcore hardcore earth/h'core	no no no	Eastern sections in good condition, but deteriorates badly to west
O-P	O-P	**80**	beaten earth	yes	Minor link in moderate condition
L-A-Q	L-A A-Q **625**	370 255	red shale red shale	yes yes	Paths are in reasonable condition but southern section suffers from encroachment

Table 12 - Path Routes Summary Table (continued)

Main Route	Sub-section	Length m	Surface	Core Path	Notes
Southern Woods (continued)					
D-L	D-L	**180**	beaten earth	yes	Moderate condition
K-V-T	K-V V-T	180 440 **620**	red shale red shale	no no	Eastern sections good condition, but path becomes unusable to east
Southern Woods/Car Park					
B-X-Y-C	B-X X-Y-C	100 190 **290**	earth/h'core beaten earth	no no	Steep sections, parts in poor condition
W-C1 **W-D1**	W-X-Y W-Y-Z Z-C1 Z-D1	140 115 90 70 **415**	beaten earth beaten earth beaten earth beaten earth	no no no no	Generally poor surface; issues with drainage and encroachment
H2-I	H2-H-C	290	tarmacadam	no	Variable condition, with tarmacadam being engulfed in organic material in places
	C-D	120	Beaten earth	no	
	D-E	175	tarmacadam	no	
	E-I	155	earth/h'core	no	
		740			
Western Pond					
F-U-S	F-B1 B1-A1 A1-X1 X1-U U-T-S	115 85 40 130 80 **450**	beaten earth beaten earth beaten earth red shale hardcore	yes no yes yes yes	Good to moderate, with drainage and surface issues
R-B1	B1-Y1 Y1-R Y1-A1	45 120 90 **255**	beaten earth hardcore beaten earth	yes yes	Generally moderate condition, with issues relating to drainage and roots
Northern Woods/Kinneil House					
X1-V1	X1-W1 W1-V1	345 225 **570**	mown grass mown grass	part no	Route along upper edge of northern woods; grass surface poor in places
B-G	B-A2 A2-D2 D2-G	135 290 260 **685**	whindust red shale tarmac	yes yes no	Routes around Kinneil House, and hill climb route – part tarmac and generally in good condition
A2-C2	A2-C2	**90**	whindust	yes	Good condition
A2-D2	A2-D2	**190**	whindust	no	Moderate condition – behind house
D2-Q1	D2-Q1	**170**	beaten earth	no	Poor condition –steep and muddy
E1-K2	E1-J1 J1-Q1 Q1-K2	85 200 100 **385**	whindust whindust whindust	no no no	Good to poor condition, with issues relating to drainage and steps

Table 12 - Path Routes Summary Table (continued)

Main Route	Sub-section	Length m	Surface	Core Path	Notes
Northern Woods/Kinneil House (continued)					
F1-N1	F1-J1	125	whindust	no	Route traverses the northern woods; generally moderate to poor condition, with issues relating to steepness and drainage. And poor surfacing
	J1-L1	85	boardwalk	no	
	J1-L1	200	whindust	no	
	L1-K2	70	whindust	no	
	K2-M1	60	beaten earth	no	
	M1-N1	200	whindust	no	
	M1-S1	80	beaten earth	no	
		820			
S1-M1	S1-M1	**80**	earth/h'core	no	Condition declining, steep sections
N1-H1	N1-H1	**85**	tarmacadam	no	Good condition

SECTION E - ANALYSIS OF INFORMATION

Factors, Constraints and Measures to be Taken

This section sets out a list of site factors or issues which potentially affect woodland management and recreational use, grouped into categories. The constraints imposed by each of the factors are detailed, together with the proposed means of addressing the constraints.

The constraints and proposed measures of addressing them have been identified through site survey and analysis, and through the scoping process (see Map 8 – Opportunities and Constraints, and Appendix 3 - Scoping Report).

Factors	Constraints	Measures to be taken
Site Factors		
Soils and Drainage	Presence of clay subsoil and poor drainage in places limits rooting depth and long-term stability.	Adopt a felling, rather than a thinning, programme as a means of addressing existing stability issues. Undertake thorough ground preparation and drainage at the restocking phase, and manage woodlands to prevent future issues with stability.
Land Quality	Land is of good quality; well suited to tree growth	Establish a wide range of species at the restocking phase.
Topography	Topography within most of southern woods permits easy management access, but narrow gully by Gil Burn, and steep slopes occupied by northern woods limits management options. Steep slopes above railway and road.	Limited management intervention on steep scarp slopes. Retain continuous tree cover on steep slopes in potentially hazardous locations by adopting low impact silvicultural systems.
Silvicultural Factors		
Species, Structural & Age-Class Diversity	The southern woodlands in particular lack species, age-class structural diversity, being limited to a handful of coniferous species, usually in dense stands, and being either mature or over-mature The northern woods exhibit greater diversity, but some areas are heavily dominated by sycamore.	Felling/thinning operations to target conifers for removal giving opportunity to diversify the species and structural composition of the woodland. Phase felling and restocking to provide a degree of age diversification. The dominance of sycamore in the northern woods will be reduced through a phased programme of small-scale felling and thinning.

Factors	Constraints	Measures to be taken
Silvicultural Factors (continued)		
Wind Damage	The southern woods have experienced severe wind damage in the past ten years, and there is an increasing likelihood of further damage. There is a lack of windfirm or 'green' edges. Windblow will reduce timber values/ increase management costs. High stocking density and tree age limits management options - thinning at this stage may result in increased vulnerability to windblow.	Adopt a programme of phased clear felling of remaining coniferous woods as further thinning will have a detrimental impact on stability. Felling boundaries to follow 'green' edges where available. Retain stable trees on external boundaries. Seek to fell areas likely to be vulnerable to windblow damage before it occurs. In the event of significant windblow, the felling programme will be accelerated. Ensure that felling coupes are large enough to obtain economies of scale, and are suitable for effective restocking.
Stocking Density	Though much of the woodland has been thinned in the past stocking densities remain very high in relation to tree age.	As above; thinning largely to be used within mixed or broadleaved stands, as over-stocked woods are too old to thin.
Timber Extraction and Haulage	Limited management access, with only two points easily accessible by lorries. Woods have high levels of public use, and paths will be vulnerable to damage by extraction vehicles. Antonine Wall severely limits potential crossing points.	Seek to minimise impact of timber haulage on access network by establishing haulage routes through retained woodland. Keep public well informed of operations. Undertake path upgrading following felling, in a phased manner. Use only estabslihed crossing points on Antonine Wall; fell to waste in inaccessible locations.
Ecological Factors		
Presence of Protected Species	Presence of active badger setts.	All works to comply with FCS wildlife and forest operations guidelines and licence regulations. Works to be phased to minimise disruption.

Factors	Constraints	Measures to be taken
Ecological Factors (continued)		
Species Composition	Southern woods heavily dominated by a limited range of coniferous species Northern woods, much of which are listed in the ASNWI, contain high proportion of exotic species. Consultees generally in favour of increased proportion of native woodland	In the southern woods, establish a wider range of woodland types, and species at the restocking phase. Element of coniferous woodland to be perpetuated. Increase proportion of native species within northern woods through a programme of selective felling and thinning targeted at sycamore and beech, followed up by removal of exotic seedlings. Undertake enrichment planting where regeneration of native species is at insufficient levels.
Watercourses and Water Bodies	Most watercourses are set within dense stands of conifers. Consultees expressed concern about condition of the ponds	Forests and Water Guidelines to be strictly adhered to. Native woodland to be estabslihed within riparian zones around watercourses in southern woods. Pond enhancement largely outwith scope of LTFP, but feasibility of implementing improvements should be encouraged.
Invasive Species	Rhododendron and snowberry are present within the site and may spread if left unmanaged. Sycamore and beech common in northern woods, where they can be regarded as being invasive	Invasive species to be treated to prevent their spread. Regeneration of non-native tree species will be targeted for removal throughout the period of the plan. Gradual move towards replacement of non-native wood through adoption of low Impact silvicultural systems.
Herbivores	Resident population of roe deer and rabbits within and around the Estate	Re-stock and new planting to be protected by fencing where feasible; shelters likely to attract vandalism. Fencing may also deter anti-social behaviour, but need to provide continued public access is recognised.

Factors	Constraints	Measures to be taken
Ecological Factors (continued)		
Disturbance	The Estates users value the local wildlife, and have expressed concerns about disturbance arsing form both management works, and increased public accessibility	The proposed felling works will result in some short and medium-term disturbance, but in the longer term, wildlife should benefit through increased habitat diversity. All relevant wildlife guidelines will be adhered to. Access upgrading works in the southernmost section of the woods will be limited, so providing a refuge for wildlife.
Cultural Heritage Factors		
Presence of Features of Cultural Significance	The Antonine Wall, and Kinneil House and Church are key features of Estate. Limitations imposed relate largely to access restrictions across the Wall.	Protect features during operations, and follow FC guidelines. Use only existing routes across the Wall during management operations
Trees on or adjacent to Historic Features	Tree growth is threatening fabric of Kinneil House Unsustainable tree cover on Antonine Wall (cpt. 11a) may threaten underground remains.	Treat woodland edge to remove threat to Kinneil House Fell trees growing on the Wall before windblow occurs, following procedures agreed with Historic Scotland. Do not restock felled woodland Obtain Scheduled Monument Consents where required.
Presence of Cultural Heritage Features within Woodland	Ha-ha is enclosed by dense coniferous cover (cpts. 1a and 1b)	Protect fabric of ha-ha during all operations, and create open ground setting to reveal ha-ha at the restocking phase.
Recreational and Social Factors		
Path Network	The path network is very extensive, and upgrading even the main routes will require significant management resources	The proposals will seek to establish a hierarchy of routes, with resources being focused on the key routes. This will provide users with a variety of recreational experiences, while retaining expenditure at a realistic level. Establish an effective maintenance regime to ensure that the value of capital works is enshrined for long term benefit.

Factors	Constraints	Measures to be taken
Recreational and Social Factors (continued)		
Path Condition	There is already concern among the Park's users about the condition of some of the paths, and excessive or ill-timed use of the paths for management purposes may have a further detrimental impact on their condition.	Path improvements works will be programmed for implementation after major woodland management works have been undertaken in any particular area. Woodland management operations will be designed to minimise impacts on existing path routes. Effective management of the woodlands, and of recreational activities, should reduce the likelihood of persistent damage from fallen trees or inappropriate use in the future.
Woodland Management	The southern woods are well used for recreational purposes, and the potential exists for woodland management operations to disrupt recreational use in the short term, and for operations to cause damage to the path network	The public will be kept well-informed of management operations. The LTFP allows operations to be implemented in a coordinated manner, to reduce disturbance to access routes and to allow scheduled re-instatement works.
User Conflict	There has been historic tension between user groups, with concerns being expressed about inappropriate mountain biking, dog walking, and fishing.	Work with Mountain Biking groups to develop site-specific facility in keeping with the levels of demand and availability of resources. Encourage co-operation between user groups through information sharing and participation with 'Friends of Kinneil'.
Recreational Linkage	Linkage is poor from the northern parts of Bo'ness and Kinneil Kerse. The proposed John Muir Trail will pass through, and by, Kinneil Estate	Largely outwith the scope of the LTFP, but discussions with relevant authorities should be held investigate the possibility of creating safe access link across the A904 or A993, potentially as part of the John Muir Trail. Additionally, the potential to take the Trail through the eastern parts of the Estate should be promoted.

Factors	Constraints	Measures to be taken

Recreational and Social Factors (continued)		
Mountain Bike Trails	Proposals for formal mountain biking facilities are being developed by White Lady Mountain Bike Group.	Provide information on long term proposals and time-scales to allow Mountain Biking Plans to be fully developed. Integrate their requirements into the implementation plans.
Vandalism/Anti-Social Behaviour	Long history of fire setting in the southern woods Concern over retention of brash material on site, as it increases risk of fire Concern over security of operational machinery Concern over littering, notably by pond	Address anti-social issues through education initiatives and by establishing an on-site staff presence. In vulnerable locations treat brash through removal, mulching, or chipping. Ensure that security issues are addressed by contactors. Establish a robust maintenance regime to ensure that minor problems do not become exacerbated.
Car Parks and Entrance	The upper car park is poorly laid out, and is contained within a gloomy setting The lower car park suffers from poor drainage Many entrances are unwelcoming and poorly promoted.	Undertake silvicultural and drainage improvements in the short term. Investigate potential improvements to the upper car park, and in particular the means of enhancing existing entrances.
Promotion and Interpretation	There is a dearth of signage and on-site interpretation	Produce signage and interpretation plan to develop the outline proposals for increased signage and interpretation Plan should also address recreational infrastructure etc.
Socio-Economic Issues	Parts of Bo'ness suffer from high levels of deprivation, with youth unemployment being a particular concern	Investigating the feasibility of implementing some of the proposals, and much of the longer-term maintenance, through training and employment schemes will be a priority.

Factors	Constraints	Measures to be taken
Landscape Factors		
Visibility – from north	The broadleaf woods on the scarp slope are visually prominent, and their presence greatly limits views onto the conifer-dominated southern woods.	Management proposals for the northern woods will adopt a low impact approach, which will ensure that continuous cover is maintained in the long term.
Visibility – from south and west	Due to the nature of the local topography and the lack of vantage points, only the margins of the woodlands are visible.	The impact of the proposed felling will be limited through the selective retention of windfirm trees on the southern and western edges, and by taking a phased approach to felling.
Visibility – from east	The eastern edge is visually prominent, but the trees around the Gil Burn preclude any views into the core of the Estate	Felling of the trees around the Gil Burn will be delayed until later phases, at which stage restocking to the west should be estabslihed. Windfirm trees on the woodland edge will be retained if practicable.
Current Appearance	The prominent coniferous component and lack of species diversity, is most obvious from within the core of the Estate. The coniferous woodlands have a derelict appearance due to the extensive areas of windblown trees and dense thickets of regeneration.	Coniferous areas which are particularly vulnerable to windblow damage will be felled in the early phases of the plan. Restocking will include a stronger broadleaved component and enhanced species diversity. Most existing areas of windblown trees will be cleared in the first phase of works.
Existing Design	The southern woods have a very uniform and linear appearance – both internally and externally.	The existing layout follows a historic design. Restocking will create woodland groups with less regimented edges, forming woodlands with a softer, more sinuous edge, although the linear pattern will be retained for access purposes.
Visual Separation	Ideally, there should be a 5 year gap, or restocking should be 2m height, between felling coupes.	It is intended to aim for this degree of separation, but in the event of further catastrophic wind damage, a request may be made to bring forward the felling years.

Factors	Constraints	Measures to be taken
Landscape Factors (continued)		
Visual Impact	Clear felling may create a significant level of visual disruption	Given that continuous cover forestry is not feasible within the southern woods, clear felling is the only practicable means of ensuring continued woodland cover in the long term. Visual disruption is inevitable, but the programme within the LTFP seeks to compartmentalise and phase this disruption.
Public Opinion	The site is well used, and benefits from active community support; there is potential to alienate this support through the implemetation of significant changes to the woodlands.	Initial soundings through the scoping process suggest that the public are aware of the need for large scale intervention. Woodland management will aim to minimise disturbance to the public. Maintaining communications with the 'Friends' and other site users will be a priority.
Stirling to Grangemouth Landscape Assessment	Kinneil lies within the 'Bo'ness Coastal Hills. Guidelines include:- *'encourage ecologically and visually appropriate management of all woodlands and encourage more public access where appropriate.'* *'encourage additional broadleaved woodland planting of native species.'*	The LTFP takes a strategic approach to management, and addresses visual, ecological, and access issues Through time, the LTFP will see the conversion of what is currently a largely coniferous woodland to a largely broadleaved one, although continued presence of strong coniferous and mixed woodland elements is seen as being desirable.
Inner Forth Landscape Study	The document identifies the following threats:- The decline in management of scarp woodlands in the 'Raised Beach' landscape type The deterioration and loss of designed landscape features in the 'Coastward Margin' landscape type	The LTFP addresses the need for further management of the northern woods, under a low impact silvicultural system. The management proposals will seek to reverse the decline in the designed landscape primarily through re-stocking with policy woodland types.

SECTION F - CONCEPT DESIGN

Design Vision

The concept design for Kinneil Woods seeks to achieve a balance between the various management objectives as set out in Section C, taking into account the constraints analysed in Section E, and while ensuring that the management is undertaken in a cost-effective and sustainable manner.

Map 8 – Concept Map shows a number of specific and general issues facing Kinneil Woods, and identifies outline proposals as a means of addressing the issues. These are further examined in Section E – Analysis of Information. Based on the analysis, Maps 9 and 10 contains 'Visions' for the long-term future of the woodlands and for access provision respectively. The means by which these visions can be delivered is contained in Section G – Woodland Management Proposals and Section H – Recreational Management Proposals.

Woodlands - In terms of woodland, the vision would seem little change in the extent of overall woodland coverage, although there would be more open ground within the southern woods. The southern woods would comprise of areas of coniferous woodland within its core, with native woodland focused on the riparian areas and edges, and with a significant area of policy (mixed) woodland centred on areas of highest public use and visibility. The southern woods would experience a much less dramatic transformation, with an increased proportion of native woodland being the key change.

The southern woods are faced with significant structural issues to the extent that their retention in their current form is not a feasible option. The Plan aims to achieve a diversification of age class structure and species type primarily through a phased felling and restocking programme. It is believed that this is the only feasible means of addressing the significant structural issues within the southern woodlands. A less intensive approach is proposed for the northern woods, where management issues relate more to species composition rather than to major structural issues. Here, a gradual increase in the proportion of native woodland will be achieved through selective felling and thinning, and manipulation of natural regeneration.

Access - In terms of access, the vision is for a continuation of Kinneil Estates current status as a 'Strategic Park' with the aim being to '*attract people from outwith of the Falkirk Council area and that are promoted as tourist attractions.*'

The vision does not include for the specific creation of any new recreational routes within the Estate, although improved linkages to other recreational features are encouraged; rather the vision includes for the upgrading of existing routes on a hierarchical basis, following on from the completion of intensive woodland management works. Significant improvements in the Estates entrances, signage and interpretation are proposed.

It is proposed to develop formalised mountain-biking facilities within the Woods, and consequently, as this will be delivered through other channels, the woodland management and access provision proposals contained in this Plan may require to be amended. Again, while outwith the scope of this Plan, it is hoped that enhanced access links to the Estate can be delivered, perhaps through the inclusion of routes as part of the John Muir Trail and linkage to Kinneil Kerse. Both potential linkages will require the identification and implementation of safe means of crossing the A904 or the A993.

Design Outcome

Achieving the visions for the woodlands management and for the access provision will require a concerted effort over a long time-span, and the woodland vision in particular cannot be realised within the 20 years span of this Plan.

Tables 13 and 14 below set out the current woodland type and age class composition of the woodlands, together with the planned outcome for the end of the Long Term Forest Plan period.

The design recognises the constraints operating at Kinneil Woods as listed in detail in Section E. These site, woodland condition, and social constraints limit what is achievable within the next 20 years, although there is good potential to have achieved the following within the lifespan of the Plan:-

- To have greatly improved the structural and age class diversity within the southern woodlands
- To have significantly increased the levels of native and mixed woods within the southern woodlands
- To have begun the process of converting significant parts of the northern woods to being entirely native
- To have established a sustainable continuous cover management approach over most of the woods in the long term
- To have upgraded and rationalised the access network
- To have provided a suitable location for mountain-biking activity and other recreational pursuits
- To have greatly improved recreational infrastructure, entrances, and interpretation.

By the end of the Long -Term Forest Plan period, Kinneil Woods will be composed as follows:-

- **~ 17% coniferous woodland**
- **~ 34% broadleaved woodland**
- **~ 36% mixed woodland**
- **~ 13% open ground (within woodland area)**

Design Summary

Woodland Type - Table 13 below sets out the current and proposed woodland cover. The current figures include the open ground provision within the woods. The implementation of the LTFP proposals will see the predominance of coniferous woodland cover diminishing, being replaced by a mixture of broadleaf woodland and mixed woodland.

The windblown element of the woodland should have been removed, and in its stead there will be a larger proportion of open ground within the woodland. In tandem with the increase in open ground, a small area of woodland will be permanently removed (from the Antonine Wall).

Roughly a third of the broadleaf dominated woodland will be native, with the longer term aim of increasing this proportion further through management of the mature woods.

Table 13 – Summary of Woodland Area by Type

Current 2012	Broadleaf Dominated	Conifer Dominated	Mixed Woodland	Windblown	Total
Area	17.0 ha	29.3 ha	4.4 ha	4.2 ha	**54.9 ha**
% of total site	23%	38%	6%	5%	72%
% of woodland	**31%**	**53%**	**8%**	**8%**	**100%**

Future 2033	Broadleaf Dominated	Conifer Dominated	Mixed Woodland	Open Ground	Total
Area	18.6 ha	9.1 ha	19.9 ha	7.3 ha	54.9 ha
% of total site	24%	12%	26%	9%	72%
% of woodland	34%	17%	36%	13%	100%

Woodland Age-Class - Table 14 provides an indication of the current and proposed woodland age class. These figures should be treated as being purely indicative, as there is no strict definition of when trees become semi-mature, mature, or over-mature. The conifers in the southern woods have been classed as mature, largely on the basis of their potential 'normal' life-span. However, due to their inherent instability, it could be argued that they are over-mature.

The implementation of the proposals will see a significant increase in the proportions of establishing and young woods, largely as a consequence of restocking following the required the felling of the mature coniferous woodlands. The extent of mature woodland will greatly diminish, with virtually all mature trees being located in the northern woods.

Table 14 - Summary of Woodland Area by Age Class

Current 2012	Establishing	Young	Semi-Mature	Mature	Windblown
Area	4.7 ha	3.5 ha	6.8 ha	35.7 ha	4.2 ha
% of woodland	9%	6%	12%	65%	8%

Future 2033	Establishing	Young	Semi-Mature	Mature	Open Ground
Area (ha)	9.0 ha	15.0 ha	7.0 ha	16.7 ha	7.3 ha
% of total woodland	16%	27%	13%	**31%**	13%

SECTION G - WOODLAND MANAGEMENT PROPOSALS

Silvicultural Policy

The silvicultural policy to be adopted over the next 20 years is intended to achieve the stated vision, aims, and objectives as set out in Section C. The policy aims to balance the multiple objectives which may conflict with one another to some extent.

Within the conifer-dominated southern woods the policy will involve sequential clear-felling of relatively small-sized compartments followed by re-stocking primarily through planting, together with re-spacing operations within the recently estabslihed trees, and the clearance of existing windblown trees, which together will deliver an increase in species and age diversity, and allow for a continuation of woodland cover. In the longer term it is intended that most of the southern woodlands will be managed on a Low Impact Silvicultural System (LISS).

Elsewhere in Kinneil Woods, the existing woodlands are currently stable enough to be managed on a LISS. Their silvicultural policy will focus on selective thinning and small-scale coupe felling, followed by both planting and natural regeneration as a means of gradually increasing the proportion of native woodland, as well as increasing species and age-class diversity. A programme of continued selective thinning, enrichment planting, and removal of exotic species will assist in attaining the stated objectives.

Maps 11 and 12 provide spatial information on coupes, and their proposed felling and thinning phases, while Map 13 shows the proposed details of the restocking, and Map 14 shows other woodland management works.

The full proposals are contained in the Work Plan, while Felling and Thinning Operations, and Re-stocking Operations, are set out in Tables 15 and 16 below.

Proposed Silvicultural Operations – Southern Woods

Clear Felling - Clear felling will be the main means of restructuring the southern woods. Felling provides the means of most effectively restructuring the southern woodlands, and creates the opportunity to treat areas suffering from windthrow damage, and to harvest groups of mature trees. As the southern woodlands are already divided in a series of small compartments by a well-estabslihed access network, and as a result of past windblow and subsequent management operations, the felling schedule utilises the existing boundaries to avoid the need to create new coupes (although the proposed felling includes for the felling a number of compartments in a single stage). In general all broadleaved trees will be retained within the clear-felled area subject to their being in sound condition, and remedial works are proposed to improve their condition on completion of the clear felling.

Selective Felling – Selective felling is proposed for the southern and western margins of the woods, and the margins of the larger pond, in situations where there is a mixed broadleaf/conifer crop, and where prolonged exposure has improved tree stability. It is proposed that most conifers and any unstable broadleaf trees will be felled; leaving only small statured, wind-firm conifers (mainly pine) and most broadleaves. It is estimated that this may result in the removal of roughly 50% of the canopy cover.

Coupe Size - Due to the high risk of further windblow the schedule aims to fell areas located in close proximity at the same time. This approach will also achieve economies of scale and

avoid repeated disturbance and damage to the access network. The largest compartment proposed for clear felling is less than 3ha, but due to the adjacency of the felling coupes, phase 1 will see a combined single area of ~7.5 ha clear felled, while a combined single are of 10 ha will be felled in phase 2. While these clear felling areas are relatively large (between 18% and 25% of the total area of the southern woods), the crop condition leaves little scope for either reducing the areas of clear felling or for adopting a different silvicultural policy. In the longer term, the southern woods should be capable, in the main, of being managed on a continuous cover basis.

Separation - The need for separation of felling coupes, in visual terms, is limited by the relatively level topography in the southern part of Kinneil Estate and its low visual prominence. These limitations mean that in most cases only the edges of the woodland are in any way visually sensitive.

Thinning - Due to the high risk of windthrow damage in the southern woods, thinning is not generally a feasible management option. However, the relatively young age and mixed composition of the woods around the car park (cpt 10c) mean that this cpt. should be capable of being successfully thinned. Given the adjacency of the car park, all timber will be removed, and all arisings will be chipped on-site. Roughly 20% of the current timber volume would be removed.

Timber Extraction - In general, all timber arising from felling operations in the southern woods will be removed from site. This will include any material recoverable from windblown trees. It is envisaged that all timber will be extracted via the entrance onto Provost Road, and that the southern edge of the open area (cpt 13d) will be used for stacking timber. Timber will be extracted to the stacking areas through felled/windblow areas wherever possible, and where this is not an option, narrow rides will be cleared through retained woodland to facilitate transport to the main extraction route along the northern of the southern woods (Route B to U). Every effort will be made to avoid using the existing access routes. Where their use is required, all damage to the path surface and drainage will be made good on completion of the extraction.

Brash Treatment - Due to the age of the crop and the relatively high stocking density, there will be relatively little lop and top/brash produced. Initially brash will be placed in narrow rows at ~15m intervals. The brash mats will be utilized for harvesting and extraction purposes, which will reduce their visual and physical impact. Brash will be placed outwith areas of conservation and amenity value (mainly riparian zones, the ha-ha and in proximity of the paths), and away from paths and tracks. To address potential issues relating to negative impacts on amenity, and to major concerns about the fire risk presented by brash being left on site, it is proposed that the brash mats will be mulched once timber extraction has been completed.

Windblow Clearance – Where economically viable, timber will be recovered from windblown areas. On completion of this exercise, windblown areas will be mulched to reduce the risk of fires, to enhance the amenity, to remove any safety risk, and to facilitate restocking. Upturn root-plates will generally be re-placed but some plates within relatively inaccessible locations will be left upstanding to provide habitat diversity.

Proposed Silvicultural Operations – Northern Woods

Clear Felling – The only clear felling proposed in the northern woods includes for the removal of a stand of Scots pine which occupies a location on the Antonine Wall. The objective

behind this proposals is to ensure a cost-effective and prompt removal of trees which have the potential to cause damage to the monument in the event of windthrow occurring. The felling will require Scheduled Monument Consent, and carefully planned and implemented felling and removal of all arisings from the SAM.

Selective Felling – Selective felling, using small-scale coupes, has been identified as key method of increasing species diversity, nativeness, and age-class diversity while avoiding the felling of significant areas of woodland. This low–impact approach is important within the northern woods given their existing biodiversity values, their visual prominence, and concerns over slope stability. Regular selective felling works, spread over the four felling phases, is proposed for the the woods in cpts. 11c and 12c. The felling will be focused on the removal of exotic species, notably sycamore, and it is envisaged that quality native trees within the coupes will be retained, giving a canopy clearance in the region of 75%.

Thinning - Thinning, along with selective felling, is one of the main methods which will be used to gradually increase the extent of native species within the northern woods. Thinning will be undertaken over most of the southern woods either in phase 1 or in phase 2. In the main, thinning will favour the removal of non-native species (mainly sycamore), but in some areas, thinning will favour the removal of poorer quality stems regardless of species – such areas will tend to be heavily dominated by sycamore or scots pine. An average thinning intensity of around 20% of current timber volume is generally proposed.

It is likely that further thinning will be undertaken in southern woods in phases 3 and 4, but programming of this will be dependent on the impact of the initial felling.

Timber Extraction - Where feasible timber will be removed from site, but the steep slopes and the presence of Antonine Wall will limit extraction options. Where whole stem extraction is not possible, on-site processing will be investigated; failing that timber will be cut into short-medium lengths, and secured safely on-site. In the main, branchwood will be stacked neatly on-site, but in the more accessible locations, chipping may be used to reduce the risk of fire. The cut stumps of exotic broadleaf species will be treated with herbicide to prevent their re-growth.

General Silvicultural Works

Re-spacing – Areas of young, but fully estabslihed, woodland in both the northern and the southern woods will be re-spaced to remove poorer quality or less desirable stems. In general, the re-spacing will favour the retention of best quality stems at ~3.0 to 3.5m centres, but a denser spacing may be retained in the youngest or least dense areas, while in selected areas, the re-spacing will favour the retention of native broadleaf stems rather than best quality ones. Some stems may be pruned to improve their form. Arisings will be stack neatly into piles, set back from paths and watercourses. In areas deemed to be a high fire risk, the arisings will be chipped.

Cleaning – Areas of young trees which are not yet fully estabslihed will be cleaned. This will entail the removal of shelters where present, removal of dense ruderal vegetation, and the removal of more poorly developed or inappropriate saplings. A final spacing of 2-3m centres is proposed. Formative pruning may be undertaken if required. Arisings will be stacked neatly into piles, set back from paths and watercourses. In areas deemed to be a high fire risk, the arisings will be chipped.

Management of Exotic Natural Regeneration – In the northern woods, and in areas proposed as 'native woodlands' within the southern woods natural regeneration of exotic species (sycamore and beech in the main, but including Sitka spruce, Norway maple etc) will be removed. This will entail the removal of seedlings and saplings less than 10 years old or 5cm diameter. Cut stumps will be treated with herbicide to prevent their regrowth. The control of exotic regeneration within designated areas will be repeated on a five-year cycle.

Deadwood Treatment - Standing and fallen deadwood, including a few raised root-plates, will be retained where safe and appropriate to do so in terms of plant health and public safety, although the high level of public use at Kinneil, and the comprehensive network of path routes, imposes a major constraint on the extent and location of dead wood retention.

Invasive Species Removal - There are a small number of rhododendron and snowberry bushes present within the woods. These species can be invasive and can seriously damage the ground flora and natural regeneration within woodlands. The coverage of these species is currently at a low level and it is recommended to treat them before they get a chance to spread and become a more onerous issue. The bushes will be cut to ground level and the stumps treated with herbicide to limit regrowth. The process should be repeated for 2 or 3 years as required.

Wildlife Issues

Where possible, felling and thinning operations will be timed to avoid the bird breeding season, but as felling during periods of wet weather and saturated ground conditions is undesirable, it may not be possible to avoid felling during spring and summer. Pre-felling check for protected species, including badgers, which are known to be present, will be conducted and licences will be obtained as required. All guidelines relating to forest operations and wildlife, and water and archaeology, will be complied with (FCS Guidance Notes 9, and 31 to 34, 'Forests and Water'(5th ed.), and 'Forests and Archaeology).

Work Timing

The clear felling programme is separated into four five-year phases, with all phase 1 felling occurring in year 1, phase 2 felling in year 6, phase 3 felling in year 11, and phase 4 felling in year 16. This achieves the desired minimum separation period of 5 years between adjacent felling areas, while still allowing for some economies of scale and damage and disturbance to be minimised. Given the condition of the crop, and the results of the windthrow damage risk it is not thought sensible to try to spread the felling programme over a longer period, nor to increase the number of felling operations. Furthermore, given the potential for further severe windblow, the possibility that the felling programme will need to be condensed into a shorter period is identified and raised a strong possibility. This may entail either increasing the size of the proposed felling areas; or shortening the period between felling years; or undertaking all felling within 1 to 3 phases. If any of these were to be undertaken following on from severe windblow incident, the details of the restocking operations and access works would require to be reconsidered.

The majority of the works are shown as being planned for in phases 1 2 of the Plan. This 'frontloading' is proposed as a means of dealing with the windblown areas and areas recognised as being at risk of windblow in the early stages to avoid the loss of the value of the timber; as a means of improving the appearance of the woodland at an early stage; and as the first and most significant step in restructuring the woodland.

It is likely that other work requirements will be identified during the lifetime of the Plan. Such works are likely to include the above-mentioned continuation of the thinning programme, and further cleaning and re-spacing operations.

Table 15 – Felling and Thinning Programme

Period	Cpt	Area (ha)	Operation	Main Species	Age (at treatment)
phase 1					
2013	1d	0.53	felling	Sitka spruce	80
2013	4a	1.00	felling	Scots pine	80
2013	4c	0.55	felling	Sitka spruce	80
2013	6b	0.58	felling	Sitka spruce	80
2013	7a	1.20	felling	Larch/pine/sitka	80
2013	7b	2.72	felling	Sitka spruce	80
2013	7d	0.21	felling	Sitka spruce	80
2013	8c	0.27	felling	Sitka spruce	80
		7.06			
2013	6a	0.23	selective felling	Mixed conifers	80
2013	7b	0.50	selective felling	Mixed conifers	80
2013	7c	0.60	selective felling	Mixed conifers	80
2013	7d	0.13	selective felling	Mixed conifers	80
2013	9a	0.15	selective felling	Mixed conifers	80
2013	11c	0.15	selective felling	Sycamore	50-100
2013	12c	0.15	selective felling	Sycamore	50-100
		1.91			
2013	1c	0.05	clear windblow	n/a	n/a
2013	1d	0.35	clear windblow	n/a	n/a
2013	2a	0.19	clear windblow	n/a	n/a
2013	3a	0.10	clear windblow	n/a	n/a
2013	3b	0.06	clear windblow	n/a	n/a
2013	4a	0.10	clear windblow	n/a	n/a
2013	4b	1.76	clear windblow	n/a	n/a
2013	4c	0.24	clear windblow	n/a	n/a
2013	7a	0.20	clear windblow	n/a	n/a
2013	7b	0.50	clear windblow	n/a	n/a
2013	7c	0.06	clear windblow	n/a	n/a
2013	7d	0.55	clear windblow	n/a	n/a
2013	8c	0.33	clear windblow	n/a	n/a
2013	9a	0.10	clear windblow	n/a	n/a
		4.59			
2013	9b	0.16	thinning	Mixed b'leaves	80
2013	10c	0.60	thinning	Mixed con/bl	55
2013	11e	0.09	thinning	Scots pine	80
2013	12c	1.90	thinning	Mixed b'leaves	50-100
2013	12d	0.82	thinning	Mixed b'leaves	50-100
2013	13e	0.17	thinning	Mixed b'leaves	50-100
2013	14a	1.55	thinning	Mixed b'leaves	50-100
		5.29			

Table 15 – Felling and Thinning Programme (continued)

Period	Cpt	Area (ha)	Operation	Main Species	Age (at treatment)
phase 1					
2013	3a	0.25	cleaning	Native b'leaves	10
2013	5a	0.24	cleaning	Native b'leaves	10
2013	6a	2.38	re-spacing	Mixed con/bl	15
2013	7a	0.30	re-spacing	Mixed con/bl	15
2013	7c	1.70	re-spacing	Mixed con/bl	15
2013	7d	1.24	cleaning	Mixed con/bl	10
2013	8c	0.23	cleaning	Mixed con/bl	25-50
2013	9a	0.08	re-spacing	Mixed b'leaves	25
2013	11d	0.31	re-spacing	Mixed b'leaves	25
2013	11f	0.26	re-spacing	Mixed b'leaves	25-50
		6.99			
phase 2					
2018	2a	0.89	felling	Scots pine	70
2018	2b	1.92	felling	Sitka spruce	70
2018	3a	2.07	felling	Scots pine	70
2018	3b	1.18	felling	Sitka spruce	70
2018	8a	0.88	felling	Sitka spruce	85
2018	8b	2.00	felling	Scots pine	85
2018	11a	0.53	felling	Scots pine	85
		9.47			
2018	11c	0.15	selective felling	Sycamore	50-100
2018	12c	0.15	selective felling	Sycamore	50-100
		0.30			
2018	9c	0.49	thinning	Mixed b'leaves	50-100
2018	11b	0.74	thinning	Mixed b'leaves	50-100
2018	11c	1.85	thinning	Mixed b'leaves	50-100
2018	11g	0.30	thinning	Sycamore	50-100
2018	12a	0.60	thinning	Sycamore	50-100
2018	12b	0.49	thinning	Mixed b'leaves	50-100
2018	13a	0.30	thinning	Mixed b'leaves	50-100
2018	13b	0.32	thinning	Mixed con/bl	25
2018	13c	0.86	thinning	Mixed b'leaves	25
2018	14b	0.58	thinning	Mixed b'leaves	30
		6.53			
phase 3					
2023	1a	1.35	felling	Norway spruce	75
2023	1b	1.56	felling	Sitka/larch	90
2023	1c	1.26	felling	Scots pine	90
2023	5a	1.93	felling	Sitka spruce	80
		6.10			
2023	5a	0.37	selective felling	Mixed conifers	80
2023	11c	0.15	selective felling	Sycamore	60-110
2023	12c	0.15	selective felling	Sycamore	60-110
		0.67			

Table 15 – Felling and Thinning Programme (continued)

Period	Cpt	Area (ha)	Operation	Main Species	Age (at treatment)
phase 4					
2028	10a	2.86	felling	Sitka spruce	100
2028	10b	1.96	felling	Sitka spruce	100
		4.82			
2028	11c	0.15	selective felling	Sycamore	65-115
2028	12c	0.15	selective felling	Sycamore	65-115
		0.30			

Restructuring

In general the clear-felled areas will be re-stocked to replace the felled woodland and to provide a greater degree of age and structural diversity than is currently present. The area of scots pine cleared from the Antonine Wall will not be re-stocked, while there will be a measurable increase in terms of open ground provision within the southern woods.

Conifer Woodland Restocking - Although a key aim of the Plan is to move the composition of the woodland towards a predominantly broadleaved woodland, a substantial area within the southern woods will be re-stocked with conifers, partly to provide a degree of timber production to assist in the funding of woodland management, and partly to re-create the current visitor experience obtained within the mature coniferous woodland.

The following species will be planted within the areas designated for conifer woodland. The objective is to diversify the coniferous crop both for amenity purposes, and to provide greater resilience against disease.

All trees will be planted 2m x 2m centres (2,500 plants per ha)

Conifer Mix	%	Notes
Sitka spruce	40%	Large single species stands, with sprinkling of h. larch on margin
Hybrid Larch	10%	Small single species stands, and on edges of sitka
Scots pine	15%	Medium single species stand, with sprinkling of larch
European Larch	5%	Small single species stand, and on edges of Norway spruce and scots pine
Norway spruce	5%	Small single species stand, with sprinkling of larch
Douglas fir	5%	Small single species stand, drier soils
Grand Fir	5%	Small single species stand, visible location
Western Hemlock	5%	Small single species stand, visible locations
Mixed broadleaves	5%	Beech, lime, gean, planted to form avenues on path edges

Policy Woodland Restocking - Although a key aim of the Plan is to move the composition of the woodlands as a whole towards a predominantly broadleaved woodland, a substantial area within the southern woods will be re-stocked with mixed conifer/broadleaf woodland, partly to provide an attractive woodland for recreational pursuits, and partly to resurrect the type of woodland that was, in all likelihood, planted as as part of the original designed landscape. In addition this mix accepts the presence of existing natural regeneration, whether it is broadleaved or coniferous in character.

The following species will be planted within the areas designated for policy woodland. The objective is to create visually diverse woodland capable of being managed for long-term retention, and capable of producing timber in the long-term.

All trees will be planted 2m x 2m centres (2,500 plants per ha)

Policy Mix	%	**Notes**
Scots pine	10%	In 2-3 species mix groups
European Larch	10%	In 2-3 species mix groups
Mixed conifers	10%	Grand fir, noble fir, N. spruce, w. red cedar, yew, in small, mixed groups
Pedunculate Oak	25%	In small single species stands
Ash	15%	In small single species stands
Beech	5%	In small single species stands
Mixed Broadleaves	15%	Birch, gean, N. maple, hornbeam, h. chestnut, s chestnut, in small mixed groups in visible locations
Mixed shrubs	10%	Hazel, hawthorn, holly, guelder rose, by paths

Native Woodland Restocking - A fair proportion of the felled area will be restocked to native woodland, with the aim being to enhance biodiversity, and to a lesser extent amenity, values. To maximise the biodiversity returns, native woodland will be focused on areas conducive to the development and spread of native woodland habitat, and the principles contained within the 'Creating New Native Woodlands' (FC Bulletin 112) will be followed, notably in relation to NVC woodland types. Historically, woodland cover at Kinneil is likely to have tend towards NVC W8 (Lowland mixed broadleaved woodland with dog's mercury), with W10 (Lowland mixed broadleaved woodland with bluebell) on freer draining soils, and with W7 (Alder-Ash with yellow pimpernel) in flushed and riparian zones.

All planting will be at a minimum 1,600 plants per ha, rising to 2,500 in prominent locations, and in areas protected from deer. Regeneration of all native species will be accepted, but all non-native regeneration will be removed.

In view of the potential impact of Chalara dieback of ash, the proposed use of ash in the restocking mixtures will be reviewed prior to planting. In the event that it is decided not to use ash, alternative species will be selected – within the proposed native woodland restocking, only native species will be substituted; within the policy mix, any suitable substitutes will be used.

The following mixes will be planted to match prevailing site conditions.

NVC W8 Mix	%	**Notes**
Located on gley soils		
Ash	35%	In large groups
Pedunculate oak	15%	In small groups
Downy birch	20%	Interspersed through ash, oak, and elm
Gean	5%	In small groups on edge
Aspen	5%	In small groups on edge
Elm	5%	In small groups
Hazel	5%	In mixture with other shrubs, on margins
Crab apple	5%	In mixture with other shrubs, on margins
Hawthorn	5%	In mixture with other shrubs, on margins

NVC W9 Mix	%	**Notes**
Located on drier gleys and brown earth knowes		
Pedunculate oak	40%	In large groups
Downy birch	20%	Interspersed through ash, oak, and elm
Ash	10%	In small groups
Gean	5%	In small groups on edge
Rowan	5%	In small groups on edge
Elm	5%	In small groups
Hazel	5%	In mixture with other shrubs, on margins
Holly	5%	In mixture with other shrubs, on margins
Blackthorn	5%	In mixture with other shrubs, on margins

NVC W7 Mix	%	**Notes**
Located in flushed/damp areas, and in riparian zones		
Alder	35%	In large groups
Ash	15%	In small groups
Downy birch	20%	Interspersed through ash and alder
Goat willow	5%	In mixture with rowan and bird cherry
Rowan	5%	In mixture with willow and bird cherry
Bird cherry	5%	In mixture with willow and rowan
Guelder rose	5%	In mixture with other shrubs, on margins
Elder	5%	In mixture with other shrubs, on margins
Hazel	5%	In mixture with other shrubs, on margins

Enrichment Planting - Enrichment planting is proposed as a means of diversifying the woodlands composition and age-class structure in selected areas. In particular it will be utilised to bolster levels of natural regeneration where it is used to re-stock selectively felled areas; to fill any sizeable gaps created by thinning; and to increase stocking density and species diversity within the younger woods which are to be re-spaced or cleaned.

In all cases enrichment planting will comprise of native species, selected from above the NVC-based mixes, matched to site conditions. In general a higher proportion of shrub species will be planted, and the enrichment planting will avoid excessive use of species which are already well-estabslihed in the vicinity.

Natural Regeneration - Natural regeneration will be used as a means of re-stocking selectively felled areas, and appropriate natural regeneration will be accepted in all locations.

Where natural regeneration is used as a means of restocking it will be bolstered by enrichment planting if necessary to ensure that an overall stocking density of at least 1,100 estabslihed plants per ha is achieved in all areas lacking tree canopy.

Within the selective felling area in the southern woods, regeneration of both exotic and native species will be accepted; within the selectively felled areas in the northern woods only native natural regeneration will be allowed to grown on.

Elsewhere, natural regeneration of any kind will be accepted in most of the southern woods, but within the native woodland areas of the southern woods, and in the entire area northern woods only native regeneration will be permitted to become established.

Re-stocking Summary

Table 16 below sets out the re-stocking programme by phases. At this stage re-stocking is proposed in the year following felling, clearance, or the like, although this be be varied in practice. The areas for re-stocking do not tally directly with the areas for felling, clearance, etc as in some instances, re-stocking will occur on ground previously cleared of windblow, but where re-establishment of woodland has largely failed. In addition to the re-stocking proposed for cleared areas (by planting, natural regeneration, and enrichment planting) enrichment planting is proposed in selected areas of existing woodland, most notably following on from thinning works.

Table 16 – Re-stocking Programme

Period	Cpt	Area (ha)	Woodland Type	Areas (ha)	Method
phase 1					
2014	1d	0.88	native woodland	0.62	planting
			open ground	0.26	-
2014	4a	1.10	policy	0.92	planting
			open ground	0.18	-
2014	4b	1.76	policy woodland	0.74	planting
			productive woodland	0.77	planting
			open ground	0.25	-
2014	4c	0.79	policy woodland	0.17	planting
			productive woodland	0.37	planting
			open ground	0.25	-
2014	6a	0.12	mixed woodland	0.12	nat. regen/enrichment
2014	6 b	0.58	policy woodland	0.41	planting
			open ground	0.17	-
2014	7a	1.40	policy woodland	0.47	planting
			native woodland	0.75	planting
			open ground	0.18	-
2014	7b	3.47	policy woodland	2.03	planting
			native woodland	0.81	planting
			mixed	0.25	nat. regen/enrichment
			open ground	0.38	-
2014	7c	0.36	policy woodland	0.06	planting
			policy woodland	0.3	nat. regen/enrichment
2014	7d	2.13	policy woodland	1.09	planting
			native woodland	0.70	planting
			policy woodland	0.07	nat. regen/enrichment
			open ground	0.27	-
2014	8c	0.83	native woodland	0.59	planting
			open ground	0.24	-
2014	9a	0.18	native	0.1	planting
			native	0.08	nat. regen/enrichment
2014	11c	0.15	native	0.15	nat. regen/enrichment
2014	12c	0.15	native	0.15	nat. regen/enrichment
		11.98			

Table 16 – Re-stocking Programme (cont.)

Period	Cpt	Area (ha)	Woodland Type	Areas (ha)	Method
phase 2					
2019	2a	1.08	productive woodland	0.93	planting
			open ground	0.15	-
2019	2b	1.92	policy woodland	0.04	planting
			productive woodland	1.69	planting
			open ground	0.19	-
2019	3a	2.17	policy woodland	1.05	planting
			productive woodland	0.79	planting
			open ground	0.33	-
2019	3b	1.24	policy woodland	0.03	planting
			productive woodland	0.93	planting
			open ground	0.28	-
2019	8a	0.88	productive woodland	0.63	planting
			open ground	0.25	-
2019	8b	2.00	policy woodland	0.12	planting
			productive woodland	1.53	planting
			open ground	0.35	-
2019	11a	0.53	native woodland	0.23	planting
			open ground	0.30	-
2019	11c	0.15	native	0.15	nat. regen/enrichment
2019	12c	0.15	native	0.15	nat. regen/enrichment
		10.12			
phase 3					
2024	1a	1.35	policy woodland	1.13	planting
			open ground	0.22	-
2024	1b	1.56	productive woodland	1.35	planting
			open ground	0.21	-
2024	1c	1.31	native woodland	0.6	planting
			productive woodland	0.5	planting
			open ground	0.21	-
2024	5a	2.11	policy woodland	1.25	planting
			native woodland	0.39	planting
			native woodland	0.18	nat. regen/enrichment
			open ground	0.29	-
2024	11c	0.15	native woodland	0.15	nat. regen/enrichment
2024	12c	0.15	native woodland	0.15	nat. regen/enrichment
		6.63			
phase 4					
2028	10a	2.86	policy woodland	1.75	planting
			native woodland	0.80	planting
			open ground	0.31	-
2028	10b	1.96	native woodland	1.43	planting
			open ground	0.53	-
2029	11c	0.15	native woodland	0.15	nat. regen/enrichment
2029	12c	0.15	native woodland	0.15	nat. regen/enrichment
		5.12			

Timing - Planting will generally be undertaken within 12 months of harvesting, but some re-stocking of the conifer areas may be held back to obtain a greater degree of separation.

Ground Preparation and Drainage - Individual planting spots will be created by mounding by mechanical means wherever possible, but by manual means in any location that is difficult to access.

It is believed that the existing drainage network will be largely adequate although ditches will require to be cleared, in tandem with other remedial work following felling operations. New ditches will be estabslihed where necessary to ensure that suitable ground conditions are obtained.

All drains will stop well short of watercourses and if required silt traps will be created.

The Forests and Water guidelines (5th edition) will be fully complied with during all management operations.

Protection - Both natural regenerated and planted trees will be vulnerable to grazing by roe deer, rabbits, and voles. Broadleaf trees will be vulnerable to roe deer throughout the Estate, but perhaps more particularly in the more remote parts, away from regular disturbance by human activity. Currently, it would appear that young trees around the open heart of the Estate will be those most at risk from rabbit damage. Broadly speaking planted broadleaf trees will be most at risk from grazing, followed by naturally regenerated broadleaf trees, with planted and naturally regenerated conifers being at least risk.

There is a variety of methods that could be used to protect vulnerable young trees from grazing damage; all methods have their own strong points and weak points, and these vary according to factors such as the extent, location, and composition of the trees to be protected, impact of protective methods used on access provision, their capital and maintenance costs, their silvicultural effectiveness, and environmental impact. The various options are assed below in table 17, with particular reference to the issues at play at Kinneil.

Table 17 – Analysis of Tree Protection Options

Method	Cost	Social issues	Silviculture/environment
Deer fencing	Cost effective for areas above ~1 ha/more than 2,000 trees. Potentially high maintenance costs.	Limits public access, so may not be popular with site users. Inclusion of access within enclosures may make fencing less effective. Unsightly in prominent locations. Prone to vandalism. May conflict with mountain biking activity.	Not likely to be effective against rabbits. Protects all enclosed trees and shrubs. Relatively low environmental impact. May limit potential for fires though precluding access

Table 17 – Analysis of Tree Protection Options (cont.)

Method	Cost	Social issues	Silviculture/environment
Tree shelters	Generally high unit cost, but cheaper than fencing in small areas, and good for scattered/low density planting High maintenance and removal cost	Very prone to vandalism Can be unsightly in large numbers and if used in prominent locations	Only suitable for broadleaves, and may have negative impact on tree form Unsuitable in shady locations High maintenance approach can reduce their negative silvicultural impacts
Rabbit guards	Relatively cheap	Open to vandalism, but less so than shelters	Only suitable for broadleaf trees (i.e. not shrubs) Not needed if tree shelters are used
Culling	Insignificant	Undoubtedly contentious, and may not be politically acceptable, particularly for deer control	Unlikely to be fully effective, particularly for deer Significant safety issues would need to be addressed
No protection	No cost initially but potential for very high costs if required stocking density is not achieved (either grant repayments of expensive remedial work will be required)	None	May be suitable in location where deer and rabbit pressures are low, and where

The general principles for tree protection at Kinneil are:-

Deer fencing – will be used in less prominent and more vulnerable locations, where public access can be channelled without incurring strong opposition or excessive vandalism, which would increase the risk of deer incursion into enclosed areas. Deer fencing will only be used in locations where there are a relatively large number of young plants. Self-closing kissing gates and stiles will be installed to allow access, and fences will avoid crossing estabslihed access routes. Where feasible, fences will be set back from path edges to limit its visual impact. The fencing will be removed once it has served its function. Rabbit netting is unlikely to be effective in excluding rabbits therefore it will not be used.

Tree shelters – will be used where fencing is too costly or contentious, where plant numbers are low or density sparse, and where the risk of vandalism is thought to be low. For both silvicultural and amenity reasons, mesh shelters, with perforated transparent covering, should be used. The use of shelters will require an effective maintenance programme to ensure that they remain effective, while the work programme should include for shelter removal in the longer term. Where they are used, shelters should be held back from path edges, and if feasible the intervening ground should be made inhospitable to access.

Culling – Deer control will only be considered as a fall-back in the event of excessive levels of damage occurring and even then only when general public acceptance is obtained, and once all safety issues are addressed. Rabbit culling is likely to be less contentious, and the culling of rabbit populations on a regular basis is proposed once social and safety issues have been fully addressed

Rabbit guards – Rabbit guards will be used to protect individual broadleaf trees outwith deer enclosures and where shelters would be too expensive or too prone to vandalism, and only in areas where high levels of damage are anticipated.

No protection – Areas of restocking where no protective measures are proposed include where re-stocking is predominately coniferous, where high levels of vandalism can be anticipated, and in locations thought to be less at risk from damage

In any event, the use of protective measures needs to be flexible, with options being reconsidered in event of the felling and restocking programme changing, and with methods being adjusted in the light of experience. In all instances the reasons for the adoption of the protective methods should be explained to site users.

Grey Squirrels - The presence of grey squirrels also poses a threat to the development of broadleaf trees, albeit at a later stage, when the trees are at sapling or pole stage. The control of squirrels at Kinneil is not thought to be feasible given the potential for populations to spread into the Woods from neighbouring woods and gardens. Consequently, the use of vulnerable species such as sycamore and beech in re-stocking mixes will be limited, and in any event, the long-term aim for the northern woods would see a very limited role for these species.

Tree Maintenance - All planted trees will be maintained to ensure successful establishment at the stated densities, using the following means:-.

- → Replacement planting, will be undertaken as necessary to achieve the required stocking density. Where practical, replacement planting will be with the same species, however, if it becomes apparent that certain species are not suited to a particular location then a more suitable species will be used.

- → On restock sites all plants will be treated to limit damage by weevils, by both pre-planting treatment and by follow up applications of insecticide until the plants have passed the vulnerable stage.

- → If required, weed growth will be controlled through the application of systemic herbicides. All appropriate FCS guidelines will be adhered to.

- → Where present, all fencing will be maintained in an effective condition, and removed when no longer needed.

- → Where present, all trees and tree shelters will be maintained in a vertical and windfirm position, and removed when no longer needed.

- → Natural regeneration of any kind will be accepted in most of the southern woods, but within the native woodland areas of the southern woods, and in the entire northern woods only native regeneration will be permitted to become established.

→ Plants will be monitored for signs of disease, nutrient deficiency, and damage, and appropriate action taken as necessary.

→ The site will be routinely monitored to ensure that the specifications are being achieved, and in order that any unforeseen problems can be identified and dealt with, at an early stage.

SECTION H - RECREATIONAL MANAGEMENT PROPOSALS

Scope of Proposals

The existing access network within Kinneil Estate extends to almost 11 km in length, with over half of the network having Core Path status. The financial burden of the maintenance requirements alone on this size and status of network is very substantial, without taking into account the potential financial costs of the understandable demands for improvements to the network and its related infrastructure; of access promotion; of meeting requests for user-specific facilities; and of realising the opportunities to establish links to other recreational facilities and initiatives.

That said, as a 'Strategic Park', Kinneil Estates primary function is provide recreational and amenity benefits to the public at large and consequently it is reasonable that significant resources should be allocated to the Estates recreational provision.

In terms of access provision, the scope of this Plan is restricted to the land within the Estate boundary; to requirements for informal recreational and management access; and to it related infrastructure and promotion. The proposals do not include for links to other recreational locations however desirable they may be, nor to upgrading works associated with initiatives such as the John Muir Trail. Additionally the inclusion and development of user-specific recreational facilities, such as mountain-bike trails, is beyond the scope of this Plan. As far as the woodlands proposed function as a setting for new and formal recreational facilities it is strongly recommended that any intended developments should pay full cognisance to the proposed changes to the woodlands, most particularly in the southern woods.

The proposals do not recommend the creation of any new path routes, and only for limited formalisation of routes which are currently un-surfaced. The primary reasons for this are that there appears to be no real demand for new routes, and a consensus view that the varied access network has the capability of being 'fit for purpose' if it is well-maintained.

In keeping the the general views expressed in the consultation process, and reflecting the findings of the access survey and assessment it is strongly recommended that the available resources are concentrated on the maintenance of, and improvements to, the existing access network, and equally, on enhancing entrances, recreational infrastructure, and signage and interpretation.

Recreation and Access Policy

In the light of the recommendation above, and the need to allocate resources prudently, it is proposed that the Recreation and Access Policy should be to establish a hierarchy of routes (see Map 10 - Access Vision), and that this ranking should be used in part to guide the allocation of resources.

The proposed rankings are :-

Primary Routes – these routes will form the backbone of both recreational and management access and encompass routes to Kinneil House and Church, the northern parts of the southern woods, and the larger pond, as well as connecting with entrances on the public road network. The routes will be soundly surfaced, well drained, and free of obstructions.

They will be suitable for use for all recreational purposes, and most will be capable of use by management vehicles.

Secondary Routes – these routes will provide good quality linkage between the main features of interest, as well as access to some of the wider, but easily accessible, parts of the Estate. Generally, these routes will be surfaced, well drained, and free of obstacles. They will be capable of use for most recreational purposes, but will not generally be suitable for vehicular management access.

Tertiary Routes – these routes will allow access to some of the more remote and rugged parts of the Estate, and provide connections between primary and secondary routes. They will be unsurfaced, but may have structures such as bridges and handrails, may be muddy in places, and will be free of major obstacles. They will generally be suitable for use by fit and able bodied walkers, but will not be suitable for use by horses or bikes, or for management purposes. Through time it is likely that new tertiary paths may develop, most likely in the re-stocked southern woods.

All routes, and their related infrastructure, will be maintained so as to be fit for purpose.

The Recreation and Access Policy also includes for substantially improving the provision of interpretative material, enhancing the public entrances or 'gateways' of the Estate, and for upgrading the recreational infrastructure, including aspects such as car parks and seating. While the details of such proposals are beyond the scope of this Long Term Forest Plan, general proposals are made below.

Operational and Timing Issues

The large majority of the access network either passes through, or runs alongside, woodland. The woodland management proposals will result in large-scale change, notably in the southern parts of the Estate, and the potential exists for widespread disruption of the access network, and to users usual activities. While the majority of the disruption will be curtailed to a relatively short period during the harvesting and re-stocking operations, more enduring impacts will include access restrictions in the form of deer fences, and (arguably) a loss of visual amenity following on from felling.

Damage can be limited through well designed and planned operations, for example with timber extraction routes avoiding paths as far as possible, by the construction of crossing points, and through timing operations to avoid wet conditions where feasible. The proposed mulching of arisings will help to reduce the likely concern over the appearance of felled woodlands. While deer fencing may be the most effective means of protecting newly planted trees, careful consideration will need to be given to the siting of fence lines (it is recommended that the fence lines be set back from paths) and to the installation of self-closing kissing gates.

As a consequence of the intensive approach proposed for the management of the southern woods it will be prudent to delay any major upgrading of paths until intensive works are completed in discrete areas. This will avoid unnecessary conflict, and will allow for a full assessment of the access improvement requirements to be taken after the potential for damage to the paths has receded.

Effective public awareness and liaison will be required both to alert users to health and safety issues and to potential path closures arising from operational works, and to provide

effective explanations of what works are being planned, and why they are being undertaken.

The access improvements works are contained within a ten-year programme compared to the 20 year programme for the woodland management. Reasons for this include that a) upgrading of the paths will be desirable, and should not be postponed unduly, b) most of the intensive woodland management works are planned for the first ten years and, c) that is is difficult to predict what the access requirements will be in ten years' time.

Path Improvement Proposals

The proposed access works have not be specified in great detail as the nature of the paths may be significantly altered by woodland management works, and in the period up until works are due. Rather general approaches are suggested, relating to their function, hierarchical ranking, and current condition. This means that some further survey work and detailing of specifications will be required prior to improvement works commencing.

The current path system includes for a variety of path types, and for a range of path surface materials, including whinstone, red blaes, and tarmacadam. It is recommended that a consistent approach is taken to surfacing material, and that the use of screened red blaes, or 'red' toptrek is given due consideration as a suitable and complementary surfacing material for use in the woodlands; additionally both materials are recycled. However, the hierarchical system suggested should be maintained, and the surfacing of all routes should be avoided in order to provide a variety of user experiences.

Each section of the proposed path improvements works has been assigned a priority (high, medium, or low). The priorities have been based on the current condition of the paths and their place in the suggested hierarchical system, while the imminence of woodland management works has also been taken into account.

In line with the timing issues discussed above, the proposed path improvements works have been assigned either to phase 1 or phase 2 – essentially this would mean either years 2-3 or years 6-7 of the work programme. That's said, there is scope of undertaking some works at an earlier than proposed stage, at least in the locations removed from intensive woodland management works.

The general nature of each of the operations proposed are set out in Table 18 below:-

Table 18 – Path Improvement Operations

Proposed Operation	Outline Specifications
upgrade/ construct path	This would involve the construction of a sound, surfaced path, generally on the line of an existing unsurfaced route, with a width of at least 1.8m.
widen/ repair path	This would involve the extending the width of existing paths to enable their use by large vehicles, together with minor repair works to ensure that the surface is level, sound, and free-draining.

Table 18 – Path Improvement Operations (cont.)

Proposed Operation	Outline Specifications
resurface formal path - major	This would involve the excavation of the existing, generally poor path surface, the laying of a substantial amount of fresh surfacing material (and base material where needed), and the resolution of problems relating to path drainage.
resurface formal path - minor	This would involve the excavation of the existing, generally sound, path surface, the laying of fresh surfacing material, and the resolution of minor problems relating to path drainage.
resurface informal path - major	This would involve major repairs to unsurfaced paths by grading and infilling, drainage works, and minor surfacing where required.
resurface informal path - minor	This would involve infilling, edging and drainage works in specific locations on informally surfaced path routes.
resolve drainage issues	This involves location specific works where there is an identified drainage issue, and would involve drain excavation, replacement of culverts and building up path levels.
cut back vegetation	This will involve cutting back encroaching and overhanging vegetation sufficient to allow the passage of intended path users – this entails a more robust approach where paths are intended for management use or on major recreational routes, and a less-intensive approach on tertiary routes, intended for less frequent pedestrian usage.
excavate/clear drains	Generally includes for the cleaning of existing path-side drains, including the cleaning of culverts, and for minor excavation of new path-side drains where required.
scrape path	Involves the removal of debris and organic material from paths with bound surfaces, and for very minor repairs to maintain the path's integrity.
repair infrastructure	This includes for the repair of structures such as bridges, boardwalks, steps, and hand-rails. Generally supporting structures appear to be sound but rotten timbers, loose fittings, and slippery surfaces need to be addressed.

The ten-year work programme for path improvements is shown in Table 19 below. The works are divided on a sectional basis, with approximate quantities shown, as well as a suggested priority and phasing. The location of the works is shown in Map 15 – Recreational Proposals.

Table 19 Path Improvement Works - 10 Year Programme

		upgrade/ construct path	widen/ repair path	resurface formal path - major	resurface formal path - minor	repair informal path -major	repair informal path - minor	resolve drainage issues	cut back vegetation	excavate/clear drains	scrape path/minor	repair infrastructure	hierarchy ranking	Management use (Vehicles)	phase	Priority
Section	**length**	**metres**	**metres**	**metres**	**metres**	**metres**	**metres**	**no.**	**metres**	**metres**	**metres**	**no.**				
B-J-U	**595**		595					2	250	300					**1**	**H**
B-M	**465**			130	335			1							**1**	**H**
J-A	**340**				340										**2**	**M**
E-R (direct)	**1,035**				880					1035					**1**	**H**
E-R (boundary)	**1,240**					270	570	4							**1**	**M**
M-N-O-A	**560**						560								**1**	**M**
O-P	**80**						80								**1**	**M**
L-A-Q	**625**						625			370					**2**	**H**
D-L	**180**						180								**1**	**M**
K-V-T	**620**				180	200	240	2	440	250		2			**2**	**M**
B-X-Y-C	**290**						290					2			**1**	**H**
W-C1, W-D1	**415**					415						2			**1**	**H**
H2-I	**740**	120		175					740		290				**2**	**M**

Table 19 Path Improvement Works - 10 Year Programme (continued)

		upgrade/ construct path	widen/ repair path	resurface formal path - major	resurface formal path - minor	repair informal path -major	repair informal path - minor	resolve drainage issues	cut back vegetation	excavate/clear drains	scrape path/minor	repair infrastructure	hierarchy ranking	phase	Priority
Section	**length**	**metres**	**metres**	**metres**	**metres**	**metres**	**metres**	**no.**	**metres**	**metres**	**metres**	**no.**			
F-U-S	**450**				250		200		450					**2**	**M**
R-B1	**255**				165							2		**2**	**M**
X1-V1	**570**	530			40		90							**2**	**L**
B-G	**685**				425									**2**	**L**
A2-C2	**90**				90				90			2		**2**	**M**
A2-D2	**190**				190									**2**	**L**
D2-Q1	**170**						170		170					**2**	**L**
E1-K2	**385**						385		385			6		**2**	**L**
F1-N1	**740**	30			170	80	540		740			10		**2**	**M**
S1-M1	**80**					80			80			4		**2**	**M**
N1-H1	**85**								85					**2**	**L**
Total	**10,885**	**680**	**595**	**305**	**3065**	**1045**	**3930**	**9**	**3430**	**1955**	**290**	**30**			

Other Recreational Infrastructure Proposals

The enhancement of the path routes as proposed above will not in isolation be sufficient to achieve the overall recreational aims and objectives, and the lack of signage and interpretation, and the low key appearances of the Estates entrances has already been identified as weak points in the Estates functioning as a Strategic Park. Consequently it is recommended that effort and finances are targeted towards improving aspects of the recreational infrastructure aside from the paths themselves.

The production of a detailed recreational strategy is outwith the scope of this Plan. However indicative or outline proposals have been included within the Plan, on the basis that they may form the basis of a more detailed and comprehensive document (see Map 10 – Access Vision).

The timing of the recreational infrastructure works is less dependent on the timing of the woodland management operations, and it would make sense to develop a work programme that undertook works at the earlier parts of the programme.

It is important that recreational strategy should include for a consistent approach being taken in terms of design and in the materials used for signage and interpretation. Similarly it would be best if there is consistency over the provision of site furniture and any reconstruction of bridges, handrails etc.

Proposals for improvements to the Estate's recreational infrastructure are set out in Table 20.

Table 20 - Recreational Infrastructure Improvement Proposals

Feature	Outline Proposals
Improve Car Parks	The main car park by the Gil Burn Bridge is generally fit for purpose but would benefit from drainage works. The car park off Provost Road is badly laid out and poorly surfaced. Its appearance, capacity, and its functionality could be significantly improved by undertaking a radical re-design and reconstruction
Enhance Gateways	None of the existing gateways effectively promotes the presence of Kinneil Estate, and most are overgrown and unwelcoming. A radical re-design of both vehicular and pedestrian entrances is required. Works are likely to involve vegetation management; the construction or repair of stone walls; resurfacing; and signposting. The locations of the gateways recommended for enhancement are shown on Map 15– Recreational Proposals. Major upgrading is proposed for 3 gateways (at the car parks and main vehicular access points, and minor (or lower cost) upgrading is proposed for a further 6 gateways
Signage and Interpretation	The Estates lacks effective signage, with only some of the historical aspects of the estate being effectively interpreted. The estate as a whole is not promoted. It is proposed that a fresh examination of the interpretation and signage requirements is taken, with the emphasis being on promotion of the Estate to a new and wider audience, and also to particular aspects of the Estate.

Table 20 - Recreational Infrastructure Improvement Proposals (cont.)

Feature	Outline Proposals
Signage and Interpretation (cont.)	Key locations for interpretative features are shown in Map 15 – Recreational Proposals Within the site consideration should be given to setting out and promoting recognised routes, either with a particular theme (such as cultural heritage, biodiversity, or health based aspects (e.g by walking time, energy use or distance).
Furniture	Most of the site furniture currently on-site is old and in poor condition, and there is a variety of styles in evidence. It is recommended that a systematic approach is taken to the placement of robust furniture, constructed from a uniform material, and following a set style.
Monitoring	There is no data on the levels of usage that the Estates currently has, on where users go, or on what activities are undertake. The installation of people counters would go so way to obtaining statistical information that would be of use in terms of reaching management decisions and in supporting funding bids. The installation of a people counter at the main entrance is proposed. This will only provide partial information but it would be very difficult and cost-ineffective, to attempt to collect data from all entrances.

Other Management Proposals

During the production of the Long Term Forest Plan other pieces of work. beyond its remit, were identified as being useful in terms of the overall management of the Estate, and worthy of consideration. These were as below:-

Pond Improvements – Heritage Environmental Ltd. produced an Ecological Report and Management Proposals for the two ponds in 2005. Given the popularity of the ponds, and evident concerns about their condition, the Management Proposals should be re-visited with a view to their implementation.

Habitat Survey – The production of an Estate wide Habitat Survey is proposed. Such a document would be of assistance in determining detailed specifications for management works, for identifying protective measures and new biodiversity opportunities, and to serve as a benchmark for future surveys.

Parklands Assessment – The parklands extend to the east and west of Kinneil House, and are currently managed as high amenity grassland in the main. The Parkland to the east of the House contains a number of mature specimen trees; remnants of a historic designed landscape that has largely been lost elsewhere. There are also substantial numbers of younger trees scatted around the Estate buildings. It is recommend that a detailed survey of the trees is undertaken covering both their current condition and management and their relation to the historic designed landscape, and that proposals are drawn up to cover the rejuvenation of the designed landscape where feasible. Additionally, in tandem with the Habitat Survey, the parkland assessment could address issues relating to the purposes and

cost of management, and identify means by which public benefits can be accrued and management costs reduced without diminishing the aesthetic appeal of the parklands.

Table 21 – Recreational Infrastructure and Other Work Proposals

Recreational Works

Feature	Proposal	no.	higher priority	Lower priority
Car Park 1	resolve drainage issues	1	1	
Car Park 2	re-design to improve functionality	1		1
Gateways	major enhancements	3	2	1
Gateways	minor enhancements	6	3	3
Interpretation	design and install interpretation/map boards	6	4	2
Signage	design and install additional signage	8	4	4
Furniture	Installation of site furniture (benches, seats)	20	10	10
Monitoring	install people counter at main entrance	1	1	

Other Works

Feature	Proposal	no.
Ponds	undertake works identified in Ecological Report	1
Ecology	undertake Habitat Survey	1
Parkland	undertake individual tree survey and assessment, with enhancement proposals	1

SECTION I – WORK PROGRAMME AND IMPLEMENTATION

Work Programmes

The Woodland Management Work Programme is contained in Table 22 below. The various management tasks proposed for each compartment and sub-compartment have been quantified, and placed in one of four 5-year phases.

The work programmes for Path Improvements and for Recreational Infrastructure Improvements are contained in the preceding section within Tables 19 and 21.

Timing

The work programme places the woodland management tasks into 5-year long phases, and the production Forecast Table in Appendix 5 provides a more precise timing for felling and restocking operations.

It must be emphasised that there will need to be a high degree of flexibility about the timing of both woodland management operations and recreational improvement works. The felling and restocking programme may have to be advanced should there be further widespread wind damage to the trees, with the likely knock-on effect that other related works will also have to be advanced. Conversely other works, most likely recreational improvement works, may have to be postponed until sufficient funding can be sourced. The Tolerance Table contained in Appendix 6 gives an idea of the flexibility that may be required for woodland management operations.

Maintenance

The works listed in the work programmes are, by and large, capital works. Only the re-stocking proposals include for maintenance. It will be imperative that a regular and thorough maintenance regime is put in place, dealing with both the existing maintenance requirements and the new burdens that the implementation of the capital works will bring with. The continuation of grass mowing, littering picking and small-scale remedial works will give the Estate a well-cared for appearance, while the physical presence of staff on-site may assist in addressing the anti-social issues that currently pervade the Woods.

Management

The development of the Plan and the implementation of the works will undoubtedly result in greatly increased management requirements being placed on staff, particularly in the first couple of years. The work programmes are relatively large, and complex and it will be vital to ensure that a firm handle is kept on progress, particularly in the event of changes to the programmes contents and timings. Key early tasks will be to finesse the Plan, to obtain funding for its implementation, and to undertake the final consultations and liaison that will be required before large-scale works commence.

Further, effective management will be required to ensure that the works undertaken are of the required standards, that works run to time and to budget, and that users are kept fully informed of planned activities. As noted above, a fundamental management task will be to ensure that the estate and the new works are maintained and monitored in an effective manner.

Implemetation

The means by which the proposals are implemented will require careful consideration. There are a range of means by which the works could be implemented, and each will have its own strengths and weaknesses. Some of the means of delivery are listed below, but in all likelihood the implementation will involve most, if not all of them.

In- house Staff – As highlighted above, the development and implementation of this Plan will require significant input from Falkirk Community Trust staff. Whilst appreciating that by and large the physical works will be implemented by others, it is recommended that serious consideration is given to the use of dedicated staff either to assist in managing the project on the ground or to at least providing a contact point and on-site presence. Adoption of this suggestion could greatly assist in ensuring the quality of the works and to providing an important public face for the Estate.

Falkirk Council Staff – Council staff are already involved in maintenance and management operations, and there will be scope to enlarge this role during the implementation stage.

Specialist Contactors – Undoubtedly the bulk of the harvesting and restocking works, and most likely, the majority of the pathworks, will require to be undertaken by specialist contractors. While the use of commercial contactors should perhaps be the most-cost effective means of delivery, their exclusive use would not result in the delivery of some of the socio-economic benefits that other delivery methods could bring.

Training and Employment Teams – There is great scope to involve training and employment teams in the implementation of the Plan, particularly in light of the Estates proximity to Bo'ness, and the prevalent problems of youth and long-term unemployment suffered by parts of its population. Many of the tasks listed in the Plan are suitable for implementation by such teams, and in particular they may well be of use in proving an on-going maintenance function. While the use of training and employment teams may not appear to be the most cost-effective way of achieving the desired physical results on the ground, and there are limitations on the range of works that can be undertaken, their use could deliver widespread benefits in socio-economic terms, as well as establishing a greater sense of ownership from the town's population.

Volunteers – At this stage it is not clear what potential there will be for using volunteers in the Plan's implementation. While the use of volunteers is likely to be positively viewed it will take it will require time and effort to build up capacity. While it is very unlikely that volunteers could undertake a measurable amount of the capital works they could play an invaluable role in delivering the finer grained finishing touches, and as with the training and employment teams, the use of volunteers could forester a greater sense of ownership among the population.

Table 22 - Woodland Management Work Programme

Kinneil Woods Woodland Management Works																						
20 Year Work Programme																						
Cpts. 1 to 5	**Qty.**	**1a**	**1b**	**1c**	**1d**	**2a**	**2b**	**3a**	**3b**	**4a**	**4b**	**4c**	**5a**			**Phase Coding**						
area		1.35	1.56	1.31	0.88	1.08	1.92	2.42	1.24	1.10	1.76	0.79	2.54				**Phase 1**					
Woodland Management																						
clear fell - retain suitable broadleaves	ha	1.35	1.56	1.26	0.53	0.89	1.92	2.07	1.18	1.00		0.55	1.93									
selective fell - 50% (susceptible conifers)	ha												0.37				**Phase 2**					
group fell - 75% canopy removal (~0.15 ha)	ha																					
remove windblow - area	ha			0.05	0.35	0.19		0.10	0.06	0.10	1.76	0.24					**Phase 3**					
remove windblow - individual trees	no.	75	50	75		100	50	50	100				100									
mulch/clear arisings	ha	1.35	1.56	1.31	0.88	1.08	1.92	2.17	1.24	1.1	1.76	0.79					**Phase 4**					
chip/clear arisings	ha																					
remove exotic broadleaves (saplings)	ha			0.6	0.88								0.39				**equal proportions across all 4 phases**					
remove shelters	note							yes					yes									
cleaning young trees	ha							0.25					0.24									
re-spacing/early thinning	ha																					
thinning (mature trees) favour native	ha																					
thinning (mature trees) favour best stems	ha																					
extract timber	note	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes									
treat retained trees	note	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes									
remove rhododendron/exotic shrubs	note																					
individual tree works	note																					
timber tonnage	income	550	700	400	315	350	850	560	510	320		265	760									
Sub Total																						
Restocking																						
drainage	lin. m	150	200	150	100	150	200	200	150	150	200	100	200									
cultivation	ha	1.13	1.35	1.10	0.62	0.93	1.73	1.84	0.96	0.92	1.51	0.49	1.64									
restock - policy woodland	ha	1.13					0.04	1.05	0.03	0.92	0.74	0.17	1.25									
restock - native woodland	ha			0.60	0.62								0.39									
restock - productive woodland	ha		1.35	0.50		0.93	1.69	0.79	0.93		0.77	0.32										
restock - natural regeneration	ha												0.18									
restock - open ground	ha	0.22	0.21	0.21	0.26	0.15	0.19	0.33	0.28	0.18	0.25	0.30	0.29									
enrichment planting	no.							100					200									
erect tree shelters	no.					150	200	1750	125		1400	300										
erect rabbit guards	no.	2000	200	1500	1500																	
erect deer fencing	lin. m			260	270			500	400	330	120	140	540									
erect management gates	no.			1	1			1	1		1		2									
erect recreational access gates	no.			2	1			2	1	1		1	3									

Table 22 - Woodland Management Work Programme (cont.)

Cpts. 6 to 10	Qty.	6a	6b	7a	7b	7c	7d	7e	8a	8b	8c	9a	9b	9c	9d	10a	10b	10c				
area		2.61	0.58	1.70	3.72	2.36	2.13	0.14	0.88	2.00	0.83	0.33	0.16	0.49	1.65	2.86	1.96	1.02				
Woodland Management																						
clear fell - retain suitable broadleaves	ha		0.58	1.20	2.72		0.21		0.88	2.00	0.27					2.86	1.96					
selective fell - 50% (susceptible conifers)	ha	0.23			0.50	0.60	0.13					0.15										
group fell - 75% canopy removal (~0.15 ha)	ha																					
remove windblow - area	ha			0.20	0.50	0.06	0.55				0.33	0.10										
remove windblow - individual trees	no.			25		100	50		50	100	25	25				150	50					
mulch/clear arisings	ha		0.58	1.40		0.06	0.71		0.88	2.00	0.60	0.1				2.86	1.96					
chip/clear arisings	ha																	0.6				
remove exotic broadleaves (saplings)	note			1.00	1.00	0.50	1.00				0.83	0.33	0.16			0.8	1					
remove shelters	note	yes				sum	sum															
cleaning young trees	ha						1.24				0.23											
re-spacing/early thinning	ha	2.38		0.30		1.70						0.08										
thinning (mature trees) favour native	ha												0.16	0.49								
thinning (mature trees) favour best stems	ha																	0.60				
extract timber	note	yes	yes	yes	yes	yes	yes		yes	yes	yes	yes	no	no		yes	yes	yes				
treat retained trees	note	yes	yes	yes	yes	yes	yes		yes	yes	yes	yes	yes			yes	yes	yes				
remove rhododendron/exotic shrubs	note							yes								yes	yes					
individual tree works	note																					
timber tonnage	income		280	600	1520		100		500	660	100					1275	1020					
Sub Total																						
Restocking																						
drainage	lin. m		100	300	300		300		100	300	100	100										
cultivation	ha		0.41	1.22	2.84		1.76		0.63	1.65	0.59	0.10				2.35	1.13					
restock - policy woodland	ha		0.41	0.47	2.03	0.06	1.06			0.12						1.75						
restock - native woodland	ha			0.75	0.81		0.70				0.59	0.10				0.80	1.43					
restock - productive woodland	ha								0.63	1.53												
restock - natural regeneration	ha	0.12			0.25	0.3	0.07					0.08										
restock - open ground	ha		0.17	0.18	0.38		0.18		0.25	0.35	0.24					0.31	0.53					
enrichment planting	no.	500		100	300	500	500					100	100	200								
erect tree shelters	no.								100	400												
erect rabbit guards	no.													200			3576					
erect deer fencing	lin. m	410	100	220	280	430	320				260					640						
erect management gates	no.	1	1	1	1	1	1				1					2						
erect recreational access gates	no.	1	1	1	1	1	1				1					3						

Table 22 - Woodland Management Work Programme (cont.)

Cpts. 11 to 15	Qty.	11a	11b	11c	11d	11e	11f	11g	12a	12b	12c	12d	12e	12f	13a	13b	13c	13d	13e	14a	14b	15a
area		0.53	0.74	2.43	0.31	0.09	0.37	0.30	0.60	0.49	2.50	1.04	1.00	0.53	0.30	0.32	0.86	9.06	0.46	1.55	0.58	8.58
Woodland Management																						
clear fell	ha	0.53																				
selective fell - 50% (susceptible conifers)	ha																					
group fell - 75% canopy removal (~0.15 ha)	ha			0.60							0.60											
remove windblow - area	ha																					
remove windblow - individual trees	no.																					
mulch/clear arisings	ha																					
chip/clear arisings	ha	0.53	0.37	0.15	0.31	0.09	0.26	0.15	0.30		0.60	0.20			0.30	0.32	0.86		0.17		0.58	
remove exotic broadleaves (saplings)	note	0.30	0.74	2.43	0.31	0.09	0.26	0.15		0.49	2.50	1.04			0.30	0.32	0.86		0.17	1.55		
remove shelters	note																					
cleaning young trees	ha																					
re-spacing/early thinning	ha				0.31		0.26															
thinning (mature trees) favour native	ha		0.74	1.83				0.30			1.90	0.82			0.30					1.55		
thinning (mature trees) favour best stems	ha					0.09			0.60	0.49						0.32	0.86		0.17		0.58	
extract timber	note	yes	no	some	no	yes	yes	some	yes	some	yes	yes			some	some	some		no	no	yes	
treat retained trees	note																					
remove rhododendron/exotic shrubs	note								yes	yes	yes	yes								yes	yes	
individual tree works	note									yes					yes				yes			
timber tonnage	income	25		25					15	15	15											
Restocking																						
drainage	lin. m																					
cultivation	ha																					
restock - policy woodland	ha																					
restock - native woodland	ha	0.23																				
restock - productive woodland	ha																					
restock - natural regeneration	ha			0.60							0.60											
restock - open ground	ha	0.30																				
enrichment planting	no.			400							400	200			50	100	200		100	150		
erect tree shelters	no.			400							400	200										
erect rabbit guards	no.	750													50	100	200		100	150		
erect deer fencing	lin. m																					
erect management gates	no.																					
erect recreational access gates	no.