

Red John Pump Storage Scheme 275kV Connection

Consultation Document

April 2022



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GLOSSARY

Term	Definition
Above Ordnance Datum (AOD)	The term 'Ordnance Datum' refers to the height of mean sea level. Therefore, Above Ordnance Datum, means above the height of mean sea level.
Alignment	A centre line of an overhead line route, along with location of key angle structures.
Amenity	The natural environment, cultural heritage, landscape, and visual quality. Also includes the impact of SSEN Transmission's works on communities, such as the effects of noise and disturbance from construction activities.
Ancient Woodland	Woodland which has been in continuous existence since before 1750 in Scotland and is important for biodiversity and cultural identity. Ancient semi-natural woodland is Ancient Woodland composed of mainly locally native trees and shrubs that derive from natural seed fall or coppice rather than from planting.
BNG	Biodiversity Net Gain
Centre Line	The linear connection between the central point of each support structure along the length of the overhead line.
Circuit	Overhead line or underground cable consisting of multiple conductors, to carry electric current.
Commercial Forestry	Planting, maintaining and growing trees for commercial production of timber.
Conductor	A metallic wire strung from structure to structure, to carry electric current.
Consultation	The dynamic process of dialogue between individuals or groups, based on a genuine exchange of views and, normally, with the objective of influencing decisions, policies, or programmes of action.
Corridor	A linear area which allows a continuous connection between the defined connection points. The corridor may vary in width along its length; in unconstrained areas it may be many kilometres wide.
Desk-based Assessment	A desktop appraisal using existing information available.
European Protected Species	Species of plants and animals protected by law throughout the European Union.
Environmental Impact Assessment (EIA)	A formal process set down in The Electricity Works (EIA) (Scotland) Regulations 2000 (as amended in 2008) used to systematically identify, predict, and assess the likely significant environmental impacts of a proposed project or development.
Gardens and Designed Landscape (GDL)	The Inventory of Gardens and Designed Landscapes lists those gardens or designed landscapes which are considered by a panel of experts to be of national importance.
Geographical Information Systems (GIS)	A spatial system that creates, manages, analyses, and maps all types of data.
GWDTE	Groundwater Dependent Terrestrial Ecosystem
Habitat	Term most accurately meaning the place in which a species lives, but also used to describe plant communities or agglomerations of plant communities.
Indicative Proposed Alignment	An alignment for the overhead line identified following public consultation that is taken forward to EIA and detailed design.
Kilovolt (kV)	One thousand volts.
Listed Building	Building included on the list of buildings of special architectural or historic interest and afforded statutory protection under the 'Planning (Listed Buildings and

Term	Definition
	Conservation Areas) (Scotland) Act 1997' and other planning legislation. Classified categories A – C(s).
Local Nature Conservation Site (LNCS)	LNCSs identify locally important natural heritage that could be damaged by development.
Major Crossing	Major crossings include other electric lines of 132kV and above, railways, rivers/loch (200m+), navigable watercourses, motorways and other major roads, and major pipelines.
Minor Crossing	Minor crossings include all road crossing and minor watercourses not considered major. Private tracks and driveways may also be considered where the need for access to be maintained is present, or where relatively high traffic volumes are anticipated.
Mitigation	Term used to indicate avoidance, remediation, or alleviation of adverse impacts.
National Scenic Area (NSA)	A national level designation applied to those landscapes considered to be of exceptional scenic value.
Operational Corridor	The area needed for operational maintenance.
Ordnance Survey (OS)	Ordnance Survey is the national mapping agency for Great Britain.
Overhead Line (OHL)	An electric line installed above ground, usually supported by lattice steel towers or trident wood poles.
Preferred Alignment	An alignment for the overhead line taken forward to stakeholder consultation following a comparative appraisal of route options.
Proposed Alignment	An alignment taken forward to consent application. It comprises a defined centre line for the overhead line and includes an indicative support structure (tower or pole) schedule, also specifying access arrangements and any associated construction facilities.
Proposed Development	The construction and operation of an underground connection from the consented Red John 275kV Switching Station to the existing Knocknagael 275kV Substation which includes a site extension for the Knocknagael Substation.
RAG	Red/Amber/Green, rating applied for the comparative appraisal.
Report on Consultation Document	A report that documents the result of a consultation process.
Route	A linear area of approximately 1 km width (although this may be narrower/wider in specific locations in response to identified pinch points / constraints), which provides a continuous connection between defined connection points.
Routeing	The work undertaken which leads to the selection of a proposed alignment, capable of being taken forward into the consenting process under Section 37 of the Electricity Act 1989.
Royal Society for the Protection of Birds (RSPB)	The RSPB is a charitable organisation founded in 1889. It works to promote conservation and protection of birds and the wider environment.
Scheduled Monument	A monument which has been scheduled by the Scottish Ministers as being of national importance under the terms of the 'Ancient Monuments and Archaeological Areas Act 1979'.
Scottish Environment Protection Agency (SEPA)	Scottish Environmental Protection Agency is Scotland's environmental regulator and national flood forecasting, flood warning and strategic flood risk management authority.

Term	Definition
Semi-natural Woodland	Woodland that does not obviously originate from planting. The distribution of species will generally reflect the variations in the site and the soil. Planted trees must account for less than 30% of the canopy composition
Sites of Special Scientific Interest (SSSI)	Areas of national importance. The aim of the SSSI network is to maintain an adequate representation of all natural and semi-natural habitats and native species across Britain.
Special Area of Conservation (SAC)	An area designated under the EC Habitats Directive to ensure that rare, endangered, or vulnerable habitats or species of community interest are either maintained at or restored to a favourable conservation status.
Special Protection Area (SPA)	An area designated under the Wild Birds Directive (Directive 74/409/EEC) to protect important bird habitats. Implemented under the Wildlife and Countryside Act 1981.
SSEN Transmission	Scottish and Southern Energy Networks Transmission, operating under licence held by Scottish Hydro Electric Transmission plc (SHET plc).
Stakeholders	Organisations and individuals who can affect or are affected by SSEN Transmission works.
Study Area	The area within which the corridor, route and alignment study takes place.
Substation	Part of the electrical transmission and distribution system that transforms voltage from high to low, or the reverse, before switching to another electricity network.
The National Grid	The electricity transmission network in the Great Britain.
Underground Cable (UGC)	An electric line installed below ground.
Volts	The international unit of electric potential and electromotive force.

PREFACE

This Consultation Document has been prepared by ERM on behalf of Scottish and Southern Electricity Networks Transmission (SSEN Transmission), operating under licence held by Scottish Hydro Electric Transmission plc, to seek comments from all interested parties on the Red John Pump Storage Scheme Grid Connection.

The Consultation Documents are available online at:

<https://www.ssen-transmission.co.uk/projects/red-john-pump-storage-scheme-275kv-connection/>

The **public consultation** event detailing the proposals described in this document will be held at the following time:

- Thursday 28th April 2022: Victoria Room, Lochardil House Hotel, Stratherrick Road, Inverness, IV2 4LF; 14:00 – 19:00.

Comments on this Consultation Document should be sent to:

Ryan Davidson

Scottish Hydro Electric Transmission

1 Waterloo Street,

Glasgow G2 6AY

Email: ryan.davidson@sse.com

All comments are requested by Friday 27th May 2022.

EXECUTIVE SUMMARY

SSEN Transmission is proposing to construct and operate an underground cable connection from the consented Red John 275kV Switching Station associated with the consented 450MW Red John pump storage scheme to the existing Knocknagael 275kV Substation which includes a site extension for the Knocknagael Substation (the 'proposed development').

This Consultation Document invites comments from all interested parties on the three Route Options and five Site Options under consideration. The route and site options are appraised against environmental, engineering and cost criteria.

The key environmental considerations for the routes considered in this report are potential to impact on qualifying feature species for the Loch Ashie SPA and SSSI, impact on peatland habitats, impacts on semi-natural ancient woodland, impacts on non-designated heritage and visual impacts. From an environmental, engineering and economic perspective Route B is preferred. This is because it has lower potential for impacts to sensitive habitat including peat, blanket bog and forestry, as well as a lower potential to impact agriculture and is located further from residential properties. It is also the most direct and shortest route and therefore it is anticipated it will have few construction and operational costs.

The key environmental considerations for the sites considered in this report are impacts on ancient woodland and Groundwater Dependent Terrestrial Ecosystems (GWDTE), effects on cultural heritage assets, landscape character and visual impacts. As the electrical extension of Knocknagael will occur using overhead AIS equipment, which requires a close connection to the existing busbar sets, only Options 1 and 3 would be practical for the extension of the site. Economically, Options 1 and 3 allow a technically feasible connection into the existing substation without the need for significant engineering works to the existing electrical infrastructure.

Route B is selected as the preferred route and Options 1 and 3 together are selected as the preferred site.

The proposed connection requires a firm connection into Knocknagael Substation meaning that each of the two proposed circuits will need to be connected on either side of the bus section. This requirement dictates that the existing substation needs to be extended on two sides to allow the appropriate connection.

A consultation event will be held in April 2022 and further consultation will be arranged with statutory and other stakeholders. The responses received, and those sought from statutory consultees and other key stakeholders will inform further consideration and design leading to the identification of a proposed route and site to take forward to the alignment, site selection and consenting stages.

When providing comments and feedback on this Consultation Document, SSEN Transmission would be grateful for your consideration of the questions below:

- Have we explained the need for this Project adequately?
- Have we explained the approach taken to select the preferred route and sites adequately?
- Are there any factors, or environmental features, that you consider may have been overlooked during the preferred route and site selection process?
- Do you feel, on balance, that the preferred route and sites selected are the most appropriate for further consideration at the alignment stage and next stage of site selection?
- Do you have any particular concerns or queries on the proposed connection project?

1. INTRODUCTION

1.1 Purpose of the Document

SSEN Transmission is proposing to construct and operate an underground connection from the consented Red John 275kV Switching Station to the existing Knocknagael 275kV Substation and also a site extension to the Knocknagael Substation (the 'proposed development'). This Consultation Document invites comments from all interested parties on both of the three Route Options and five Site Options under consideration (see Figure 1 and 5 in Appendix A respectively).

This document presents the findings of an environmental, engineering and economic appraisal of the three route options and five site options identified by SSEN Transmission, and describes the process by which a preferred route and site has been selected. The preferred route and site are considered to provide the optimal opportunity to achieve an economically viable, technically feasible and environmentally sound alignment within it.

1.2 Document Structure

This Consultation Document comprises the following sections:

- Section 1: Introduction
- Section 2: Project Overview – describes the project need, the project overview, and consultation history;
- Section 3: Route Selection Process – describes the process for selecting the route, based on environmental, engineering, and economic considerations;
- Section 4: Description of Routes – describes the identification of Route Options and provides a summary of each Route Option (A, B and C);
- Section 5: Comparative Appraisal – a summary of the environmental, engineering and economic topics, followed by a comparative analysis summary and a description of the Preferred Route;
- Section 6: Site Selection Process – describes the process for selecting the site, based on environmental, engineering, and economic considerations;
- Section 7: Description of Sites – describes the identification of Site Options and provides a summary of each Site Option (Options 1, 2, 3, 4 and 5);
- Section 8: Comparative Appraisal – a summary of the environmental, engineering and economic topics, followed by a comparative analysis summary and a description of the Preferred Site; and
- Section 9: Consultation on the Proposals – invites comments on the preferred option process, the identification of preferred route/site and next steps.

1.3 Next Steps

As part of the consultation exercise, comments are sought from members of the public, statutory consultees, and other stakeholders on the preferred route option put forward in this report.

A Report on Consultation will be published after the consultation period has ended, which will document the consultation responses received, and the decisions made considering these responses to select a Proposed Route and Site. The Proposed Route will go forward to Alignment Selection, Stage 3 (see Section 3.1). The Proposed Site will go forward to Site Selection, Stage 2.

Further engineering and environmental studies will be undertaken to identify a Preferred Alignment within the Proposed Route. Consultation on a Preferred Alignment will be undertaken in Summer 2022.

Upon completion of the alignment selection process, an Indicative Proposed Alignment will be selected and further technical and environmental assessment will be undertaken. This will culminate with an application to The Highland Council for consent for the construction and operation of the Knocknagael substation extension under the Town and Country Planning (Scotland) Act 1997 (as amended). The underground cable (UGC) will benefit

from Permitted Development rights as set out under Class 40 1(a) of The Town and Country Planning (General Permitted Development) (Scotland) Order 1992 (TCP GDPO) and does not require planning permission.

The intention is to submit the application for consent for the substation extension in Spring 2023.

2. PROJECT OVERVIEW

2.1 The Need for the Project

SSEN Transmission is a wholly owned subsidiary of the SSE plc group of companies. SSEN Transmission owns and maintains the electricity transmission network across the north of Scotland and holds a licence under the Electricity Act 1989 to develop and maintain an efficient, co-ordinated and economical system of electricity transmission.

The consented Red John 450MW Pumped Storage (hydro) Scheme requires connection to the Scottish and Southern Electricity Network's (SSEN) electricity network at Knocknagael substation by 2027.

2.1.1 Red John Pumped Storage (hydro) Scheme Grid Connection

Due to the developer wanting certainty as to the consenting process, they have decided to pursue an underground cable route (the Proposed Development) from the Red John development to the substation at Knocknagael. This work can be undertaken via Permitted Development (PD) Rights as set out in under Class 40 1(a) of The Town and Country Planning (General Permitted Development) (Scotland) Order 1992 (TCP GDPO) and does not require planning permission.

2.1.2 Knocknagael Substation Extension

As part of the works required to connect the Red John generation into the wider grid, it is necessary to undertake a substation extension at Knocknagael. The works will involve an extension of the existing footprint of the substation at Knocknagael within two distinct areas. The proposed connection requires a firm connection meaning that each of the two proposed circuits will need to be connected on either side of the bus section. This requirement dictates that the existing substation needs to be extended on two sides to allow the appropriate connection. The proposed development is in line with SSEN Transmission's commitment and licence obligation to facilitate the connection of renewable generators to the grid through an economical, efficient and coordinated approach to transmission reinforcement.

2.2 Proposals Overview

2.2.1 Red John Pumped Storage (hydro) Scheme Grid Connection

A full underground cable solution is proposed to mitigate the following issues:

- Landscape and visual impacts;
- Impact to bird species associated with the nearby Loch Ashie SPA; and
- The additional complexity of consenting an overhead line.

Construction Activities

Key tasks during construction of underground cable (UGC) will involve:

- Enabling work (e.g. forestry clearance, public road improvements and establishment of temporary works such as construction drainage and site compound/welfare);
- Construction of permanent and temporary access roads and drainage;
- Excavation of cable trench;
- Installation of electrical equipment;
- Installation of cable ducts and joint bays;
- Inspections and commissioning; and
- Removal of temporary works and site reinstatement.

Access During Construction

The access strategy has not yet been determined. Where possible, existing access tracks will be used and upgraded as required. New access tracks may be required and where there is a justified long-term requirement, they will be left in place. Where ground conditions permit, it is preferable to construct the infrastructure without an access track (e.g. on dry and level pasture). Temporary matting may be used in sensitive areas subject to an assessment of gradients and ground conditions.

New access tracks (permanent or temporary) would generally be constructed using a geotextile, with approximately 200 mm of crushed and compacted stone laid on top. Tracks may be floated over areas of peat, or may use cut and fill approaches, subject to ground conditions and gradients.

Forestry Removal

Construction of the Proposed Development would require the removal of sections of forestry, which would be undertaken in consultation with Scottish Forestry and affected landowners.

After felling, any timber removed that is commercially viable would be sold and the remaining forest material would be dealt with in a way that delivers the best practicable environmental outcome and is compliant with waste regulations.

An operational corridor would be required to enable the safe operation and maintenance of the UGC. This will vary depending on the type of woodland (based on species present) in proximity to the UGC.

Biodiversity Net Gain

SSEN Transmission has a target to achieve No Net Loss (NNL) on all projects gaining consent from April 2020 and Net Gain (NG) on projects gaining consent from April 2025.

As part of the route optioneering process, a Biodiversity Net Gain (BNG) assessment has been undertaken against each route option presented within this report. A summary is provided in each section and the full BNG report with analysis of Biodiversity Habitat Units, Biodiversity Habitat Units per hectare and the area of each habitat within each route option.

Programme

The programme for the Project is currently under development, an indicative programme is as follows:

- Construction Start: November 2024; and
- Construction complete and UGC operational: July 2027.

2.2.2 Knocknagael Substation Extension

Construction Activities

Key tasks during construction of the substation are as follows:

- Enabling work (e.g. forestry clearance, public road improvements and establishment of temporary works such as construction drainage and site compound/welfare);
- Construction of cut/fill to provide a level platform;
- Construction of permanent access roads and drainage;
- Construction of civil engineering infrastructure;
- Installation of mechanical/electrical equipment;
- Inspections and commissioning; and
- Removal of temporary works, landscape design implementation (if required) and site reinstatement.

Access During Construction

The access strategy has not yet been determined. Where possible, existing access tracks will be used and upgraded as required. New access tracks may be required and where there is a justified long term requirement, they will be left in place. Where ground conditions permit, it is preferable to construct the infrastructure without an access track (e.g. on dry and level pasture). Temporary matting may be used in sensitive areas subject to an assessment of gradients and ground conditions.

New access tracks (permanent or temporary) would generally be constructed using a geotextile, with approximately 200 mm of crushed and compacted stone laid on top. Tracks may be floated over areas of peat, or may use cut and fill approaches, subject to ground conditions and gradients.

Programme

The programme for the Project is currently under development, an indicative programme is as follows:

- Construction Start: November 2024; and
- Operation: July 2027.

3. ROUTE SELECTION PROCESS

3.1 Guidance Documents

The approach to route selection is informed by the following SSEN Transmission guidance:

- Procedures for Routeing Overhead Lines and Underground Cables of 132kV and above, SSEN Transmission, 2020 (PR-NET-ENV-501) (Routeing Guidance); and
- Biodiversity Net Gain Flow Chart, Guidance and Project Toolkit (FC-NET-ENV-500).

The guidance develops a process which aims to balance environmental, technical and economic considerations throughout a staged route options process.

The principal routeing stages are:

- Stage 0: Routeing Strategy Development;
- Stage 1: Corridor Selection;
- Stage 2: Route Selection; and
- Stage 3: Alignment Selection.

For certain projects, such as Red John Pumped Hydro Storage Scheme Grid Connection, Stage 1 is not required due to the small scale of the project. As a result, this consultation document presents the appraisal completed at Stage 2 – Route Selection.

In consideration of the above, the method of identifying a preferred route option in this study has involved the following four key tasks:

- Identification of the baseline;
- Identification of alternative route options;
- Environmental, technical and economic analysis of route options; and
- Identification of a preferred route option.

3.2 Area of Search

The area of search is between a proposed connection point within the proposed Red John Pumped Hydro Storage Scheme (approx. grid reference NH60652 34088), and the existing Knocknagael substation (approx. grid reference NH65235 39105). The route has been assessed against the routeing guidance to identify potential environmental impacts ahead of the alignment stage. The route options can be viewed in Appendix A, Figure 1.

3.3 Baseline Conditions

The following information sources have informed the desk based baseline study to identify potential environmental constraints within and adjacent to the route. The study area applied for natural heritage features was 20 km, for landscape and visual 15 km, and cultural heritage 2 km.

- Identification of environmental designated sites and other constraints, utilising GIS datasets available via NatureScot Site Link¹ and other sources. These include:
 - Special Areas of Conservation (SAC);
 - Special Protection Areas (SPA);
 - Proposed Special Protection Areas (pSPA);
 - Sites of Special Scientific Interest (SSSI);
 - National Scenic Area (NSA);

¹ <https://sitelink.nature.scot/home>

- Wild Land Areas (WLA);
 - Royal Society for the Protection of Birds (RSPB) reserves;
 - Land capability for agriculture;
 - Ancient Woodland Inventory (AWI);
 - Geological Conservation Review Sites;
 - Carbon-rich soil, deep peat and priority peatland habitats; and
 - Areas at risk of flooding (SEPA flood map ⁽²⁾).
- Identification of archaeological designations and other recorded sites, utilising GIS datasets available via Historic Environment Scotland Data Services and Local Historic Environment Teams. These include:
 - World Heritage Sites (WHS) and buffers;
 - Scheduled Monuments;
 - Category A, B and C listed buildings; and
 - Gardens and Designed Landscapes.
 - Review of the Highland Wide Local Development Plan (2012) to identify local policies and further environmental constraints and opportunities, such as Local Nature Conservation Sites (LNCS), core paths or other locations important to the public;
 - Review of landscape character assessments of relevance to the Study Area;
 - Review of Ordnance Survey (OS) mapping (1:50,000 and 1:25,000) and online GIS data sources from OS Open Data) and aerial photography (where available) to identify other potential constraints such as settlement, properties, walking routes, cycling routes etc.;
 - Extrapolation of OS Vectormap GIS data to identify further environmental constraint including locations of watercourses and waterbodies, roads classifications and degree of slope; and
 - Review of other local information through online and published media such as tourism sites.

Vantage point surveys are being undertaken in 2021/22 to understand the interaction between birds and potential overhead lines along the routes.

3.4 Route Identification and Selection Methods

Route options were identified following site appraisals, that considered the constraints identified during the desk-based baseline studies. The following has been taken into account during route selection (Stage 2) and will be considered in more detail at the next stage - alignment selection (Stage 3).

- Avoid if possible major areas of highest amenity value (including those covered by national and international designations and other sensitive landscapes);
- Avoid by deviation, smaller areas of high amenity value; and
- Technical issues related to clearances, connectivity, outages, maintenance, and faults.

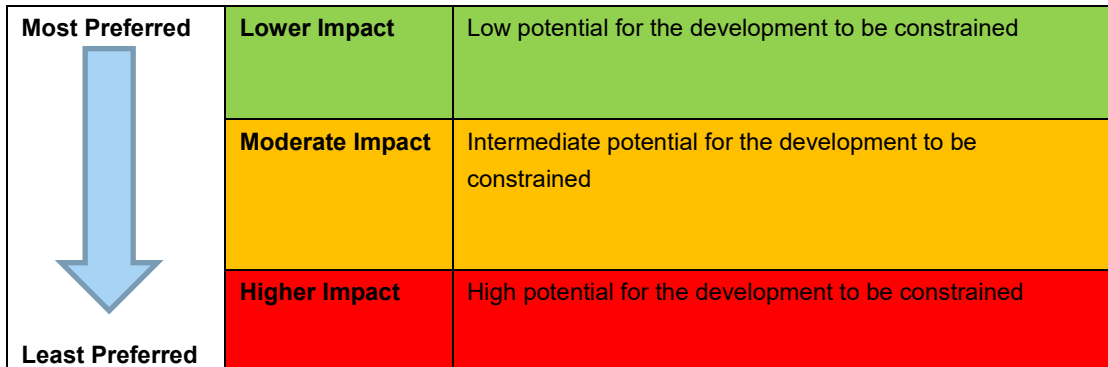
Indicative routes have been identified at 1 km widths (although this depends on site specific constraints and the route may be wider or narrower in places), to allow for subsequent identification of alignments during the next stage of the process.

3.5 Appraisal Method

Appraisal of route options has involved systematic consideration against the following environmental, technical and economic topic areas.

² <http://map.sepa.org.uk/floodmap/map.htm>

A RAG rating has been applied to each topic area within each section, indicating potential constraint to development. A high-level convention for assigning RAG ratings from the SSEN Transmission Routeing Guidance is shown in Table 3.1.



Most Preferred Least Preferred	Lower Impact	Low potential for the development to be constrained
	Moderate Impact	Intermediate potential for the development to be constrained
	Higher Impact	High potential for the development to be constrained

Table 3.1: RAG Rating for Comparative Analysis

3.5.1 Environmental

Appraisal of route options has followed the process defined within the SSEN Transmission Routeing Guidance, including systematic consideration against the following environmental topic areas:

- Natural Heritage (Designations, Protected Species, Habitats, Ornithology and Geology, Hydrology and Hydrogeology);
- Cultural Heritage (Designations and Cultural Heritage Assets);
- People (Proximity to dwellings);
- Landscape (Designations and Character); and
- Land Use (Agriculture, Forestry and Recreation).

Environmental sensitivity has been considered qualitatively, based on professional judgement and utilising the red, amber, green (RAG) rating. It has been applied to each topic area indicating potential impacts.

3.5.2 Engineering

Appraisal of site options has followed the process defined within the SSEN Transmission Routeing Guidance, including systematic consideration against the following engineering topic areas:

- Infrastructure crossings (major crossings);
- Environmental design (elevation, atmospheric pollution, contaminated land, flooding);
- Ground conditions (terrain, peat);
- Construction/Maintenance (access); and
- Proximity (clearance distance, communication masts, metallic pipelines).

Engineering sensitivity has been considered qualitatively, based on professional judgement and utilising the red, amber, green (RAG) rating. It has been applied to each topic area indicating potential impacts.

3.5.3 Economic

Appraisal of site selection options involves systematic consideration against capital and operational cost including construction, diversions, public road improvements, felling, land assembly, consent mitigation, inspection and maintenance.

4. DESCRIPTION OF ROUTES

4.1 Identification of Route Options

4.1.1 Route A

Start and end points will be determined through suitable connections from the proposed switching station at the Red John Pumped Storage and Knocknagael Substation. Route A begins in the Red John Pumped Storage site and travels north until it meets the B862. Here, the route travels in a north-easterly direction until it crosses Laggan Burn, where the route curves to the east to join the Knocknagael substation, east of Essich.

4.1.2 Route B

Start and end points will be determined through suitable connections from the proposed switching station at the Red John Pumped Storage and Knocknagael Substation. Route B begins in the Red John Pumped Storage development, and travels in a north easterly direction, to the west of Loch Ashie, until it meets Knocknagael substation. Route B is the most direct route of the options considered.

4.1.3 Route C

Start and end points will be determined through suitable connections from the proposed switching station at the Red John Pumped Storage and Knocknagael Substation. Route C begins in the Red John Pumped Storage development and travels east, to the south of Loch Ashie. Just before the route meets Loch Ashie, it narrows to pass through a small corridor between Loch Ashie and the consented headpond, that will form part of the Red John Pumped Storage development and must be avoided. The route curves around the south of Loch Ashie, to continue north towards Knocknagael substation.

Routes A, B and C are illustrated on Figure 1 in Appendix A.

5. ROUTE ENVIRONMENTAL, ENGINEERING AND ECONOMIC APPRAISAL

5.1 Introduction

This section presents a summary of the environmental, engineering and economic appraisal of the three route options. Routes A, B and C are illustrated alongside environmental designations on Figures 2 and 3 in Appendix A.

5.2 Route A

5.2.1 Environmental Baseline and Appraisal

The majority of Route A passes through the lower slopes of the Great Glen, through areas of woodland and conifer forests, and agricultural land. The route transitions from an area of broad steep-sided glen, to rolling farmland and woodland in the north, and is lightly settled with farms and scattered properties, interconnected by a network of minor roads and tracks. The southern portion of Route A passes through the Loch Ness and Duntelchaig Special Landscape Area (SLA)³, as designated by the Highland Council. This is an area of the Highlands that is '*dominated by the vast linear feature of Loch Ness and its dramatic landform trench, flanked by steep, towering wooded slopes that leads to undulating moorland ridges and a contrasting remote interior plateau of upland lochs, small woods and rocky knolls*'. As the route is UGC, there will only be temporary visual impacts on the SLA at construction phase, and not during operation. As Route A is UGC, visual impacts from the SLA, nearby settlements, residential properties, roads and core paths would only be experienced during the construction phase and of short duration.

Route A does not pass through internationally, nationally, or locally designated sites for nature conservation. However, the route is 900 m from Loch Ashie SPA and SSSI at the closest point, with potential to impact on qualifying feature species during construction. There would be no loss of supporting habitat for qualifying feature species. Route A passes through no known areas of peat. Further potential risks to natural heritage that have been identified in a desk-based assessment of the route are:

- Impact on 19 ancient woodland inventory sites (AWIS) comprising two 'ancient (of semi-natural origin)' and 17 'long established (of plantation origin)' sites;
- Impact on Annex I habitat H91C0 Caledonian Forest; and
- Impact to European and nationally protected species considered likely to be present.

There are two Category B listed buildings within Route A and one Scheduled Monument. There are 23 Listed Buildings located within 2 km of the proposed route, including two Category A. There are 13 Scheduled Monuments and three Gardens and Designed Landscapes within 2 km.

Route A is mainly agricultural land with some forestry at the start and end of the route (Figure 3, Appendix A). The route also has a number of core paths within it which include:

- Kindrummond to Dirr Wood Core Path;
- Drumashie Moor Core Path;
- Cullaird and Drumashie Plantation Core Path;
- Drumashie to Cullaird Core Path; and
- Antfield to Drumashie Core Path.

³ Assessment of Highland Special Landscape Areas

The Loch Ness 360° Trail is a 116km (72 mile) long distance circular trail. It follows the Great Glen Way on the north side of Loch Ness and the South Loch Ness Trail on the south side. The portion from Dores to Inverness follows the South Loch Ness Trail northwards from Dores and runs through the corridor for Route A. The Caledonia Way National Cycle Path (National Route 78) also lies within Route A, running parallel to the B862.

The environmental impact rating is provided in Table 5.1.

Route	RAG Impact Rating - Environmental														
	Natural Heritage					Cultural Heritage		People	Landscape			Land Use			Planning
	Designations	Protected Species	Habitats	Ornithology	Hydrology/geology	Designated	Non-designated	Proximity to dwellings	Designations	Character	Visual	Agriculture	Forestry	Recreation	Policy
Route A	H	L	M	L	L	L	M	L	L	L	L	M	H	L	L

Table 5.1 – Route A Environmental RAG Impact Rating

5.2.2 BNG Appraisal

A summary of the preliminary BNG findings for Route A is contained within Table 5.2 below. For more detailed information, refer to the BNG report. Biodiversity Units in underground cabling sections are presented as temporary loss, based on the assumption that the habitat will be restored once the cable has been laid.

Route A BNG Summary	Route A
UGC Biodiversity Units (BU)	5,697.68
Irreplaceable habitats (BU)	174.79
Area (ha)	901.33
Biodiversity Units / Area	6.52

Table 5.2 - Route A Biodiversity Units (BU) and BU per unit of area (ha)

5.2.3 Engineering Baseline and Appraisal

Route A is approximately 9 km long and the approach to Knocknagael from the north would require a more complex cable routing around the Knocknagael Substation Site than Routes B and C. There is sloping ground to the north of Red John and very steep slopes west of Essich as well as a risk of shallow groundwater and flooding in the vicinity of Laggan Burn, Scaniport. There would be a visual disturbance to properties in the Great Glen and from the B862. The cost of Route A would be more than Route B as it is longer and would require specialist installation techniques and potentially designs in areas of severe slopes.

The engineering impact rating is provided in Table 5.3.

Route	RAG Impact Rating – Engineering										
	Project Technical Objectives			Cable Installation Works				Cost		Operations and Maintenance	
	Route Length and Complexity	Route Obstacles and Crossings	Topology	Access for Installation Works	Public Disturbance and Visual Impact	Ground Conditions	Woodland Clearance	Cable System Cost	Installation Cost	Access for Maintenance	Geotechnical
Route A	M	L	M	L	M	M	L	M	M	L	M

Table 5.3 – Route A Engineering RAG Impact Rating

5.2.4 Economic Appraisal

Route A is a longer, less direct route than Route B and is considered to cost more to construct due to greater volume of materials and time required, this includes potentially a greater number of landowners, land take (as it is a longer route) and associated time in administrating relevant agreements. There are a number of dwellings throughout the route and in the absence of detailed surveys it is considered there is a risk of infrastructure diversions associated with the dwellings that would require to be accounted for, however at this time and based on the engineering assessment significant diversions are not expected. Road improvements such as site access from the public road would likely be required but not significantly more than the other route options considered. Forestry is present in the route, some of which cannot be avoided. Mitigation to be implemented as part of any consent is considered to be similar across all options. With a longer route and therefore a greater amount of infrastructure it is anticipated operational costs would be higher than that for Route B.

The economic impact rating is provided in Table 5.4.

Route	RAG Impact Rating – Cost							
	Capital						Operational	
	Capital	Diversion	Public Road Improvements	Tree Felling	Land Assembly	Consent Mitigations	Inspections	Maintenance
Route A	M	L	L	L	M	L	M	M

Table 5.4 - Route A Economic RAG Impact Rating

5.3 Route B

5.3.1 Environmental Baseline and Appraisal

The majority of Route B passes through broad leaved woodland, conifer forests, and open moorland, with areas of farmland in the north. Route B is very lightly settled, with man-made structures including electricity towers and poles visible in the open plateau landscape. The southern portion of Route B passes through the Loch Ness and Duntelchaig SLA⁴, as designated by the Highland Council. This is an area of the Highlands that is 'dominated by the vast linear feature of Loch Ness and its dramatic landform trench, flanked by steep, towering wooded slopes that leads to undulating moorland ridges and a contrasting remote interior plateau of upland lochs, small woods and rocky knolls'. As the route is UGC, there will only be temporary visual impacts on the SLA at construction phase, and not during operation. As Route B is UGC, visual impacts from the SLA, nearby

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settlements, residential properties, roads and core paths would only be experienced during the construction phase and of short duration.

Route A does not pass through internationally, nationally, or locally designated sites for nature conservation. However, the route is located directly adjacent but outwith Loch Ashie SPA and SSSI, with potential to impact on qualifying feature species during construction. There would be no loss of supporting habitat for qualifying feature species. Route B passes through no known areas of peat. Further potential risks to natural heritage that have been identified in a desk-based assessment of the route are:

- Direct impacts on blanket bog due to it being intersected by the route;
- Impact on ten ancient woodland inventory sites (AWIS) comprising 'long established (of plantation origin)' woodland' sites;
- Impact on Annex I habitat H91C0 Caledonian Forest; and
- Impact to European and nationally protected species considered likely to be present.

There are no designated cultural heritage assets within the proposed route B. There are assets within close proximity that may be sensitive to settings impacts, or impacted by development within the route including eight Listed Buildings, two garden and designed landscapes and 12 scheduled monuments located within 2 km of the proposed route.

For proposed route B, there are 32 known non-designated assets within the route and 28 identified within 250 m of the route. Many of these indicate a mortuary or ritual landscape, while further identified assets range in function from agricultural field systems, domestic monuments, industrial quarries, to military defence roads including several isolated findspots. As a result of the known archaeological presence a high risk to unknown archaeology (extant and buried) is anticipated in the area.

Route B passes through mainly open moorland, forestry and agriculture (Figure 3, Appendix A) and impacts are likely to be temporary and of short duration. Any impact to forestry is likely to be of small scale but may impact commercial returns. As with Route A, there are number of Core Paths which intersect the route however there are no national cycle paths within or adjacent to the route. Also, the Dores to Inverness portion of the Loch Ness 360° Trail utilises the South Loch Ness Trail which runs through the central portion of Route B.

The environmental impact rating is provided in Table 5.5.

Route	RAG Impact Rating – Environmental														
	Natural Heritage					Cultural Heritage		People	Landscape			Land Use			Planning
	Designations	Protected Species	Habitats	Ornithology	Hydrology/geology	Designated	Non-designated	Proximity to dwellings	Designations	Character	Visual	Agriculture	Forestry	Recreation	Policy
Route B	H	L	M	L	L	L	M	L	L	L	L	L	H	L	L

Table 5.5 - Route B Environmental RAG Impact Rating

5.3.2 BNG Appraisal

A summary of the preliminary BNG findings for Route B is contained within Table 5.6 below. For more detailed information, refer to the BNG report. Biodiversity Units in underground cabling sections are presented as temporary loss, based on the assumption that the habitat will be restored once the cable has been laid.

Route A BNG Summary	Route B
UGC Biodiversity Units (BU)	8,017.83
Irreplaceable habitats (BU)	1,284.45
Area (ha)	915.53
Biodiversity Units / Area	10.16

Table 5.6 - Route B Biodiversity Units (BU) and BU per unit of area (ha)

5.3.3 Engineering Baseline and Appraisal

Route B is most direct route at approximately 7 km in length with a western approach to Knocknagael which is more practical than Route A. No crossings of significant watercourses, trunk road or services have been identified however the crossing of Darris Road would be required and potentially multiple crossings of Essich Road to lessen environmental impacts. There would likely be some localised felling of mature trees in Clune Wood.

The engineering impact rating is provided in Table 5.7.

Route	RAG Impact Rating – Engineering										
	Project Technical Objectives			Cable Installation Works				Cost		Operations and Maintenance	
	Route Length and Complexity	Route Obstacles and Crossings	Topology	Access for Installation Works	Public Disturbance and Visual Impact	Ground Conditions	Woodland Clearance	Cable System Cost	Installation Cost	Access for Maintenance	Geotechnical
Route B	L	M	L	L	L	L	M	L	L	L	L

Table 5.7 – Route B Engineering RAG Impact Rating

5.3.4 Economic Appraisal

Route B is the shortest route considered and therefore likely to be the least costly to construct. The area in which it encompasses is considered to appropriately support UGC construction. As the route is the most direct and shortest, costs associated with land agreements including associated time in administrating relevant agreements is considered lower than the other route options. Infrastructure diversions are considered a medium level of constraint in line with the engineering assessment. Road improvements such as site access from the public road would likely be required but not significantly more than the other route options considered. Forestry is present in the route, some of which cannot be avoided, however there is likely to be scope to avoid some areas. Mitigation to be implemented as part of any consent is considered to be similar across all options. With a shorter route it is anticipated operational costs would be lower than that for Routes A or C.

The economic impact rating is provided in Table 5.8.

Route	RAG Impact Rating – Cost							
	Capital						Operational	
	Capital	Diversion	Public Road Improvements	Tree Felling	Land Assembly	Consent Mitigations	Inspections	Maintenance
Route B	L	M	L	L	L	L	L	L

Table 5.8 – Route B Economic RAG Impact Rating

5.4 Route C

5.4.1 Environmental Baseline and Appraisal

The majority of Route C passes through the large scale landscape of the flat plateau moorland, with a landcover of heather moorland and scrub, or conifer forests. The landscape is largely uninhabited with settlements in no distinct pattern, and man-made structures including electricity towers and poles in high visibility on the open landscape. There is little diversity in the landscape. The southern portion of Route C passes through the Loch Ness and Duntelchaig SLA⁵, as designated by the Highland Council. This is an area of the Highlands that is '*dominated by the vast linear feature of Loch Ness and its dramatic landform trench, flanked by steep, towering wooded slopes that leads to undulating moorland ridges and a contrasting remote interior plateau of upland lochs, small woods and rocky knolls*'. As the route is UGC, there will only be temporary visual impacts on the SLA at construction phase, and not during operation. As Route C is UGC,

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visual impacts from the SLA, nearby settlements, residential properties, roads and core paths would only be experienced during the construction phase, and of short duration.

Route C does not pass through internationally, nationally, or locally designated sites for nature conservation. The route is immediately adjacent to Loch Ashie SPA and SSSI, with potential to impact on qualifying feature species during construction. Route C passes directly through two areas of Class 2 peat. There would be no loss of supporting habitat for qualifying feature species. Further potential risks to natural heritage that have been identified in a desk-based assessment of the route are:

- Direct impacts on blanket bog due to it being intersected by the route;
- Impact on five ancient woodland inventory sites (AWIS) comprising 'long established (of plantation origin)' woodland' sites;
- Impact on Annex I habitat H91C0 Caledonian Forest which is present within Route C; and
- Impact to European and nationally protected species considered likely to be present.

There is one Scheduled Monument with the proposed route. There are six Listed Buildings located within 2 km of the proposed route, including three Category B, as well as, 12 Scheduled Monuments and two Gardens and Designed Landscapes. These may require an assessment for indirect effects resulting from the cable works and infrastructure.

For proposed route C, there are 43 known non-designated assets within the route and 40 identified within 250 m of the route. Many of these indicate a mortuary or ritual landscape, while other assets range in function from agricultural field systems, domestic monuments, industrial quarries, to military defence roads including several isolated findspots. As a result of the known archaeological presence a high risk to unknown archaeology (extant and buried) is anticipated in the area.

Route C passes through mainly open moorland, forestry and agriculture (Figure 3, Appendix A) and impacts are likely to be temporary and of short duration. Any impact to forestry is likely to be of small scale but may impact commercial returns. As with Route A, there are number of Core Paths which intersect the route however there are no national cycle paths within or adjacent to the route.

The environmental impact rating is provided in Table 5.9.

Route	RAG Impact Rating - Environmental														
	Natural Heritage					Cultural Heritage		People	Landscape			Land Use			Planning
	Designations	Protected Species	Habitats	Ornithology	Hydrology/geology	Designated	Non-designated	Proximity to dwellings	Designations	Character	Visual	Agriculture	Forestry	Recreation	Policy
Route C	H	L	M	L	M	L	M	L	L	L	L	L	H	L	L

Table 5.9 – Route C Environmental RAG Impact Rating

5.4.2 BNG Appraisal

A summary of the preliminary BNG findings for Route C is contained within Table 5.10 below. For more detailed information, refer to the BNG report. Biodiversity Units in underground cabling sections are presented as temporary loss, based on the assumption that the habitat will be restored once the cable has been laid.

Route A BNG Summary	Route C
UGC Biodiversity Units (BU)	9,254.64
Irreplaceable habitats (BU)	1,481.04
Area (ha)	891.45
Biodiversity Units / Area	12.04

Table 5.10 - Route C Biodiversity Units (BU) and BU per unit of area (ha)

5.4.3 Engineering Baseline and Appraisal

Route C is approximately 9 km long with a southern approach to Knocknagael which is more practical than Route A. Route C would require crossing the Big Burn and works to be installed through the peaty wetlands to the south-west of Knocknagael. Therefore, some temporary drainage and improvements could be needed as well as permanent access tracks within the Big Burn catchment area for access. Corridor clearance or widening of the access tracks would be required through plantations south of Loch Ashie. The cost of Route C would also be more than Route B as it is longer.

The engineering impact rating is provided in Table 5.11.

Route	RAG Impact Rating – Engineering										
	Project Technical Objectives			Cable Installation Works				Cost		Operations and Maintenance	
	Route Length and Complexity	Route Obstacles and Crossings	Topology	Access for Installation Works	Public Disturbance and Visual Impact	Ground Conditions	Woodland Clearance	Cable System Cost	Installation Cost	Access for Maintenance	Geotechnical
Route C	M	H	L	H	L	H	M	M	M	M	H

Table 5.11 – Route C Engineering RAG Impact Rating

5.4.4 Economic Appraisal

Similar to Route A, Route C is a longer less direct route than Route B and is considered to cost more to construct due to greater volume of materials and time required, this includes potentially a greater number of landowners, land take (as it is a longer route) and associated time in administrating relevant agreements. Similar to Route B, infrastructure diversions are considered to be less of a constraint than for Route A due to there being less dwellings. Road improvements such as site access from the public road would likely be required but not significantly more than the other route options considered. Forestry is present in the route, some of which cannot be avoided. There is likely to be less scope for avoidance. Mitigation to be implemented as part of any consent is considered to be similar across all options. With a longer route and therefore a greater amount of infrastructure it is anticipated operational costs would be higher than that for Route B.

The economic impact rating is provided in Table 5.12.

Route	RAG Impact Rating – Cost							
	Capital						Operational	
	Capital	Diversion	Public Road Improvements	Tree Felling	Land Assembly	Consent Mitigations	Inspections	Maintenance
Route C	M	M	L	M	M	L	M	M

Table 5.12 - Route C Economic RAG Impact Rating

5.5 Comparison of Routes and Preferred Option

5.5.1 Comparison of Routes A, B and C

From an environmental perspective, although none of the route options pass through internationally or nationally designated sites, Routes A, B and C all have potential to impact on qualifying feature species for the Loch Ashie SPA and SSSI. However, Routes B and C are immediately adjacent to it. All route options have potential to impact semi-natural ancient woodland, however Route A intersects a larger number of ancient woodland sites. The southern portion of all the route options pass through the Loch Ness and Duntelchaig SLA however as the route is UGC, there will only be temporary visual impacts on the SLA at construction phase, and not during operation. Route C passes directly through two areas of Class 2 peat in comparison to Routes A and B, which pass through no known areas. All route options have cultural heritage features within 2 km, that may experience effects to settings, however both Route A and C have features within the proposed routes. Route A has two Category B listed buildings – and one scheduled monument and Route C has a scheduled monument.

The environmental impact rating summary is provided in Table 5.13.

Route	RAG Impact Rating - Environmental														
	Natural Heritage					Cultural Heritage		People	Landscape			Land Use			Planning
	Designations	Protected Species	Habitats	Ornithology	Hydrology/geology	Designated	Non designated	Proximity to dwellings	Designations	Character	Visual	Agriculture	Forestry	Recreation	Policy
Route A	H	L	M	L	L	L	M	L	L	L	L	M	H	L	L
Route B	H	L	M	L	L	L	M	L	L	L	L	L	H	L	L
Route C	H	L	M	L	M	L	M	L	L	L	L	L	H	L	L

Table 5.13 - Environmental RAG Impact Rating Summary

On the results of the BNG Appraisal, Route A is the preferred option overall on biodiversity grounds. However, this is solely an assessment of habitats and does not take account of species data across the route options.

The BNG appraisal summary is provided in Table 5.14.

Route	Biodiversity Units (BU)
A	5,697.68
B	8,017.83
C	9,254.64

Table 5.14 – BNG Appraisal Summary

From an engineering perspective, there would be more technical challenges and costs associated with the longer routes of Routes A and C and the steep slopes of Route A. Route C is also not considered readily practical due to the very wet and peaty ground in the Big Burn catchment area. Although it may be possible to route through this area, it would require significant ground investigation works to prove feasibility. It is also likely that the specialist installation techniques and access works that would be needed in the wet and peaty areas would cause significant environmental impacts.

The engineering impact rating summary is provided in Table 5.15.

Route	RAG Impact Rating – Engineering										
	Project Technical Objectives			Cable Installation Works				Cost		Operations and Maintenance	
	Route Length and Complexity	Route Obstacles and Crossings	Topology	Access for Installation Works	Public Disturbance and Visual Impact	Ground Conditions	Woodland Clearance	Cable System Cost	Installation Cost	Access for Maintenance	Geotechnical
Route A	M	L	M	L	M	M	L	M	M	L	M
Route B	L	M	L	L	L	L	M	L	L	L	L
Route C	M	H	L	H	L	H	M	M	M	M	H

Table 5.15 - Engineering RAG Impact Rating Summary

From an economic perspective, Route B is the shortest route compared to Route A and C and therefore likely to be the least costly to construct due to a smaller volume of materials and time required. Also, because costs associated with land agreements, including associated time in administering relevant agreements, is considered to be lower than the other route options. There are larger areas of forestry in Routes A and C in comparison to Route B, with less scope for avoidance, hence costs are considered to be lower in Route B. With a longer route and therefore a greater amount of infrastructure it is anticipated operational costs would be higher than that for Route B. As Route B is shorter route than A and C, it is anticipated operational costs would be lower than that of the other routes.

The economic impact rating summary is provided in Table 5.16.

Route	RAG Impact Rating – Cost							
	Capital						Operational	
	Capital	Diversion	Public Road Improvements	Tree Felling	Land Assembly	Consent Mitigations	Inspections	Maintenance
Route A	M	L	L	L	M	L	M	M
Route B	L	M	L	L	L	L	L	L
Route C	M	M	L	M	M	L	M	M

Table 5.16 - Economic RAG Impact Rating Summary

5.5.2 Selection of Preferred Route

From an environmental perspective Route B is preferred. This is because it has lower potential for impacts to sensitive habitat including peat, blanket bog and woodland, as well as a lower potential to impact agriculture and is located further from residential properties.

From an engineering perspective, Route B is preferred. This is because its main impacts are associated with likely requirements for multiple crossings of the Essich Road and the felling of some mature trees. These risks would be mitigated as much as possible during the development of the cable route alignment.

From an economic perspective Route B is preferred. This is because it is the most direct and shortest route and therefore it is anticipated it will have few construction and operational costs. It also has the potential to pass through fewer areas of forestry.

Overall, the preferred route is Route B as shown on Figure 4, Appendix A.

6. SITE SELECTION PROCESS

6.1 Guidance Documents

The approach to site selection is informed by the following SSEN Transmission guidance:

- DRAFT Substation Site Selection Procedures for Voltages at or above 132kV (Site Selection Guidance); and
- Biodiversity Net Gain Flow Chart, Guidance and Project Toolkit (FC-NET-ENV-500).

The guidance develops a process which aims to balance environmental, technical and economic considerations throughout a staged site options process.

6.2 Area of Search

The area of search is on the periphery of the existing Knocknagael substation due to the need for the connection directly into the substation. Five options have been assessed, which span the circumference of the existing substation area. The site extension options have been assessed against the site selection guidance to identify potential environmental impacts ahead of the next stage. Figure 5, Appendix A, shows the proposed site option locations, that have been appraised in this report.

6.3 Baseline Conditions

The following information sources have informed the desk based baseline study to identify potential environmental constraints within and adjacent to the site. The study area applied for natural heritage features was 20 km, for landscape and visual 15 km, and cultural heritage 2 km.

- Identification of environmental designated sites and other constraints, utilising GIS datasets available via SNHi Site Link and other sources. These include:
 - Special Areas of Conservation (SAC);
 - Special Protection Areas (SPA);
 - Proposed Special Protection Areas (pSPA);
 - Sites of Special Scientific Interest (SSSI);
 - National Scenic Area (NSA);
 - Wild Land Areas (WLA);
 - Royal Society for the Protection of Birds (RSPB) reserves;
 - Land capability for agriculture;
 - Geological Conservation Review Sites;
 - Carbon-rich soil, deep peat and priority peatland habitats; and
 - Areas at risk of flooding (SEPA flood map⁶).
- Identification of archaeological designations and other recorded sites, utilising GIS datasets available via Historic Environment Scotland Data Services and Local Historic Environment Teams. These include:
 - World Heritage Sites (WHS) and buffers;
 - Scheduled Monuments;
 - Category A, B and C listed buildings; and
 - Gardens and Designed Landscapes.

⁶ <http://map.sepa.org.uk/floodmap/map.htm>

- Review of the Highland Wide Local Development Plan (2012) to identify local policies and further environmental constraints and opportunities, such as Local Nature Conservation Sites (LNCS), core paths or other locations important to the public;
- Review of landscape character assessments of relevance to the Study Area;
- Review of Ordnance Survey (OS) mapping (1:50,000 and 1:25,000) and online GIS data sources from OS Open Data) and aerial photography (where available) to identify other potential constraints such as settlement, properties, walking routes, cycling routes etc.;
- Extrapolation of OS Vectormap GIS data to identify further environmental constraint including locations of watercourses and waterbodies, roads classifications and degree of slope; and
- Review of other local information through online and published media such as tourism sites.

6.4 Site Identification and Selection Methods

Five sites have been appraised based on SSEN guidance; Substation Site Selection Procedures for Voltages at or above 132 kV. This includes Annex A; Holford Rules: Supplementary Notes of the Siting of Substations. The following considerations have been taken into account during site selection.

- Respect areas of high amenity value and take advantage of the containment of natural features such as woodland, fitting in with the landscape character of the area.
- Take advantage of ground form with the appropriate use of site layout and levels to avoid intrusion into surrounding areas.
- Use space effectively to limit the area required for development, minimising the effects on existing land use and rights of way.
- Alternative designs of substations may also be considered, e.g. 'enclosed', rather than 'open', where additional cost can be justified.
- Consider the relationship of towers and substation structures with background and foreground features, to reduce the prominence of structures from main viewpoints.
- When siting substations take account of the effects of line connections that will need to be made.

6.5 Appraisal Method

Appraisal of site options has involved systematic consideration against the following environmental, technical and economic topic areas.

A RAG rating has been applied to each topic area within each section, indicating potential constraint to development. A high-level convention for assigning RAG ratings from the SSEN Transmission Site Selection Guidance is shown in Table 6.1.

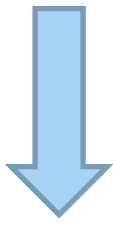
Most Preferred  Least Preferred	Lower Impact	Low potential for the development to be constrained
	Moderate Impact	Intermediate potential for the development to be constrained
	Higher Impact	High potential for the development to be constrained

Table 6.1: RAG Rating for Comparative Analysis

6.5.1 Environmental

Appraisal of site options has followed the process defined within the SSEN Transmission Site Selection Guidance, including systematic consideration against the following environmental topic areas:

- Natural Heritage (designations; protected species, habitats, ornithology, geology, hydrogeology and hydrology);
- Cultural Heritage (designations, cultural heritage assets);
- People (settlements, visual, physical effects);
- Landscape (designations and character);
- Land Use (agriculture and recreation);

A Red, Amber, Green (RAG) rating has been applied to each topic area for each site option, indicating potential for development to be constrained. This rating is based on a three point scale as shown in Table 6.1.

6.5.2 Engineering

Although the environmental site selection assessment considered five options, only two of these options would be practical for the extension of the site from an engineering perspective. This is because the electrical extension of Knocknagael will occur using overhead AIS equipment, requiring a close connection to the existing busbar sets which only Options 1 and 3 offer. Therefore, only an assessment of Options 1 and 3 has been undertaken.

The proposed connection requires a firm connection meaning that each of the two proposed circuits will need to be connected on either side of the bus section. This requirement dictates that the existing substation needs to be extended on two sides to allow the appropriate connection.

Appraisal of site options has followed the process defined within the SSEN Transmission Site Selection Guidance, including systematic consideration against the following engineering topic areas:

- Connectivity (existing circuits / network, future development possibilities, interface with SSEN Distribution and Generation, DNO Connection);
- Footprint Requirements (technology, adjacent land use, space availability);
- Hazards (unique hazards, existing utilities);
- Ground Conditions (topography, geology);
- Environmental Conditions (elevation, site pollution, flooding, carbon footprint, SF6, contaminated land, noise);
- Construction Access (substation access road, transformer delivery route); and
- Operation and Maintenance (access).

Engineering sensitivity has been considered qualitatively, based on professional judgement and utilising the red, amber, green (RAG) rating.

For both Options 1 and 3, initial sub-options within each have been identified. These will continue to be refined as the selection process progresses. RAG ratings have therefore been applied to each of these sub options based on the categories listed above. At this stage of the selection process an overall RAG rating for Option 1 and 3 footprint areas has been included based on an average across the sub-options. This is to allow consistency in assessment in this report.

6.5.3 Economic

Appraisal of site selection options involves systematic consideration against capital and operational cost including construction, diversions, public road improvements, felling, land assembly, consent mitigation, inspection and maintenance.

7. DESCRIPTION OF SITES

7.1 Identification of Site Options

7.1.1 Option 1

Option 1 is located immediately to the west of the existing substation, within an area of open woodland, scrub and grassland to the east of Essich Road.

7.1.2 Option 2

Option 2 is to the north of the existing substation in an area of improved grassland.

7.1.3 Option 3

Option 3 is to the east of the existing substation, to the west of Big Burn.

7.1.4 Option 4

Option 4 is to the south of the existing substation, north of a side road to the east of Essich Road.

7.1.5 Option 5

Option 5 is to the west of the existing substation, to the east of Essich Road.

Options 1, 2, 3, 4 and 5 are illustrated on Figure 5 in Appendix A.

8. SITE ENVIRONMENTAL, ENGINEERING AND ECONOMIC APPRAISAL

8.1 Introduction

This section presents a summary of the environmental, engineering and economic appraisal of the five site options. Options 1, 2, 3, 4 and 5 are illustrated alongside environmental designations on Figure 6 in Appendix A.

8.2 Option 1

8.2.1 Environmental Baseline and Appraisal

Site Option 1 sits within the Rolling Farmland and Woodland LCT, primarily within an area of improved grassland used for agricultural purposes. There are no settlements within the proposed option, but there would be potential views from nearby scattered properties and tourist accommodation.

Option 1 has no direct interaction with any internationally, nationally, or locally designated sites for nature conservation. Loch Ashie Special Protection Area (SPA) and Site of Special Scientific Interest (SSSI) is located 3.4 km to the south. There are six Ancient Woodland Inventory Sites (AWIS) within 2 km of Option 1, with the closest located 450 m to the west. European protected species are known to occur in the area and suitable habitat for these species is present within Option 1.

There are no designated assets within Option 1. There are two listed buildings, five scheduled monuments and one garden and designed landscape within 2km of Option 1. Although Option 1 does not contain any designated assets, the Proposed Development will require an assessment of potential change to the landscape at long-distance from the assets, as a result of the potential to introduce an impact on the setting. There are also isolated areas of high and medium surface water flooding immediately to the north of the Site.

There are no known non-designated assets within Option 1. There are seven known non-designated (Canmore database) assets within 250m of Option 1. Given the nature of the known archaeological remains in the wider area there is the potential for currently unknown buried archaeology to be encountered during works. As the significance of the potential buried archaeological remains cannot be assessed, the possibility remains that the significance may range from low to high.

The environmental impact rating is provided in Table 8.1.

Option	RAG Impact Rating - Environmental														
	Natural Heritage					Cultural Heritage		People	Landscape and Visual			Land Use			Planning
	Designations	Protected Species	Habitats	Ornithology	Hydrology/geology	Designated	Non-designated		Designations	Character	Visual	Agriculture	Forestry	Recreation	
Option 1	L	L	L	L	L	L	M	L	L	L	L	L	L	L	L

Table 8.1 – Option 1 Environmental RAG Impact Rating

8.2.2 BNG Appraisal

A summary of the preliminary BNG findings for Option 1 is contained within Table 8.2 below. For more detailed information, refer to the BNG report.

Option 1 BNG Summary	Option 1
Option 1 Biodiversity Units (BU)	196.51
Irreplaceable habitats (BU)	0.00
Area (ha)	43.50
Biodiversity Units / Area	4.52

Table 8.2 - Option 1 Biodiversity Units (BU) and BU per unit of area (ha)

8.2.3 Engineering Baseline and Appraisal

The engineering impact rating is provided in Table 8.3.

Option	RAG Impact Rating – Engineering						
	Connectivity	Footprint Requirements	Hazards	Ground Conditions	Environmental Conditions	Construction Access	Operational and Maintenance
Option 1	M	L	M	L	L	L	L

Table 8.3 – Option 1 Engineering RAG Impact Rating

8.2.4 Economic Appraisal

Option 1 allows a technically feasible connection into the existing substation without the need for significant engineering works to the existing infrastructure. Construction cost is therefore considered low compared to the other options. Existing UGC would require to be rerouted to make way for the extension, as such there would be increased costs to facilitate the reroute. Road improvements such as site access from the public road is not anticipated to be required as the existing substation site entrance could potentially be used. This is similar to Options 2, 3 and 4, as such costs are considered low and similar for Options 1 to 4. Limited established tree felling would be required for Option 1. When compared to Options 2 to 4, where no felling of established woodland is anticipated, costs would be greater. Part of the Option footprint falls within third party land therefore a land agreement would be required. This is similar for Options 3 to 5. Option 2 falls within SSEN Transmission

landownership. Therefore, land costs associated with Option 1 would be greater than that for Option 2 and similar to that for Options 3 to 5. Consent mitigation cost is unknown at this time but it is considered a limited volume of felling of established woodland would be required for Option 1 and therefore compensatory planting would be required. Other mitigation is unknown but it is anticipated any further required mitigation would likely be required for all Options considered. Option 1 allows a technically feasible connection into the existing substation without the need for significant engineering works to the existing infrastructure, on this basis it is anticipated operational costs would be kept to a minimum.

The economic impact rating is provided in Table 8.4.

Option	RAG Impact Rating – Cost							
	Capital						Operational	
	Capital	Diversion	Public Road Improvements	Tree Felling	Land Assembly	Consent Mitigations	Inspections	Maintenance
Option 1	L	M	L	M	M	M	L	L

Table 8.4 – Option 1 Economic RAG Impact Rating

8.3 Option 2

8.3.1 Environmental Baseline and Appraisal

Option 2 sits within the Rolling Farmland and Woodland LCT, primarily within an area of improved grassland used for agricultural purposes. There are no settlements within the proposed option, but there would be potential views from nearby scattered properties and tourist accommodation.

Option 2 has no direct interaction with any internationally or nationally designated sites. Loch Ashie Special Protection Area (SPA) and Site of Special Scientific Interest (SSSI), is located 3.5 km to the south. There are seven Ancient Woodland Inventory Sites (AWIS) within 2 km of Option 2, with the closest located 530 m to the northeast. European protected species known to occur in the area and suitable habitat for these species is present within Option 2. There are also isolated areas of high and medium surface water flooding immediately to the north of the Site.

There are no designated assets within Option 2. There are two listed buildings and four scheduled monuments within 2km Option 2. Although Option 2 does not contain any designated assets, the Proposed Development will require an assessment of potential change to the landscape at long-distance from the assets, as a result of the potential to introduce an impact on the setting.

There are no known non-designated assets within Option 2. There are three known non-designated (Canmore database) assets within 250m of Option 2. Given the nature of the known archaeological remains in the wider area there is the potential for currently unknown buried archaeology to be encountered during works. As the significance of the potential buried archaeological remains cannot be assessed, the possibility remains that the significance may range from low to high.

The environmental impact rating is provided in Table 8.5.

Option	RAG Impact Rating - Environmental														
	Natural Heritage					Cultural Heritage		People	Landscape and Visual			Land Use			Planning
	Designations	Protected Species	Habitats	Ornithology	Hydrology/geology	Designated	Non-designated	Proximity to Dwellings	Designations	Character	Visual	Agriculture	Forestry	Recreation	Policy
Option 2	L	L	L	L	L	L	M	L	L	L	L	L	L	L	L

Table 8.5 – Option 2 Environmental RAG Impact Rating

8.3.2 BNG Appraisal

A summary of the preliminary BNG findings for Option 2 is contained within Table 8.6 below. For more detailed information, refer to the BNG report.

Option 2 BNG Summary	Option 1
Option 1 Biodiversity Units (BU)	217.61
Irreplaceable habitats (BU)	0.18
Area (ha)	42.95
Biodiversity Units / Area	4.52

Table 8.6 - Option 2 Biodiversity Units (BU) and BU per unit of area (ha)

8.3.3 Engineering Baseline and Appraisal

As stated in section 6.5.2, Option 2 was not considered practical for the extension of the site. Therefore, no further assessment has been undertaken or a RAG impact rating provided.

8.3.4 Economic Appraisal

Option 2 does not allow a technically feasible connection into the existing substation without the need for significant engineering works to the existing infrastructure. Construction cost is therefore considered high. Currently, no diversions of existing infrastructure is considered to be required for Option 2. Road improvements such as site access from the public road is not anticipated to be required as the existing substation site entrance could potentially be used. This is similar to Options 1, 3 and 4, as such costs are considered low. Young trees planted for screening are present within Option 2, these would require to be replaced however they are of an age where they are not regarded as established trees. Option 2 falls within SSEN Transmission landownership and therefore land costs are considered to be the lowest of all options assessed. Consent mitigation cost is unknown at this time but it is anticipated any further required mitigation would likely be required for all Options considered. There would be an additional cost in replacing the young trees on site but this is considered to be a relatively low cost. Option 2 does not allow a technically feasible connection into the existing substation without the need for significant engineering works to the existing infrastructure, on this basis it is anticipated operational costs would be high.

The economic impact rating is provided in Table 8.7.

Option	RAG Impact Rating – Cost							
	Capital						Operational	
	Capital	Diversion	Public Road Improvements	Tree Felling	Land Assembly	Consent Mitigations	Inspections	Maintenance
Option 2	H	L	L	L	L	M	H	H

Table 8.7 - Option 2 Economic RAG Impact Rating

8.4 Option 3

8.4.1 Environmental Baseline and Appraisal

Option 3 sits within the Rolling Farmland and Woodland LCT, an area arable land, shrub heathland and broad leaved woodland. There are no settlements within the proposed option, but there may be the potential for views from nearby scattered properties, tourist accommodation and the local road network.

Option 3 has no direct interaction with any internationally or nationally designated sites. Loch Ashie Special Protection Area (SPA) and Site of Special Scientific Interest (SSSI), is located 3.3 km to the south. There are seven Ancient Woodland Inventory Sites (AWIS) within 2 km of Option 3, with the closest located 565 m to the north. European protected species known to occur in the area and suitable habitat for these species is present within Option 3.

The groundwater is high in this location due to close proximity to drains, any habitats in this area will be surface fed, particularly as underlain by largely impermeable till leading to low/medium potential for GWDTE. There is no flooding within the area but surface water flooding is noted at boundary of substation and at river banks.

There are no designated assets within Option 3. There are four scheduled monuments within 2km of Option 3. Although Option 3 does not contain any designated assets, the Proposed Development will require an assessment of potential change to the landscape at long-distance from the assets, as a result of the potential to introduce an impact on the setting.

There are no known non-designated assets within Option 3. There are four known non-designated (Canmore database) assets within 250m of Option 3. Given the nature of the known archaeological remains in the wider area there is the potential for currently unknown buried archaeology to be encountered during works. As the significance of the potential buried archaeological remains cannot be assessed, the possibility remains that the significance may range from low to high.

The environmental impact rating is provided in Table 8.8.

Option	RAG Impact Rating - Environmental														
	Natural Heritage					Cultural Heritage		People	Landscape and Visual			Land Use			Planning
	Designations	Protected Species	Habitats	Ornithology	Hydrology/geology	Designated	Non-designated	Proximity to Dwellings	Designations	Character	Visual	Agriculture	Forestry	Recreation	Policy
Option 3	L	L	L	L	M	L	M	L	L	L	L	L	L	L	L

Table 8.8 – Option 3 Environmental RAG Impact Rating

8.4.2 BNG Appraisal

A summary of the preliminary BNG findings for Option 3 is contained within Table 8.9 below. For more detailed information, refer to the BNG report.

Option 3 BNG Summary	Option 1
Option 1 Biodiversity Units (BU)	228.15
Irreplaceable habitats (BU)	14.43
Area (ha)	43.05
Biodiversity Units / Area	5.63

Table 8.9 - Option 3 Biodiversity Units (BU) and BU per unit of area (ha)

8.4.3 Engineering Baseline and Appraisal

The engineering impact rating is provided in Table 8.10.

Option	RAG Impact Rating – Engineering						
	Connectivity	Footprint Requirements	Hazards	Ground Conditions	Environmental Conditions	Construction Access	Operational and Maintenance
Option 3							

Table 8.10 – Option 3 Engineering RAG Impact Rating

8.4.4 Economic Appraisal

Option 3 allows a technically feasible connection into the existing substation without the need for significant engineering works to the existing infrastructure. Construction cost is therefore considered low compared to the other options. Currently, no diversions of existing infrastructure is considered to be required for Option 3. Road improvements such as site access from the public road is not anticipated to be required as the existing substation site entrance could potentially be used. This is similar to Options 1, 2 and 4, as such costs are considered low. No tree felling would be required for Option 3. The Option footprint falls within third party land therefore a land agreement would be required. This is similar for Options 1, 4 and 5. Consent mitigation cost is unknown at this time but it is anticipated any further mitigation would likely be required for all Options considered. Option 3 allows a technically feasible connection into the existing substation without the need for

significant engineering works to the existing infrastructure, on this basis it is anticipated operational costs would be kept to a minimum.

The economic impact rating is provided in Table 8.11.

Option	RAG Impact Rating – Cost							
	Capital						Operational	
	Capital	Diversion	Public Road Improvements	Tree Felling	Land Assembly	Consent Mitigations	Inspections	Maintenance
Option 3	L	L	L	L	M	L	L	L

Table 8.11 - Option 3 Economic RAG Impact Rating

8.5 Option 4

8.5.1 Environmental Baseline and Appraisal

Option 4 sits within the Rolling Farmland and Woodland LCT, primarily within an area of improved grassland used for agricultural purposes. There are no settlements within the proposed option, but there would be potential views from nearby scattered properties.

Option 4 has no direct interaction with any internationally or nationally designated sites. Loch Ashie Special Protection Area (SPA) and Site of Special Scientific Interest (SSSI), is located 3.2 km to the south. There are eight Ancient Woodland Inventory Sites (AWIS) within 2 km of Option 4, with the closest located 680 m to the northwest. European protected species known to occur in the area and suitable habitat for these species is present within Option 4. The groundwater is high in this location due to close proximity to watercourse but no point sources of groundwater emergence. The marshy wet habitat in the surrounding area is further evidence of the high groundwater leading to medium potential for GWDTE. There are also larger isolated areas of high to medium surface water flooding within the area.

There are no designated assets within Option 4. There are four scheduled monuments within 2km of Option 4. Although Option 4 does not contain any designated assets, the Proposed Development will require an assessment of potential change to the landscape at long-distance from the assets, as a result of the potential to introduce an impact on the setting.

There are no known non-designated assets within Option 4. There are six known non-designated (Canmore database) assets within 250m of Option 4. Given the nature of the known archaeological remains in the wider area there is the potential for currently unknown buried archaeology to be encountered during works. As the significance of the potential buried archaeological remains cannot be assessed, the possibility remains that the significance may range from low to high.

The environmental impact rating is provided in Table 8.12.

Option	RAG Impact Rating - Environmental														
	Natural Heritage					Cultural Heritage		People	Landscape and Visual			Land Use			Planning
	Designations	Protected Species	Habitats	Ornithology	Hydrology/geology	Designated	Non-designated	Proximity to Dwellings	Designations	Character	Visual	Agriculture	Forestry	Recreation	Policy
Option 4	L	L	L	L	M	L	M	L	L	L	L	L	L	L	L

Table 8.12 – Option 4 Environmental RAG Impact Rating

8.5.2 BNG Appraisal

A summary of the preliminary BNG findings for Option 4 is contained within Table 8.13 below. For more detailed information, refer to the BNG report.

Option 4 BNG Summary	Option 1
Option 1 Biodiversity Units (BU)	201.55
Irreplaceable habitats (BU)	2.82
Area (ha)	40.96
Biodiversity Units / Area	4.99

Table 8.13 - Option 4 Biodiversity Units (BU) and BU per unit of area (ha)

8.5.3 Engineering Baseline and Appraisal

As stated in section 6.5.2, Option 4 was not considered practical for the extension of the site. Therefore, no further assessment has been undertaken or a RAG impact rating provided.

8.5.4 Economic Appraisal

Option 4 does not allow a technically feasible connection into the existing substation without the need for significant engineering works to the existing infrastructure. Construction cost is therefore considered high. Existing UGC would require to be rerouted to make way for the extension, as such there would be increased costs to facilitate the reroute. Road improvements such as site access from the public road is not anticipated to be required as the existing substation site entrance could potentially be used. This is similar to Options 1, 2 and 3, as such costs are considered low. No tree felling would be required for Option 4. The Option footprint falls within third party land therefore a land agreement would be required. Consent mitigation cost is unknown at this time but it is anticipated any required mitigation would likely be required for all Options considered. Option 4 does not allow a technically feasible connection into the existing substation without the need for significant engineering works to the existing infrastructure, on this basis it is anticipated operational costs would be high.

The economic impact rating is provided in Table 8.14.

Option	RAG Impact Rating – Cost							
	Capital						Operational	
	Capital	Diversion	Public Road Improvements	Tree Felling	Land Assembly	Consent Mitigations	Inspections	Maintenance
Option 4	H	M	L	L	M	L	H	H

Table 8.14 - Option 4 Economic RAG Impact Rating

8.6 Option 5

8.6.1 Environmental Baseline and Appraisal

Option 5 sits within the Rolling Farmland and Woodland LCT, within an area of arable land. There are no settlements within the proposed option, but there may be the potential for views from nearby scattered properties to the west and north along Essich Road and the local road network.

Option 5 has no direct interaction with any internationally or nationally designated sites. Loch Ashie Special Protection Area (SPA) and Site of Special Scientific Interest (SSSI), is located 3.1 km to the south. There are eight Ancient Woodland Inventory Sites (AWIS) within 2 km of Option 5, with the closest located 465 m to the north. European protected species known to occur in the area and suitable habitat for these species is present within Option 5.

There is a high potential for GWDTE at Option 5 due to groundwater abstractions of wells marked within the area associated with shallow groundwater and a wet habitat. There are also small areas with a high likelihood of surface water flooding at boundaries of the area.

There are no designated assets within Option 5. There are four scheduled monuments within 2km of Option 5. Although Option 5 does not contain any designated assets, the Proposed Development will require an assessment of potential change to the landscape at long-distance from the assets, as a result of the potential to introduce an impact on the setting.

There are four known non-designated assets within Option 5 and two known non-designated (Canmore database) assets within 250m. Given the nature of the known archaeological remains in the wider area and within the option footprint itself, there is the potential for currently unknown buried archaeology to be encountered during works. As the significance of the potential buried archaeological remains cannot be assessed, the possibility remains that the significance may range from low to high.

The environmental impact rating is provided in Table 8.15.

Option	RAG Impact Rating - Environmental														
	Natural Heritage					Cultural Heritage		People	Landscape and Visual			Land Use			Planning
	Designations	Protected Species	Habitats	Ornithology	Hydrology/geology	Designated	Non-designated	Proximity to Dwellings	Designations	Character	Visual	Agriculture	Forestry	Recreation	Policy
Option 5	L	L	L	L	M	L	M	M	L	L	M	L	L	L	L

Table 8.15 – Option 5 Environmental RAG Impact Rating

8.6.2 BNG Appraisal

A summary of the preliminary BNG findings for Option 4 is contained within Table 8.16 below. For more detailed information, refer to the BNG report.

Option 5 BNG Summary	Option 1
Option 1 Biodiversity Units (BU)	189.40
Irreplaceable habitats (BU)	0.00
Area (ha)	46.51
Biodiversity Units / Area	4.07

Table 8.16 - Option 5 Biodiversity Units (BU) and BU per unit of area (ha)

8.6.3 Engineering Baseline and Appraisal

As stated in section 6.5.2, Option 5 was not considered practical for the extension of the site. Therefore, no further assessment has been undertaken or a RAG impact rating provided.

8.6.4 Economic Appraisal

Option 5 does not allow a technically feasible connection into the existing substation without the need for significant engineering works to the existing infrastructure. Construction cost is therefore considered high. Option 5 spans the existing public road therefore significant diversion work would be required to facilitate the extension, as such there would be increased costs to facilitate the reroute. Road improvements such as site access and public road diversion would be required. Costs to complete this are considered high in comparison to the other Options. Negligible tree felling would be required for Option 5. Compensatory planting would be required however, given felling is negligible, the cost associated with this is considered low. The Option footprint falls within third party land therefore a land agreement would be required. Consent mitigation cost is unknown at this time but it is anticipated any required mitigation, in addition to compensatory tree planting, would likely be required for all Options considered. Option 5 does not allow a technically feasible connection into the existing substation without the need for significant engineering works to the existing infrastructure, on this basis it is anticipated operational costs would be high.

The economic impact rating is provided in Table 8.17.

Option	RAG Impact Rating – Cost							
	Capital						Operational	
	Capital	Diversion	Public Road Improvements	Tree Felling	Land Assembly	Consent Mitigations	Inspections	Maintenance
Option 5	H	H	H	L	M	M	H	H

Table 8.17 - Option 5 Economic RAG Impact Rating

8.7 Comparison of Sites and Preferred Option

8.7.1 Comparison of Options 1, 2, 3, 4 and 5

From an environmental perspective, a comparison of the five proposed substation extension site options has identified that no option shows a high risk. Options 1 to 4 have identified no non-designated assets within the Proposed Development area whereas for Option 5 there are four known non-designated assets. Given the nature of the known archaeological remains in the wider area there is the potential for currently unknown buried archaeology to be encountered during works. As the significance of the potential buried archaeological remains cannot be assessed, the possibility remains that the significance may range from low to high. Options 3, 4 and 5 have identified small areas with a high likelihood of surface water flooding whilst these are not present in Options 1 and 2. Although Option 5 has no settlements within the proposed option, there may be the potential for views from nearby scattered properties and the local road network.

The environmental impact rating summary is provided in Table 8.18.

Route	RAG Impact Rating - Environmental														
	Natural Heritage					Cultural Heritage		People	Landscape			Land Use			Planning
	Designations	Protected Species	Habitats	Ornithology	Hydrology/geology	Designated	Non-designated	Proximity to dwellings	Designations	Character	Visual	Agriculture	Forestry	Recreation	Policy
Option 1	L	L	L	L	L	L	M	L	L	L	L	L	L	L	L
Option 2	L	L	L	L	L	L	M	L	L	L	L	L	L	L	L
Option 3	L	L	L	L	M	L	M	L	L	L	L	L	L	L	L
Option 4	L	L	L	L	M	L	M	L	L	L	L	L	L	L	L
Option 5	L	L	M	L	M	L	M	M	L	L	M	L	L	L	L

Table 8.18 - Environmental RAG Impact Rating Summary

On the results of the BNG Appraisal, Option 1 and Option 5 are the preferred option(s) overall on biodiversity grounds. However, this is solely an assessment of habitats based on a desk study without a site visit and does not take account of species data across the site options.

The BNG appraisal summary is provided in Table 8.19.

Option	Biodiversity Units (BU)
1	196.51
2	217.61
3	228.15
4	201.55
5	189.40

Table 8.19 – BNG Appraisal Summary

From an engineering perspective, only Options 1 and 3 would be practical for the extension of the site. This is because the electrical extension of Knocknagael will occur using overhead AIS equipment, requiring a close connection to the existing busbar sets which only Options 1 and 3 offer.

The proposed connection requires a firm connection meaning that each of the two proposed circuits will need to be connected on either side of the bus section. This requirement dictates that the existing substation needs to be extended on two sides to allow the appropriate connection.

The engineering impact rating summary is provided in Table 8.20.

Option	RAG Impact Rating – Engineering						
	Connectivity	Footprint Requirements	Hazards	Ground Conditions	Environmental Conditions	Construction Access	Operational and Maintenance
Option 1	Yellow	Green	Yellow	Green	Green	Green	Green
Option 2	N/A						
Option 3	Yellow	Yellow	Green	Green	Green	Green	Green
Option 4	N/A						
Option 5	N/A						

Table 8.20 - Engineering RAG Impact Rating Summary Table

From an economic perspective, the construction cost of Options 1 and 3 are considered low compared to the other options due to the nature of the current electrical infrastructure design and layout. Road improvements such as site access from the public road are not anticipated to be required as the existing substation site entrance could potentially be used. This is similar to Options 1, 2 and 4, as such costs are considered low. For Options 1, 3, 4 and 5 the footprint falls within third party land therefore a land agreement would be required. Consent mitigation cost is unknown at this time but it is anticipated any further mitigation would likely be required for all Options considered.

The economic impact rating summary is provided in Table 8.21.

Option	RAG Impact Rating – Cost							
	Capital						Operational	
	Capital	Diversion	Public Road Improvements	Tree Felling	Land Assembly	Consent Mitigations	Inspections	Maintenance
Option 1	L	M	L	M	M	M	L	L
Option 2	H	L	L	L	L	M	H	H
Option 3	L	L	L	L	M	L	L	L
Option 4	H	M	L	L	M	L	H	H
Option 5	H	H	H	L	M	M	H	H

Table 8.21 - Economic RAG Impact Rating Summary Table

8.7.2 Selection of Preferred Site

From an environmental perspective Option 1 and 2 are preferred. This is because they have a lower likelihood of surface water flooding and a lower potential for visual impacts to properties and the local road network.

The proposed connection requires a firm connection meaning that each of the two proposed circuits will need to be connected on either side of the bus section. This requirement dictates the existing substation needs to be extended on two sides. Therefore, from an engineering perspective only Options 1 and 3 would be practical for the extension of the site. This is because the electrical extension of Knocknagael will occur using overhead AIS equipment, requiring a close connection to the existing busbar sets which only Options 1 and 3 offer.

From an economic perspective Options 1 and 3 are preferred. This is because it allows a technically feasible connection into the existing substation without the need for significant engineering works to the existing infrastructure, on this basis it is anticipated operational costs would be kept to a minimum.

Overall, the preferred site options are Options 1 and 3 together as shown on Figure 7, Appendix A.

9. CONSULTATION ON THE PROPOSAL

9.1 Introduction

SSEN Transmission places great importance on, and is committed to, consultation and engagement with all parties and stakeholders likely to have an interest in proposals for new projects. Stakeholder engagement is an essential part of an effective development process.

The proposals detailed in this report have been developed through environmental and technical analysis of various route and site options. The potential for environmental effects remains and further assessment and design will be important in giving detailed consideration to the development and integration of mitigation measures to address environmental effects identified.

When providing comment and feedback, SSEN Transmission would be grateful for your consideration of the questions below:

- Have we explained the need for this Project adequately?
- Have we explained the approach taken to select the preferred route and sites adequately?
- Are there any factors, or environmental features, that you consider may have been overlooked during the preferred route and site selection process?
- Do you feel, on balance, that the preferred route and sites selected are the most appropriate for further consideration at the alignment stage and next stage of site selection?
- Do you have any particular concerns or queries on the proposed connection project?

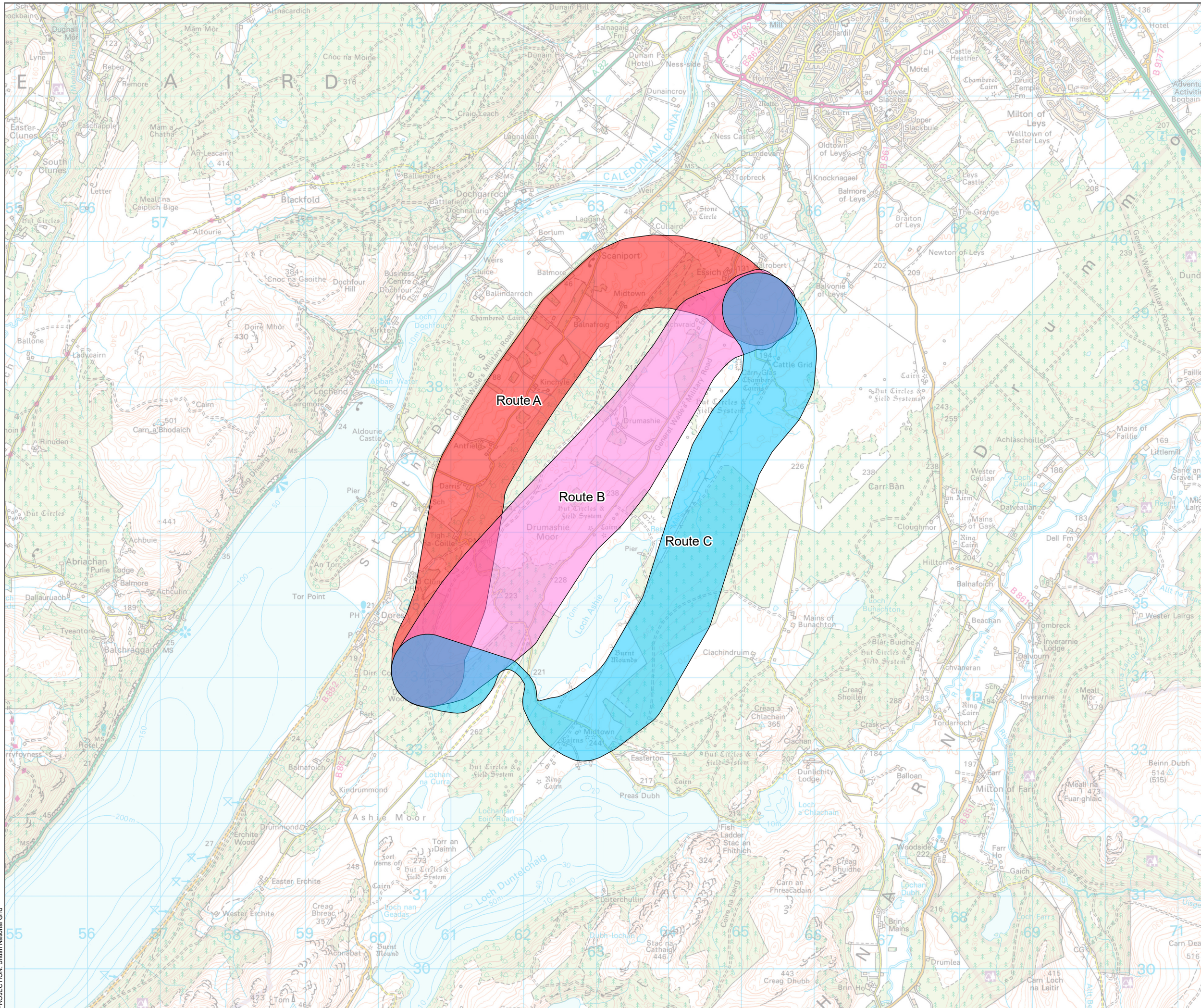
9.2 Next steps

A consultation event will be held in April 2022 and meetings will be arranged with statutory and other stakeholders. The responses received, and those sought from statutory consultees and other key stakeholders will inform further consideration and design leading to the identification of a proposed route and site to take forward to the alignment, site selection and consenting stages.

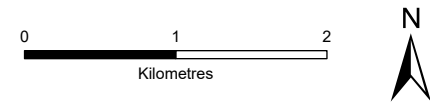
Please submit your comments to Ryan Davidson, Community Liaison Manager, Scottish Hydro Electric Transmission, 1 Waterloo Street, Glasgow, G2 6AY (ryan.davidson@sse.com). All comments are requested by Friday 27th May 2022.

APPENDIX A FIGURES

Figure 1 Red John Route Options



- Proposed Route Option A
- Proposed Route Option B
- Proposed Route Option C



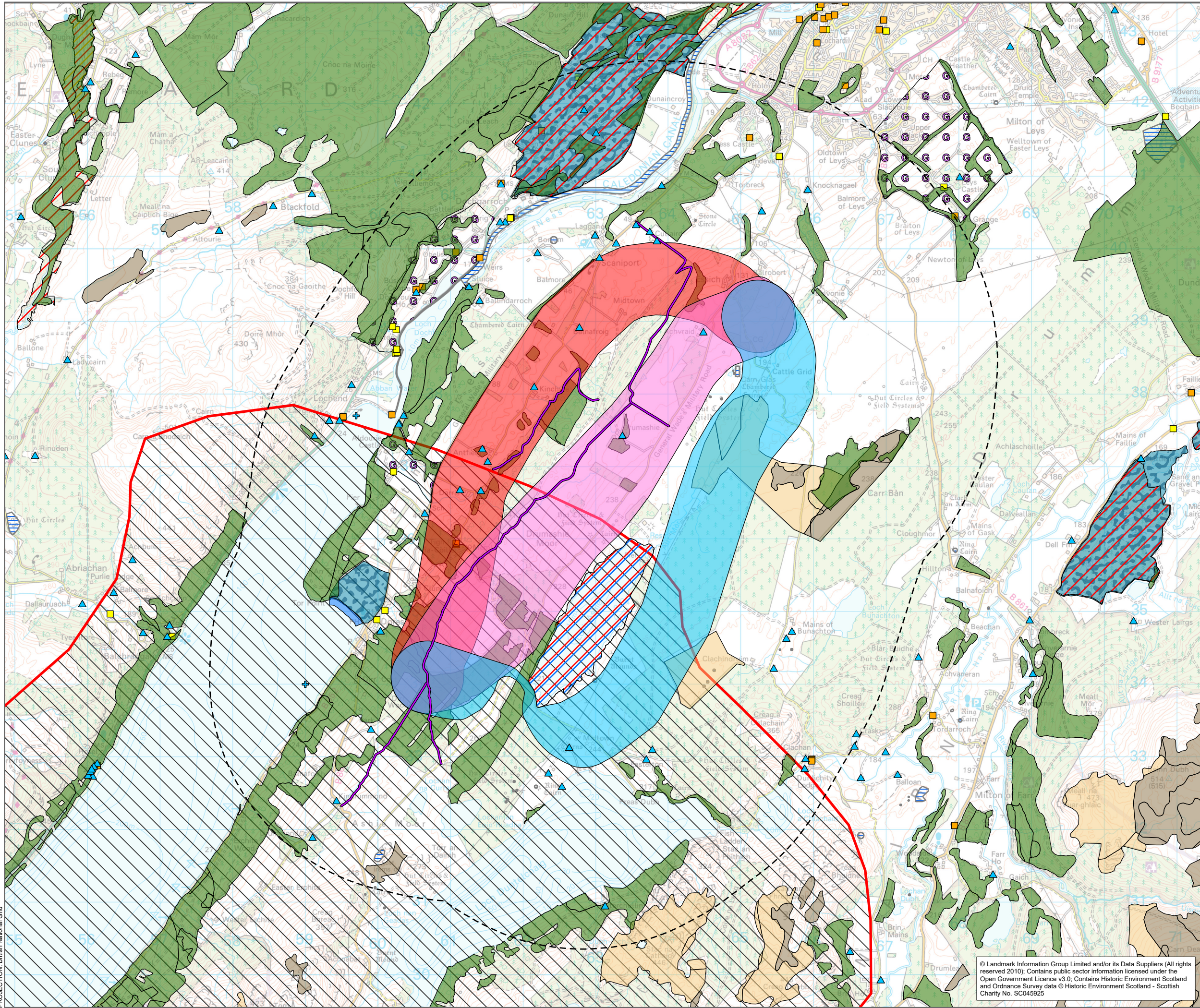
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DATE: 22/04/2022	APPROVED:

Figure 1
Red John Route Options

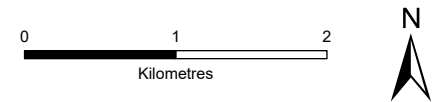


PROJECTION: British National Grid

Figure 2 Red John Combined Constraints - All Routes



- ▲ Private Water Supply
- + National Record of the Historic Environment (Maritime)
- Category B Listed Building
- Category C Listed Building
- Core Path
- 2.5 km Buffer of Proposed Project Area
- Proposed Route Option A
- Proposed Route Option B
- Proposed Route Option C
- Bathing Water Site
- Scheduled Monument
- Ancient Woodland
- Geological Conservation Review Area
- Class 1 Carbon and Peatland
- Class 2 Carbon and Peatland
- Special Area of Conservation
- Special Protection Area
- Site of Special Scientific Interest
- Special Landscape Area
- Garden and/or Designed Landscape



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PROJECT: 0631293	CHECKED: ES
DATE: 22/04/2022	APPROVED:

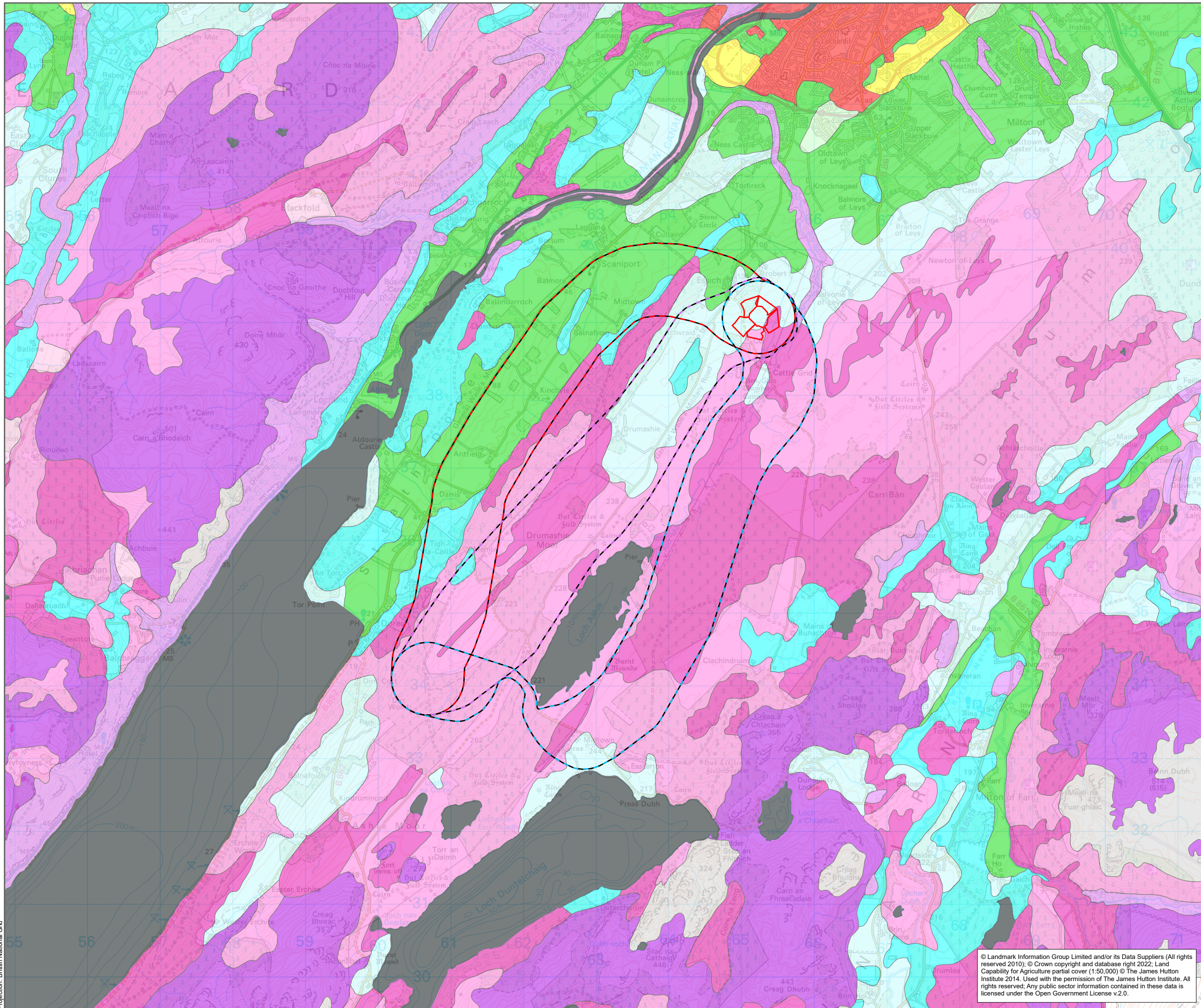
Figure 2
Combined Constraints - All Routes



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PROJECTION: British National Grid

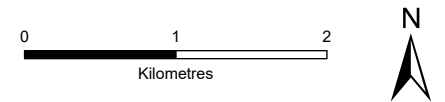
Figure 3 Red John Land Capability for Agriculture (LCA)



- Proposed Substation Options
- Proposed Route Option A
- Proposed Route Option B
- Proposed Route Option C

Land Capability for Agriculture (LCA):

- 1
- 2
- 3.1
- 3.2
- 4.1
- 4.2
- 5.1
- 5.2
- 5.3
- 6.1
- 6.2
- 6.3
- 7
- Built-up area
- Inland water
- Uncoded islands



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 PROJECT: 0631293
 DATE: 22/04/2022

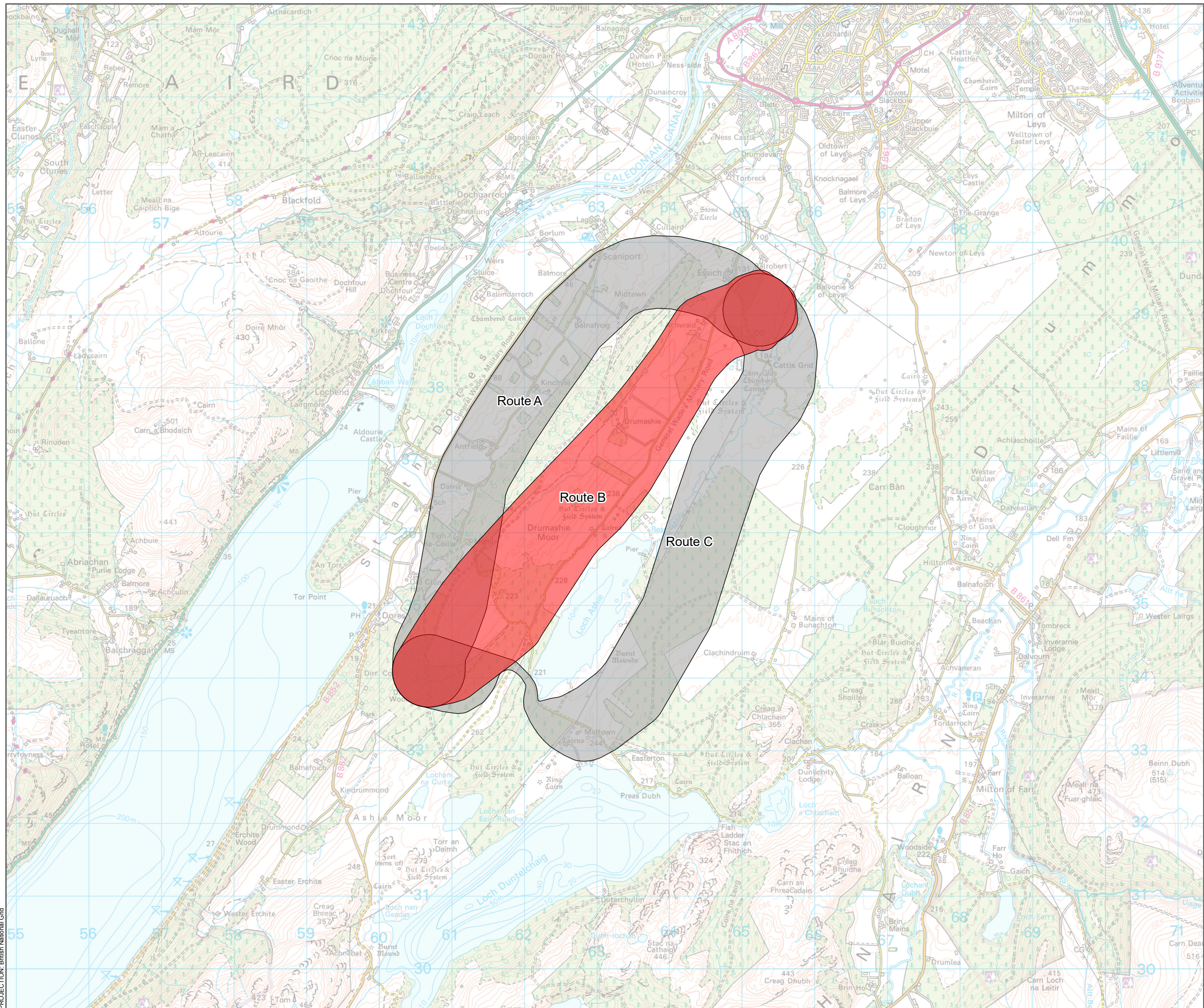
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 CHECKED: ES
 APPROVED: KG

Figure 3
LT325 Red John: Land Capability
for Agriculture (LCA)

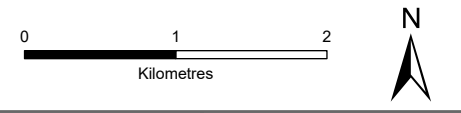
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Figure 4 Red John Preferred Route



█ Preferred Route Option
█ Alternative Route Option



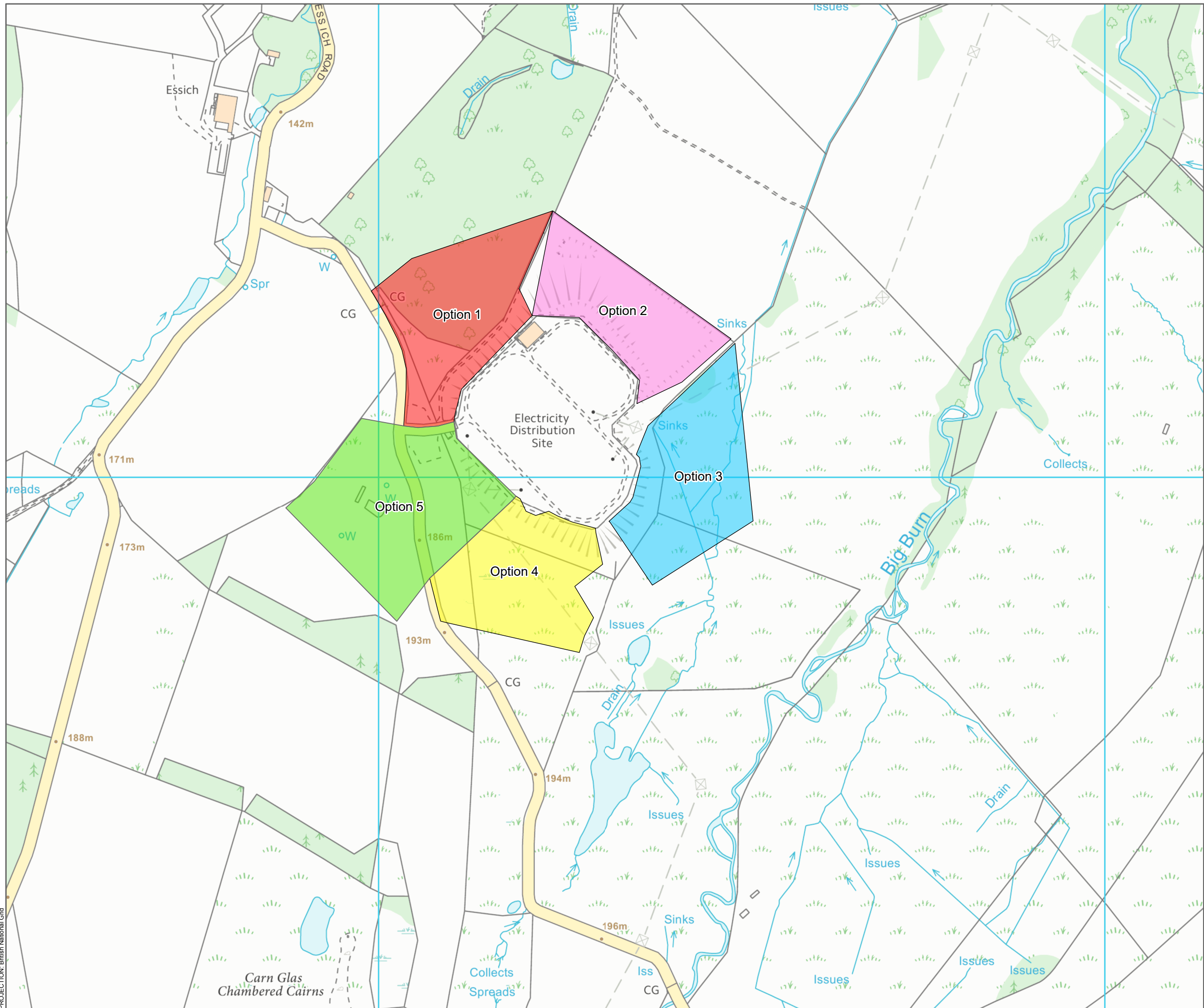
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Figure 4
Red John Overall Preferred Route

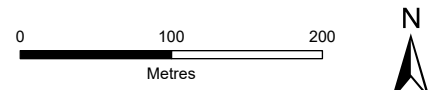


PROJECTION: British National Grid

Figure 5 Red John Substation Options



- Substation Option 1
- Substation Option 2
- Substation Option 3
- Substation Option 4
- Substation Option 5



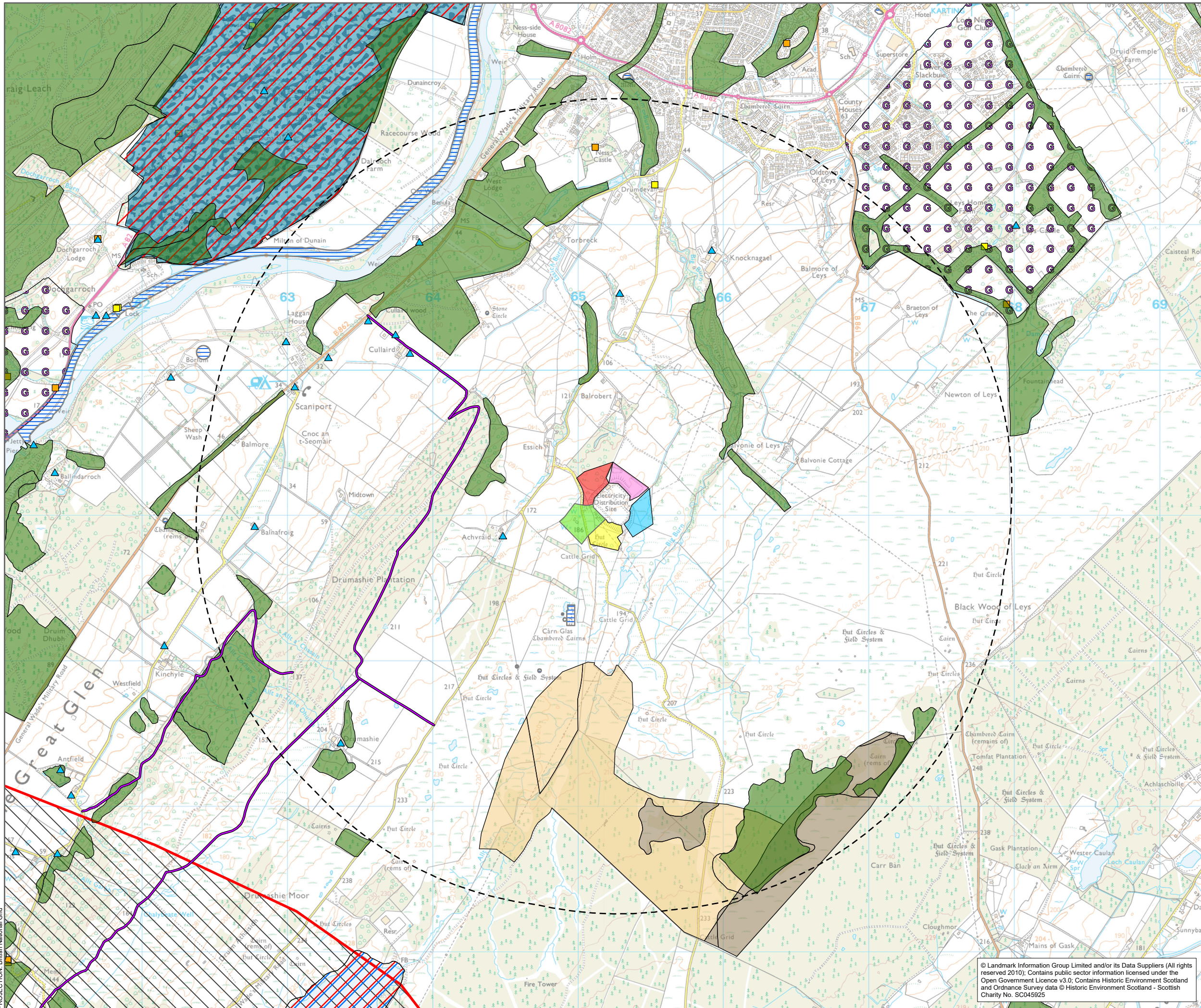
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Figure 5
Red John Substation Options



PROJECTION: British National Grid

Figure 6 Red John Combined Constraints - All Substation Options



- ▲ Private Water Supply
- Category B Listed Building
- Category C Listed Building
- Core Path
- 2.5 km Buffer of Proposed Project Area
- Substation Option 1
- Substation Option 2
- Substation Option 3
- Substation Option 4
- Substation Option 5
- Scheduled Monument
- Ancient Woodland
- Geological Conservation Review Area
- Class 1 Carbon and Peatland
- Class 2 Carbon and Peatland
- Special Protection Area
- Site of Special Scientific Interest
- Special Landscape Area
- Garden and/or Designed Landscape



SCALE: See Scale Bar	VERSION: A02
SIZE: A3	DRAWN: DN
PROJECT: 0631293	CHECKED: ES
DATE: 22/04/2022	APPROVED: KG

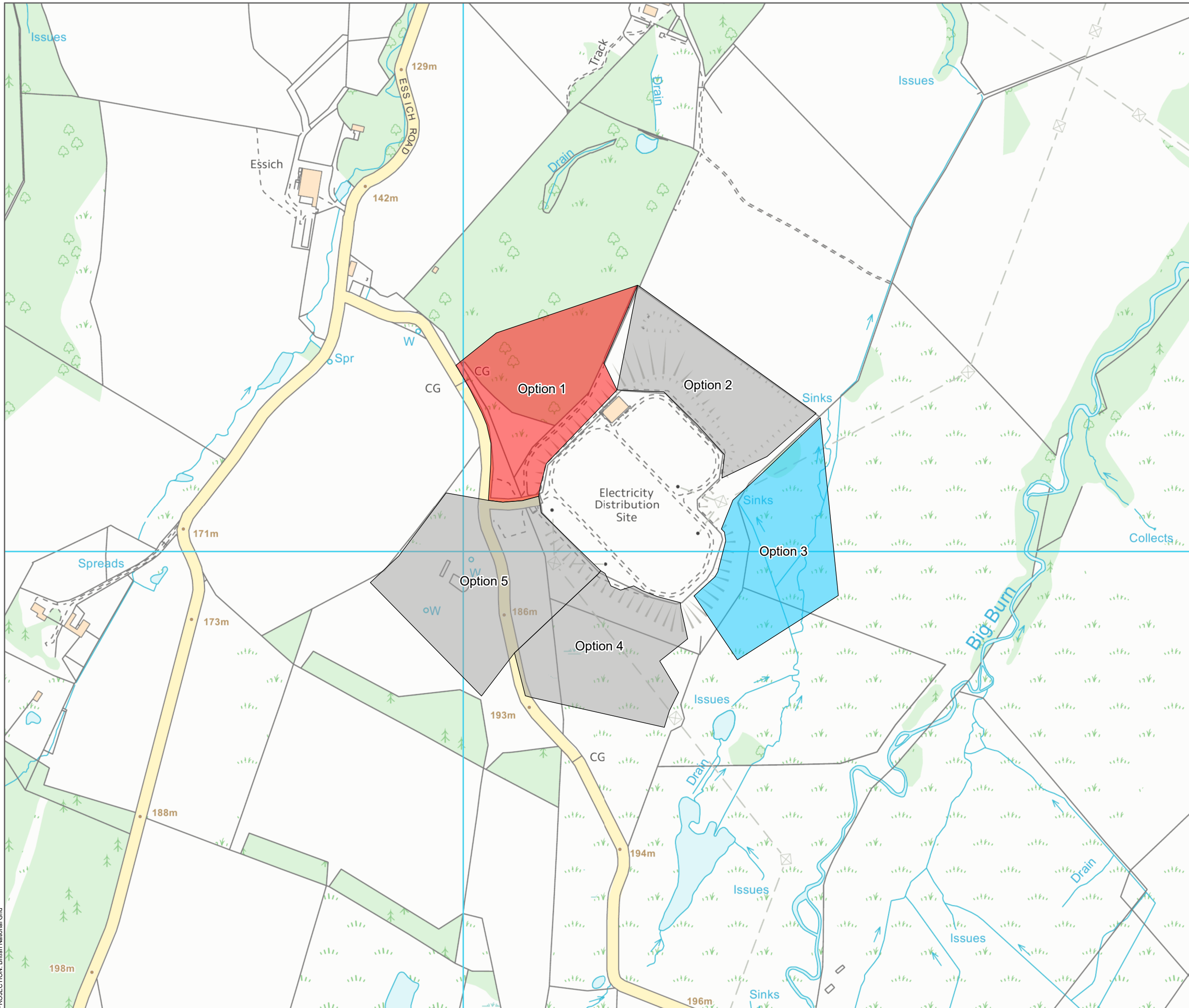
Figure 6
Combined Constraints - Substation Options



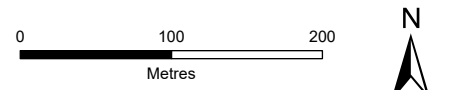
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Figure 7 Red John Preferred Substation Options



- Preferred Substation Option 1
- Preferred Substation Option 3
- Alternative Substation Option



SCALE: See Scale Bar	VERSION: A01
SIZE: A3	DRAWN: DN
PROJECT: 0631293	CHECKED: ES
DATE: 22/04/2022	APPROVED: KG

Figure 7
Red John Overall Preferred Substation Options



PROJECTION: British National Grid