Forestry and Land Scotland
Coilltearachd agus Fearann Alba

Land Management Plan

Crianlarich

Central Region

CRIANLARICH

Land Management Plan

Approval date: 29 June 2020

Plan Reference No: LMP - 03 - 2019

Plan Approval Date: 29-06-2020

Plan Expiry Date: 28-06-2030

CSM 6 Appendix 1b

FOREST AND LAND SCOTLAND - Application for Land Management Plan Approvals in Scotland

Forest and Land Scotland - Property

Region:	Central
Woodland or property name:	Crianlarich
Nearest town, village or locality:	Crianlarich
OS Grid reference:	NN 421252
Local Authority district/unitary Authority:	LLTNP

Areas for approval

	Conifer	Broadleaf
Clear felling	310.8	
Selective felling		
Restocking	175.0	135.7
New planting (complete appendix 4)		

1. I apply for Land Management Plan approval for the property described above and in the enclosed Land Management Plan.
2. I apply for an opinion under the terms of the Environmental Impact Assessment (Forestry) (Scotland) Regulations 1999 for roads, tracks and quarries as detailed in my application.
3. I confirm that the initial scoping of the plan was carried out with FLS staff on 16th January 2018.
4. I confirm that the proposals contained in this plan comply with the UK Forestry Standard.
5. I confirm that the scoping, carried out and documented in the Consultation Record attached, incorporated those stakeholders which SF agreed must be included.
6. I confirm that consultation and scoping has been carried out with all relevant stakeholders over the content of the of the land management plan. Consideration of all of the issues raised by stakeholders has been included in the process of plan preparation and the outcome recorded on the attached consultation record. I confirm that we have informed all stakeholders about the extent to which we have been able to address their concerns and, where it has not been possible to fully address their concerns, we have reminded them of the opportunity to make further comment during the public consultation process.
7. I undertake to obtain any permissions necessary for the implementation of the approved Plan.

Signed ..... Signed.....

Regional Director Conservator

Region Central Conservancy....Central Scotland Conservancy.

25 November 2019 **Date of Approval**.....29 June 2020.....

Date approval ends .....28 June 2030.....

Environmental Impact Assessment
Screening Opinion Request Form

Please complete this form to find out if you need consent from Forestry Commission Scotland, under the **Forestry (Environmental Impact Assessment) (Scotland) Regulations 2017**, to carry out your proposed forestry project. Please refer to Schedule 2 Selection Criteria for Screening Forestry Projects under Applying for an opinion. If you are not sure about what information to include on this form please contact your local Conservancy office.

Proposed Work							
Please put a cross in the box to indicate the type of work you are proposing to carry out. Give the area in hectares and where appropriate the percentage of conifers and broadleaves							
Proposed Work	select	Area in hectares	% Conifer	% Broad-leaves	Proposed work	select	Area in hectares
Afforestation	☐				Forest roads	☒	7.8
Deforestation	☐				Forest quarry	☐	
Location of work		Crianlarich Land Management Plan					

Description of Forestry Project and Location
Provide details of the forestry project (size, design, use of natural resources such as soil, and the cumulative effect if relevant). Please attach map(s) showing the boundary of the proposed work and other known details.
See section 3.0, Appendix III and relevant maps

Provide details on the existing land use and the environmental sensitivity of the area that is likely to be affected by the forestry project.
These are described in section 4.0 and 8.0 of the plan

Description of Likely Significant Effects
Provide details on any likely significant effects that the project will have on the environment (resulting from the project itself or the use of natural resources) and the extent of the information available to assist you with this assessment.
Some tracks and roads are visible from popular footpaths and tourist routes. Impacts have been assessed through site visits and analysis in GIS and summarised in section 3.0 of the plan.

Include details of any consultees or stakeholders that you have contacted in order to make this assessment. Please include any relevant correspondence you have received from them.

Mitigation of Likely Significant Effects
If you believe there are likely significant effects that the project will have on the environment, provide information on the opportunities you have taken to mitigate these effects.
See section 3.0 and Appendix III of the plan.

Sensitive Areas	
Please indicate if any of the proposed forestry project is within a sensitive area. Choose the sensitive area from the drop down below and give the area of the proposal within it.	
Sensitive Area	Area
National Park (NP)	7.8ha
Select...	

Property Details			
Property Name:	Crianlarich		
Business Reference Number:		Main Location Code:	
Grid Reference: (e.g. NH 234 567)	NN 421252	Nearest town or locality:	Crianlarich
Local Authority:		LLTNP	

Owner's Details				
Title:	Ms	Forename:	Shirley	
Surname:	Leek			
Organisation:	FLS		Position:	Planning Manager
Primary Contact Number:	0131 370 5674		Alternative Contact Number:	
Email:	enquiries.central@forestryandland.gov.scot			
Address:	Forestry and Land Scotland			
Central Region, Aberfoyle Office				
Postcode:	FK8 3UX		Country:	
Is this the correspondence address?			Yes	

Agent's Details				
Title:		Forename:		
Surname:				
Organisation:			Position:	
Primary Contact Number:			Alternative Contact Number:	
Email:				
Address:				
Postcode:			Country:	
Is this the correspondence address?			Select...	

Office Use Only	
GLS Ref number:	

Contents

Support documents: maps

1. Concept
2. Management zones
3. Management – all phases
4. Management – phases 1 and 2, including thinning
5. Future habitats and species – long term proposals
6. Conservation and heritage
7. Roads, tracks and quarries
8. Utilities
9. Footpaths and trails
10. Viewpoints
11. Species distribution

Support documents: perspectives

Appendices:

I) Consultation record
II) Scoping record
III) Quarry development plans
IV) Summary of operations

1.0 Summary

1.1 Introduction

The Crianlarich Land Management Plan area consists of two forest blocks to the south and east of the village. The northern and western boundaries are defined by the A82 and A85 trunk roads, while the south and east is open land rising to several peaks over 3000 feet elevation. The total area is 1379ha of which 653ha (47%) is woodland. The woodlands are dominated by commercial Sitka spruce plantation and all other species amount to only 25% of the area of that species. A process of restructuring aimed at increasing both age and species diversity has been ongoing for the past 10 to 15 years and a key objective of the new plan is to continue this process: in particular to restore ancient woodland sites that have been planted with non-native conifer.

Timber production using non-native species will remain an important part of management in Crianlarich but there are a number of other key issues that will be addressed. These include taking into account the visibility and landscape setting of the woodlands, protection and possible expansion of key habitats and designated sites and protection of heritage features.

1.2 Objectives

- Continue the process of restructuring aiming to create a diverse, resilient forest delivering a range of ecosystem services.
- Establish a definitive ancient woodland restoration area, using this as a framework for restocking proposals.
- Seek to expand native woodlands and integrate these into wider habitat networks.
- Outside the habitat networks maximise production using Sitka spruce as the predominant species in a clearfell management system.
- Establish a coupe structure that takes account of windblow risk on steep slopes, clearfelling before this becomes unacceptable.
- Use climate, site and operational constraints to inform species choice, avoiding productive forestry on sites that might give poor economic returns or are potentially unstable.
- Manage ground within black grouse lek zones to favour that species.
- Manage Benmore SSSI as per updated management plan and keep invasion by SS to within acceptable tolerances.
- Maintain perimeter deer fence and establish a system of deer control appropriate to the species to be established.
- Seek to soften landscape impacts where these are obtrusive.

1.3 Key proposals

Total Plan Area	1379 (ha)
Planned operations	
Felling	310.8ha.; 152350m^3
Thinning	140.0ha; 7000m^3
Restock	175.0ha of conifer; 135.7ha of broadleaf.
New planting	0ha
Roads and tracks	2875m road; 26500m track; 75 ramps; 14975m road upgrade
Public access	

1.4 Species diversity

Species group	**2020**	**2030**	**2040**
Sitka spruce	43.9%	37.1%	34.8%
Other conifers	5.2%	3.3%	2.9%
Scots pine	1.0%	2.1%	2.4%
Native broadleaves	9.0%	14.7%	16.4%
Open space	40.9%	42.8%	43.5%

1.5 Major issues

Issue	Description/mitigation
Issue 1	Mature trees on steep slopes in eastern part of Benmore block with no access. Build road, fell early in plan period to minimise wind risk.
Issue 2	Extensive areas of plantation on ancient woodland sites. Establish extent of ancient woodland and restore.
Issue 3	
Issue 4	

1.6 Critical success factors

The following are critical to success of the plan:

- Timely construction of new, or upgrading of existing, roads, and roads/tracks to access approved felling coupes.
- Adequate deer control measures for protection of broadleaved species and soft conifers.

1.7 Standards and guidelines

This plan takes account of Scottish Government and Forestry and Land Scotland policy and strategy. It has been developed in accord with the latest UKFS Guidelines and is audited under the UK Woodland Assurance Standard. Guidance in Planting in Caledonian pinewoods: reducing risks from Dothistroma Needle Blight (2017) will be followed when establishing native woodland in the vicinity of Glen Falloch SSSI. Guidance on Seed Sources for Planting Native Trees and Shrubs in Scotland will be followed

when restoring Plantations on Ancient Woodland Sites to native woodland. Forestry and Land Scotland Woodlands are certified as being sustainable by both FSC and PEFC.

1.8 Consultation

During the development of this plan we have consulted with stakeholders known to have an interest in this plan area. A list of stakeholders and their response can be found in Appendix I.

1.9 Contacts and further information

For further information on this or any other land management plan please contact:

Forest and Land Scotland
enquiries.central@forestryandland.gov.scot
Aberfoyle
FK8 3UX

tel. 0131 370 5674

2.0 Scottish Forestry regulatory requirements

2.1 Context and rationale for concept

Crianlarich combines two forest blocks to the south and east of the village. It is situated amidst dramatic mountain scenery where two important transport routes meet, at the junction of Glen Falloch and Glen Dochart. The woodlands have been dominated by commercial spruce plantations and re-structuring of relatively even aged forests has been ongoing for some years. The plan continues the restructuring process and takes into account key landscape and environmental issues whilst maintaining a large element of productive forestry.

2.2 Proposed felling in years 2021 – 2030

Phase	Area (ha)	Volume (m^3)
1	195.5	105900
2	115.3	46450
	310.8	**152350**

Table 2.1 Summary of felling proposals

Map M4 shows the coupes for which approval is being sought for clearfelling and thinning during the plan period. These are set in the context of longer term management proposals in Map M3. The future habitats map (M5) should also be referred to.

2.3 Proposed thinning in years 2021 – 2030

Phase	Area (ha)	Volume (m^3)
1	40.0	2000
2	100.0	5000
	140.0	**7000**

Table 2.2 Summary of thinning proposals

Proposed thinning coupes are shown on map M3 and further detail found in section 5.1.2.

2.4 Proposed restocking in years 2021 – 2030

Phase	Species	Area (ha)
1/2	Conifer	175.0
1/2	Broadleaf	135.8
		310.8

Table 2.3 Summary of restocking proposals

Restocking proposals are shown on map M5 and further details found in section 5.2. The overall objective has been to maintain a high level of production whilst introducing greater diversity and restoring large areas of plantation on ancient woodland sites.

Where production is the key objective conifers will be planted at densities of approximately 2700 stems per hectare (sph) and broadleaves in the region of 3500. Restocking will be within two years of felling unless Hylobius Management Support System indicates a longer fallow period is necessary. In the latter case planting will be carried out within five years.

Where production is not the key objective target densities for planting, or natural regeneration, of native and non-native species, will vary depending on site objectives. On planted sites and the majority of natural regeneration sites an overall density of at least 1600sph will be achieved; in transitional areas, such as upper treelines, lower densities, of at least 1100sph, will be accepted. Natural regeneration sites will be assessed four years after felling. If it seems unlikely regeneration will become established by year 5, the site will be planted to achieve the desired stocking level.

Open areas will be allowed up to 20% tree cover. Non-native species will be managed to meet aspirations to restore Plantations on Ancient Woodland Sites (PAWS). Small amounts of rhododendron are known to be present and appropriate measures to control this species will be put in place.

2.5 Access and roading in years 2021 – 2030

Phase	Species	Length (m)	Area (ha)
1/2	New roads	2875	2.0
1/2	Tracks/ramps	26500	5.8
		23205	**7.8**

Table 2.4 Summary of roads and tracks

Proposed roads and tracks are shown on map M7 and more detail is to be found in section 3.0.

2.6 Departures from UKFS guidelines

There are no departures from UKFS guidelines. Coupes 57029 and 57031 are being treated as the same coupe; coupes 58060 and 58042 will also be treated as one coupe and felled at the same time.

2.7 Tolerance table

	Adjustment to felling period	Adjustment to felling coupe boundaries	Timing of restocking	Change to restocking species	Changes to road lines	Designed open ground	Windblow clearance
SF Approval not normally required	Felling date can be moved within 5 year period where separation or other constraints are met	Up to 10% of coupe area (up to a maximum of 1ha)	Up to 2 planting seasons after felling	Change within species group e.g. evergreen conifers or broadleaves		Increase by up to 5% of coupe area	
Approval by exchange of letters and map		Up to 15% of coupe area	Between 2 and 5 planting seasons after felling subject to the wider forest and habitat structure not being significantly compromised		Additional felling of trees not agreed in plan Departures of more than 60m in either direction from centre of roadline	Increase by up to 10% Any reduction in open ground within coupe area	Up to 5ha
Approval by formal plan amendment including map	Felling delayed into second or later period. Felling advanced into earlier 5 year period	More than 15% of coupe area	More than 5 planting seasons after felling subject to the wider forest and habitat structure not being significantly compromised	Change from specified native species Change between species groups	As above, depending on sensitivity	More than 10% of coupe area Colonisation of open areas agreed as critical	More than 5ha

3.0 EIA screening determination for forestry projects

3.1 Proposed deforestation

There are no deforestation proposals.

3.2 Proposed afforestation

There are no afforestation proposals.

3.3 Proposed forest roads, tracks and other facilities

This is a request for an EIA determination for works covering construction of, roads, tracks, ramps and other facilities in Crianlarich LMP area. The request covers proposals for the full ten year period of the plan which will offer some flexibility with the work programme without the necessity of having to re-submit a determination. Any work to be carried out in the second half of the plan period will be preceded by a new EIA determination request.

Several new lengths of road will be required to facilitate access to harvesting coupes for machinery and timber lorries. The total length is about 2875m with a footprint about 7m wide. The nominal area is 2.0ha. The proposed roads will be constructed to the standard FLS Class A road specification and in line with the principles described in the SNH guidance on Constructed Tracks in the Scottish Uplands. Construction will also conform to the Forest and Water Guidelines (Fifth Edition). Roads will have a waterbound surface (not tarmac), with one layby at about 500m intervals and with a turning point at the end.

The road lines have been selected to follow the site topography and to minimise cut and fill. The impact of the road construction will be further reduced by ensuring batter angles and, in general, the disturbed ground, is left in a condition that will promote early natural vegetation regeneration. The location of turning points and laybys will be carefully selected to minimise disturbance and the batter angle of any cut required in construction. Where possible laybys and turning points will be positioned on the downhill side of the new roads. Also, where possible top soil stripped from the roadline will be stored to be used for landscaping after construction. As an additional measure, given the landscape sensitivities, groups of native trees will be planted at appropriate points to help screen the road from the surrounding area.

A proportion of the materials required to construct roads may be sourced from within the excavation corridor the remainder will come from the closest available FLS quarry.

Approximately 26500m of forwarder and ATV tracks will be required to access harvesting sites and to facilitate harvesting, silvicultural and deer management operations. In addition, up to 75 ramps will be required to allow harvester/forwarder access into coupes that are to be felled during the design plan period.

It is estimated that about 2300m of forwarder extraction track will be required. Construction will be kept to a minimum, but where it is required material will be sourced either from the line of the track or the nearest FLS quarry. The surface of extraction tracks will be protected with a layer of branches and tops. Forwarder tracks will be approximately 3m to 4m wide with a nominal area of about 0.7ha. When no longer needed for extraction the width will be narrowed to 2.5m and both track and batters will be allowed to revegetate.

The total length of ATV tracks will be approximately 24200m and they will be about 2m wide; the nominal area amounts to 4.8ha. ATV tracks will be constructed in line with the principles described in the SNH guidance on Constructed Tracks in the Scottish Uplands. Construction will also conform to the Forests and Water Guidelines (Fifth Edition). During construction ground disturbance will be kept to a minimum. ATV tracks will not be treated as permanent features; once operations are complete tracks will be allowed to grass over and the running surface and side batters will be left in a condition that will promote vegetation regeneration. Tracks will be constructed with a top-side drain and will have regular drainage cut-offs to prevent erosion of the trackside drain. No water from the trackside drains will discharge directly into any watercourse.

Indicative positions of the roads and tracks are shown on the roads and tracks map (M7) and final positions will be within ± 60m of these. The actual lines will be planned to minimise landscape impact and ground disturbance, reflecting existing topography, avoiding steep gradients where possible and avoiding sensitive habitats.

Ramps will be approximately 3m wide and up to about 15m long. The total nominal area is approximately 0.34ha. They will not be treated as permanent features and will be removed following operations. The final number and location of the ramps will be determined at the time of operations but we believe one ramp per 100m of road/coupe interface will be sufficient.

A summary of roads and tracks is found in the table in section 3.5.

3.4 Proposed quarries

There are two quarries in the plan area for which extensions are proposed during the lifetime of the plan. These quarries will provide vital aggregate for the construction of new roads and maintenance of existing roads essential for delivery of the felling programme. Using quarries located within the forest block will reduce traffic on public roads and result in lower carbon emissions. The quarry locations are indicated on the roads and tracks (map M7). Quarry development plans (see Appendix III) provide additional information.

Given the landscape sensitivities of these developments a separate screening opinion request will be submitted for them.

3.5 Screening opinion request summary

Coupe	Length (m)	Area (ha.)	Purpose	Landscape	Water quality	Archaeology	Biodiversity	Access	Recreation	Material
57002	267	0.19	access for harvesting machinery and timber lorries	no major impact	standard protection measures	no known issues	no significant issues	from forest road	n/a	nearest FLS quarry
57031	993	0.70	access for harvesting machinery and timber lorries	partially visible from A85	standard protection measures	no known issues	no significant issues	from forest road	n/a	nearest FLS quarry
58025	751	0.53	access for harvesting machinery and timber lorries	visible from summit of Cruach Ardrain	standard protection measures	no known issues	no significant issues	from forest road	n/a	nearest FLS quarry
58046	862	0.60	access for harvesting machinery and timber lorries	visible from Benmore hill paths	standard protection measures	no known issues	no significant issues	from forest road	n/a	nearest FLS quarry
57001	328	0.10	access for harvesting	visible from Benmore hill path	standard protection measures	no known issues	no significant issues	from forest road	n/a	nearest FLS quarry
57028	708	0.18	access for harvesting	no major impact	standard protection measures	no known issues	no significant issues	from forest road	n/a	nearest FLS quarry
57029	844	0.25	access for harvesting	partially visible from A85c	standard protection measures	no known issues	no significant issues	from forest road	n/a	nearest FLS quarry
58001	289	0.09	access for harvesting	visible from West Highland Way	standard protection measures	no known issues	no significant issues	from forest road	n/a	nearest FLS quarry
58033	159	0.05	access for harvesting	Visible from A85	standard protection measures	no known issues	no significant issues	from forest road	n/a	nearest FLS quarry

Screening opinion request summary continued

Coupe	Length (m)	Area (ha.)	Purpose	Landscape	Water quality	Archaeology	Biodiversity	Access	Recreation	Material
57001	783	0.16	crop establishment and deer management	visible from Benmore hill path	standard protection measures	no known issues	no significant issues	from forwarder track	n/a	to be found on site
57002	771	0.15	crop establishment and deer management	visible from Benmore hill path	standard protection measures	no known issues	no significant issues	from forest road	n/a	to be found on site
57003	645	0.13	crop establishment and deer management	visible from Benmore hill path	standard protection measures	no known issues	no significant issues	from forest road	n/a	to be found on site
57004/ 57005	1686	0.34	crop establishment and deer management	no major issues	standard protection measures	no known issues	no significant issues	from forest road	n/a	to be found on site
57006	628	0.13	crop establishment and deer management	no major issuesc	standard protection measures	no known issues	no significant issues	from forest road	n/a	to be found on site
57010	1308	0.26	crop establishment and deer management	no major issues	standard protection measures	no known issues	no significant issues	from forest road	n/a	to be found on site
57014	527	0.11	crop establishment and deer management	no major issues	standard protection measures	no known issues	area of bog and open water	from forest road	close to forest entrance	to be found on site
57018	565	0.11	crop establishment and deer management	no major issues	standard protection measures	no known issues	no significant issues	from forest road	crosses existing Benmore hill path	to be found on site
57023	822	0.16	crop establishment and deer management	no major issues	standard protection measures	no known issues	no significant issues	from forest road	n/a	to be found on site

Screening opinion request summary continued

Coupe	Length (m)	Area (ha.)	Purpose	Landscape	Water quality	Archaeology	Biodiversity	Access	Recreation	Material
57025	897	0.18	crop establishment and deer management	no major issues	standard protection measures	no known issues	no significant issues	from forest road	n/a	to be found on site
57029	540	0.11	crop establishment and deer management	visible from A85	standard protection measures	no known issues	no significant issues	from forest road	n/a	to be found on site
57031	1149	0.23	crop establishment and deer management	visible from A85	standard protection measures	no known issues	no significant issues	from forest road	n/a	to be found on site
57028	944	0.19	crop establishment and deer management	no major issues	standard protection measures	no known issues	no significant issues	from forest road	n/a	to be found on site
58001	1197	0.24	crop establishment and deer management	visible from A82 and West Highland Way	standard protection measures	no known issues	no significant issues	from forwarder track	n/a	to be found on site
58004	1545	0.31	crop establishment and deer management	visible from A82 and West Highland Way	standard protection measures	no known issues	no significant issues	from forest road	n/a	to be found on site
58012	1642	0.33	crop establishment and deer management	visible from A82 and West Highland Way	standard protection measures	no known issues	no significant issues	from forest road	n/a	to be found on site
58018	413	0.08	crop establishment and deer management	May be visible from A85	standard protection measures	no known issues	no significant issues	from forest road	n/a	to be found on site
58025	1233	0.25	crop establishment and deer management	visible from summit of Cruach Ardrain	standard protection measures	no known issues	no significant issues	from forest road	n/a	to be found on site

Screening opinion request summary continued

Coupe	Length (m)	Area (ha.)	Purpose	Landscape	Water quality	Archaeology	Biodiversity	Access	Recreation	Material
58027	1406	0.28	crop establishment and deer management	several hairpins but not clearly visible from major viewpoints	standard protection measures	no known issues	no significant issues	from forest road	n/a	to be found on site
58029	979	0.20	crop establishment and deer management	visible from A82 and West Highland Way	standard protection measures	no known issues	no significant issues	from forest road	n/a	to be found on site
58033	474	0.10	crop establishment and deer management	may be visible from A85	standard protection measures	no known issues	no significant issues	from forest road	n/a	to be found on site
58042	571	0.10	crop establishment and deer management	visible from Benmore hill path	standard protection measures	no known issues	no significant issues	from forest road	n/a	to be found on site
58044	1019	0.20	crop establishment and deer management	visible from Benmore hill path	standard protection measures	no known issues	no significant issues	from forest road	n/a	to be found on site
58046	1275	0.26	crop establishment and deer management	visible from hill paths	standard protection measures	no known issues	no significant issues	from forest road	n/a	to be found on site
58060	1159	0.23	crop establishment and deer management	visible from Benmore hill path	standard protection measures	no known issues	no significant issues	from forest road	n/a	to be found on site

4.0 Land management plan

4.1 Introduction

This is a re-submission of a plan first developed by Forest Enterprise Scotland (now Forestry and Land Scotland) in 2007. This plan continues the work of re-structuring described in the previous work but sets it in the context of revised aspirations and policy. A summary of the plan proposals is found in section 1, whilst sections 2 and 3 deal with Scottish Forestry regulations and EIA screening requirements respectively. This section covers the context, key issues and the broad proposals of the plan. Section 5 provides greater detail on management proposals summarised in previous sections. Section 6 repeats the critical success factors and section 7 summarises broad management prescriptions. Background information is found in section 8. Several appendices deal with the consultation process, proposed quarry development and provide a summary of management proposals in tabular form.

4.2 Setting and context

The Crianlarich Land Management Plan area (see Figure 4.1) is located on the northern slopes of Ben More to the south and east of the village of the same name. The village itself sits at a key transport junction where Glen Falloch meets Glen Dochart. The plan area is split into two blocks, Inverardran and Benmore and covers a total of 1379ha about half of which is open ground. It is wholly within the Loch Lomond and the Trossachs National Park and is bordered by significant designated sites.

4.3 Analysis and important issues

Factors that have been taken into account in developing the LMP proposals are summarised in the analysis and context (map M1) these include:

- Extensive areas of plantation on ancient semi-natural woodland. FLS is committed to restoring the majority of such sites.
- Steep slopes which are potentially unstable, though not necessarily threatening key infrastructure.
- Recently constructed hydro scheme in Caorach Glen.
- Cool, wet climatic conditions and large areas of wet acidic soil.
- Significant designated sites including Benmore SSSI, Glen Falloch SSSI and River Tay SAC.
- Known black grouse leks nearby.
- Located next to important transport corridors.
- Popular walking routes.
- High landscape value.

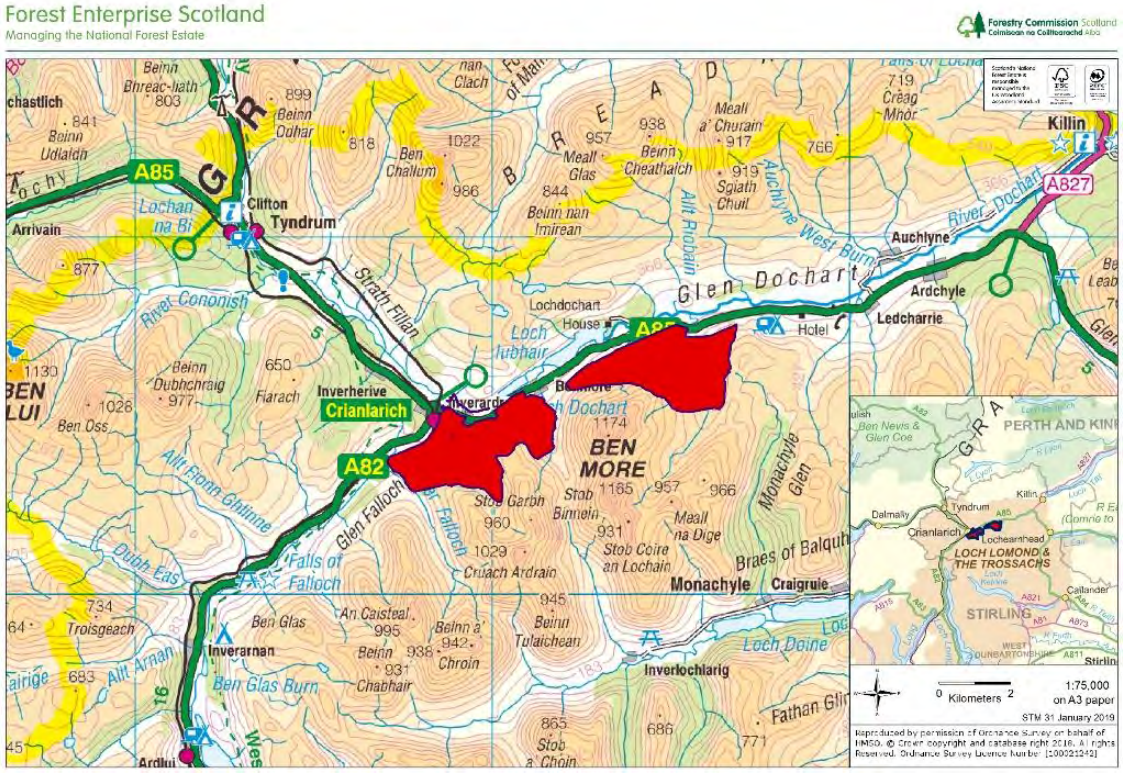


Figure 4.1Crianlarich: location

4.4 Key challenges and liabilities

Significant challenges are:

- The reduction in the area for commercial spruce forest through implementation of the PAWS policy.
- Significant areas of PAWS restoration requiring rapid establishment of native woodland and removal of non-native natural regeneration.
- Small areas of steep ground which may be uneconomic to restock with spruce but do not fall within native woodland restoration areas.
- Potentially unstable ground.

4.5 Concept

The Analysis and Concept (map M1) summarises how the important issues will be addressed, including:

- Identification and restoration of PAWS and extending the area of native woodland around these.
- Assessing slope instability and adopting management options suitable for these situations.
- Protection of all third party infrastructure.
- Taking into account site conditions when selecting species for restocking.
- Protecting designated sites and seeking opportunities to enhance/extend similar habitats.
- Extend similar protection to priority species on FLS ground.
- Protect landscape value of the area.

4.6 Management objectives

Plan objectives are to be found in section 1.2. Broad objectives are illustrated in the management zones (map M2) though it should be stressed that there will be overlap between zones.

5.0 Management plan proposals

5.1 Management

Management will be guided by the key objectives of the plan. The main management technique will be clearfelling and re-planting.

5.1.1 Clearfelling

Map M4 shows the coupes for which approval is being sought for clearfelling during the plan period. These are set in the context of longer term management proposals in Map M3.

Table 5.1 indicates net felling area and volume figures for the plan area for the first two phases. These values are approximate and coupes will be surveyed to provide more precise figures prior to felling. A breakdown of species to be felled is to be found in Appendix IV.

Phase	Area (ha)	Volume (m^3)
1	195.5	105900
2	115.3	46450
	310.8	**152350**

Table 5.1 Proposed felling

The proposed felling sequence is a balance between achieving optimum economic return and timber quality, minimising risk of wind damage and retention of some of the older trees in the medium term. Models recently developed by Forest Research and FLS suggest optimum cost recovery and timber quality is achieved when trees are between 40 and 50 years old. The timing and spatial distribution of felling coupes fall within the parameters set out in the UK Forest Standard to minimise risk of flooding and deterioration of water quality. Retention of some stands for a longer period will aid restructuring, improving future resilience and achieving a better age class balance. Coupes which would be difficult to harvest, if extensive windblow occurred, have been brought in to the phase 1 or 2 felling periods. Other coupes, of a similar age, have been retained.

In Benmore coupes 57031 and 57029 will be felled together. These both require a new road to be constructed for access and, additionally, a forwarder track for 57029. The latter is steep and will be difficult and dangerous to harvest if windblow does occur; felling within the plan period will lower that risk. The option of delaying coupe 57031 has been considered but, given the relatively high yield class of the trees here, it is believed risk of wind damage will become unacceptable if felling is delayed. Consideration has also been given to retaining

coupe 57001 for a longer period of time. However given its prominent position in the landscape, and the presence of both larch and windblow, a decision has been taken to fell it during the plan period.

In Inverardran a similar approach of balancing windrisk and a desire to improve age structure has been taken. This is seen, for example, in Benmore Glen. Coupe 58141 has been included in the first phase so that larch that might be accessible when either 58033 or 58060 are felled can be removed. In addition coupes 58042 and 58060 will be treated as one for felling purposes.

All harvesting operations will be carried out in accordance with the UK Forestry Standard Guidelines, and Forest and Water Guidelines (5th edition). Although Slope Stability and Risk (STAR) assessments concluded that no further geotechnical assessments would be required best practice will be observed during operations, to minimise risk of debris flows and rock falls. Prior to operations any known heritage features will be marked to ensure protection during the operation. Also felling coupes will be checked for protected species prior to crop surveys and operations and SNH guidelines for managing these during felling operations followed. All Schedule 1 species found on FLS ground will be monitored annually. Where necessary public access will be managed so as to reduce disruption without compromising safety. Potential impacts on infrastructure will be taken into account during operational planning and the relevant organisation contacted prior to operations. In particular both public and private water supplies will be protected during harvesting operations.

5.1.2 Thinning

Indicative thinning coupes for which approval is sought are shown on map M4, Management phases 1 and 2.

The work includes first and second thinning and some stands will receive two thinnings in the plan period. The area and volume figures for the second thinnings are incorporated into the overall figures.

This first indication of suitable stands was based on the following criteria:

- Planting year 1998 to 2008
- Slope ≤30%
- DAMS score (exposure) ≤14
- Soil type (from maps)
- Accessibility

A more detailed assessment of the stands will be made at the operational planning phase and a final decision whether to proceed with the work will be made at that point. Stands will be thinned to marginal thinning intensity, dependent on survey data. Racks will be cut at appropriate spacing and matrix trees taken to achieve the recommended thinning intensity.

5.1.3 Potential for Continuous Cover Forestry

Although site conditions exist that would favour the use of CCF techniques no coupes have been identified that would justify using them at present, largely due to the age of trees in relation to site conditions. In the future the best opportunities for CCF will be found in the native woodland zone.

5.2 Future habitats and species

The management zones map (map M2) indicates the broad aspiration for future habitats which are shown in more detail in the future habitats map (map M5). Further information is found in Appendix IV.

Table 5.2 summarises the establishment proposals for the plan area beyond the first two phases.

Phase	Species	Area (ha)
1/2	Conifer	175.0
1/2	Broadleaf	135.8
Total		**310.8**

Table 5.2 Proposed establishment

Climate and site conditions restrict the use of species for commercial production to lower elevations and even here wet acidic ground does not favour many alternatives to Sitka spruce. The latter will remain the species of choice over much of the plan area but opportunities will be sought for using other species. The favoured candidate is Norway spruce which has already established well on some sites. Scots pine will be considered for drier acidic sites using native origins close to the Glen Falloch SSSI. Where large areas of pure Sitka spruce are indicated these will be broken up along riparian zones and by not planting very poor ground. It is not possible to show this in detail until sites can be assessed following clearfelling. Where feasible the use of broadleaved species will also be used to add visual and species diversity.

A mixed Scots pine habitat will be established in the vicinity of the Glen Falloch SSSI. This will include elements of native broadleaves and open space; if pine is slow to establish, native broadleaves will help protect the soil surface in the short to medium term. Because of the risk from Dothistroma Needle Blight Scots pine will not be planted within 600m of the SSSI and natural regeneration will be the preferred method of establishment. Impacts from browsing animals will be minimised through a combination of culling and fencing. The site will be monitored and if natural regeneration of pine seems unlikely to occur other options, such as ground preparation, with or without direct seeding, will be considered. If planting does become necessary, this will be a last resort and FLS will consult with both Scottish Natural Heritage and Scottish Forestry. If seeding or planting is used as the method of regeneration, guidance on obtaining local seed sources will be adhered to.

Native woodland will be established on PAWS sites and the original area expanded where the ancient woodland distribution limits the use of non-native productive conifers such as Sitka spruce. In Benmore the native woodlands will

be a mix of oak, birch and Scots pine, though other native species will also be encouraged. Where there are adequate seed sources natural regeneration will be the preferred establishment option. Elsewhere, or where natural regeneration is not developing quickly enough, planting will take place. For both broadleaves and Scots pine local provenances will be used wherever possible.

In general the existing commercial treeline will be lowered when the ground is restocked. This is for both commercial and landscape reasons. Mixed natural regeneration will be allowed in these areas though the percentage of non-native species will be kept within acceptable tolerances adjacent to SSSIs.

At restocking adequate buffer zones will be created around public and private water supplies as per Forest and Water Guidelines.

5.3 Management of open land

Open land ranges from high elevation hillsides and plateaus to riparian and bog habitat at lower elevations. It includes roadlines wayleaves and other open space around buildings, for example.

Roads will be routinely maintained during the plan period and this will include drain maintenance and removal of natural regeneration where it interferes with the integrity and use of the road. Wayleaves will also be kept open and managed in accordance terms agreed with the relevant utility companies.

Much of the open space within woodland areas will be considered transient and is not mapped. Buffer areas around riparian zones will not be restocked with commercial conifer, as per guidelines, but an open woodland habitat will be allowed to develop. In this case non-native species will be kept to within tolerable limits.

5.4 Visitor zones and access

The area around the entrance to Inverardran will be managed in association with the local community. The aim will be to maintain footpaths and create a pleasant and diverse system of woodland walks. Some small trees may be removed during the plan but volumes will be small and are incorporated into the overall thinning figures. Informal access to open hill will not be restricted but routes will not be maintained.

5.5 Deer management

Forestry and Land Scotland carry out deer control as part of a collaborative effort with Balquhidder Deer Management Group. The two sections form a single deer management unit and deer control is carried out under contract. Deer numbers have been relatively high in recent years and there have been high levels browsing of soft conifer, especially in Inverardran. The number of deer shot in the plan area has been increased as part of a programme to reduce background numbers of deer. Both sections are surrounded by a perimeter deer fence, though this is compromised in several places and ongoing repairs will be necessary. In the long term the intention is to maintain the perimeter fence to a high standard and reduce deer numbers within the LMP area. This should allow for less reliance on fencing of individual coupes. In the short term restock

coupes will be assessed on a case by case basis and additional internal fencing used where necessary. Where deer fences cross marked routes pedestrian gates will be installed if required. Where appropriate deer fences will be marked to minimise risk of bird collisions.

Part of deer management will include the creation and maintenance of deer glades. Size and location of these will be determined during operational planning.

5.6 Other proposals

Road maintenance will proceed as and when necessary during the plan period. This might include removal of roadside vegetation including occasional trees in excess of 10cm dbh. Similarly management associated with wayleaves and other facilities may include removal of some larger individuals or groups of trees. The volumes involved will not amount to more than 40m^3 per annum.

There are two quarries that will be developed during the lifetime of the plan. More details can be found in appendix II. It is unclear how much of the proposed extensions will take place during the plan period as this is very much dependent on stone requirements. However the developments are included in the SOR found at the beginning of the plan.

5.7 Restructuring

5.7.1 Summary

The felling proposals continue the process of restructuring the forest developed in previous plans. The aim of restructuring is to gradually convert a largely even aged, single species woodland into one with a more balanced age structure and a more diverse species range. It is believed that a more diverse forest encourages greater resilience to both disease and damage from extreme climatic events. Creating a coupe structure where adjacent coupes are not felled and restocked within five to fifteen years of each other is a standard method of achieving diversity. So called "adjacency" issues have been avoided as far as possible. The retention of several stands beyond the age of 60years will afford improved age structure and resilience in the medium to long term. Permanent woodland and a mix of open ground and natural regeneration along riparian zones both within and outside the FHN will further improve resilience.

5.7.2 Species diversity

Table 5.3 indicates the change in relative species composition between 2020 and 2040. There is a reduction in the amount of Sitka spruce relative to other species over the 20 year period, but it remains the dominant species. There is also a relatively large reduction in the amount of other conifers especially Norway spruce and lodgepole pine. The amount of larch is reduced as a response to the threat of Ramorum disease. Diversity is maintained due to the significant increase in native broadleaves. The figures for open space include areas awaiting restocking.

Species	2020	2030	2040
Sitka spruce	43.9%	37.1%	34.8%
Birch	9.0%	14.7%	16.4%
Scots pine	1.0%	2.1%	2.4%
Other conifer	5.2%	3.3%	2.9%
Open	40.9%	42.8%	43.5%
	100%	100%	100%

Table 5.3 Change in species diversity over time

5.7.3 Age structure

Table 5.4 shows the change in relative age structure between 2020 and 2040. These figures indicate that it will take some time to achieve a balanced age structure. There is an early fall in older age classes which will not be fully compensated for till after 2040.

Age Class	2020	2030	2040
0-10	13.7	44.1	29.7
11-20	21.0	8.1	35.3
21-40	0.0	21.7	29.9
41-60	64.0	0.3	0.0
60+	1.4	25.8	5.0
	100.0	100.0	100.0

Table 5.4 Age structure in Crianlarich (percent of forested area)

6.0 Critical success factors

The following are critical to success of the plan:

- Timely construction of new, or upgrading of existing, roads, and roads/tracks to access approved felling coupes.
- Adequate deer control measures for protection of broadleaved species and soft conifers.

7.0 Management prescriptions

Clearfelling is the dominant management system that will be used. Coupe design takes into account topography, landscape and operational constraints and is intended to facilitate future restructuring. Age of clearfelling will generally be in the range 40 to 60 years.

Some younger stands will be thinned and these will be assessed beforehand to determine the most suitable methodology. In general thinning will be to marginal thinning intensity. A rack system will be established with racks at appropriate intervals, any outstanding volume being taken from the matrix. The potential to continue thinning into the future will be assessed on a stand by stand basis.

Restocking for productive purposes will be by planting following any necessary site preparation. The latter will include brash management, necessary drainage and, in general, mounding to provide a sheltered weed free planting site. On steep ground flat planting might be necessary. Fallow periods will be used to help mitigate weevil damage in line with aspirations to minimise use of chemical deterrents. Softer species may be protected by fencing from animal browsing.

Large areas will be left for natural regeneration, the success of which will be monitored.

8.0 Background information

8.1 Previous plan

8.1.1 History

This is the second plan for the Crianlarich block the first having been produced in 2007 by the then Lorne Forest District. The block is an amalgamation of two closely related but separate blocks, Inverardran and Benmore. The first planting took place in 1959 and was completed by the late 1960s. The vast majority of the block was planted with Sitka spruce only small amounts of other species, including larch and Norway spruce, being used. The clear intention was to establish a productive forest and the previous plan examined ways in which a range of other objectives could be achieved without overly compromising production. This plan takes into account the aspirations of the previous plan and builds on these in light of changing policy.

8.1.2 Analysis of previous plan

The broad aims of the previous plan were:

- To maintain timber production
- Align with aspirations of the newly established Loch Lomond and the Trossachs national Park.
- Expand the area of native woodland

In addition a range of wider potential benefits were described, including an intention to improve mountain access.

Most of the planned operations have been achieved in the approval period. Access difficulties have delayed felling in one or two coupes and there has been some additional felling due to wind damage. However the overall integrity of the plan has been maintained and restocking has been in line with intentions shown in the plan.

8.1.3 Continuity with previous plan

The broad objectives of the previous plan are relevant to the new land management plan, though there is a slight change in emphasis with regards to some of these. Sustainable timber production remains a key objective and the plan seeks to maximise the productive potential of the area without compromising other objectives. In addition, due to climatic and site conditions it is recognised that there are only limited opportunities to use species other than Sitka spruce for productive purposes. The area mapped as PAWS has been re-examined and there will be a much greater expansion of native woodland than described in the previous plan. Diversification will be achieved by continuing to increase the amount of native species in FHNs. The felling programme follows guidelines to minimise risk to water quality in drinking water protected areas. The landscape remains a key element in forest design. The zones map (map M2) illustrates the relative importance of the main objectives throughout the area, though there is a degree of overlap.

8.2 Physical site factors

8.2.1 Geology, soils and landform

Crianlarich is set at the junction of Glen Fillan/Glen Dochart and Glen Falloch in a landscape dominated by the high mountains of Benmore and Stob Binean. These rise to elevations of over 1100m directly from the valley bottom at about 150m. The elevation within the plan area varies from 160m to 730m. Aspect is generally northerly and the steep slopes mean there is little insolation in winter. Upper slopes are steep, frequently in excess of 40% and there are many examples of exposed rock faces. At lower elevations there are more extensive areas of flatter ground, especially in the western part of Inverardran. Valley floors tend to be narrow and filled with hummocky moraines.

The solid geology is dominated by fine grained metamorphosed sedimentary rocks with low base status. These are overlain by a variable depth of glacial material of variable texture. There is frequent induration at depth. This material shows signs of instability in places and parts of both Inverardran and Benmore were the subjects of geotechnical appraisals to assess slope stability and risk (STAR). There are several examples of small landslips along burn sides and there is some risk of debris flow and rock fall in places. Only Benmore has a detailed soil survey and this indicates that peaty gley and surface water gley dominate the lower slopes. Brown earths occur on steeper slopes but these are likely to be of low base status and tending towards podsolization. Deep peat, of

variable nutrient status occurs in the western part of Inverardran, flatter benches on hillsides and higher moorland.

8.2.2 Water

The area is drained by several large burns most of which drain into the Tay river system. Burns in the every south western part of Inverardran drain south via Glen Falloch. The burns are steep and occasionally incised and can rise quickly during high rainfall events. SEPA flood risk maps indicate that there is high risk of flooding within short distances of burns but more extensive risk areas are restricted to flatter ground in Glen Dochart. There will be some potential for erosion and resulting sedimentation downstream. There are renewable hydro schemes on the Caorach Burn which runs through the Benmore section and in Benmore Glen which borders Inverardran. There are several private water supplies in the block and an important public supply point on the Allt Coire Ardrain. All of the area falls within drinking water catchment areas (DWPAs) of which the latter is at most risk from forestry activity.

8.2.3 Climate

Using the measures of warmth and wetness defined in the Ecological Site Classification (ESC, see Forestry Commission Bulletin 124) the Crianlarich LMP area is categorized as cool and wet becoming increasingly cold at higher elevations where small areas are considered sub-alpine. Average annual rainfall is in the region of 1450mm, about 60% of which falls between October and March. The lower parts of the glens are considered sheltered, but exposure increases rapidly becoming severely exposed on open hillsides above 400m.

8.2.4 Future climate

Predicting the impact of future climate change presents one of the biggest challenges in forest planning. Analysis carried out by Forest Research indicates an overall increase in average temperatures with warmer summers and milder winters. There will be regional variation in the future rainfall pattern and distribution, with a predicted decrease in summer rainfall in the east but a predicted increase in the west of the country. This will lead to more frequent drought in the east but a reduction in moisture deficit in the west.

There is less confidence in predicting changes in other climatic parameters such as windiness and extreme winter cold or summer heat. However, there is a general belief that the number of frost days will decrease and that the incidence and severity of extreme events (e.g. gales and heavy rain) will increase.

Data for the LMP area suggest an increase in accumulated temperature of over 50% by 2050, compared to baseline 1960 – 1990 data, and about 75% by 2080. Relative increase is even greater at higher elevations and all parts of the forest are predicted to be classed as warm as early as 2050. Annual rainfall is predicted to remain more or less the same, a decrease in summer rainfall being compensated by a similar increase in winter. Despite the decrease in summer rainfall moisture deficit is predicted to also decrease. The impact of these changes on soil properties is uncertain. Potentially there could be an increase in

growth rate in all tree species and a wider range of species may become suitable. However where exposure is currently a limiting factor it seems likely to remain so, and this potential for increased growth rate will be restricted to more sheltered parts of the forest.

8.3 Biodiversity and environmental designations

The commercial planting is dominated by Sitka spruce and there is relatively little species diversity at present. Outwith these areas there are a number of different woodland and open ground habitats. The high moorland above both sections is designated as a SSSI notified for its plant assemblage and examples of more unusual plant types have been found within the plan area. Glen Falloch Pinewood SSSI is immediately south of the Inverardran and there are extensive areas of ancient semi natural woodland in Glen Dochart much of which is dominated by broadleaved species. There are also extensive areas mapped as ancient woodland within the Benmore section, most of which were planted with Sitka. There are however some remnants above the current treeline in Benmore that could act as a seed source for natural regeneration. There are areas of bog habitat at lower elevations some of which have been planted with Sitka spruce.

A number of bird and mammal species utilise the forest and there are several small areas which come within priority zones for black grouse management. Both osprey and white tailed eagle are known to be colonising the wider area.

8.4 The existing forest

8.4.1 Species, age structure and yield class

The forested area is dominated by Sitka spruce, the earliest planting of which was in the late 1950s (see Map M11). The information in table 8.1 below includes open space but if the latter is excluded Sitka spruce makes up 74% of the forested area. Native broadleaves, mostly birch, are the next most abundant group making up about 14% of the woodland. The woodlands are relatively even aged - over 60% of the woodland is in the 41 – 60 age class; only 35% is aged between 1 and 20 and there is nothing in the 21 – 40 category. Less than 2% of the woodland is greater than 60 years old. Productivity can be very good with yield classes in excess of $20m^3ha^{-1}$ on sheltered sites with good soil conditions. At higher elevations a combination of lower temperatures, poorer soil conditions and increasing exposure reduce yield class to no more than $12m^3ha^{-1}$. Across all sites yield class can change over a very short distance for example where freely draining raised sites sit adjacent to flatter, poorly drained sites.

Species	Area ha	Area %
Sitka spruce	604.7	43.9
Birch (downy/silver)	114.5	8.3
Larch	46.9	3.4
Scots pine	14.3	1.0
Native broadleaves	9.4	0.7
Lodgepole pine	9.2	0.7
Norway spruce	9.0	0.7
Other conifers	6.2	0.4
Open	564.7	41.0
	1379	**100**

Table 8.1 Species diversity, 2020

Age Class	Area ha	Area %
0-10	92.4	13.7
11-20	141.6	21.0
21-40	0	0.0
41-60	432.2	64.0
60+	9.5	1.4
	676	**100**

Table 8.2 Age diversity, 2020

8.4.2 Access

Each section of the plan area has a single entrance for vehicles which will be the access points for timber haulage. The forest road network is extensive but several kilometres of new road will have to be built to access some coupes. The approximate positions of these are shown on the roads and tracks (map M7). More details on requirements for roads and tracks can be found in section 3.0.

8.5 Landscape and land use

8.5.1 Visibility, landscape character and value

Crianlarich is set against the backdrop of some of the highest mountains in the Southern Highlands and these rise steeply from relatively narrow straths and glens. Snow covered in winter, the mountains give a sense of wild grandeur and remoteness. The steep, often rocky slopes, dissected by fast flowing burns retain remnants of native pine and broadleaved woodland at lower elevations. The sparsely populated straths and glens are more diverse in character with a number of small settlements, a mix of pasture types and larger rivers and lochs. The straths and glens provide important transport routes and utility corridors that provide travellers with their first glimpses of the Highlands. The landscape is thus highly valued. Of the two sections Inverardran is more visible than Benmore, particularly heading north along the West Highland Way or A82 trunk road. It is masked somewhat from the north and Benmore is also largely hidden from the main routes.

8.5.2 Neighbouring land use

The village of Crianlarich lies at the north west boundary of Inverardran and is a busy rail and road junction for major north-south, east-west routes. It provides facilities for locals and tourists. The straths and glens are largely agricultural providing mainly improved pasture for livestock. The steeper slopes and upper parts of the summits provide rough grazing and are also used for deer stalking. There is private forestry in Glen Dochart where there are also remnants of ancient semi-natural woodland. Tourism is important and the West Highland Way is an extremely popular long distance walking route. The summits of the surrounding hills are also popular destinations being easily accessible from the major road network.

8.6 Social factors

8.6.1 Recreation

There are few formal facilities in the LMP area; these and other features are shown on the footpath and trails (map M9). There is a small parking area at the entrance to Inverardran from which several small woodland walks can be accessed. There are also links to these directly from the village of Crianlarich. There are informal routes through both sections of the plan area which access the major mountain summits of Ben More, Stob Binnein and Cruach Ardrain. The main hill path to the summit of Benmore is not on FLS ground though the new hydro scheme road facilitates access to the north east ridge. The West Highland Way, on the western side of Glen Falloch, provides open views of the Inverardran section.

8.6.2 Community

The area at the entrance to Inverardran is managed as a community woodland.

8.6.3 Heritage

Fifteen heritage features have been identified and these are shown on the conservation and heritage (map M6). Most are remnants of shielings or sheep enclosures though there is also a probable farmstead in the Benmore section. The latter has regional importance. Remnants of Old Military Roads in the Inverardran section also have regional importance. There are sites of two possible duns in the Benmore section.

Appendix I: Consultation record

Consultee	Date contacted	Date response received	Issue raised	Forest District Response
Forestry Commission Scotland	08.02.18	n/a	n/a	information only
Loch Lomond and The Trossachs National Park	10.17	28.11.17	This is a core transit area, for road, rail and foot travel and the forest is a prominent backdrop for southbound travellers. Though the Inverardran section is considered more sensitive than Benmore, infrastructure developments in both require careful consideration. Careful choice of viewpoints for visualisations is important. Would like to see a "softening" of forest edges and removal of awkward outliers of Sitka spruce following clearfelling. Maintenance of hill access is considered important. Maintenance of "permeable" forest habitat networks is desirable, especially with respect to native pinewoods. Area of ancient woodland should be confirmed. Buffers around Benmore SSSI should be incorporated into the plan. Increase in species diversity desirable.	Recognition of landscape sensitivities; viewpoints will be chosen to reflect these in relation to transit routes and agreed with LLTNP. Harsh forest edges will be softened and outliers of Sitka spruce managed removed where appropriate. Existing forest roads and tracks will continue allow access to open hill. Forest habitat networks will concentrate on riparian zones and PAWS and include restoration of latter and resulting increase in species diversity. Buffers around SSSI will be incorporated into the plan.
SEPA	08.02.18	12.03.18	Steps must be taken to protect the water environment during operations and relevant guidelines should be adhered to. Consider opportunities for peatland and wetland restoration. Protect private water supplies. Take appropriate measures where there are flood risk receptors downstream of the site.	Relevant guidelines will be followed. Several areas of wet and boggy ground will not be restocked with commercial conifer. Private water supplies to be protected and felling planned and managed to minimise risk of flooding.

Consultee	Date contacted	Date response received	Issue raised	Forest District Response
Scottish Water	08.02.18	07.03.18	Essential that water quality and quantity are protected in all DWPAs – there is potential high risk in the All Coire Ardrain catchment. Take specific account of guidelines relating to peatland areas. Would like further consultation if any new planting of conifer is to occur within the Allt Coire Ardrain catchment. Request that SW guidelines regarding activity near to SW assets be taken into account. Presence of DWPA should be noted in future documentation and SW consulted prior to operations. Scottish Water assets in Inverardran block will require protection. Location of assets should be confirmed prior to operations.	Relevant guidelines regarding protection of water supplies will be followed and reference made to the DWPA during operational planning and SW consulted. No new planting of conifer is anticipated. SW water assets will be identified and afforded protection during operations.
		20.04.20	Requirement to identify and protect assets stressed at final consultation: The raw water intake, raw water main and the 4" potable water main will have to be accurately located and provide a design to Scottish Water for review detailing how abstraction and pipe will be protected during their operations. No works to take place within the vicinity of this pipe without something in writing from Scottish Water confirming it is ok to proceed. All Scottish Water assets potentially affected by the activity should be identified, with particular consideration being given to access roads and pipe crossings. If necessary, local Scottish Water personnel may be able to visit the site to offer advice. All of Scottish Water's processes, standards and policies in relation to dealing with asset conflicts must be complied with.	Assets will be identified and protection measures implemented. Scottish Water to be consulted before any work commences.
BSBI plant recorders	08.02.18	11.02.18	Several unusual or rare plants found in those parts of the Benmore SSSI on FLS land. Wilson's filmy fern present in Allt Coire Clach. Other species may be present elsewhere. Concern regarding naturally regenerating Sitka spruce within SSSI.	Possibility of presence of unusual plant species is recognised. Buffers will be established between non-native conifers and SSSIs at restocking. SSSIs to be managed through plans agreed with SNH.

Consultee	Date contacted	Date response received	Issue raised	Forest District Response
SNH	08.02.18	05.03.18	Potential risk to River Tay SSSI would be addressed by adhering to relevant guidelines. Advise no restocking where current tree planting crosses over Ben More SSSI boundary. Opportunity to pull back the plantation edge from the SSSI to lower the risk of self-seeding invasive trees.	Relevant guidelines to minimise risks to SAC will be followed. Buffer zones to be established adjacent to SSSI and non-native regeneration managed accordingly.
RSPB	08.02.18	05.03.18	Welcome proposals to establish a definitive native woodland restoration area and expansion to native woodlands. Also to manage certain sites for black grouse. Proposals should include measures to maintain and enhance designated sites. Opportunity to increase resilience of Glen Falloch Pinewood SSSI. Enhancing native woodland in the FHN and boundary zones with open ground will favour several bird species including black grouse. Ensuring connectivity of open ground will also improve habitat for black grouse as will ensuring a diversity of age classes in commercial crops. Mark all deer fences where they are constructed to aid tree establishment.	Large areas of native woodland establishment are proposed including Scots pine ecosystems near to Glen Falloch SSSI. New deer fences will be marked where appropriate.
Keilator Farm	08.02.18	05.18	spoke on phone: no major concerns	
Benmore Farm	08.02.18	05.18	spoke on phone: some concerns with boundary fence	FLS will seek to address issues with march fences.
Auchessan	08.02.18	08.02.18	No issues raised	
Auchlyne and Suie Estate	08.02.18	10.02.18	No issues raised	
Balquhidder Deer Management Group	08.02.18	09.03.18	Welcome native woodland extension. Recognise protection from herbivores will be necessary and current difficulties with march fences.	FLS will continue to review deer management options and seek to address issues with march fences.
Portnellan	04.09.18	04.09.18	Concerns regarding nearness of trees to chalet accommodation	Trees close to chalets are due to be felled early in the plan period. A suitable buffer will be established at restocking.
Mountaineering Scotland	08.02.18	none received 27.04.20	 Initial lack of response possibly due to staff changes and re-organisation. Supportive of aspiration to improve natural landscape and reduce deer numbers, preferring culling to fencing. Would appreciate pass gates where fencing is used. Request to maintain parking area at entrance to Inverardran.	 Records updated. A balance will be struck between fencing and culling. Access to open hill will be maintained where possible. Parking area will be retained.

Consultee	Date contacted	Date response received	Issue raised	Forest District Response
Green Highland Renewables Ltd	08.02.18	09.03.18	No issues raised.	
Raptor study group	08.02.18	none received		
Butterfly and moth recorders	08.02.18	none received		
Tay District Salmon Fisheries Board	08.02.18	none received		
Inverhaggernie Farm	08.02.18	none received		
Mountaineering Scotland	08.02.18	none received		
Strathfillan Community Council	08.02.18	none received		
Scottish Wild Land Group	08.02.18	none received		
Sustrans	08.02.18	none received		
Transport Scotland	08.02.18	none received		
SSE	08.02.18	none received		
Scottish Power	08.02.18	none received		
CONFOR	08.02.18	none received		

Appendix II: Scoping record and design brief

Crianlarich Land Management Plan

Scoping was carried out by post and email and a number of stakeholders contacted between October 2017 and September 2018.

A summary of responses is given in Appendix I

An internal meeting was held on 16th January 2018 and a draft set of objectives drawn up. Further advice was taken from operational staff and final objectives reflect the aspirations of both internal and external stakeholders.

Design brief

The objectives of the new plan, which were developed following the internal and external consultation, are summarised overleaf and emphasise the key principals of maintaining the productive potential of the forest whilst delivering a range of other ecosystem services into the future.

- Continue the process of restructuring aiming to create a diverse, resilient forest delivering a range of ecosystem services.
- Establish a definitive ancient woodland restoration area, using this as a framework for restocking proposals.
- Seek to expand native woodlands and integrate these into wider habitat networks.
- Outside the habitat networks maximise production using Sitka spruce as the predominant species in a clearfell management system.
- Establish a coupe structure that takes account of windblow risk on steep slopes, clearfelling before this becomes unacceptable.
- Use climate, site and operational constraints to inform species choice, avoiding productive forestry on sites that might give poor economic returns or are potentially unstable.
- Manage ground within black grouse lek zones to favour that species.
- Manage Benmore SSSI as per updated management plan and keep invasion by SS to within acceptable tolerances.
- Maintain perimeter deer fence and establish a system of deer control appropriate to the species to be established.
- Seek to soften landscape impacts where these are obtrusive.

NB: All forests managed by FLS are certified under the UK Woodland Assurance Scheme (UKWAS), which requires forests to be managed sustainably. The UKWAS is part of the Forest Stewardship Council (FSC) scheme, which allows timber sourced from certified forests to carry the FSC label. Crianlarich FDP will incorporate the various requirements of UKWAS within its proposals.

Appendix III: Quarry development plans

Quarry Name: Benmore **Date: 18/03/19**

Location: Benmore, Crianlarich, Central Region

NGR: NN 4552 2641

Date of Last Appraisal

Current working Plan: Dormant

Variation from Design: No current design plan

Future Design Plan: The intention is to expand the scope of the quarry to produce usable aggregate for the forest road network and general road repairs. This development plan attempts to cover the longer term issues associated with rock production from this quarry while mitigating as much as possible the impact of the development of the rock outcrop, while also maximising the volume of stone that can be recovered.

As can be seen from the aerial photograph (below) the surrounding trees have been clear felled and no restocking has taken place as yet.

At present, there is a perimeter fence surrounding the quarry and a double galvanised gate at the entrance. The existing fence would be removed during the development with the overburden being used to form a perimeter bund. This bund serves two purposes. 1 defines the extent of the quarry development and 2 will be used to assist with the landscaping of the exposed rock once all the useful stone has been quarried.

A cut off drain must be installed on the inside of the perimeter bund to catch any water runoff that has formed on the upper level of the quarry. A cut-off drain will be constructed on the lower level as well. Both drains will connect to a settlement pond where any run off can gather and settle. The settlement pond will connect to the main roadside drains but will have a natural filter in place. This means that once the pond overflows, the water is steadily released and naturally filtered. Please note that the exact location of such features cannot be determined until the over burden has removed and the underlying rock surface has been exposed. It is from there that we identify the most suitable locations for the quarry drainage features.

To assist with access and rock extraction there will be a haul road constructed within the perimeter of the quarry.

Rock extraction will be carried out by drilling and blasting. The rock will then be crushed by mobile rock crushing machinery to make it useable on the forest road network. Crushed rock will be stockpiled within the quarry perimeter and used when required. Blasts will be no greater than 30,000 tonnes at a time, at

frequencies dictated by the new road programme and maintenance requirements.

As time progresses, more of the quarry floor will open up and create a bigger stockpile area.

Existing quarry extends to 0.59 hectares

Proposed quarry development extends a further 1.67 hectares

Proposed final quarry extends to 2.26 hectares. This equates to approx. 3.5% of FES owned land in the Benmore block.

- The area outlined in black shows the extent of the proposed development.
- There will be a perimeter bund constructed using the overburden with a fence and signs erected.
- Over time the overburden will vegetate and act as a screen for the quarry.
- At the entrance there is currently a double gate. This will be maintained and in addition a large threshold sign will be erected.
- The purple line shows the proposed internal haul roads.
- The red hatched area shows the extent of the existing quarry.

With regards to the visual and audible impact of the quarry in the landscape; under normal conditions this would be mitigated by surrounding tree cover.

The location of this site means it is rarely frequented by walkers, cyclists or horse trekkers. The quarry cannot be seen from any public roads or footpaths.

Final Design Plan

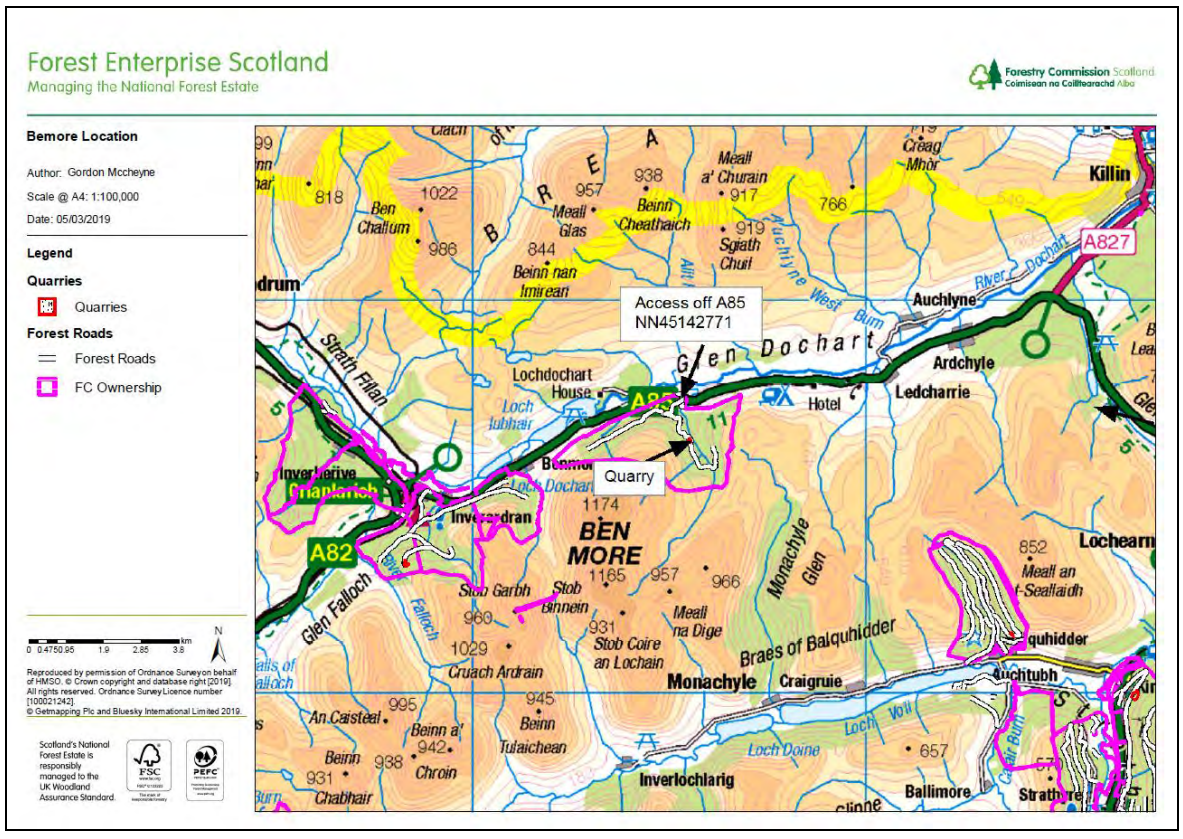
Given the requirements for road stone, this quarry will doubtless be required for the foreseeable future and it is beyond the scope of this review to comment on the final disposition of the quarry. However, in general terms when this quarry has reached the end of its useful life, there will be a blast or series of blasts to remove any high faces, the rock will be left in situ, at a stable angle of repose and the overburden from the perimeter bund will be spread over the rock to encourage vegetation growth.

Name: Gordon McCheyne

Signed: G. McCheyne **.....**

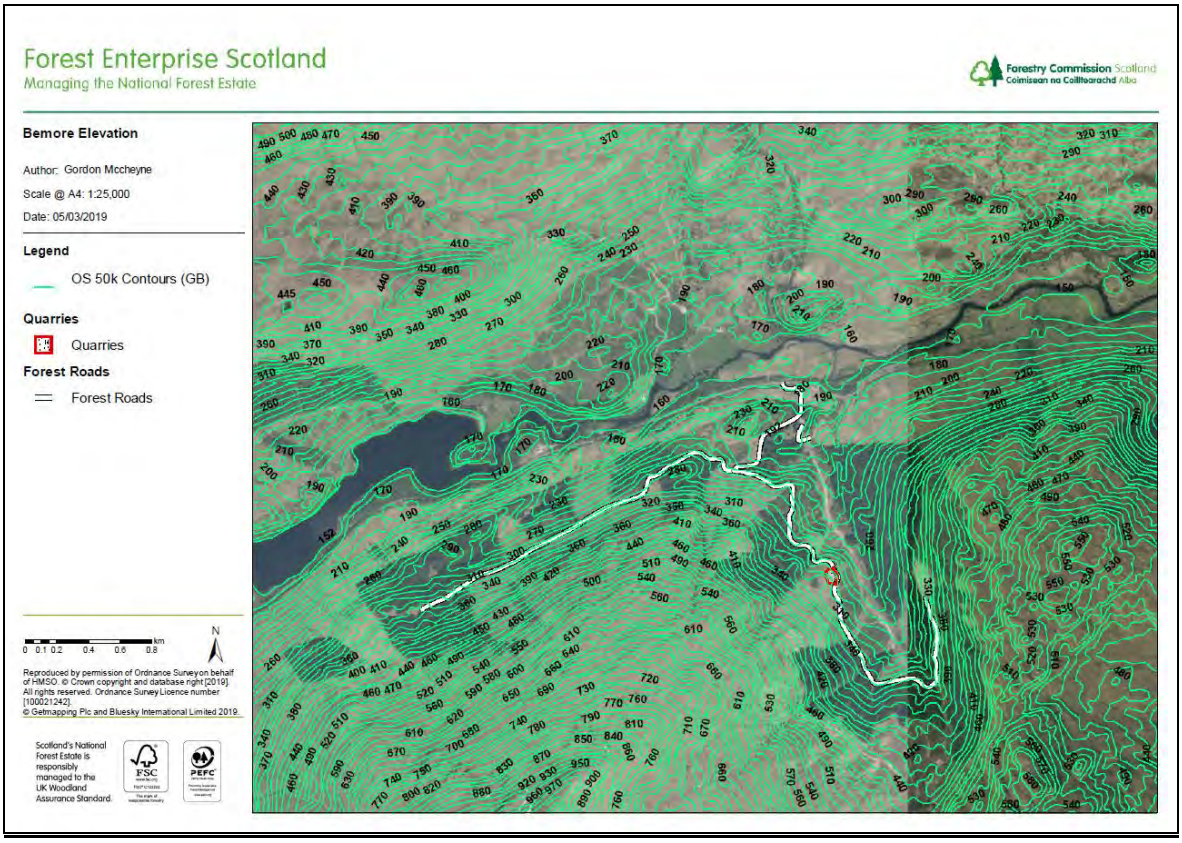
18/03/19

Benmore Quarry – Location

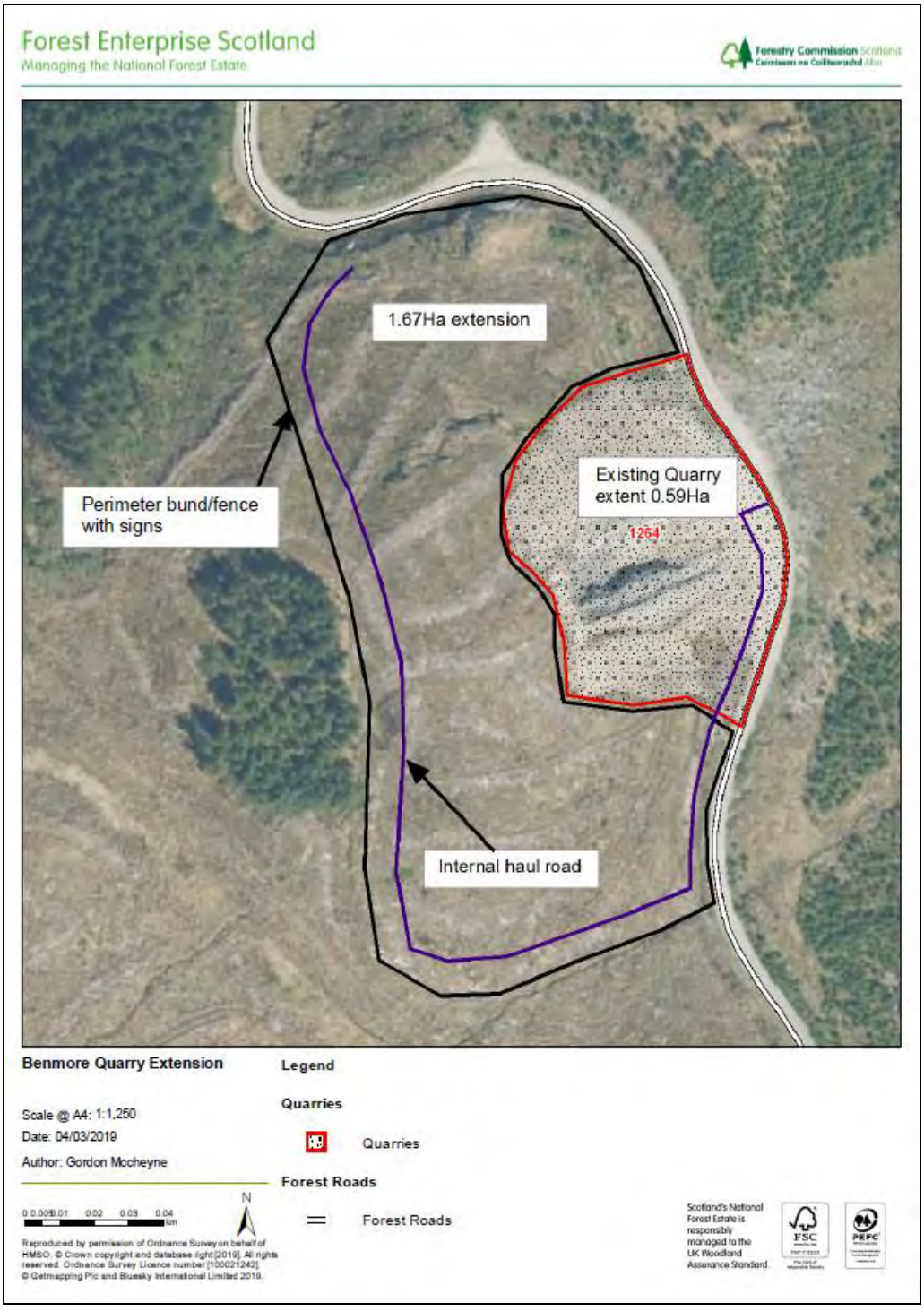


Benmore Quarry Elevation– Aerial Photograph

Aerial Photograph included to show surrounding landscape



Proposed Quarry Design



Existing Quarry Photographs

View of Quarry looking south.

View of Quarry looking north.

Quarry Name: Inverardran **Date: 29/04/19**

Location: Benmore, Crianlarich, Central Region

NGR: NN 4552 2641

Date of Last Appraisal

Current working Plan: Dormant

Variation from Design: No current design plan

Future Design Plan: The intention is to expand the scope of the quarry to produce usable aggregate for the forest road network and general road repairs. This development plan attempts to cover the longer term issues associated with rock production from this quarry while mitigating as much as possible the impact of the development of the rock outcrop, while also maximising the volume of stone that can be recovered.

The existing quarry extends to 0.93 hectares, although not all this area has had mineral removed. Approximately 0.36 hectares serves as access to the current quarry top with approximately 0.57 hectares being quarried.

The proposed quarry development extends a further 2.04 hectares for mineral extraction.

Opposite the quarry is a proposed overburden tip site approx. 0.52 hectares in size. This is where the tree stumps, root plates, soil and vegetative matter will be stored.

The proposed final quarry area, including the tip site extends to 3.59 hectares. This equates to approx. 2.1% of FES owned land in the Benmore block.

Development proposals include safety measures to restrict access to the quarry. These include installation of a galvanised gate at the entrance and one at the foot of the existing access ramp. At the entrance gate a main quarry sign would be erected with smaller signs attached to the perimeter fence posts at approximately 25m intervals. During the overburden stripping operation a perimeter bund would be constructed. This bund serves two purposes. 1 defines the extent of the quarry development and 2 will be used to assist with the landscaping of the exposed rock once all the useful stone has been quarried. A new perimeter fence approximately 900m in length would be erected.

A cut off drain must be installed on the inside of the perimeter bund to catch any water runoff that has formed on the upper level of the quarry. A cut-off drain will be constructed on the lower level as well. Both drains will connect to a settlement pond where any run off can gather and settle. The settlement pond will connect to the main roadside drains but will have a natural filter in place. This means that once the pond overflows, the water is steadily released and naturally filtered. Please note that the exact location of such features cannot be determined until the over burden has removed and the underlying rock surface has been exposed. It is from there that we identify the most suitable locations for the quarry drainage features.

To assist with access and rock extraction there will be a haul road constructed within the perimeter of the quarry. On the plan this has been shown as the pink line. This haul road will also enable harvesting machinery to access and extract timber, and will allow future tree planning access and forest management.

Rock extraction will be carried out by drilling and blasting. The rock will then be crushed by mobile rock crushing machinery to make it useable on the forest road network. Crushed rock will be stockpiled within the quarry perimeter and used when required. Blasts will be no greater than 30,000 tonnes at a time, at frequencies dictated by the new road programme and maintenance requirements. To mitigate against excessively high faces, the quarry will be benched with face highs at a maximum of 12.0m. Where there is a crest and toe, safety bunds will be constructed. Access to the bench(es) will be from the existing and proposed haul roads.

As time progresses, more of the quarry floor will open up and create a bigger stockpile area.

- The hatched area outlined in red shows the extent of the proposed development. There will be a perimeter bund constructed using the overburden with a fence and signs erected. Over time the overburden will vegetate and act as a screen for the quarry.
- The pink line shows the proposed internal haul roads.
- The blue line shows the existing haul road
- The hatched area in brown shows the extent of the proposed tip site
- The hatched area in black shows the extent of the existing quarry.

With regards to the visual and audible impact of the quarry in the landscape; under normal conditions this would be mitigated by surrounding tree cover.

The location of this site means it is rarely frequented by walkers, cyclists or horse trekkers.

Final Design Plan

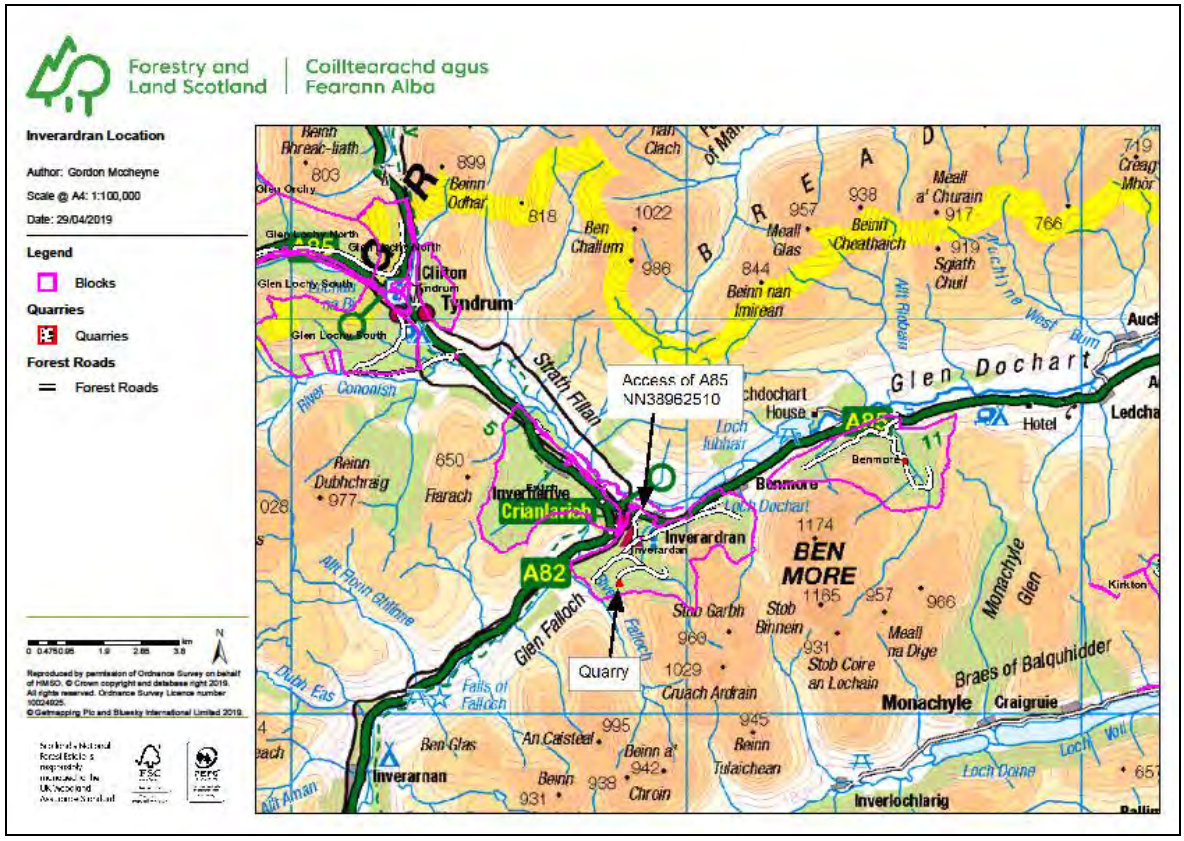
Given the requirements for road stone, this quarry will doubtless be required for the foreseeable future and it is beyond the scope of this review to comment on the final disposition of the quarry. However, in general terms when this quarry has reached the end of its useful life, there will be a blast or series of blasts to remove any high faces, the rock will be left in situ, at a stable angle of repose and the overburden from the perimeter bund will be spread over the rock to encourage vegetation growth.

Name: Gordon McCheyne

Signed: .  **.**

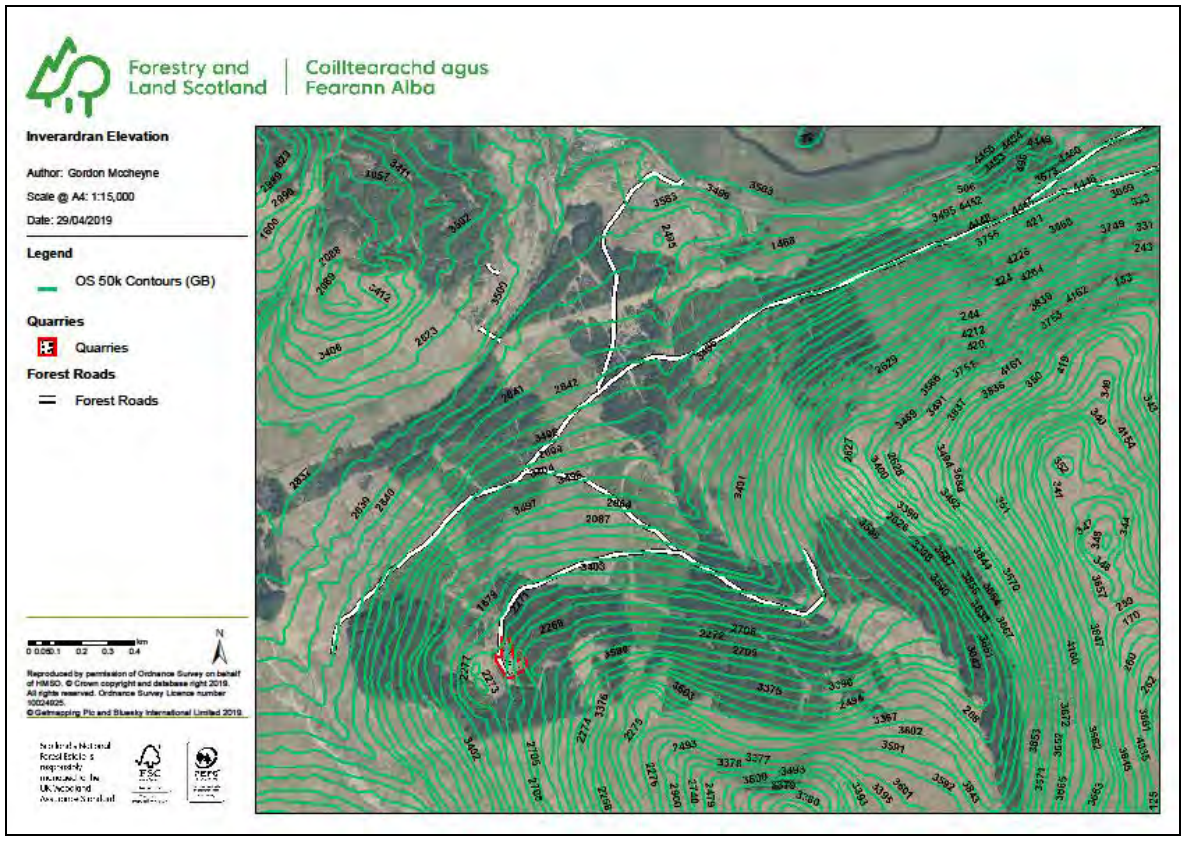
29/04/19

Inverardran Quarry – Location

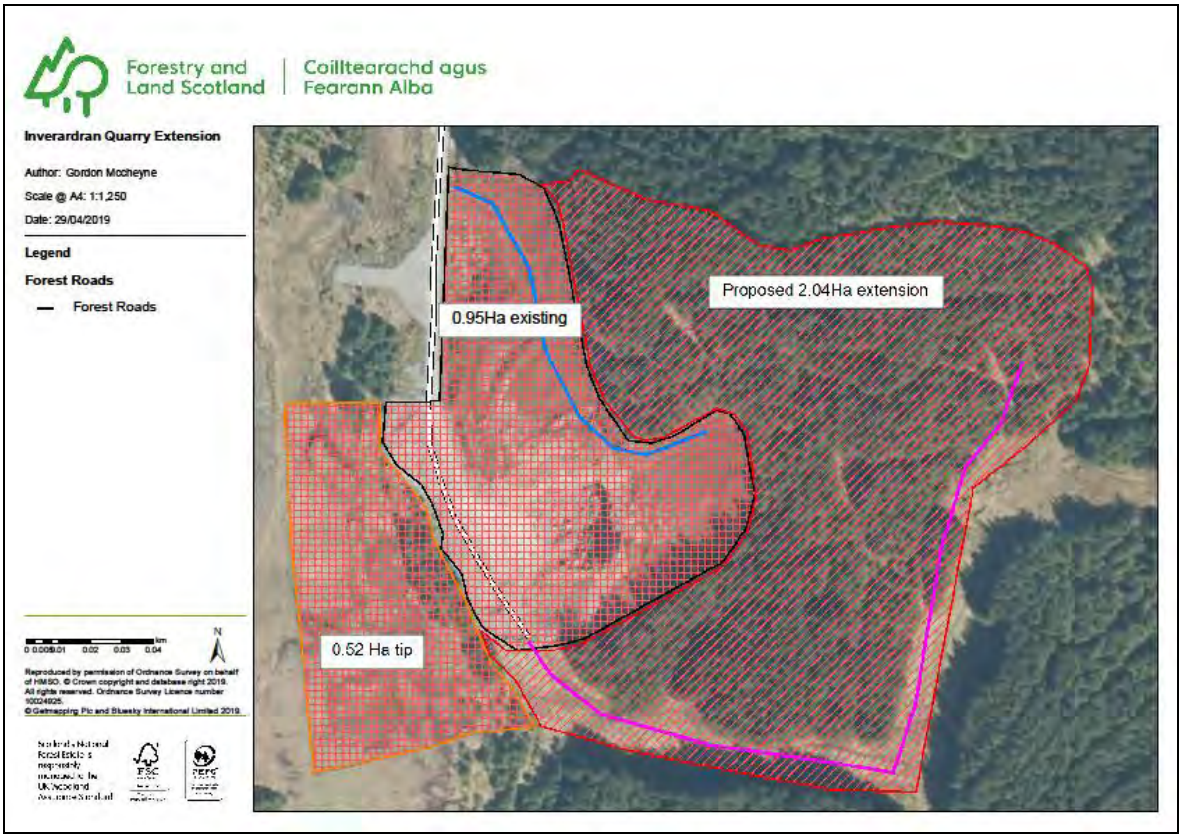


Inverardran Quarry Elevation– Aerial Photograph

Aerial Photograph included to show surrounding landscape



Proposed Quarry Design



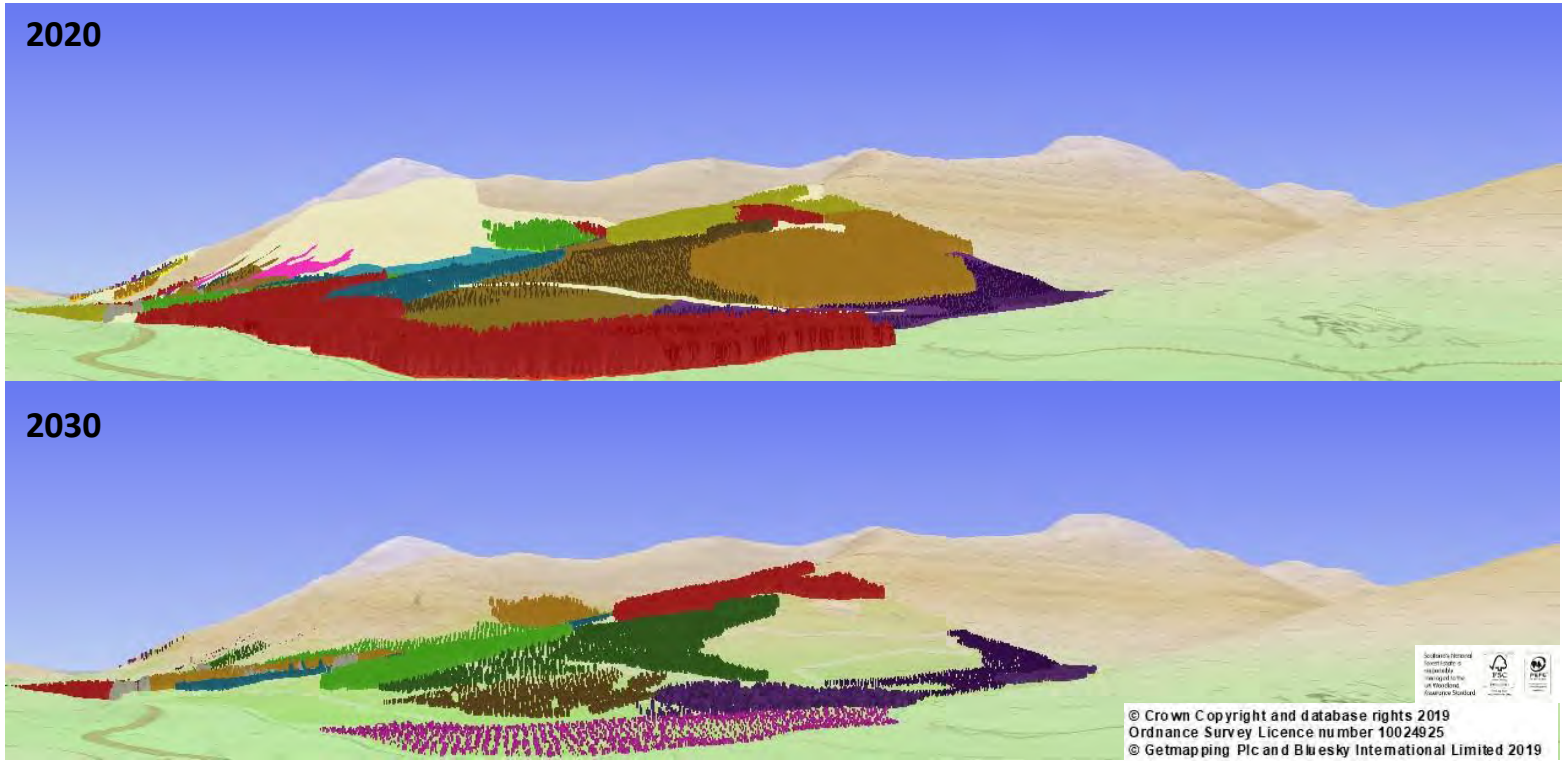
Existing Quarry Photographs

Internal view

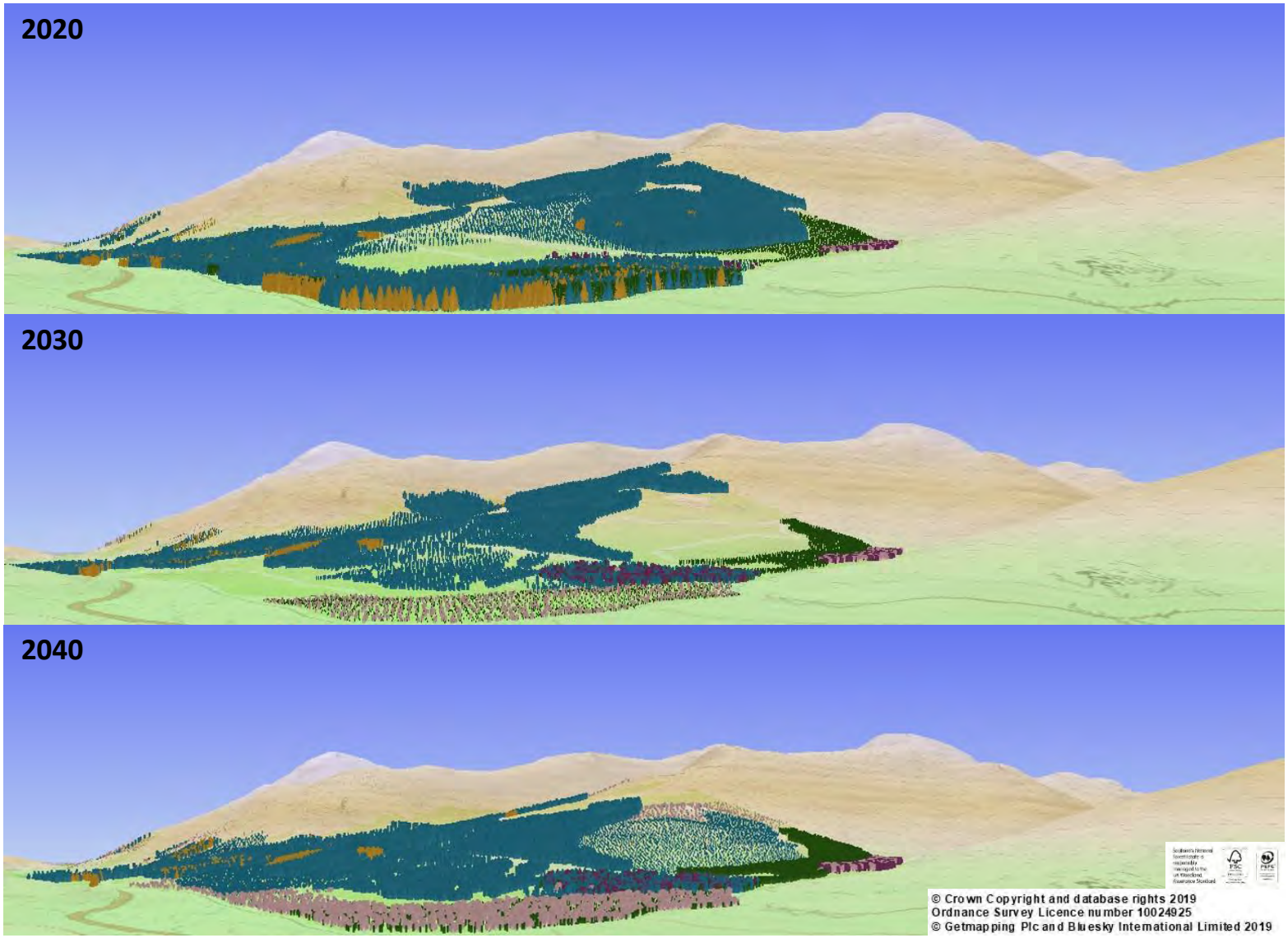
View from West Highland Way

Inverardran Quarry from the West Highland Way at grid reference NN363238

Felling

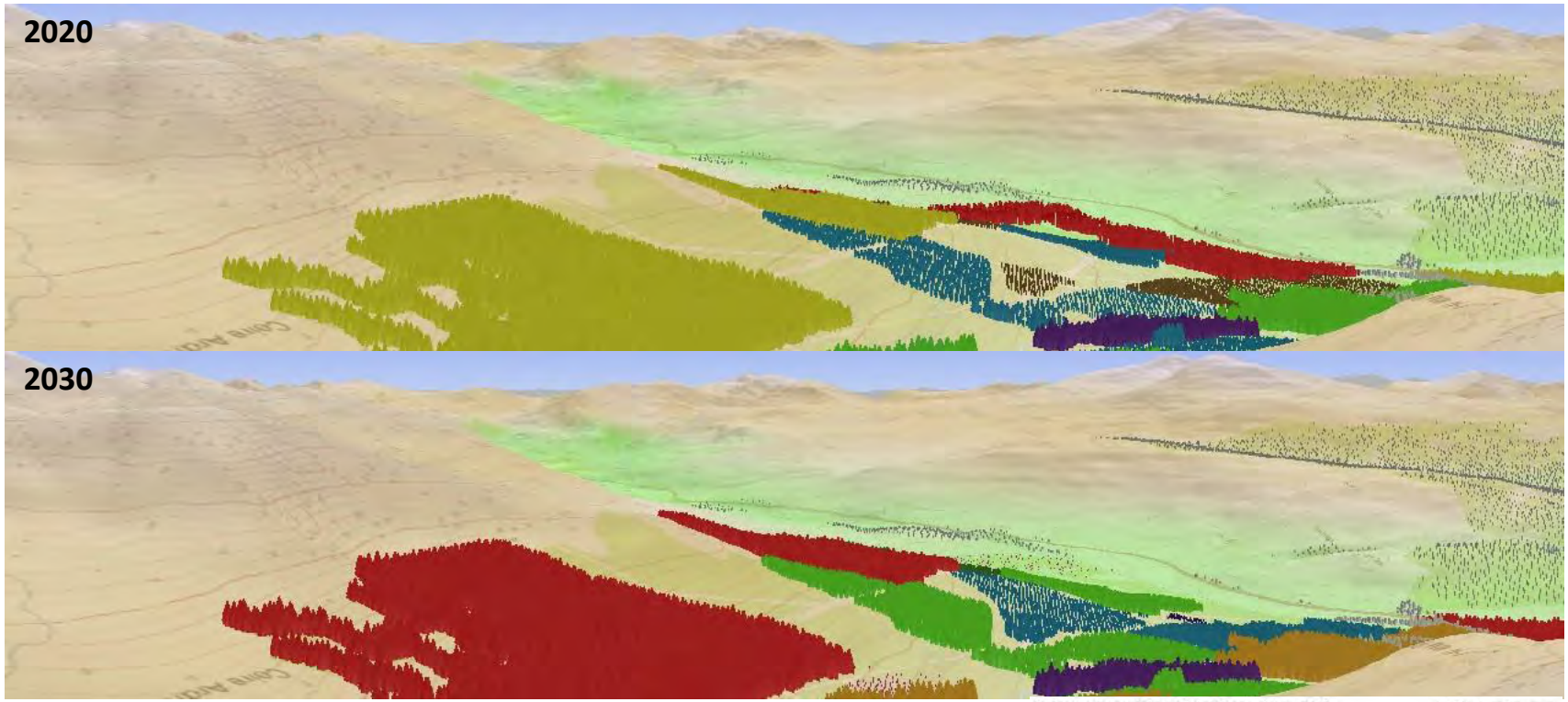


Tree species

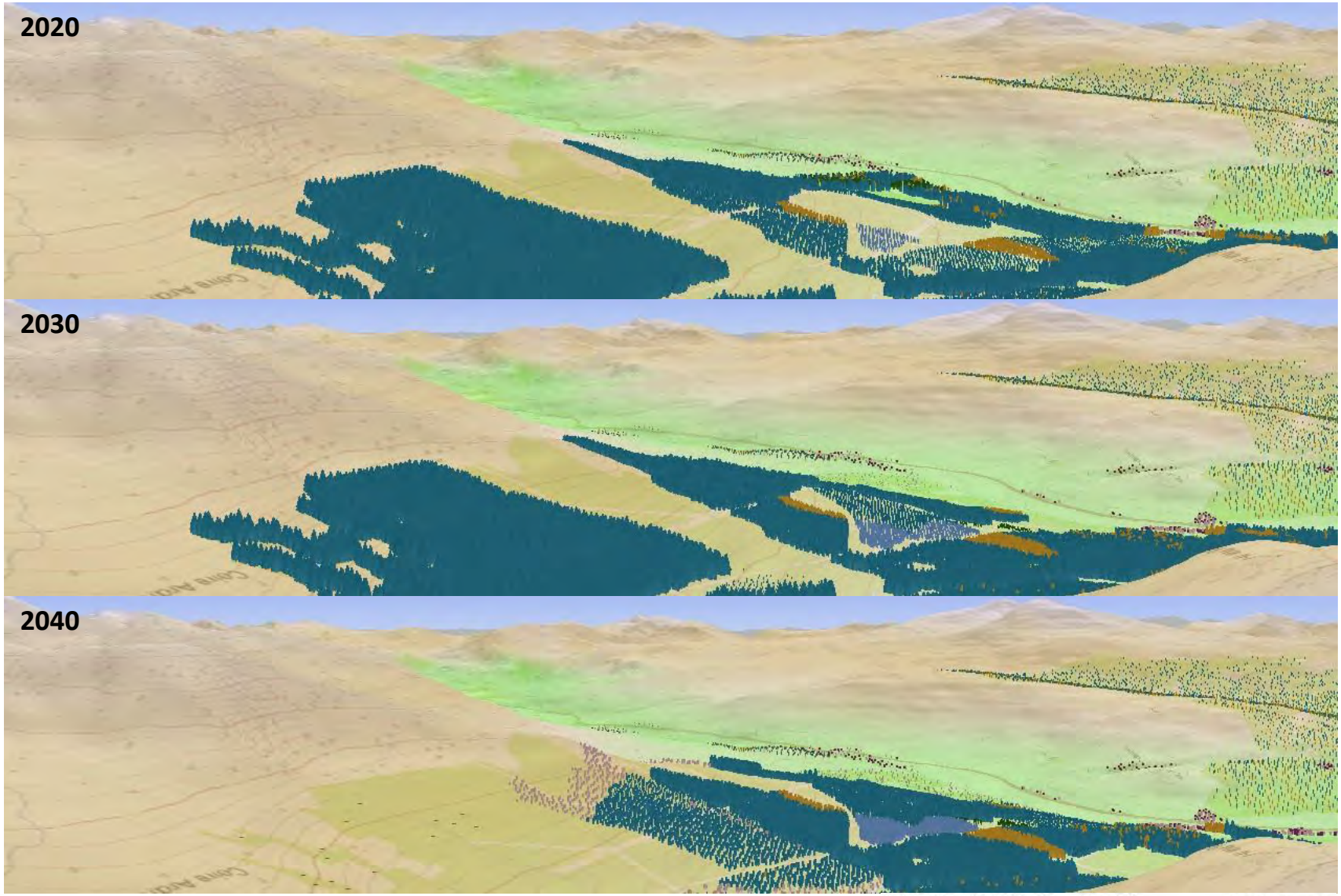


Inverardran Quarry from the north east ridge of Cruach Ardrain at grid reference NN405237

Felling



Tree species



Appendix IV: Summary of operations

Section	Coupe	Fell Year	Phase	Gross Area	Felling		Establishment			
					Species	Net Area	Species	P/NR	Year	Area
Benmore	57001	2025	2	8.6	SS	4.1	NW	NR	2030	4.3
					NS	1.0	Open			4.3
					LP	0.4				
					JL	1.3				
					NF	0.5				
	57002	2020	1	13.6	SS	10.7	NW	NR	2025	9.5
					JL	1.8	Open			4.1
	57003	2025	2	8.9	SS	6.9	NW	P	2027	6.2
					JL	0.6	Open			2.7
	57004	pre 2020	na	11.8	na	na	NW	P	2022	8.3
							Open			3.5
	57005	pre 2020	na	11.6	na	na	NW	P	2022	8.1
							Open			3.5
	57006/ 57106	pre 2020	na	14.3	na	na	NW	P	2022	10.0
							Open			4.3
	57009/ 57091	pre 2020	na	17.0	na	na	NW	NR	2025	8.5
							Open			8.5
	57010	2025	2	20.0	SS	11.5	SS	P	2027	14.8
					JL	1.0	NW	NR	2030	2.6
					WH	0.2	Open			2.6
	57014	2022	1	11.6	SS	8.1	SS	P	2024	3.3
					NS	0.2	NW	P	2024	6.3
					JL	0.4	Open			2.0

Summary of operations continued

Section	Coupe	Fell Year	Phase	Gross Area	Felling		Establishment			
					Species	Net Area	Species	P/NR	Year	Area
Benmore	57018	pre 2020	na	11.9	na	na	SS	P	2021	3.1
							NW	NR	2023	5.3
							Open			3.5
	57023	pre 2020	na	14.0	na	na	SS	P	2022	4.6
							NW	NR	2025	4.5
							Open			5.0
	57025	2029	2	13.3	SS	7.9	SS	P	2031	7.3
					JL	1.8	NW	NR	2034	2.0
					WH	0.2	Open			4.0
	57028	2020	1	28.9	SS	24.2	SS	P	2022	16.2
					JL	0.7	NW	NR	2025	6.1
							Open			6.6
	57029	2022	1	20.1	SS	16.5	SS	P	2024	12.5
					LP	0.1	NW	NR	2027	3.7
					JL	2.7	Open			3.9
	57031	2022	1	20.1	SS	14.9	SS	P	2024	12.5
					LP	0.1	NW	NR	2027	4.3
					JL	2.6	Open			3.3
	57093/94	pre 2020	na	14.1	na	na	NW	NR	2025	6.8
							Open			7.3
	57113/ 57115	pre 2020	na	9.4	na	na	NW	NR	2025	6.2
							Open			3.2

Summary of operations continued

Section	Coupe	Fell Year	Phase	Gross Area	Felling		Establishment			
					Species	Net Area	Species	P/NR	Year	Area
Inverardran	58001	2022	1	16.1	SS	6.1	SP	NR	2027	4.8
					LP	4.2	NW	P/NR	2027	6.4
					JL	2.9	Open			4.8
	58004	2022	1	18.7	SS	14.1	SS	P	2024	11.5
					LP	0.3	MC	P	2024	1.3
					JL	2.0	NW	NR	2027	1.7
							Open			4.2
	58012	2025	2	19.6	SS	17.5	SS	P	2027	12.8
					JL	0.6	NW	NR	2030	4.1
							Open			2.7
	58018	2029	2	6.7	SS	5.6	SS	P	2031	4.9
					JL	0.8	MC	P	2031	0.6
					HL	0.2	Open			1.2
	58025	2023	1	16.9	SS	13.5	SS	P	2025	8.5
							NW	NR	2028	1.7
							Open			6.7
	58027	2020	1	19.2	SS	16.7	SS	P	2022	9.7
							NW	NR	2025	4.4
							Open			5.1
	58029	pre 2020	na	13.0	na	na	SS	P	2022	8.6
							MC	P	2022	2.1
							NW	NR	2025	1.0
							Open			1.3
	58032	pre 2020	na	7.8	na	na	NW	NR	2022	2.0
							Open			5.8

Summary of operations continued

Section	Coupe	Fell Year	Phase	Gross Area	Felling		Establishment			
					Species	Net Area	Species	P/NR	Year	Area
Inverardran	58033	2021	1	6.1	SS	3.1	NW	NR	2026	2.9
					LP	0.5	Open			3.2
					JL/HL	1.9				
	58042	2023	1	9.1	SS	7.8	SS	P	2025	5.1
					LP	0.3	MC	P	2025	0.7
					JL	0.1	NW	NR	2028	0.3
							Open			3
	58044	2024	1	14.9	SS	11.3	SS	P	2026	7.7
							NW	NR	2029	3.4
							Open			3.8
	58046	2029	2	21.3	SS		SS	P	2031	13.3
							NW	NR	2034	2.4
							Open			5.6
	58060	2023	1	15.5	SS	12.0	SS	P	2025	7.3
					LP	2.0	MC	P	2025	1.8
					JL	0.4	NW	NR	2028	1.9
							Open			4.5
	58141	2023	1	1.6	HL	0.7	NW	NR	2028	0.8
							Open			0.8

clearfell	**310.8**		**247.5**	**SS**	**163.7**
restock only	**124.9**		**na**	**MC**	**6.5**
gross	**435.7**	**net felled**	**247.5**	**SP**	**4.8**
				NW	**135.7**
				Open	**125.0**
				gross	**435.7**