LOCH KEMP STORAGE

Derogation Report

November 2023

REPORT

Loch Kemp Storage: Case for Derogation

Client: Loch Kemp Storage Limited

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1 Introduction

1.1 Project Background

1.1.1 Loch Kemp Storage Limited ("the Applicant") is proposing to construct the Loch Kemp Storage Scheme within the Dell Estate adjacent to Loch Ness (the "Proposed Development"). The scheme would export up to 600-Megawatts (MW) and import 630MW of long duration electricity storage (LDES) to support grid balancing and limit the curtailment of Scotland's renewable energy contribution. The application for consent under Section 36 of the Electricity Act 1989 is being prepared by Statera Energy (UK) Limited ("the Developer") on behalf of the Applicant. The intent of the scheme is also to help ensure energy security in the UK without gas[1].

1.1.2 Parts of the Proposed Development fall within the Ness Woods Special Area of Conservation (SAC) designated for mixed woodland on base-rich soils, western acidic oak woodland and otter; all of which are in an unfavourable condition. Given this, and in line with requirements of The Conservation of Habitats and Species Regulations 2017[2] and The Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019[3] (the 'Habitats Regulations'), information to support Habitats Regulations Assessment (HRA) is being prepared by the Developer.

1.1.3 Stage 1 of the HRA process – screening for Likely Significant Effects (LSE) – determined that LSE could arise for all qualifying features of the Ness Woods SAC and, consequently, a Stage 2 Statement to Inform Appropriate Assessment (SIAA) has been prepared. This report concluded that adverse effects on otter would not arise, but that adverse effects on western acidic oak woodland and mixed woodland would. It also concluded that adverse effects would not arise on any other European sites beyond the Dell Estate (for example Loch Knockie, Urquhart Bay Wood, and Moriston River).

1.1.4 Therefore, a case for 'derogation' under the Habitats Regulations (Regulation 64 and Regulation 68) needs to be made and Stage 3 of the HRA process needs to be progressed. Derogation involves the application of three legal tests in the following order:

1. An Assessment of Alternative Solutions (AAS), that is, demonstration that there are no feasible alternative solutions that would have a lesser or no effect on a European site.
2. Demonstration that the Proposed Development needs to be undertaken for Imperative Reasons of Overriding Public Interest (IROPI).
3. Demonstration that compensation measures to ensure the coherence of the Natura 2000 network can be secured.

[1] *Ensuring energy security in the UK without gas*. Malcolm Turnbull's Open Letter to UK PM Rishi Sunak (1 August 2023).

[2] The Conservation of Habitats and Species Regulations 2017 apply in Scotland in relation to certain specific activities (reserved matters), including consents granted under Section 36 and 37 of the Electricity Act 1989. They implement Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora (the Habitats Directive).

[3] The Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019 amend the Conservation of Habitats and Species Regulations 2017 so that they remain operable, ensure protection continues, to meet the UK's international commitments following withdrawal from the European Union.

1.2 This Report

1.2.1 This report presents the case for derogation. The Proposed Development is described in full, along with the qualifying features of the Ness Woods SAC, in the Habitats Regulations Appraisal Report prepared by SLR Consulting Ltd and Gavia Environmental Ltd on behalf of the Developer. The Stage 2 SIAA within this report examines potential adverse effects on the integrity of the Ness Woods SAC (as well as adjacent European sites) in detail, to provide the competent authority with the information required to inform their Appropriate Assessment. These descriptions and assessments are not repeated here.

1.2.2 This report has been prepared by Ms Sian John on behalf of Royal HaskoningDHV. Ms John and Royal HaskoningDHV have significant experience and expertise in undertaking HRAs, the preparation of derogation cases and the development of compensatory measures. They have been working in this field since 1998, including for the Harwich Haven Channel Deepening, London Gateway Port Development, Horizon Nuclear Power Station, Wylfa Newydd Nuclear Power Station, Hornsea Project Three and Four Offshore Windfarms, Norfolk Boreas Offshore Windfarm, and the Boston Alternative Energy Facility. Ms John also led the Ecosystem Enhancement Programme for Tidal Lagoon Power.

1.2.3 **Section 2** herein includes the Assessment of Alternative Solutions (AAS).

1.2.4 **Section 3** sets out the Imperative Reasons of Overriding Public Interest (IROPI) for the Proposed Development.

1.2.5 **Section 4** provides details of the package of compensatory measures proposed to be delivered by the Applicant. Namely, the restoration of 235ha of the Ness Woods SAC with the aim of improving its condition from unfavourable to favourable and the addition of 8ha to the SAC. It concludes that the delivery of this package of measures would have a net positive effect in the medium to long term on the integrity of the Ness Woods SAC and enhance the biodiversity of the study area.

2 Assessment of Alternative Solutions

2.1 Introduction

2.1.1 An assessment of alternative solutions should identify and examine alternative ways of achieving the objectives of the Proposed Development to establish whether there are solutions that would avoid effects, or have a lesser effect, on Natura 2000 sites. In this case, the Ness Woods SAC and the following features:

- Mixed woodland on base-rich soils associated with rocky slopes [H9180]. A priority habitat under the Habitats Directive.
- Western acidic oak woodland [H91A0].

2.1.2 Alternative solutions can include projects of a different nature and scale (as long as they met the objectives of the Proposed Development, see paragraph 2.2.3), in a different location and with a different design, as well as ‘doing nothing’.

2.1.3 Where it can be demonstrated that there are no alternative solutions that would have a lesser effect on Natura 2000 sites, the derogation process can move to the consideration of IROPI.

2.2 Methodology

Guidance

2.2.1 The methodology adopted to assess alternative solutions has been developed based on guidance from a range of sources, including (in date order):

- European Commission (EC) (1992). Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora.
- EC (2000). Assessment of plans and projects significantly affecting Natura 2000 sites, methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive.
- European Court of Justice (ECJ) (2006). C-239/04 Decision and Advocate General’s opinion.
- EC (2012). Guidance Document on Article 6(4) of the 'Habitats Directive' 92/43/EEC.
- Planning Inspectorate (PINS) (2017). Advice Note Ten: Habitat Regulations Assessment relevant to Nationally Significant Infrastructure Projects.
- Department for Environment, Food and Rural Affairs (Defra) (2021). Habitats regulations assessments: protecting a European site. Guidance on how a competent authority must decide if a plan or project proposal that affects a European site can go ahead. Defra, 24 February 2021.
- Tyldesley and Chapman (2013-2023). Habitats Regulations Assessment Handbook.
- NatureScot. NatureScot’s casework guidance.

2.2.2 It is acknowledged that the PINS and Defra guidance has been developed for England and Wales but there is no equivalent Scottish guidance. Hence its use here, alongside NatureScot's casework guidance.

Five Steps

2.2.3 The methodology consists of the following five steps, to establish the presence or absence of alternative solutions:

1. Identify the need for the Proposed Development and set out its 'objectives'. It is important to define the Proposed Development's objectives to determine what constitute relevant alternatives. Alternative solutions are limited to those which would deliver the original objectives of the Proposed Development.
2. Identify the potential 'harm' the Proposed Development is predicted to cause to the integrity of Natura 2000 sites (the Ness Woods SAC).
3. Produce a long list of potential 'alternative solutions' that could address the potential harm and screen these to produce a short list. Only alternatives that meet or deliver the need for the Proposed Development and its objectives are considered in Step 4.
4. Consider whether any short listed potential alternative solutions are 'feasible' alternative solutions (i.e., legally, technically, and financially feasible).
5. Consider whether any feasible alternative solutions would have a 'lesser effect' on the integrity of Natura 2000 sites (the Ness Woods SAC).

2.2.4 Each of these steps is considered in turn below.

2.3 Step 1: Project Need and Objectives

Project Need

2.3.1 **The need for the Proposed Development is described in Chapter 3** but is summarised here as:

The need for Pumped Hydro Storage to help meet the UK's requirement for 24GW of LDES by 2035, including 10GW of capacity from technologies with the ability to store electricity for between 8 and 16 hours, to avoid the curtailment of the renewable energy contribution to net zero targets and to support energy security.

2.3.2 Of the LDES technologies currently available, only Pumped Hydro Storage (PHS) can store electricity for over 8 hours. Loch Kemp would be capable of storing 600MW (0.6GW) of electricity for 15 hours. Of the 10GW requirement for PHS, 8GW is required for energy balancing[4] and 2GW for locational balancing[5], which is particularly relevant to PHS provision in Scotland.

[4] To prevent the loss of renewable energy generated by wind due to its intermittency, by storing excess energy generated during high wind conditions for use during low wind conditions (thereby avoiding the need to rely so heavily on fossil fuels in these conditions).

[5] To balance the constrained capacity of the UK network, between significant low carbon energy generation in the North and the demand centre of the South.

Project Objectives

2.3.3 Based on the need, the primary objective for the Proposed Development is to deliver PHS in northern Scotland to help the UK meet the requirement for 24GW of LDES capacity, and 10GW of LDES capacity with the ability to store electricity for between 8 and 16 hours, by 2035[6].

2.3.4 Supplementary objectives include:

- To help Scotland and the UK meet their net zero targets by 2045 and 2050 respectively, and the UK's target to decarbonise the electricity system by 2035, by limiting the curtailment of renewable energy provision.
- To displace hundreds of thousands of tonnes per annum of CO_2 emissions from fossil fuel power stations to (at least) 2050[7].
- To help the UK become less dependent on energy from outside the UK.
- To help mitigate transmission constraints and limit the curtailment of northern Scotland's renewable energy contribution to net zero.

Project Requirements

2.3.5 PHS projects are locationally constrained. In the first instance, they need to be in northern Scotland to store "excess" energy generated from wind in this region that cannot be transmitted south of the B6 boundary to areas of demand in England. Beyond this, in general, they require the following:

- Sufficient land to provide the capacity to realise necessary economies of scale (with a 300MW minimum).
- Paired water bodies where the lower reservoir has a large enough body of water (to avoid excessive changes in the water level) and the upper reservoir has a natural bowl (to minimise the capital costs of new dams).
- Sufficient vertical distance ('Head') between the two reservoirs (at least 100m, ideally more, to minimise costs/MW).
- A short horizontal distance between the two reservoirs (to minimise the capital cost of additional tunnel length). A short tunnel also allows the use of a shaft-type powerhouse rather than an underground cavern (reducing costs).
- Proximity to and capacity within the grid, to allow a grid connection at a sensible cost and within a sensible timescale.
- No major geological faults and good access for construction.

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[6] Jacobs (2020) and Aurora Energy Research (2022); see **Section 3.3**.

[7] Further details are provided in Technical Appendix 3.6: Outline Carbon Balance to the Proposed Development's Environmental Impact Assessment.

2.3.6 These criteria significantly limit the number of viable locations for PHS. However, the Loch Kemp Scheme (atypically) meets these requirements. The existing reservoirs being within 1km of one another and a minimum head of >160m support favourable capital expenditure per megawatt (Cap Ex/MW) for energy generation and storage. Short waterways also allow high round-trip (circulating the entire storage capacity of the upper reservoir) efficiency figures of at least 78%.

2.3.7 Gilkes Energy undertook an assessment of paired water bodies in the Highlands to identify potentially viable sites for PHS and found between 25 and 30 locations where an upper reservoir (loch) was within 3km of a lower reservoir, with more than 200m of Head, and less than 20km from a 132-275kV grid line. However, a more detailed review of these locations suggested that there were a limited number of other candidate sites where the need to create upper reservoir entrapment areas at a very high cost could be avoided, and considerable further work (with significant cost and time implications) would be required to understand the nature of the geology for tunnels, the restrictions that might apply to operations from constraints on the lower reservoir (e.g., existing hydro schemes), and likely liabilities and timescales for connecting into existing grid lines (rather than substations). Further, assuming landowner support could be obtained, they would all have environmental impacts (including impacts on European designated sites).

2.3.8 These challenges are verified by the fact that, despite the increasingly favourable economic landscape over the last 10 years for renewable deployment, no pumped hydro scheme has been built in the UK since 1984 (Dinorwig) and in Scotland since 1969.

2.4 Step 2: Potential for Harm

2.4.1 Full details of the predicted adverse effects of the Proposed Development on the integrity of the Ness Woods SAC are provided in the Stage 2 SIAA within the Shadow Habitats Regulations Appraisal (HRA) Report (Stage 1 & 2)[8] and are not repeated here. However, an overview is provided of the envisaged potential for ‘harm’ and the aspects of the Proposed Development that this would arise from. Mitigation measures that have been applied to reduce this harm (as far as possible) are also described. Alternative solutions are solutions that would both meet the need for the Proposed Development and avoid, or reduce, such harm.

Overview

2.4.2 **Figure 2-1** shows the proposed layout of and optimised design for the various components making up the Loch Kemp Storage Scheme and their interaction with the Ness Woods SAC. The powerhouse platform, powerhouse building[9], access tunnel adit, and access track would be permanent features within the SAC, along with the powerhouse quayside immediately adjacent to the SAC. In addition, a site compound is proposed to be located within the SAC in the construction phase, within the overall footprint of the powerhouse platform, and a working corridor is proposed around both the access track and powerhouse platform. Hence, the SAC would experience direct, permanent[10] habitat loss due to land take for infrastructure and temporary species loss in the working corridor (albeit a long recovery time is acknowledged).

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[8] *Loch Kemp Storage: Shadow Habitats Regulations Appraisal (HRA) Report (Stage 1 & 2)*, prepared by SLR Consulting Ltd (SLR) in support of the Section 36 Application for the Proposed Development.

[9] Including an internal substation.

[10] For the duration of the Pumped Storage Scheme.

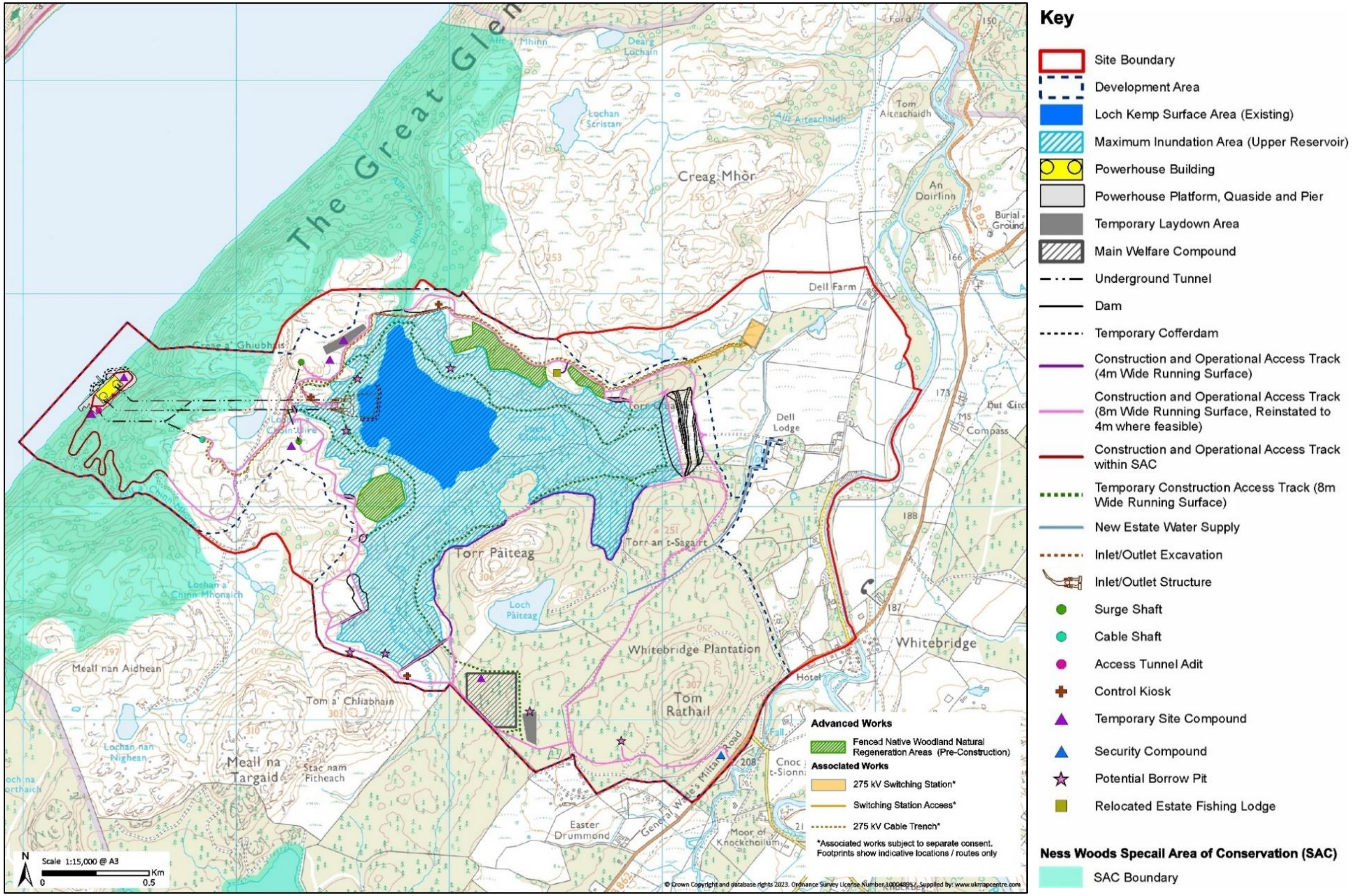

***Figure 2-1** Site Layout: Loch Kemp Storage Scheme and the Ness Woods SAC*

2.4.3 The Conservation Objectives (COs) for the woodland features of the Ness Woods SAC are set out in **paragraph 4.2.6** and include restoring or maintaining: the extent and distribution of the habitat; the structure, function and supporting processes of the habitat; and the distribution and viability of typical species. For the purposes of defining 'harm', all of these COs would be adversely affected by the loss of the habitat (including structure, function, processes and the distribution and viability of typical species, including the important lichen and bryophyte communities the woodland supports). Tree surveys have indicated that the SAC habitat to be cleared is largely upland oak-birch woodland, with stands of hazel groves (supporting lichen and bryophyte communities) and smaller bracken-dominated areas, dry heath, and upland mixed broadleaf woodland. Very few oak trees are present. However, the soil sampling has shown that the soils in the footprint of the works are acidic sandy soils. Hence, the seed bank and soils could support western acidic oak woodland. For this reason, all woodland habitat, as well as bracken stands, within the footprint of the works has been included in the habitat loss calculations for the SAC's woodland qualifying features.

2.4.4 **Figure 2-2** shows the habitats that would be in the footprint of works and **Table 2-1** summarises the areas of habitat that are predicted to be lost based on the optimised design (within which the structure, function and supporting processes would change, along with the distribution and viability of typical species). Due to a lack of certainty relating to exactly which sections of the access track's 3m working corridor could be built on ahead of the detailed design phase (explained further below), habitat loss has been presented in **Table 2-1** as a range for each habitat type. The worst-case (precautionary) prediction, however, is that up to 0.6ha of mixed woodland on base-rich soils and up to 4.96ha of western acidic oak woodland would be built upon; **amounting to the loss of up to 5.52ha of qualifying woodland habitat**[11].

Table 2-1 *Summary of predicted qualifying habitat removal from the Ness Woods SAC*

Habitat type	Loss due to permanent infrastructure (ha)			Loss from working corridor (ha)	Total loss (ha)	Loss of total qualifying habitat in SAC
	Access track	Inundation area / dam	Powerhouse infrastructure			
Mixed woodland on base-rich soils	0.04	-	0.28	0.23 - 0.27	0.56 - 0.60	2.22 - 2.38%
Western acidic oak woodland	0.71	0.44	1.84	1.87 - 1.97	4.86 - 4.96	0.90 - 0.92%

2.4.5 In **Table 2-1**, a 70% land take has been assumed within the access track's working corridor on a precautionary basis. That is, the access track's permanent infrastructure includes its running surface (4m), a drainage channel and safety barrier (1m either side) and indicative cut and fill requirements informed by available topographical data. These predicted cut and fill requirements change with the slope gradient, track routing and bend radius. At hairpin bends on a steep slope, for example, fill has been allowed to provide structural stability on the downhill edge of the access track; while for straighter sections of the access track, or areas on gentler slope gradients, significant cut and fill is not required. However, the full extent of these requirements cannot be determined until detailed ground investigations have been undertaken.

[11] This figure differs from the total derived by adding together the figures for the different habitat types, because the worst-case loss would not be experienced for both habitats (i.e., the works would affect one or the other).

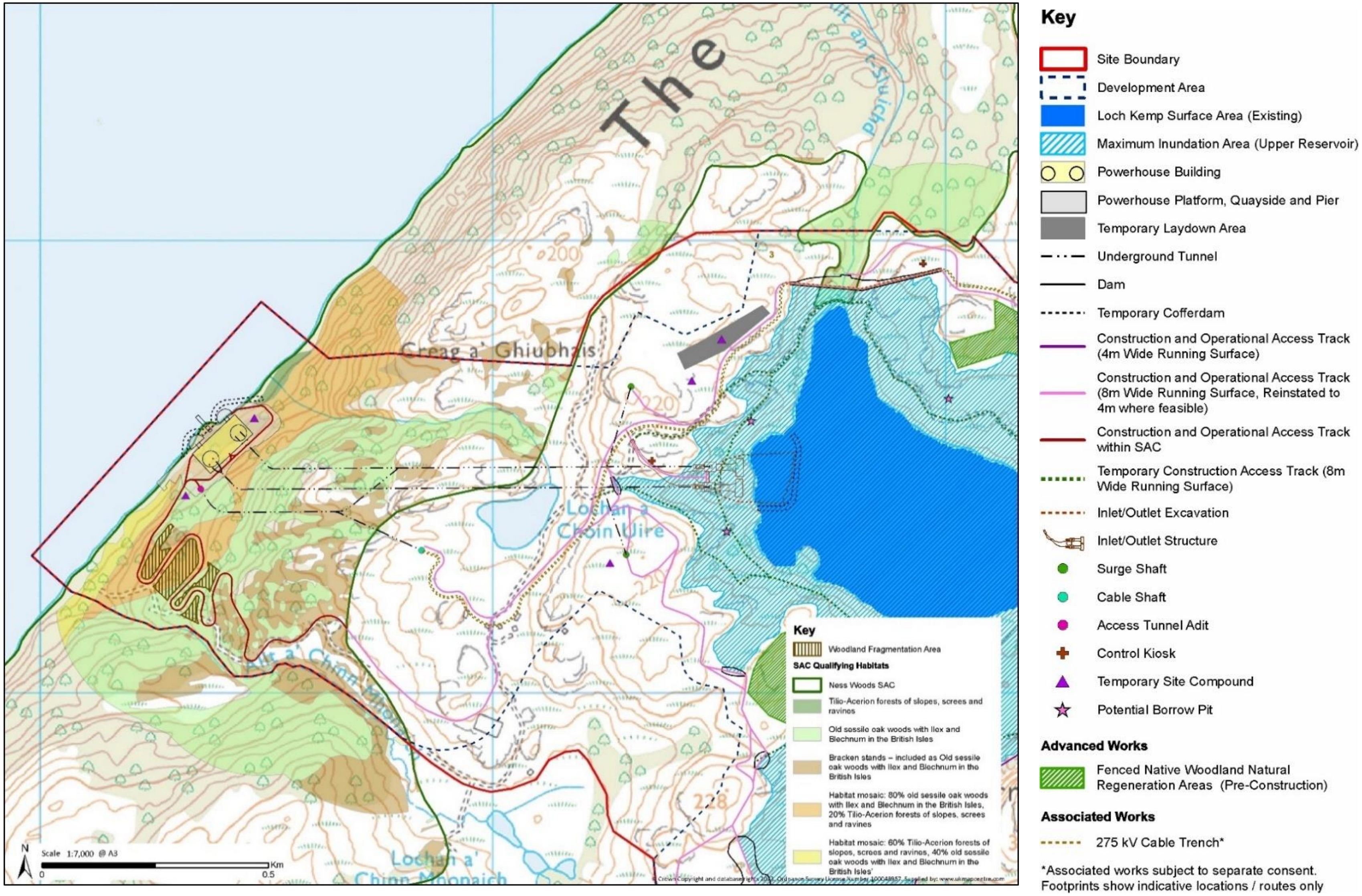

Figure 2-2 *Ness Woods SAC qualifying interest habitats and proposed infrastructure*

2.4.6 A 3m working corridor for the construction of the access track has also been allowed from the edge of the predicted cut and fill, within which any additional cut and fill would be accommodated. But the built footprint of the access track would not occupy 100% of this corridor. 70% has been assumed on a highly precautionary basis. During the detailed design phase, the intention would be to try to limit the built percentage of the working corridor are far as possible.

2.4.7 It has, however, been assumed that 100% of the trees (and their lichen and bryophyte assemblages) within the working corridor would be lost during the construction phase. **Table 2-2** lists the species and number of trees that would be removed. These are the typical species of the woodland features, and the numbers reflect their distribution.

2.4.8 In addition to the direct effects described above, indirect effects are predicted in the root protection area (RPA) proximate to the works and due to habitat fragmentation. That is, it has been assumed that any trees within a 4m RPA[12] of the areas to be built upon and the working corridor would be at-risk and (on a precautionary basis) that 70% of these would be harmed or lost along the access track[13], 100% around the powerhouse (see **Figure 2-2** and **Table 2-2**).

Table 2-2 *Predicted individual tree loss within the Ness Woods SAC*[14]

<table>
<tr><th>Tree species</th><th>Predicted number of trees to be lost (permanent infrastructure and working corridor)</th><th>Estimate of number of at-risk trees that could suffer harm (70% of trees in the RPA of the access track and 100% in the RPA of the powerhouse platform) *</th></tr>
<tr><td>Birch / Silver Birch</td><td>711</td><td rowspan="8">* It is not known which tree species would be affected in the at-risk area</td></tr>
<tr><td>Hazel</td><td>90</td></tr>
<tr><td>Alder</td><td>20</td></tr>
<tr><td>Rowen</td><td>13</td></tr>
<tr><td>Ash</td><td>5</td></tr>
<tr><td>Standing deadwood</td><td>4</td></tr>
<tr><td>Oak</td><td>1</td></tr>
<tr><td>Unidentified / Cherry</td><td>6</td></tr>
<tr><td>Total</td><td>850</td><td>107</td></tr>
</table>

2.4.9 Further, areas of woodland within the hairpin bends of the access track could become isolated and suffer from the effects of fragmentation. Bryophytes and lichens are sensitive to changes in micro-climatic conditions. Edge effects could affect the resilience and long-term viability of typical species and, consequently, their extent and distribution. Given this, again on a precautionary basis, it has been assumed that the woodland within the two tightest hairpin bends and the two lowest hairpin bends (characterised by high value trees and a reasonable closed canopy) could suffer from habitat change[15].

[12] Refer to Section 5.4.1, Potential effects for the project alone, Tree Loss Assumptions of the *Loch Kemp Storage Habitats Regulations Appraisal Report (Stage 1 & 2)*.

[13] Based on the assumption that 70% of the access track working corridor would be built upon.

[14] The table shows the residual effects predicted, following the optimization of the design and mitigation of effects (described below).

[15] Refer to Section 5.4.1, Potential effects for the project alone, Habitat Fragmentation of the *Loch Kemp Storage Habitats Regulations Appraisal Report (Stage 1 & 2)*.

2.4.10 The total area of qualifying woodland habitat that could be harmed by the Proposed Development is set out in **Table 2-3**.

Table 2-3 *Predicted habitat loss and habitat change (fragmentation) within the Ness Woods SAC*

Qualifying habitat type	Habitat loss (ha)	Habitat change (ha)	Total area (ha)
Mixed woodland on base-rich soils	0.56 – 0.60	0.13	0.69 – 0.73
Western acidic oak woodland	4.86 – 4.96	1.04	5.90 – 6.00
Total (ha)			6.59 – 6.69

Mitigation

2.4.11 Mitigation measures identified as part of the examination of alternative approaches and already built into the design of the Proposed Development to reduce the extent of harm to the SAC are extensive and include the following (full details are provided in Volume 1, Chapter 2: Design Evolution and Alternatives of the *Loch Kemp Storage EIA Report*).

Compact design

- The powerhouse and its associated infrastructure have been designed (and redesigned) to be as compact as a possible. Further, no construction or welfare compounds or laydown areas are proposed within Ness Woods SAC outside of the powerhouse platform area; and access to and from the visitor centre would be via the quayside on Loch Ness only.
- The design of Dam 1 has been altered (by using concrete rather than rockfill) to reduce its footprint in the SAC by 50%.
- The size of the working corridor and track length has been reduced as much as possible by reducing the track width as far as is feasible to still allow use by a typical construction vehicle (3m – 3.5m width). Furthermore, the cut and fill requirements for the supporting track foundation have been minimised as far as possible based on the topographic contours of the site.

Sitting adjustments

- The powerhouse building has been sited on a flat area close to the Loch Ness shoreline in an area dominated by bracken, reducing tree loss.
- Causeway and pontoon designs considered on the margin of Loch Ness for construction laydown have been removed from the design. It has been concluded that sufficient laydown area can be accommodated within the proposed powerhouse platform area, without any additional land take. Together with the careful siting, optimisation of the design of the powerhouse and construction area has meant that the footprint of the powerhouse in the SAC has been reduced by around 2ha.
- Multiple access track route options have been considered to try to reduce land take within the qualifying woodland habitat and minimise tree loss, as well as impacts on bryophyte and lichen communities, as far as possible[16]. The proposed access route follows the existing track and passes through non-SAC habitat (primarily acid grassland) in its upper stretch. Local sitting adjustments have also been made, where possible, to avoid hazel trees and areas with the highest lichen

[16] See Section 2.6 of Volume 1, Chapter 2: Design Evolution and Alternatives of the *Loch Kemp Storage EIA Report*.

and bryophyte interest; and to stay more than 10m away from any watercourses (in fact the closest point of the track to the Allt a Chinm Mhonaich watercourse is 14m) at the request of the Scottish Environmental Protection Agency. However, the steep topography of the site and the requirement for the track to have a safe 10% gradient to access the powerhouse building (see **paragraph 2.6.13**), means that it needs to deviate from the existing track and pass through SAC habitat in its middle and lower stretches. Nevertheless, the route of the access track has been optimised[17] and is as short as possible (to minimise the effect on the SAC), hence it includes several switchback corners (hairpin bends), whilst not exceeding a 10% gradient[18].

- The width of the proposed access track in the SAC has been reduced from 8m (the standard for tracks out with the SAC) to 6m on straight sections and 7m on bends, including a 4m running surface (5m on bends), a 1m drainage channel on one side and 1m safety/crash barrier on the other[19]. Together with the proposed routing, the width reduction has meant that the footprint of the access track and construction corridor in the SAC has been reduced by just over 1ha.
- In addition, instead of laying the cable for the grid connection in a new trench through the SAC along the access track (requiring an additional allowance in the working corridor for both the trench and thermal conductivity separation distances), a tunnel spur is to be constructed from the access tunnel to the vertical surge shaft (located outside the SAC) to carry the cable underground without causing additional land take within the SAC, reducing the footprint of the works in the SAC by 3 to 4ha.

2.4.12 The final measure is significant in the context of the assessment of alternative solutions and the compensation package because, although the grid connection is associated with the project, it does not form part of the Proposed Development for which consent is being sought here. Nevertheless, the Developer sought to reduce harm to the Ness Woods SAC as far as possible and commissioned an assessment of alternatives to laying the cable in the SAC. The outcomes of which were:

- Cable in Loch Ness - laying a cable in Loch Ness, rather than in the ground in the SAC, would have no impact on the SAC. However, this option is not technically feasible to achieve due to the significant depth of Loch Ness (>200m), access restrictions (including issues associated with accessibility for the marine cable installation equipment), and the high risk of delay to project delivery.
- Overhead line - connecting to the grid via an overhead line would be challenging but, in theory, technically feasible and could reduce the land take in the SAC by 2.7ha. However, the visual impact would be considerable and likely unacceptable. In addition, based on the working assumption that a 30m wide clear corridor would be required under the overhead line for permanent support tower foundations and safe cable operation distances, this gain may not be realised.
- Follow the existing track route - following the existing estate track route for the connection to the grid would be challenging but, in theory, technically feasible and could reduce the land take in the SAC by up to 1.98ha. However, the requirement

[17] This includes committing to delivering some of the larger equipment to the lower reservoir works site by boat.

[18] There is a short section of the track in the SAC which is at a 12% gradient. This is permissible in this case because it has 6% relief either side. All other lengths of the proposed track do not exceed a 10% gradient.

[19] It has been assumed that the fill area requirements to support the access track would have a 1:3 (height to length) ratio. This could be optimised (to a steeper gradient and smaller footprint) further during the detailed design phase, based on the results of the ground investigations.

to widen the track route to achieve this and link the hairpin bends to avoid the tight radius, means that this gain may not be realised.

- Construction of a tunnel spur from the access tunnel to the roadside cable trench in the access track outside the SAC – this would be technically feasible and would avoid any harm to the SAC, but at a cost of circa £10M to the Proposed Development.

2.4.13 The tunnel spur option has been progressed as part of the Proposed Development as a key mitigation measure in respect of the avoidance of cumulative effects on the SAC.

Residual Potential for Harm

2.4.14 The design for which consent is sought, which includes compact design, careful siting and optimising the footprint of the works, has reduced the direct habitat loss in the Ness Woods SAC from an initial estimated 12-13ha to a maximum of 5.52ha. The impact on the SAC has been minimised as far as possible.

2.4.15 In addition, to the mitigation measures identified as part of the examination of alternative approaches, built into the design (and relevant to the AAS), other mitigation measures to reduce or remove effects on qualifying features are described in the Habitats Regulations Appraisal Report (Step 4: Mitigation Measures). These include the preparation of a detailed Construction Environmental Management Plan, the employment of an Environmental Clerk of Works, demarcation of retained habitat areas, maintenance of the natural flow regime etc.

2.5 Step 3: Potential Alternative Solutions

Developing a List

2.5.1 The first part of this step involves identifying and listing potential alternative solutions in accordance with EC (2012) paragraph 1.3.14 and the Planning Inspectorate (2016) paragraph 4.286. In line with this guidance, the formulation of the long list of potential alternative solutions included here has not been constrained by economic considerations.

2.5.2 Defra (2021) reinforces the fact that alternatives need to meet the original objective of the proposal (in this case to deliver PHS quickly) and gives examples of alternatives that may not meet the original objective, including proposals that: offer nuclear instead of offshore wind energy; provide rail instead of road transportation; or aim to import freight in a different way instead of increasing port capacity (Defra, 2021). Hence, alternative forms of energy storage are not included in the list below, but are considered in **paragraphs 2.5.7 to 2.5.9** (Do nothing).

2.5.3 Based on the above, potential alterative solutions to the Proposed Development that could avoid the predicted harm of up to 6.69ha of the SAC include:

- **Doing nothing** – not progressing the Proposed Development.
- **Alternative locations** – progressing the Proposed Development in a different location, away from a European site.
- **Alternative scales** – progressing the Proposed Development in the same location but reducing its scale.

- **Alternative designs** – progressing the Proposed Development in the same location but adopting an alternative design to minimise the harm to the SAC. Options include:
    - Use of a cavern – positioning the powerhouse underground at the mid-point between the upper and lower loch – potential to reduce SAC land take by 0.5ha.
    - Moving the powerhouse 13m towards to the foreshore – potential to reduce SAC land take by 0.2ha.
    - Using the existing estate track within the SAC – potential to reduce SAC land take by 3ha[20].
    - Widening and realigning the existing track – potential to reduce SAC land take by 1ha.
    - Altering the alignment of the track to maximise land take within the managed grassland area of estate (to the south of the burn) – potential to reduce SAC land take by 0.9ha.
    - Adopting a route for the track to the north of the powerhouse to minimise hairpins – potential to reduce SAC land take by 0.6ha.
    - Constructing an access tunnel to the powerhouse – potential to reduce SAC land take by 3.2ha.
    - Including a conveyor system – potential to reduce SAC land take by 1ha.
    - Establishing an A82 compound and barge shuttle service to limit the need to use tracks and use the existing track for emergency access – potential to reduce SAC land take by 3ha.
    - Further reducing the width of proposed access track – at the request of NatureScot.

Screening Alternative Solutions

2.5.4 The second part of this step involves screening the long list of potential alternative solutions against the need for the Proposed Development and its objectives (as set out in **paragraphs 2.3.3 to 2.3.4**); only alternatives that meet or deliver the need for and objectives of the Proposed Development are considered in Step 4.

2.5.5 The results of this screening exercise are presented in **Table 2-4** (which, for completeness, considers alternative forms of demand management).

2.5.6 Further details on doing nothing, alternative storage technologies and alternative locations – which are screened out in **Table 2-4** – are also provided below.

[20] The land take reductions provided here were calculated based on the pre-mitigation design (e.g., in this case, prior to the reduction of the width of the access track in the SAC from 8m to 6-7m), so now overstate the potential gain in some cases.

__Table 2-4__ Screening potential alternative solutions

Potential alternative solution	Does it meet the project:		Commentary
	Need?	Objectives?	
Do nothing	No	No	Doing nothing would not deliver the need for the Proposed Development – for PHS to provide LDES to balance the grid and help the UK decarbonise – or meet its objectives. Nor would it help the UK become more energy independent.
Alternative forms of demand management	No	No	In theory, alternative measures to store, manage and reduce demand (which, to date, have had limited success) could be used to reduce CO_2 emissions and help Scotland and the UK achieve their net zero targets by 2045 and 2050, but they would not address the need for 10GW of capacity with the ability to store electricity for between 8 and 16 hours by 2035 to limit the curtailment of the renewable energy contribution and support energy security. In addition, the alternative approaches that could be used to balance the grid and store renewable energy are all required (to meet the requirements for 24GW of LDES by 2035) and all have limitations (as described in **paragraph 2.5.8**). Such alternative sources, measures and approaches are also beyond the scope of the Proposed Development's objectives.
Alternative locations	No	Yes, but only partially	The delivery of the Proposed Development in an alternative viable location (should this be an option open to the Applicant, which it is not) would make a 600MW contribution but would not help the UK meet the need for 24GW of LDES capacity, and 10GW of LDES capacity with the ability to store electricity for between 8 and 16 hours, by 2035. This requires all viable locations to be developed and developed soon (i.e., not a viable location to be removed from consideration). This is examined further in **paragraph 2.5.12** onwards.

Potential alternative solution	Does it meet the project:		Commentary
	Need?	Objectives?	
Reduced scale	No	Yes, but only partially	The delivery of the Proposed Development at a reduced scale would contribute to meeting its objectives but would fall short in terms of meeting the need for 24GW of LDES capacity by 2035. This requires all viable locations to be developed at scale. Further, reducing the scale of the Proposed Development would make it uneconomic and significantly reduce its contribution to the requirement for 10GW of LDES capacity in general, and 2GW in Scotland for the purposes of locational balancing, with the ability to store electricity for between 8 and 16 hours.
Alternative designs			
1. Use of a cavern for the powerhouse	Yes	Yes	Because these alternatives would meet or deliver the need for and objectives of the Proposed Development their legal, technical, and financial feasibility (i.e., can they be implemented?) is assessed in Step 4, see **Section 2.6**.
2. Move powerhouse			
3. Use existing estate track			
4. Widen and realign existing estate track			
5. Alter track alignment to maximise grassland take			
6. Use route to north to minimise hairpins			
7. Access tunnel to powerhouse			
8. Conveyor system			
9. Establish A82 compound and barge			
10. Reducing the width of proposed access track			

Do nothing – grid balancing alternatives

2.5.7 It is clearly understood and accepted that there will need to be substantial further deployment of renewables in the UK to decarbonise the electricity system. It follows that the mix of generation into the grid will become increasingly intermittent and the concomitant need to store energy (in times of surplus) and provide power (when the wind is not blowing and the sun not shining) will increase. Currently, when renewable energy provision is low, fossil fuels are used to 'fill the gap' and, when renewable energy provision is high, the power can be lost (and providers are paid to turn off generation).

2.5.8 While more PHS is critical for grid balancing, there are four other principal ways that the grid could be balanced going forward. These are reducing demand (over peak periods), batteries (currently for durations of 1 to 2 hours but they may be competitive for up to 6 hours in the future), green hydrogen (for daily, weekly, and seasonal storage), and interconnectors between Europe and Scandinavia. Each option for grid balancing has its own idiosyncrasies and limitations but all are required to decarbonise the system. These limitations are:

- **PHS** (providing balancing for 6 to *c*48 hours) – is capital intensive and there is no guarantee of contracted revenue.
- **Demand reduction** – National Grid ESO delivered the first live version of its Demand Flexibility Scheme, saving 250MWh in energy and paying back over £1 million to consumers, in the winter of 2022. However, it achieved a relatively small amount of demand reduction compared to the very high price paid to consumers to deliver this (£4000/MWh), raising concerns on the scalability of this option.
- **Batteries** – approximately 2GW of relatively short duration (1-2 hour) battery storage is currently deployed. The forecasting models indicate a requirement for both 10 times this amount and longer duration storage. Consequently, battery storage producers are looking to extend storage duration to 6-8+ hours but this is some time away and faces constraints relating to size/space requirements, density, the availability of lithium, and the point at which batteries will become uncompetitive. Further, currently available battery technologies degrade through cell power cycling during operation, providing an effective operational lifespan of 5-10 years. Hence, while batteries will play a critical role in intraday balancing, their role in offering longer duration storage is unlikely to compete with PHS for some time, if at all[21].
- **Green hydrogen** – the UK is in the very earliest stages of developing the commercial business case, consenting, and operating policies and safety protocols for green hydrogen. There is optimism that green hydrogen (using surplus wind power to electrolyse water into hydrogen and oxygen and then using that hydrogen to generate power or for heavy industry and fertiliser manufacture) could play a major role in balancing the grid and negating the need for future transmission reinforcement, but this is some time away (with trials to start at the earliest in 2028/29) and will not meet the current need.

[21] The benefit of LDES compared to short duration batteries, is linked to being able to continuously charge the store with excess renewables and discharge power to the grid for several hours or days when wind and solar output is low.

- **Interconnectors** – are necessarily limited in extent and their availability subject to open market trading. Further, if Northern Europe experiences similar climatic conditions, particularly low wind generation, the ability of the UK to rely on interconnectors becomes uncertain and, as Western European markets rapidly decarbonise, there is likely to be some correlation across the region of output from renewables. Therefore, each incremental interconnection will have a diminishing role in offering the UK security of supply, which is of particular importance with the current heightened conflicts in the Ukraine and Middle East.

2.5.9 The most significant barrier to PSH deployment in liberalised energy markets, such as that of the UK, is not the technology itself but the financial support mechanisms and surrounding regulatory frameworks. These present uncertainty in deployment lead times, long-term revenue stability and permitting risks. The technological requirements and supply chain risks of PHS are well understood and manageable domestically. This is particularly the case when compared to newer LDES technologies which often place heavy reliance on processes yet to be deployed at a grid scale or dependence on sourcing materials and minerals not readily available within the UK.

2.5.10 Therefore, of all the LDES technologies available at present, PSH represents the lowest risk of non-delivery, the most flexible grid scale energy security mechanism based on a proven technology with the longest, non-degrading operational life (60 to 100-year typical project life).

2.5.11 Given this uncertain backdrop, as a proven, long-term, low-carbon and low-cost solution, the UK cannot afford to impose a limit on the amount of PHS that could come forward. If it did, the direct consequences would be greater reliance on fossil fuels for longer, impacting energy security and the ability of the Scotland and the UK to meet their net zero targets.

Alternative locations

2.5.12 As set out in **paragraph 2.3.7**, it can take years to develop PHS projects to a point where they could be ready to be built, even theoretically. Hence, although there may be 25 to 30 locations in Scotland where (in theory) a scheme might work, it is complicated and time consuming to obtain landowner agreement, develop a feasible engineering solution and secure a grid connection (where available connection dates are often many years in the future). The Coire Glas scheme for example, which has the potential to deliver up to 1.5GW of storage (30GWh), was conceived some 10 years ago and it may be another 6 or 7 years before it is built and generating power. Therefore, progressing other locations as alternatives to Loch Kemp (acknowledging that other schemes do need to be brought forward in addition to Loch Kemp) will not meet the requirement for 10GW of LDES capacity able to store electricity for between 8 and 16 hours by 2035. That is, new schemes not already proposed cannot be built in the required timeframe.

2.5.13 In addition, despite the number of theoretical alternative locations to Loch Kemp, there are fewer than 10 other potential schemes in Scotland currently being promoted[22]. These include Coire Glas (described above) and the following schemes:

[22] Several schemes identified in the Jacobs (2020) report, based on work undertaken by SSE in 2006 (p.56), as potential (600MW) future projects have not been progressed, including Balmacaan, Craigroyston, Ardvorlich, Breaclaich and Lawers. In addition, others have not come forward for planning submission yet, namely Ben Alder (800MW) (now Corrievarkie), Loch Awe (520MW) (now Balliemeanoch) and Eishken (150MW).

- Glenmuckloch – which was consented in 2016 and has the potential to provide 210MW and 8 hours of storage. This scheme is believed to remain some way off construction (currently not having progressed through a final investment decision (FID)) and its storage capacity is of a relatively short duration. Further, this scheme will not help the UK to meet the requirement for 10GW of LDES capacity with the ability to store electricity for between 8 and 16 hours by 2035.
- Red John – which was consented in 2021 and has the potential to provide 450MW and 6 hours of storage. Similarly, construction of this scheme has not started, and its storage capacity is of a relatively short duration (short of the 10GW LDES requirement), a duration that battery storage may be able to achieve relatively soon (see **paragraph 2.5.8**).
- Cruachan Extension – which has the potential to provide 600MW and to extend the storage duration of Cruachan well beyond 24 hours; Section 36 planning consent has been recently granted.
- Balliemeanoch – which has the potential to provide 1.5GW and 30 hours of storage; the project is in the early stages of scoping.
- Project Earba – which has the potential to provide 900MW and 36 hours of storage; and is also in the application preparation stage.
- Corrievarkie – which has the potential to provide 600MW and 24 hours of storage; and is in the project scoping stage.

2.5.14 Hence, while Jacobs (2020) states that PHS is the lowest cost and most mature and well proven technology of those considered for LDES, *"having been the mainstay of medium-term energy storage over the past 60 years, and thus should be the prime candidate for at least the initial developments required by 2030"* (p.62), it remains exceedingly challenging to deliver. For all the above schemes, reaching an investment decision to build (FID), requires the capital cost to be low enough to match what is uncertain trading revenue[23]. This is an advantage the Loch Kemp Scheme has by virtue of its location (including the presence of a natural bowl for the reservoir). There are continuing calls for a form of subsidy (likely to be a 'Cap and Floor' subsidy), but the outcome of this lobbying remains uncertain. That said, the economic conditions and the consensus on future energy market volatility created by intermittent renewables (a precursor of the economic model for PHS) have been positive for some time, but the fact that no new PHS scheme has been built in the UK since 1984 (Dinorwig in Wales) reflects the challenge.

2.5.15 In addition, the environmental impacts associated with all these schemes, and other potential locations, are seldom insignificant, with effects predicted on European sites, other conservation interests (such as peat) or landscape and wild land, or a combination of these. Other challenges include real constraints on access, a lack of grid capacity (with no additional capacity forecast until after 2029), and that landowner agreements can be notoriously challenging to tie down (another advantage that the Loch Kemp Scheme has).

[23] For projects to come forward to FID at all, the capital costs must be low enough so that, in combination with a subsidy regime (which must be affordable to electricity customers), the project can meet the requirements for private sector energy infrastructure returns. These returns must reflect the risk in a typically long construction period (4-5 years) and reliance on wholesale merchant revenues, alongside a floor return from a subsidy to allow for debt.

2.5.16 Given these challenges and the significant need for deployment of PHS now, alongside shorter duration batteries and weekly, monthly, and seasonal balancing from green hydrogen, progressing the Proposed Development in another location is not an alternative solution. That is, against the 10GW requirement for 8 to 16 hour LDES by 2035 forecast by Aurora Energy Research (2022) and the 10GW requirement for PHS by 2035 forecast by Jacobs (2020) in addition to the 2.8GW of existing storage (see Section 3.3), if all the schemes for which details are available where progressed (i.e., those detailed in paragraph 2.5.13, Loch Kemp and Glyn Rhonwy in Wales, consented in 2017[24]) they would only deliver 7.06GW, and not all of these schemes will be built. Hence, **all schemes that can demonstrate a satisfactory planning balance are required**.

2.5.17 The location of the Proposed Development is the only location that Statera Energy (UK) Limited currently wishes to progress. The Loch Kemp Storage Scheme was initiated three years ago with full landowner support. The advantages of the site include its size, the presence of a natural bowl for the upper reservoir, the length of the tunnel required is limited to 1km, the geology is suitable, and there is existing infrastructure, a workable grid connection, and only one landowner. It is this rare combination of factors that mean the cost per MWh is acceptable and the scheme is viable.

2.6 Step 4: Feasible Alternative Solutions

Introduction

2.6.1 In Step 3 potential alternative solutions are screened to understand whether they could meet or deliver the need for the Proposed Development and its objectives; only those alternatives that could do so are considered in Step 4. In this case, those alternatives include all the alternative designs (1 to 9) listed in **Table 2-3**. Their 'feasibility' is, therefore, assessed in this section.

2.6.2 Defra (2021) states that an alternative solution is acceptable if it is financially, legally, and technically feasible. Conversely, an alternative solution is not acceptable if it is not financially, legally, or technically feasible. An alternative should not be ruled out simply because it would cause greater inconvenience or cost, however, there will be a point where an alternative is so expensive or technically or legally difficult that it would be unreasonable to consider it a feasible alternative.

2.6.3 Definitions for financial, legal, and technical feasibility are provided below. It is important to note, however, that **environmental feasibility** (i.e., whether an alternative would have a lesser effect on the integrity of a European site) **is not considered as part of this step**.

Financial feasibility

2.6.4 A potential alternative is not financially feasible where its cost is disproportionately high in the context of the scale of the reduction in the environmental effect that the alternative would achieve (Defra, 2021).

2.6.5 There are direct and indirect costs associated with potential alternative solutions. Direct costs include the cost of using more expensive equipment or the additional costs of constructing the alternative solution. Indirect costs would arise from the consequences of (for example) extending the project construction schedule due to the adoption of an alternative methodology.

[24] Glyn Rhonwy in Snowdonia received consent in March 2017 and has the potential to provide 100MW (700MWh) of storage. However, the developer is still working on fulfilling the various planning requirements specified in the Development Consent Order, as well as detailed engineering design.

Legal feasibility

2.6.6 Where there is a legal impediment or, from a legal or consenting perspective, it would be unreasonably difficult to deliver an alternative because it would have 'unacceptable' impacts, an alternative is not considered to be legally feasible.

Technical feasibility

2.6.7 A potential alternative is not technically feasible where it is impractical, incapable of being implemented, technically unsound and/or would not meet safety and regulatory requirements (including health and safety).

Alternative Designs

1. Use of a cavern for the powerhouse

2.6.8 In theory, this design option could reduce the harm to the SAC (by 0.5ha)[25] by locating the powerhouse underground at the mid-point between the upper and lower loch. However, an access track to the tailrace would still be required, and the tailrace would remain as a significant loch side structure.

2.6.9 This option may be capable of being implemented (legally and technically feasible) but there are two major constraints. First, the cost of the upfront geological investigation would run into millions and, secondly, it would add circa £70m (15-20%) to the forecast capital expenditure for the Proposed Development. This cost would make the project unviable and is disproportionately high in the context of the 0.5ha reduction in impact that it could achieve. Hence, this option is not financially feasible.

2. Move the powerhouse

2.6.10 The powerhouse could be moved 13m closer to the loch foreshore to avoid more of the SAC. This would require the construction of an extensive coffer dam to prevent water egress into the vertical shaft tailrace construction area.

2.6.11 The technical feasibility of this option is not certain, due to the very steep shoreline gradient identified in bathymetric surveys and difficult construction conditions. It is likely that safety would be significantly compromised and its cost disproportionately high in the context of the scale of the reduction in the environmental effect that it would achieve (0.2ha). It would require an additional £10m of direct expenditure (largely due to the huge amount of fill that would be required) and would introduce further indirect costs through additional project risks and delay to the programme. This cost would be on top of other committed costs, including circa £10M for the construction of a tunnel spur from the access tunnel to the access track outside of the SAC for the grid connection (which reduces the footprint of the works in the SAC by 3.6ha). Such additional expenditure would be prohibitive.

3. Use existing estate track

2.6.12 This option would involve using the existing estate track in the SAC for access, without making any changes to it (potentially reducing the footprint of the pre-mitigation Proposed Development in the SAC by around 3ha). Loch access would still be required from the powerhouse to the bottom of the existing track.

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[25] Note that the environmental implications of an alternative are only considered for alternatives deemed to be financially, legally, and technically feasible (as part of Step 5). Harm is only referenced here given its role in identifying potentially viable alternatives worthy of consideration.

2.6.13 In terms of technical feasibility, there would be issues associated with the suitability of the existing track for construction purposes and, consequently, safety. In its current form, it has a gradient of 1 to 3 in places (33%) and is only suitable for occasional 4 x 4 use; that is, it is too steep and would significantly constrain the manoeuvrability of construction vehicles. The HSE COMAH guidance[26] for roadways and site traffic states that gradients should not exceed a maximum of 1 in 12 (8.33%). While a 10% gradient is acceptable for the plant, equipment and HGVs that would use the access track in this case, it should not be exceeded for safety reasons (with contractors raising concerns over access and haul roads with 12% gradients)[27]. A further constraint is at "corners" where the turning capabilities of construction vehicles and articulated HGVs is limited, requiring a minimum corner radius of 15m. Therefore, use of the existing track is not technically feasible.

4. Widen and realign existing track

2.6.14 Widening and realigning the existing track (to reduce the footprint of the pre-mitigation Proposed Development in the SAC by approximately 1ha) would not provide suitable construction access, as its gradient would still be too steep. Even with upgrades, the existing track would still have a +12% gradient and both safety and manoeuvrability would be compromised, which would lead to reduced contractor interest. Therefore, use of the existing track, even if upgraded, is not a technically feasible option for access to the lower reservoir works.

5. Alter the track alignment to maximise grassland take

2.6.15 This option would entail altering the alignment of the track to maximise land take within the area of Dell Estate managed grassland (in theory reducing the harm to the SAC by 0.9ha). There is an extensive area of grass to the south of the burn.

2.6.16 In terms of technical feasibility, on further examination it was determined that there would be significant challenges associated with its constructability. The option would require two bridges and extensive earthworks on the approaches to the bridges to achieve a suitable alignment which, along with the track cut to the south of the burn, would have a large footprint in the SAC. Hence, the envisaged gain would not be realised and the harm to the SAC would increase.

6. Use route to north of the powerhouse to minimise hairpins

2.6.17 Use of an alternative track route to the north, which reduced the number of hairpins, was assessed (the potential to reduce the harm to the SAC by 0.6ha was envisaged). However, in terms of technical feasibility, the extent of the earthworks required would be prohibitive due to the extremely steep terrain, to the point where this option was not considered to be constructable / technically feasible.

2.6.18 Moreover, on further examination it was determined that the earthworks associated with the required cut and fill were likely to have a large footprint in the SAC, meaning that any reduction in the footprint of the Proposed Development in the SAC would not be realised. That is, the use of route to the north of the powerhouse would require a bridge crossing the outflow of the Allt an t-Sluichd watercourse into Loch Ness, which would require significant additional earthworks within the SAC.

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[26] HSE COMAH Technical Measures Document: Roadways / site traffic control / immobilisation of vehicles (Roadways / site traffic control / immobilisation of vehicles (hse.gov.uk))

[27] The SAC land take for a 12% track gradient was also tested and the change did not make a substantive difference, because the gains due to a reduced track length were countered by additional cut and fill requirements (to support the track down the slope).

7. Access tunnel to powerhouse

2.6.19 This option would involve constructing an access tunnel from outside the SAC to the powerhouse for use in both the construction and operational phases. Instead of the proposed track, access to the powerhouse would be via a roadway that would run through the tunnel. Hence the footprint of the access track would be removed from the SAC. The tunnel would need to ramp down from an elevation of 180m AOD to 20m AOD, requiring a minimum distance of approximately 1.6km to achieve a safe gradient for vehicle movements (of less than 10%).

2.6.20 In terms of the impact of this option on project feasibility overall, the tunnel is estimated to require approximately two years to construct and, because it is required for access to commence excavation of the powerhouse shafts and waterways, it needs to be completed before the main works could commence. This would have the effect of increasing the construction schedule to over six and a half years. Underground works also have a higher risk profile in terms of unforeseen delays and cost overruns. Any issues with the tunnelling would directly impact on the overall construction schedule and budget of the Proposed Development, with little scope for mitigation due its position on the critical path.

2.6.21 The significant volume of additional excavated rock mass from the construction of an access tunnel, would also generate a surplus in the mass balance of the Proposed Development and the additional rock would require barging or trucking off-site for disposal, with implications outside of the Proposed Development area.

2.6.22 In terms of financial feasibility, the direct cost associated with constructing a 6m tunnel of this length is estimated to be £42M. In addition, the programme extension would have an indirect cost of at least £10M. Hence the total additional cost would be £52M and prohibitive on top of other committed costs, threatening the viability of the Proposed Development.

8. Conveyor system

2.6.23 This option would involve the use of the conveyor system along the route of the existing estate track to reduce land take in the SAC, in theory, by 1ha. It would transport tunnel spoil out of the site. A straight line is preferred, but a route with one change of direction is feasible. The pads for the conveyer could be steel or concrete and could be buried as part of the reinstatement of the site but would be in the SAC (reducing the 1ha gain).

2.6.24 In terms of the technical feasibility of this option, the issue would remain that the existing track is not suitable for construction access. Even with upgrades, it would still have a +12% gradient and a track at 10% would be required for all other construction purposes (see **paragraphs 2.6.12 to 2.6.14**). Hence, this option is not technically feasible.

9. Establish A82 compound and barge

2.6.25 This option would involve establishing a compound near the A82 and a barge shuttle service to limit the need to use tracks. In theory it had the potential to reduce the land take in the SAC by 3ha. The existing track would then be utilised for emergency 4 x 4 access.

2.6.26 In terms of its technical feasibility, it would introduce double handling, additional risk due to logistical challenges, and potentially add up to six months to the construction programme. The use of a barge shuttle service to the A82 would also have significant water borne traffic implications on Loch Ness and road haulage traffic implications on the A82 and B862, and through the town of Fort Augustus, by adding a significant number of HGV movements to the wider area; specifically due to the >500,000m^3 of excavated rock from the access tunnel which is to be reused in rockfill dam structures at the upper reservoir (i.e., that needs to be moved up the hill).

2.6.27 In addition, a vehicular access track would still be required to provide direct access for emergency services' vehicles and as the powerhouse evacuation route in the event of an emergency. Hence, the potential benefit of this alternative and the 3ha saving would not actually be realised.

2.6.28 The additional direct capital expenditure required is estimated to be £3M, with £10M of programme costs (i.e., an additional of £13M). On top of other committed costs, such additional expenditure would be prohibitive.

10. Further reduce the width of the proposed access track

2.6.29 A 6-7m access track (reduced from the 8m standard) is proposed based on the width of the construction vehicles and HGVs that would use it, ranging typically from 3m to 3.4m in width. The running surface of the track would be approximately 4m on straight sections (increasing to 5m on bends) but, in addition, 1m has been allowed Loch side for edge protection (most likely a metal safety barrier) and 1m hillside for a drainage channel. The level of detail set out below is usually considered at the detailed design stage, when site investigation information and detailed topographical survey data are available, however a typical section and articulated HGV (28t payload) is shown in **Figure 2-3**. Excavators, pile drilling machines, sheet pile ramming machines and vehicles transporting long sheet piles, formwork and reinforcement all need to access the site.

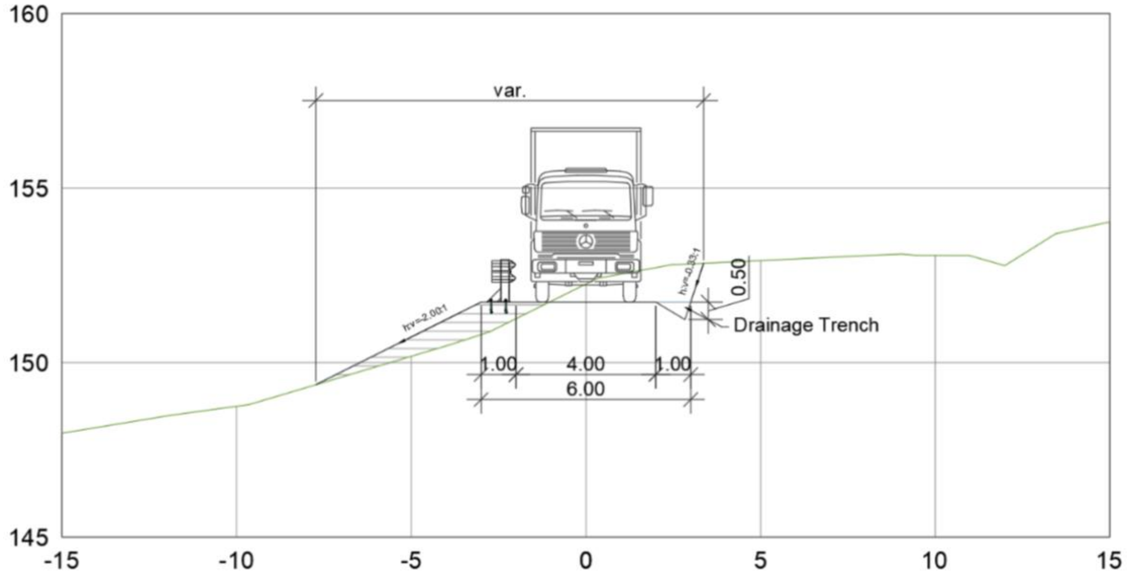

Figure 2-3 *Schematic of a typical section of the access track*

2.6.30 Beyond the 6-7m access track, cut and fill requirements (as shown in **Figure 2-3**) and a 3m buffer on either side of the track have been allowed for the track's working corridor, possible enlargement of the cut and fill requirements (based on the outcomes of the ground investigations at the detailed design stage) and micro-siting during detailed design (without increasing the proposed SAC take). It is highly unlikely that the whole 3m margin would be utilised for the entire length of the access track. However, it has been included as part of the works area as a precautionary measure.

2.6.31 Based on this assessment, it is not technically feasible to reduce the width of the track any further at this stage. However, further optimisation could be achieved as part of the detailed design.

2.7 Step 5: Lesser Effects

2.7.1 In Step 5, any alternatives deemed to be legally, technically, or financially feasible in Step 4 need to be assessed as to whether they would have a lesser effect on the integrity of the Ness Woods SAC.

2.7.2 None of the alternatives assessed in Step 4 were deemed to be legally, technically, or financially feasible. That is, there are not any viable alternatives, beyond the mitigation measures already built in, that would have a lesser effect on the integrity of the Ness Woods SAC.

2.8 Conclusion

2.8.1 This assessment has identified and examined alternative ways of achieving the objectives of the Proposed Development to establish whether there are solutions that would avoid effects, or have a lesser effect, on the Ness Woods SAC.

2.8.2 It has demonstrated that there are no alternative solutions, beyond those measures that have already been implemented to reduce the footprint of the Proposed Development on the SAC as far as possible, that would have a lesser effect on Natura 2000 sites.

2.8.3 Given this, the second legal test of the derogation process can be progressed, and consideration given to whether IROPI exists for the Proposed Development.

3 Imperative Reasons of Overriding Public Interest

3.1 Introduction

3.1.1 The assessment of IROPI has been undertaken in accordance with the following guidance documents (acknowledging **paragraph 2.2.2**):

- EC (2012). Guidance document on Article 6(4) of the Habitats Directive 92/43/EEC.
- PINS (2017). Advice Note 10: HRA relevant to Nationally Significant Infrastructure Projects.
- EC (2018). Managing Natura 2000 sites. The provisions of Article 6 of the Habitats Directive.
- Defra (2021). Guidance, HRAs: protecting a European site.
- NatureScot. NatureScot's casework guidance.

3.1.2 PINS Advice Note 10 provides that, where an adverse effect on the integrity of a European site is predicted to arise as a result of a project and it can be demonstrated that there are no alternative solutions that would have a lesser effect or avoid an adverse effect on the integrity of the European site, the project may still be carried out if the competent authority is satisfied that the scheme must be carried out for IROPI.

3.1.3 For European sites designated under the Habitats Regulations, the IROPI grounds on which a project can proceed depend on the nature of the site that would be affected. In cases where priority natural habitats or species would be affected by the development, the IROPI justification must relate to:

- human health, public safety or beneficial consequences of primary importance to the environment; or
- have due regard to an opinion sought from Scottish Ministers relating to any other IROPI.

3.1.4 In all other cases the competent authority can consider IROPI that relate to social or economic benefits, in addition to those matters set out above.

3.1.5 In this case the Proposed Development is predicted to affect a priority habitat (mixed woodland on base-rich soils associated with rocky slopes [H9180]). Hence, the IROPI justification relates to human health, public safety or beneficial consequences of primary importance to the environment.

3.1.6 EC (2012) states that consideration of the objective of the plan or project is central to the determination of IROPI. As set out in **paragraph 2.3.3**, the primary objective of the Proposed Development is:

To deliver PHS in northern Scotland to help the UK meet the requirement for 24GW of LDES capacity, and 10GW of LDES capacity with the ability to store electricity for between 8 and 16 hours, by 2035.

3.1.7 Supplementary objectives demonstrating that the Proposed Development will have beneficial consequences of primary importance to the environment and, consequently, human health and public safety include:

- To help Scotland and the UK meet their net zero targets by 2045 and 2050 respectively, and the UK's target to decarbonise the electricity system by 2035, by limiting the curtailment of renewable energy provision.
- To displace hundreds of thousands of tonnes per annum of CO_2 emissions from fossil fuel power stations to (at least) 2050.
- To help the UK become less dependent on energy from outside the UK.
- To help mitigate transmission constraints and limit the curtailment of northern Scotland's renewable energy contribution to net zero.

3.1.8 When identifying IROPI, a competent authority should consider the different defining elements of the term, that is:

- **Imperative**: it must be essential (whether urgent or otherwise), weighed in the context of the other elements below, that the project proceeds.
- **Overriding**: the interest served by the project must outweigh the harm (or risk of harm) to the integrity of the site identified in the appropriate assessment.
- **Public Interest**: a public benefit must be delivered rather than a solely private benefit. This can occur at a national, regional or local level and should be long term.

3.1.9 The following matters (considered in turn below) establish that – **the Proposed Development has long term human health, public safety and environmental benefits which are imperative and overriding, and that there is a public interest in it proceeding despite the predicted adverse effects on the Ness Woods SAC:**

- The health, safety and environmental threats associated with climate change and the need to decarbonise.
- The substantial commitment to renewable energy generation in Scotland and the UK to provide both energy security and achieve net zero by 2045 and 2050 respectively, that needs to be supported by LDES due to its intermittency.
- The need for PHS to provide 10GW of LDES capacity with the ability to store electricity for between 8 and 16 hours.
- Alignment with the national spatial strategy for Scotland.

3.2 Decarbonisation

"The world is facing unprecedented challenges. The global climate emergency means that we need to reduce greenhouse gas emissions and adapt to the future impacts of climate change." Scottish Government, National Planning Framework 4 (NPF4)[28].

3.2.1 In response to the well-established need for the UK to decarbonise, in June 2019 Parliament passed legislation requiring the Government to reduce the UK's net emissions of greenhouse gases by 100% relative to 1990 levels by 2050. Doing so would make the UK a 'net zero' emitter[29]. In October 2021, plans were unveiled to decarbonise the UK's electricity system by 2035 and the 'net zero strategy'[30] set out policies and proposal for decarbonising all sectors of the UK economy to meet the 2050 net zero target. This is a highly ambitious target but one that needs to be met.

3.2.2 In April 2022, largely in response to Russia's invasion of Ukraine, the UK Government announced a new British Energy Security Strategy[31]. This spelt out the importance of UK based energy generation and the need to wean the UK off its dependency on foreign energy sources and fossil fuels. Energy security, alongside the UK's net zero ambition, requires significant investment in renewable energy. Hence, the UK Government has invested in and plans a significant expansion of renewable energy generating capacity.

3.2.3 In his open letter to the Prime Minister, *Ensuring Energy Security in the UK without Gas* (1 August 2023), the Honourable Malcolm Turnbull (International Hydropower Association (IHA) President Designate), makes it clear that investment in variable renewable energy is not sustainable without backing up the electricity supply when the sun is not shining, or the wind is not blowing[32]. In this context he says: "*if we don't get the frameworks right to enable a rapid deployment of pumped storage, there is a real risk that decarbonisation will stall, just as it needs to accelerate"*.

3.2.4 Other relevant national drivers include:

- Climate change will increase flood risk, water scarcity, impact on forestry and agriculture, and generate risks to health, food security and safety (and its impacts will not be equitable). It is the single greatest threat to Scotland's habitats[33], including the Ness Woods SAC. Therefore, projects that support decarbonisation are essential.
- Maintaining energy security means responding to seasonal variations in supply and demand (Scottish Government, 2023) and requires energy balancing.
- The UK electricity network must adapt to meet the decarbonisation challenge.

3.2.5 The Proposed Development would provide up to 600MW of export and 630MW of import LDES. LDES is essential to support decarbonisation and the UK's ability to meet net zero targets, which will have beneficial consequences of primary importance to the environment (including the Ness Woods SAC) and human health.

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[28] National Planning Framework 4: revised draft - gov.scot (www.gov.scot)

[29] https://www.instituteforgovernment.org.uk/

[30] https://www.gov.uk/government/publications/net-zero-strategy

[31] https://www.gov.uk/government/publications/british-energy-security-strategy/

[32] In South Australia, an enormous investment in wind power and the closer of coal-fired generation, contributed to a state-wide black-out in August 2016.

[33] https://www.nature.scot/climate-change/climate-change-impacts-scotland

3.2.6 Further, by providing energy balancing, LDES has the potential to avoid the emission of hundreds of thousands of tonnes per annum of CO_2 from fossil fuel power stations (by displacing the need for 425kg per MW hour of energy generated by natural gas to fill the gap when renewable energy provision is low). Assuming energy generation requires the use of fossil fuels to at least 2050, and an operational scheme by 2028, this could reduce emissions of CO_2 by 11M tonnes[34]. The annual reduction would be equivalent to 1.25% of Scotland's total CO_2 emissions in 2020[35] and would provide human health, public safety and environmental benefits.

3.3 Net Zero and LDES

3.3.1 To achieve net zero (and energy security, with clear public safety benefits) the UK Government[36] has invested in a significant expansion of renewable energy generating capacity which, due to its intermittency, needs to be supported by investment in LDES[37]. **Paragraphs 2.5.7 and 2.5.8** cover the need to store energy (in times of surplus) and provide power (when the wind is not blowing and the sun not shining) and the critical role of PHS in grid balancing at a high level. Further detail is provided below.

3.3.2 In its 'Energy White Paper: Powering our net zero future' (2020), the UK Government set out that long duration storage technologies like pumped hydro, would play an essential role in decarbonising UK's electricity supply by integrating renewable energy and maintaining security of supply. That is, LDES enables renewable energy to power the grid and accelerate carbon neutrality. Through LDES we can transition towards renewable energy in an affordable, reliable and sustainable way[38].

3.3.3 According to the LDES Council (Home | LDES Council), wind, solar, and other renewables are becoming the lowest cost forms of generation but need storage to match supply with demand. Currently the imbalance in supply and demand is still being met by burning fossil fuels. Flexible LDES is needed to achieve net carbon neutrality. The world's electricity grids will need to deploy 85-140TWh of LDES by 2040.

3.3.4 The LDES Council go on to say that LDES can help increase the security of supply and create new use cases for renewable energy. LDES can also unlock new opportunities that are not addressed well by shorter-duration storage solutions. Examples include facilitating an increase in the share of renewables in the energy mix, providing resilience to unreliable grid networks for long durations (like at isolated or off-grid locations), enabling cost-efficient 24/7 renewable power purchase agreements, and providing stability to the grid. Decarbonised and energy secure countries will need LDES solutions to provide flexibility and reliability, and regulatory and policy options to overcome barriers to widespread LDES deployment. A consistent and reliable energy supply is essential to maintaining a good standard of human health and public safety.

[34] That is, PHS has the potential not only to offset direct CO_2 emissions from natural gas being used to meet short-teak peak demand, but to allow greater utilisation of a low carbon intensity grid and import and storage of zero carbon emitting renewable power. During its operational phase, the Proposed Development would actively reduce grid emissions by displacing fossil fuel generation and deliver 1.7m MWh of renewable energy in grid decarbonisation benefits – based on 600MW at a 30% load.

[35] https://www.gov.scot/news/scottish-greenhouse-gas-statistics-2020/

[36] https://www.gov.uk/government/publications/net-zero-strategy

[37] Technologies that can respond to supply and demand variations and storage energy for over 4 hours.

[38] Home | LDES Council

3.3.5 In the UK, the Department for Business, Energy and Industrial Strategy[39] 'Transitioning to a net zero energy system: Smart Systems and Flexibility Plan 2021' states that:

"The need for flexibility will rapidly increase as variable renewable power replaces fossil fuel sources, and we electrify heat and transport. We estimate that when we have 40GW of wind on the system in 2030, we will need around 30GW of low carbon flexible assets (storage, demand side response and interconnection) to cost-effectively integrate high levels of renewables, which represents a threefold increase on today's levels. Without these low carbon flexibility assets, we risk either inadequate energy security or having to build more unabated gas in the same period."

3.3.6 The Scottish Government's (2023) 'Draft Energy Strategy and Just Transition Plan' also refers to the need to build in flexibility to respond to changing levels of supply and demand in the electricity system. It specifically references grid scale battery storage and PHS as technologies that can increase flexibility and provide wider benefits for society; and recognises the need to significantly increase existing capacity (p.128). It states: *"As we transition to a net zero energy system and reduce our dependence on fossil fuel generation, renewables and other zero-carbon technologies, including PHS, will need to provide all the services needed to ensure a secure electricity system."*

3.3.7 Scotland's Draft Energy Strategy acknowledges that several recent studies have highlighted the environmental and social benefits of deploying long-duration storage technologies, such as pumped storage, in the UK. It quotes Aurora Energy Research (2022) which found that 24GW of LDES would be needed in Great Britain to meet the Government's commitment to decarbonise the power sector by 2035. Such levels of LDES would drastically cut reliance on imported gas (Scottish Government, 2023).

3.3.8 Based on the geographical concentration of intermittent generation in Scotland coupled with a rapid UK-wide transition to energy intensive electric transportation and heating infrastructure, a clear requirement for flexible, grid scale, deployable demand responsive LDES assets is apparent. PHS meets both the storage requirement and demand response requirement, whilst also being capable of providing ancillary grid support services such grid stabilisation, grid frequency response and 'black start' capability in the event of grid network power outages (with human health benefits). This technological maturity of PHS, coupled with more recent operational flexibility innovations in electro-mechanical equipment, means that PHS continues to be the most widely deployed energy storage technology globally; accounting for 90% of total global energy storage (8,500 GWh as of 2020)[40].

3.4 PHS

3.4.1 *"PSH is a clean, green, affordable, modern solution to reducing reliance on imported gas, and is by far the largest installed energy storage technology globally. It will create jobs and investment across the UK…"* (Malcolm Turnbull, IHA's, open letter to the Prime Minister, August 2023).

3.4.2 On 22 May 2023, the First Minister of Scotland (Humza Yousaf) wrote to the Prime Minister (Rt Hon Rishi Sunak)[41] in a call for the UK Government to support PHS through a market mechanism. He recognised that:

[39] Split in February 2023 into the three government departments: the Department for Energy Security and Net Zero (DESNZ), Department for Science, Innovation and Technology, and Department for Business and Trade.
[40] IEA (2022), Grid-Scale Storage, IEA, Paris https://www.iea.org/reports/grid-scale-storage

[41] Call for UK Government to support pumped hydro storage through a market mechanism: letter to Prime Minister - gov.scot (www.gov.scot)

- To tackle the climate emergency, we need to decarbonise the electricity system rapidly and fully, and that work is underway to accelerate the net zero energy transition but acknowledged that there is more to do.
- Scotland is a global leader in the deployment of renewables, and as it expands deployment both onshore and offshore, its renewable resources will play an increasingly important role in the transition to a net zero electricity system.
- While additional deployment of renewables will play an important role in lessening dependence on fossil fuels for electricity generation, large-scale, LDES is also critical to achieving our collective goals. It can help to integrate and maximise our significant renewable electricity generating capacity, ensure security of supply and manage constraints across the grid.

3.4.3 He called on the UK Government to support the development of LDES, including PHS, through an appropriate market support mechanism to provide vital resilience and flexibility (particularly as thermal generation starts to retire) – essential for decarbonisation and of primary importance to the environment and human health. The First Minister went on to say that UK Government inaction on this issue represents a significant obstacle to deployment, and risks failing to secure the benefits of PHS projects. In this regard, the progress of the Proposed Development is notable.

3.4.4 According to Mr Yousaf, a UK Government consultation in 2022 identified PHS as the most well-established large-scale, long-duration electricity storage technology in the UK. This is mirrored in the UK's Committee for Climate Change (CCC) March 2023 report on the delivery of a reliable decarbonised power system (CCC, 2023). It states that the network and storage infrastructure needed to support a decarbonised system will be very significant, with build required for the transport and storage of electricity, hydrogen, and CO_2. It sets out the requirement for storage solutions to provide flexibility, beyond simply the use of lithium-ion batteries for shorter-term storage (minutes to hours), and promotes pumped storage and compressed air energy storage are mature, proven technologies offering medium- to longer-term storage.

3.4.5 The Jacobs (2020) Strategy for Long Term Energy Storage in the UK, which is widely referenced by the CCC, concludes that "there is a clear benefit in increasing long-term storage by up to 40GW by 2050 for the purposes of balancing intermittent renewables, thereby eliminating the need for back up combined-cycle gas turbine (CCGT) plant fitted with carbon capture and storage (CCS)".

3.4.6 The strategy assumes that 10GW of the increase will come from pumped storage, making up 25% of the 40GW requirement of additional storage across all modelling scenarios, with 5GW of new PHS required by 2030 and an additional 5GW by 2035. The strategy (p.10) also assumes the provision of 30GW of green hydrogen.

3.4.7 In addition, the work by Aurora Energy Research (2022) states that the UK requires approximately 10 times its current capacity of LDES to support renewable energy generation. That is, that 24GW of LDES and 10GW of 8-to-16-hour LDES (PHS) is required by 2035 (the target year for the decarbonisation of the electricity system).

3.4.8 Notably, the current installed PHS capacity is only 2.8GW (Ffestiniog, Cruachan, Foyers and Dinorwig), with another ~7GW either having obtained planning consent or in development. This means that, even if all this additional capacity is developed (and it will not be), there will be a shortfall in PHS provision of at least 3GW that needs to be filled in the next decade against the requirement for 10GW in addition to the current installed capacity. Moreover, there is no guarantee that the other 11.2GW of LDES forecast by

Aurora as being required by 2035 and the 30GW of LDES forecast by Jacobs as being required by 2050, can be delivered by other technologies (e.g., green hydrogen).

3.4.9 DESNEZ (2023) puts this 30GW challenge in context. The ambition of the second hydrogen allocation round (HAR2) is to build on the 20 projects making up the 250MW HAR1 target by supporting a further 750MW of capacity by 2025. The ambition is then to have 5GW of green hydrogen by 2030, subject to affordability, and an optimistic view on the ability of the electrolysis supply chain to be able to deliver at this scale and the UK planning system to deliver permissions for a multitude of projects in under a year and a half.

3.4.10 These challenges, even against the relatively modest scale of the ambition by 2030, makes the target of a further 25GW in the following 20 years look even more challenging. As recently as 29 August 2023, it was reported that the green hydrogen project 'Gigastack', backed by the Department of Energy Security and trumpeted as the UK's flagship green hydrogen programme, has been put on ice.

3.4.11 **In summary**, the challenges associated with deploying LDES are significant, but PHS can play a significant role in meeting this need. As set out above, PHS is a proven technology that is well placed to help ensure a secure supply of electricity across the UK, essential in support of human health, public safety and the environment. This is particularly true for an electricity system with high levels of renewable generation like Scotland.

3.4.12 According to SSE Renewables[42], pumped storage has a fast response time, which means that it can respond quickly to grid changes and support grid stability. This could be needed in case of an unexpected plant or interconnector failure, as cover for variable renewable generation, or to respond to sudden increases in demand. It can start generating electricity in less than 30 seconds when in a spinning cycle and within just two minutes from rest.

3.4.13 Pumped storage is also the most efficient of currently available large-scale storage technology, at up to 80% total efficiency (SSE Renewables). It can store and flexibly provide reliable electricity over an extended period and, once developed, pumped storage has a long operational life.

3.5 National Spatial Strategy

3.5.1 NPF4 provides a national spatial strategy for Scotland to 2045. It sets out spatial principles, regional priorities, proposed national developments, and national planning policy. The national developments that support the strategy are a focus for delivery and include PHS, Scotland wide (with no limit on provision).

3.5.2 Scotland’s Climate Change Plan sets out an approach to achieving net zero by 2045 which is reliant (amongst other actions) on renewable energy provision (through wind and water) and, in line with NPF4, requires PHS. Notably, Scotland is already behind the point it should have reached to achieve its emissions reduction targets (75% by 2030 relative to 1990 levels of carbon dioxide, methane and nitrous oxide and 1995 levels of hydrofluorocarbons, perfluorocarbons, sulphur hexafluoride and nitrogen trifluoride, 82.5% by 2035, and 90% by 2040[43]). Its 2020 interim target of 56% was not met.

[42] The Case for Pumped Hydro Storage — Coire Glas

[43] Reducing greenhouse gas emissions - Climate change - gov.scot (www.gov.scot)

3.5.3 To deliver *"sustainable places, where we reduce emissions, restore and better connect biodiversity"* (a key component of NPF4), PHS is advocated to extend the capacity of hydroelectricity to support the transition away from fossil fuels, whilst providing employment opportunities. As set out above, PHS is also essential for the storage (for over 8 hours) and to prevent the loss of renewable energy generated by wind due to its intermittency ('energy balancing') and the constrained capacity of the UK network (between low carbon energy generation in the North and the demand centre of the South; 'locational balancing').

3.5.4 Further, Scotland's Draft Energy Strategy acknowledges that PHS projects have the potential to create a large number of jobs and benefit the local economy, as well as provide much needed resilience in the system (Scottish Government, 2023).

3.6 IROPI

3.6.1 The IROPI for the Proposed Development, therefore, can be summarised as:

The need for PHS to help meet the UK's requirement for 24GW of LDES by 2035, including 10GW of capacity from technologies with the ability to store electricity for between 8 and 16 hours, to avoid the curtailment of the renewable energy contribution to net zero targets.

3.6.2 **Imperative.** The need to decarbonise and mitigate the threats to the environment and people associated with climate change is essential. Climate change will increase the risk of flooding and drought, impacting forests - including the Ness Woods SAC, and will compromise health and safety. It is the single greatest threat to Scotland's habitats[44].

3.6.3 To achieve decarbonisation, the UK electricity network must adapt, and LDES and PHS is required to avoid curtailment of the renewable energy contribution to net zero targets. All of the currently proposed PHS schemes and more are needed to meet grid balancing requirements (and not all will be delivered). Given this, it is imperative that the Proposed Development receives consent.

3.6.4 **Overriding.** The interest served by the Proposed Development, by providing up to 600MW of export and 630MW of import LDES of 15-hour duration (energy and locational balancing), as well as the potential to reduce emissions of CO_2 by 11M tonnes (to 2050), is considered to outweigh the predicted harm to the integrity of the Ness Woods SAC.

3.6.5 **Public interest.** A long term (75 year) public benefit would arise through the provision of LDES with the ability to store electricity for between 8 and 16 hours, respond to seasonal variations in supply and demand, and provide energy balancing. As well as helping to avoid the curtailment of the renewable energy contribution to net zero, it would support energy security and decarbonisation, and is aligned with the National Spatial Strategy for Scotland.

3.6.6 Helping Scotland and the UK meet their net zero targets, displacing hundreds of thousands of CO_2 emissions from fossil fuel power stations, supporting the provision of energy security and helping to help mitigate transmission constraints and limit the curtailment of northern Scotland's renewable energy contribution to net zero, would have clear human health, public safety and beneficial consequences of primary importance to the environment.

3.6.7 **IROPI exists for the Loch Kemp Storage Scheme**.

[44] https://www.nature.scot/climate-change/climate-change-impacts-scotland

4 Compensation

4.1 Introduction

4.1.1 In accordance with regulation 64 of the Habitats Regulations, if the competent authority is satisfied that, there being no alternative solutions, IROPI exists for the Proposed Development, it may agree to it notwithstanding a negative assessment of the implications for the European site. In such circumstances, in accordance with regulation 68, necessary compensatory measures must be secured to ensure the overall coherence of the Natura 2000 network.

4.1.2 Based the outcomes of the AAS and case for IROPI provided in **Chapters 2 and 3**, this chapter provides details of the measures proposed to compensate for the predicted adverse effects of the Proposed Development on the integrity of the mixed and western acidic oak woodland of the Ness Woods SAC.

4.1.3 These adverse effects on integrity are summarised from the SIAA in **Section 2.4** above to provide context for the derogation case only. **Section 2.4** does not repeat the detail provided in the SIAA, for example, regarding the effects of the Proposed Development on the structure, function and supporting processes of the habitat or the distribution and viability of typical species of the habitat. The premise being that if the 'extent' and 'distribution' of the affected habitat within the site is restored, then structure, function, supporting processes, and the viability of typical species of the habitat will follow.

4.1.4 **Section 4.2** below briefly describes the qualifying features of the SAC and woodland Conservation Objectives, which the compensation should relate to.

4.1.5 **Section 4.3** sets out the guiding principles around which compensatory measures should be developed and **Section 4.4** provides details of the measures available to compensate for the predicted effects on the integrity of the woodland features of the Ness Woods SAC. The strengths and weaknesses of each measure are assessed.

4.1.6 **Section 4.5** considers the shortlisted measures in more detail and **Section 4.6** provides details of the package of compensatory measures proposed to be delivered by the Applicant.

4.2 Designated Features

4.2.1 The qualifying features of the Ness Woods SAC are:

- Mixed woodland on base-rich soils associated with rocky slopes [H9180] (also known as Tilio-Acerion forests of slopes, screes and ravines). This is a priority habitat under the Habitats Directive.
- Western acidic oak woodland [H91A0] (also known as old sessile oak woods with Ilex and Blechnum in the British Isles.
- Otter (*Lutra lutra*) [S1355].

4.2.2 The mixed woodland habitat typically occurs on base-rich rocks in steep-sided immature river valleys, and nutrient-rich soils that often accumulate in the shady micro-climates towards the bases of slopes and ravines. Such forests are not extensive but occur in fragmentary stands that grade into other woodland types on level valley floors or slopes above.

4.2.3 The western acidic woodland habitat comprises a range of woodland types dominated by mixtures of oak and birch. It is characteristic of base-poor soils in areas of at least moderately high rainfall. A key feature of importance within this habitat type, is the well-developed Atlantic bryophyte communities it can support.

4.2.4 From the information included in NatureScot's Conservation Advice Package for the SAC, all three features were in an unfavourable condition when their condition was last assessed (in 2008 for the woodland features and 2011 for otter, but the level of confidence associated with the survey for otter was low). The woodland features are in an unfavourable condition and believed to be declining due to grazing pressures, a poorly developed under-storey and canopy cover (due to the presence of problematic native and non-native species), and limited woodland regeneration. Uncontrolled grazing and bracken invasion has meant that key woodland tree species are either not growing (being eaten) or are not growing as well as they could be (being smothered), limiting the development of associated lichen and bryophyte assemblages. The focus of this compensation package, therefore, is on how to improve the condition of the woodland features through the management of these pressures.

4.2.5 Otter is not considered any further in this section because, as set out in **Section 1.1**, adverse effects on otter are not predicted to arise. Nor are adverse effects on any other European sites beyond the Dell Estate.

4.2.6 The woodland Conservation Objectives for the Ness Woods SAC are to:

- Ensure that its qualifying features are in favourable condition and make an appropriate contribution to achieving favourable conservation status.
- Ensure that its integrity is restored by meeting the following objectives for the mixed woodland on base-rich soils associated with rocky slopes qualifying feature:
  - Restore the extent and distribution of the habitat within the site (estimated at 25.24ha).
  - Restore the structure, function and supporting processes of the habitat.
  - Restore the distribution and viability of the typical species of the habitat. The key tree species found in this habitat being ash (*Fraxinus excelsior*), hazel (*Corylus avellana*), and wych elm (*Ulmus glabra*).
- Ensure that its integrity is restored by meeting the following objectives for the western acidic oak woodland qualifying feature:
  - Maintain the extent and distribution of the habitat within the site (estimated at 538.48ha).
  - Restore the structure, function and supporting processes of the habitat. Key elements that should be in place include mixed age classes of trees, canopy cover, deadwood, understory, ground flora and epiphytic plants; large, long-lived trees; low levels of herbivore impacts; and an absence of invasive non-native species.
  - Restore the distribution and viability of the typical species of the habitat. The key tree species found in this habitat being oak (*Quercus robur* and/or *Q. petraea*) and birch (*Betula pendula* and/or *B. pubescens*). Holly (*Ilex*) and hazel are also important components of the habitat, and the woodland supports an important component of Britain's oceanic bryophyte flora and lichen mycota.

4.3 Guidance on Compensation

4.3.1 As set out in the Habitats Regulations, compensation needs to be provided (without prejudice to other requirements first being met) where an adverse effect on the integrity of a European site (or sites) cannot be avoided, after the application of available, viable mitigation[45]. Compensatory measures must be independent of the Proposed Development (including any mitigation) and are intended to offset the residual negative effects of the plan or Proposed Development so that the overall ecological coherence of the Natura 2000 network is maintained.

4.3.2 The key guidance documents relating to compensatory measures for UK Proposed Developments[46], in date order, are:

- EC (2012). Guidance document on Article 6(4) of the Habitats Directive 92/43/EEC.
- PINS (2017). Advice Note 10: HRA relevant to Nationally Significant Infrastructure Projects.
- EC (2018). Managing Natura 2000 sites. The provisions of Article 6 of the Habitats Directive.
- Defra (2021). Guidance, HRAs: protecting a European site.
- Tyldesley and Chapman (2013-2023). HRA Handbook.

4.3.3 EC guidance on Article 6(4) of the Habitats Directive suggests that, to ensure the coherence of Natura 2000, compensation should (EC, 2012; 2018):

a. Refer to the sites' conservation objectives and address in comparable proportions the habitats and species negatively affected in terms of number and status.

b. Ensure the maintenance of the contribution of a site to the conservation of the natural habitat types and habitats of species, at a favourable status, within the biogeographical region concerned. It would not be enough for the compensatory measures to concern the same biogeographical region in the same Member State.

c. Provide properties and functions comparable to those which justified the selection criteria of the original site, particularly regarding the adequate geographical distribution of the features concerned. However, distance between the original site and the compensatory measures is not necessarily considered to be an obstacle if it does not affect the functionality of the site, its role in the geographical distribution and the reasons for its initial selection.

[45] Mitigation measures, as distinct from compensation, are those measures that aim to minimise, or even eliminate, the negative impacts likely to arise from the implementation of a plan or Proposed Development so that the site's integrity is not adversely affected. These measures are an integral part of the specifications of a plan or Proposed Development or conditional to its authorisation (EC, 2019).

[46] As set out in **paragraph 2.2.2**, it is acknowledged that the PINS and Defra guidance was developed for England and Wales but there is no equivalent Scottish guidance. Hence, NatureScot's casework guidance is also relevant (see NatureScot).

Compensatory Measures

4.3.4 The EC's 2012 and 2018 guidance includes a broad range of measures which might be acceptable and appropriate as compensatory measures. These include:

1. Habitat re-creation – recreating the affected habitat on a new or enlarged site to be incorporated into *Natura 2000*.
2. Habitat restoration or improvement in existing European sites, in proportion to the loss due to the plan or Proposed Development.
3. Species recovery and reinforcement, including reinforcement relating to prey species.
4. Species reintroduction.
5. Land purchase or rights acquisition for the provision of a new site of sufficient quality under the Habitats Directive and the implementation of conservation measures (e.g., restrictions on activities that can be undertaken).
6. Incentives for certain economic activities that sustain key ecological functions.
7. The reduction of other threats, either through action relating to a single source or through coordinated action relating to all threat factors.

4.3.5 It acknowledges that measures 2. to 7. might be more appropriate (or even preferred) to measure 1. habitat creation/re-creation, taking into consideration the specific circumstances of the plan or Proposed Development in question and the nature and scale of its effects (DTA Ecology, 2016). Defra guidance on the application of Article 6(4) also accepts that 'other things', beyond habitat creation or re-creation, could also protect the overall coherence of the network (Defra, 2021).

4.3.6 Hence the Habitats Directive is not prescriptive and does not require that compensation should be "like for like". The conservation objectives of European sites can often be met and enhanced in other ways; albeit where like for like compensation would be important for the conversation objectives of the affected European site(s) to be met, where possible, it should be sought.

Location

4.3.7 The EC 2018 guidance sets out priorities for the location of compensatory measures which are, in order:

1. Compensation within the affected *Natura 2000*.
2. Compensation outside the affected *Natura 2000* site but within a common topographical or landscape unit, provided the same contribution to the ecological structure and/or network function is feasible.
3. Compensation outside the affected *Natura 2000* site in a different topographical or landscape unit.

4.3.8 In 2010 DECC reported that, in the UK, the established practice is to locate like for like compensation within the same geographical area or ecological system (following EC priorities 1 and 2). This reduces the risk that the measures will fail to protect coherence, as they act within the same part of the geographical distribution of the habitat or species. As set out in **paragraph 4.3.3c**, distance is not considered to be an obstacle for compensation (within the biogeographical region). However, with distance uncertainty is likely to increase (and this may have consequences for the subsequent ratio applied, as discussed further below).

Replacement Ratios

4.3.9 The generic application of fixed compensation ratios[47] is not considered to be useful. In defining the requirements for the provision of compensatory habitats, replacement ratios should be based on several factors that relate both to the type and extent of the impacts and the nature of the compensation proposed. With respect to the impacts predicted, whether they are expected to be direct and indirect (and of major or minor significance) will have a significant influence on the extent of compensatory habitat determined to be required. That is, the ratio of required compensation to the impact extent should be determined on a case-by-case basis, based the value and function of the habitat to be affected and created. However, there is general acceptance that a 1 to 1 impact to compensation ratio is unlikely to be enough.

4.3.10 In this context, the following compensation parameters (Defra, 2021) are relevant:

- Location – it is preferable (but not necessary) for the compensatory habitat to be located as closely as possible to the location to be adversely affected, given that the habitat is intended to provide at least an equivalent function. The further away from the impact site the compensatory habitat is, the more likely a higher ratio of new (or enhanced) habitat for old will be required.
- Habitat type (and conditions) – should replace the qualifying habitats (and species) and replicate critical features.
- Sustainability – an assured life, likely exceeding the old, is required.
- Timing – as a general principle, a site should not be irreversibly affected by a Proposed Development before compensation is in place. However, there may be situations where it will not be possible to meet this condition (EC, 2018). That is, no requirement exists in the Directive to have compensatory habitat in place to coincide with implementation of a Proposed Development, but it is desirable to have established the compensatory habitat by the time the adverse effect arises. It is also relevant to note that delivery does not necessarily equate to functionality; but site functionality will develop once the site is in place.
- Uncertainty – does confidence exist around the ability of the new habitat to support the qualifying features? Greater uncertainty is (again) likely to lead to a higher ratio of new for old and this is particularly relevant in the context of woodlands, where the delivery of functioning compensation will be measured over long timescales.

Additionality

4.3.11 Compensatory measures should go beyond the normal, standard measures required for the designation, protection, and management of *Natura 2000* sites (EC, 2019). That is, member states have existing duties to address the causes of unfavourable condition that compensatory measures should not address. Hence, 'additionality' needs to be demonstrated as part of a compensation package.

4.3.12 The key issue regarding additionality is whether the improvement would have happened without further intervention. If not, or if not within a reasonable timeframe, then additionality

[47] That is, a replacement ratio of **x : y**; where **x** = the scale of compensation and **y** = the scale of the impact.

can be determined, and these additional measures considered to be compensation for the effects of a Proposed Development. This is known as the “but for” test.

4.3.13 A report produced by DTA Ecology for Marine Scotland covers this. The DTA Ecology report (*in press*) says that, whilst there is a responsibility on member states to implement all ‘necessary conservation measures’ and to avoid deterioration, EU guidance refers to measures qualifying as compensation if they are “additional to normal practice”. This, they advise, should consider financial and political realities. Member states are not obliged to implement all possible conservation measures and, while the Government sets NatureScot targets regarding feature condition, they are not obliged to manage sites to restore feature condition. Meaning that there could be conservation measures (that cannot be delivered by the member state due to, for example, financial constraints) that would constitute compensation.

4.3.14 Regarding what can constitute ‘necessary’ conservation measures and what cannot, the overarching principle is that there must be a reasonable degree of certainty that the measures are being, will be, or are likely to be, funded through a stable and readily available funding source (e.g., agri-environment schemes). Therefore, anything that is prohibitively expensive, not a legal obligation for a public body to deliver and involves extension to an existing SAC, or that ‘tops up’ existing externally funded grant schemes or initiatives, is not considered to be a necessary conservation measure. And, by extension, can be considered as compensation.

4.3.15 With reference to managing sites to restore feature condition rather than (for example) planting to create new habitat, whether the habitat or species to be lost is present or has the potential to be present elsewhere (rather than being unique) is also relevant. In this case, mixed woodland/western acidic oak woodland with the same species composition is present elsewhere, including elsewhere in the SAC in an unfavourable condition, and has the potential to be present where bracken stands dominate. This habitat has the potential to be managed in a way that would compensate for the specific impacts of the Proposed Development, and maintain the integrity of the Natura 2000 network, over a faster timetable than planting.

4.4 Compensatory Measures Considered

4.4.1 Of the seven categories of compensatory measures set out in **Section 4.3**, those that are the most appropriate vis-à-vis the replacement of mixed woodland on base-rich soils and western acidic oak woodland are included in **Table 4-1**.

Table 4-1 *Long-list of compensatory measures*

Category	Measure	Comment
1. Habitat re-creation	Planting hazel, oak, holly and birch[48] in the Ness Woods SAC	This could include restoration of the existing 4 x 4 track through the Ness Woods SAC, via the removal of stones and planting hazel, oak, holly and birch.

[48] This planting mix is proposed because the Conservation Advice Package lists the following as the key tree species for the woodland habitats: ash, hazel and wych elm (for mixed woodland) and oak, birch, holly and hazel (for oak woodland). No wych elm was recorded in the survey area, so it has not been included in the proposed planting mix. However, some holly was recorded, hence its inclusion (even though no holly would be removed due to the works). Ash has not been included because the ash trees in Ness Woods are showing signs of dieback. Tree planting is not advocated in these circumstances, with the emphasis being on the management of herbivore impacts and natural regeneration.

Category	Measure	Comment
	Planting hazel, oak, holly and birch outside the Ness Woods SAC to extend the SAC	Assuming suitable (soil) conditions exist outside the SAC.
2. Habitat restoration or improvement	Managing grazing in the SAC	High levels of grazing can restrict the regeneration of more palatable species such as oak, ash, holly and hazel. Too little grazing can result in a lack of diversity in the canopy and over shading, impacting negatively on lichen and bryophyte communities. Potential to restore up to 235ha of the SAC (all the SAC in the Dell Estate).
	Managing grazing outside the SAC to improve the area to SAC standard	
	The removal of bracken from the woodland in the SAC	For example, bracken, Rhododendron, and exotic conifers. The target being to bring habitats outside the SAC up to an SAC standard within 25 years.
	The removal of bracken from woodland outside the SAC to improve the area to SAC standard	
3. Species recovery or reinforcement	Managing grazing in the SAC	As above
	Managing grazing outside the SAC	
	The removal of bracken from the woodland in the SAC	As above
	The removal of bracken from woodland outside the SAC	
4. Species reintroduction	Reintroduction of western acidic oak and mixed woodland into existing conifer plantations	This could be achieved through the provision of funding to Forestry and Lands Scotland (FLS) for the restoration of native woodland on PAWS[49].
	Translocation of bryophytes and lichens from trees to be removed from the SAC to other suitable host trees	Could occur within or outside the SAC. Should focus on the host trees supporting the most important bryophyte and lichen species.
7. Reduction of other threats	The removal of bracken species from the woodland in the SAC	For example, bracken, Rhododendron, and exotic conifers.
	Managing grazing in the SAC	As above.

4.4.2 **Table 4-2** considers each of the compensatory measures included in **Table 4-1** in light of the conservation objectives (COs) for the Ness Woods SAC. In **Table 4-2** habitat and species recovery, restoration, reinforcement, and improvement measures (3. and 4. above), and the reduction of other threats (7. above), are considered together.

[49] Ancient woodland sites where semi-natural woodland has been replaced by a plantation.

Table 4-2 Review of compensatory measures

Measure	Alignment with COs	Like for Like	Additionality[50]	Timeframe
1. Planting hazel, oak, holly and birch in the Ness Woods SAC	✓ Would support woodland regeneration and the restoration of site integrity. ✓ The woodland stands of interest are fragmentary within the SAC; so, in theory, compensation for habitat loss from within the site could be provided by habitat creation within the site (if the space and characteristics required for such habitats are present in other areas of the SAC, where qualifying features are not present). × This could displace existing qualifying features or the opportunity for such. × The existing seed bank and soils across the study area could support mixed and acidic oak woodland.	✓	✓ Although there is a responsibility on member states to implement necessary conservation measures and avoid deterioration, the conservation management measures for the woodland qualifying features included in the Conservation Advice Package for the Ness Woods SAC do not include planting to support regeneration. This is not normal practice. × The soils and seed bank present could support acidic oak woodland through good management without planting. ✓ Planting in the SAC, supported by the removal of stone cover, could focus on restoration of the 4 x 4 track through the SAC (which otherwise would not regenerate).	? This measure would not deliver the qualifying features for some time (outside the Conservation Advice Package review timeframe) but neither the Habitats Directive nor the guidance specifies a timescale within which compensation must be delivered, as long as delivery is secured.
2. Planting hazel, oak, holly and birch outside the Ness Woods SAC to extend the SAC	✓ Would support woodland regeneration (assuming suitable habitat is present close to the SAC) and would not run the risk of displacing qualifying features. × Would not directly support the restoration of the site (i.e., site integrity) or the achievement of favourable condition unless the area of the Ness Woods SAC is extended to include the planted areas. × The existing seed bank and soils could support mixed and acidic oak woodland.	✓	✓ This measure would be in addition to restorative measures in the SAC.	? This would not deliver the qualifying features for some time, but neither the Habitats Directive nor the guidance specifies a timescale within which compensation must be delivered, as long as delivery is secured.

[50] Action that is in addition to normal practice or an existing obligation on another party.

Measure	Alignment with COs	Like for Like	Additionality[50]	Timeframe
3. Removal of bracken from the woodland in the SAC	✓ Would improve the quality of the under-story and canopy (through the management of problematic species) and support the restoration of site integrity.	? This would directly enable woodland regeneration	✓ The conservation management measures for the woodland qualifying features – for which the Conservation Advice Package allocates responsibility to NatureScot and the land managers – include improving the imbalance in the age structure (the shortage of young native trees and saplings). The proposed means of achieving this is through managing grazing. Hence, a commitment to remove long-standing problematic bracken would offer clear additionality over and above normal practice. × NatureScot does not consider the management of bracken to be an early priority (but acknowledge it could be beneficial once grazing has been controlled). The inaccessibility and complexity of the Dell Estate means that substantial funding, over and above that available from grant aid, would be required for this to be delivered[51]. Bracken removal and management would also need to occur over a wide area, potentially for decades.	✓ This measure would support the restoration of integrity in the Conservation Advice Package review timeframe. ✓ It could also be a long-term commitment, for the life of the Proposed Development, and linked to managing and monitoring planting.

[51] The cost of the bracken removal from the estate would be prohibitive under normal circumstances. Bracken is generally managed through chemical treatment but given the conservation importance of the site, the challenging terrain, and its proximity to Loch Ness (a Drinking Water Protected Area), this would not be acceptable. Similarly, the terrain is likely to mean that mechanical clearance (rolling) techniques cannot be used. As a result, persistent hand-cutting or trampling of bracken for several years (mimicking the effect that cattle would have) is likely to be necessary. And, on sites where bracken is dense and tall, it is more effective to carry out two cuts per year; the first early in the season to clear emerging bracken before it is fully open and the second later in the summer to deal with later growth. The cost of bracken clearance is site specific and dependent on the extent and density of the bracken, the means of control and how accessible the site is but, as a guide, applicants to the Scottish Forestry Grant Scheme can access between £150 and £225/ha for the treatment of bracken; but the grant aid is only meant to be a contribution to costs and the rates are out of date. A provision of £500/ha per year is expected to be more realistic and at least five years of continued treatment is expected to be needed to have a significant impact on bracken (although, if this is combined with a significant reduction in browsing pressure, the establishment of tree regeneration could reduce this period). Such an investment is unlikely to be able to be funded by as a conversation measure.

Measure	Alignment with COs	Like for Like	Additionality[50]	Timeframe
4. Removal of bracken from the woodland outside the SAC to improve the managed area to SAC standard	✓ Would improve the quality of the under-story and canopy (through the management of problematic species). × Would not directly support the restoration of the site (i.e., site integrity) or the achievement of favourable condition until/unless the area of the Ness Woods SAC is extended to include the improved area.	? This would directly enable woodland regeneration	✓ This measure would be in addition to restorative measures in the SAC.	✓ This measure would support the restoration of integrity in the Conservation Advice Package review timeframe. ✓ It could also be a long-term commitment, for the life of the Proposed Development, and linked to managing and monitoring planting.
5. Manage grazing in the SAC	✓ Would reduce grazing pressure and support the restoration of site integrity. ✓ Of the pressures leading to unfavourable condition, grazing is the most significant. NatureScot recommend that management efforts to improve site condition are focused on managing grazing impacts. That is, to achieve favourable condition, the most important measure is consider to be the managed of grazing.	? This would indirectly enable woodland regeneration	× The conservation management measures for the woodland qualifying features include managing herbivore impacts. The Conservation Advice Package lists the land managers, NatureScot, and deer management groups as the responsible parties. There is evidence that some action (i.e., fencing) has been taken in this regard, but with very limited success. ✓ As for the removal of bracken, the inaccessibility and complexity of the Dell Estate means that substantial funding, over and above that available from grant aid, would be required for this to be delivered at scale. But a compensation package to be provided over an extended period of time could deliver it and provide additionality over and above normal practice.	✓ This measure would support the restoration of integrity in the Conservation Advice Package review timeframe.

Measure	Alignment with COs	Like for Like	Additionality[50]	Timeframe
6. Manage grazing outside the SAC to improve the managed area to SAC standard	✓ Would reduce grazing pressure. ✗ But would not directly support the restoration of the site itself (i.e., site integrity) or the achievement of favourable condition until/unless the area of the Ness Woods SAC is extended in time to include the improved area[52].	? This would indirectly enable woodland regeneration	✓ This measure would be in addition to restorative measures in the SAC.	✓ This measure would support the restoration of integrity in the Conservation Advice Package review timeframe.
7. Reintroduction of western acidic oak and mixed woodland into existing conifer plantations to improve the area to SAC standard	✓ Would support woodland regeneration (assuming suitable habitat is present close to the SAC) and would not run the risk of displacing qualifying features. ✗ But would not directly support the restoration of the site itself (i.e., site integrity) or the achievement of favourable condition until/unless the area of the Ness Woods SAC is extended (in due course) to include the planted areas.	✓	✓ This measure would be in addition to restorative measures in the SAC. ✓ NatureScot has advised that restoring the PAWS conifer plantation north of the site could deliver value for the SAC (D. Greene email 20/03/2023). Some of the FLS ground would undoubtedly support hazel too.	? This measure would not deliver the qualifying features for some time but neither the Habitats Directive nor the guidance specifies a timescale within which compensation must be delivered, as long as delivery is secured; as above, delay may be offset by scale.
8. Translocation of bryophytes and lichens from trees to be removed from the SAC to other suitable host trees	✓ Would support woodland regeneration and the restoration of site integrity; with the COs acknowledging that the distribution and viability bryophyte and lichen assemblages should be maintained, with particular focus on assemblages that indicate a long period of ecological continuity. ✗ This could displace existing qualifying features (or opportunity for such).	✓ Replacement of a component of the woodland habitat	✓ This measure would be in addition to restorative measures in the SAC. ✗ The levels of uncertainty associated with the likely success of translocation are currently high.	✓ If successful, this measure would support the restoration of integrity in the Conservation Advice Package review timeframe.

[52] Albeit reduced deer grazing outside the SAC (at a landscape scale) would make it easier to manage deer in the SAC and help expand/restore nearby woodlands, increasing connectivity at the landscape scale.

4.5 Compensation Measures Shortlisted

4.5.1 Of measures set out in **Table 4-2**, it is not proposed that the three listed below (Measures 1, 7 and 8) are progressed for the following reasons:

Measure 1. Planting hazel, oak, holly and birch within the SAC (in general). The SAC habitat in the study area is largely upland oak-birch woodland, including stands of hazel groves, with acidic sandy soils and an assumed seed bank. It could, therefore, support acidic oak woodland through good management without planting. Consequently, planting may not add to the qualifying status of the SAC, **with one main exception** (also see **paragraph 4.6.3** below).

The Proposed Development provides the opportunity for the 4 x 4 track through the SAC used by the Dell Estate to access the loch to be largely reinstated. That is, aside from needing to maintain access over the burn, the rest of the track would become redundant because of the Proposed Development Access Track. Its reinstatement, through the selective removal of roading stone from and planting of hazel, oak, holly and birch on the track and its associated clearing (along with future management), would restore 0.26ha of the SAC which would not readily regenerate otherwise.

Measure 7. Reintroduction of western acidic oak woodland into the PAWS conifer plantation north of the site. This measure would not deliver qualifying features for a long time, if at all, i.e., there is no guarantee that mixed or acidic oak woodland would develop in this location. The current conifers need to mature to the point that they could be harvested and removed, and then new woodland established to mature. There is also highly unlikely (as significant constraints exist) that the Applicant would be able to get access to this site and/or develop this measure. The other measures available are expected to provide a better outcome sooner.

Measure 8. Translocation of bryophytes and lichens from trees to be removed from the SAC to other suitable host trees. Significant uncertainty exists around the likely success of such translocation, with little evidence of successful translocations of bryophytes and lichens in woodlands. Consequently, NatureScot has indicated that it does not think it could be sufficiently assured of success such that the translocation of bryophytes and lichens could be considered an appropriate compensatory measure. It has indicated that a more relevant measure would be to restore the habitat which bryophytes and lichens would be able to colonise.

4.5.2 **Figure 4-1** shows the SAC improvement and compensation measures taken forward for further consideration. These being Measures 2. to 6. from **Table 4-2**.

4.5.3 **Measure 2. Planting of hazel, ash, oak and birch outside the SAC**. The area shaded purple on Figure 4-1 ‘Non-Woodland for Possible Incorporation into SAC’ was considered as an area to be planted. However, soil sampling has indicated that this area (and Site 4) has peat-based soil. Further, hazel groves and their bryophyte and lichen assemblages would take many decades to develop, and the richness that would be achieved cannot be guaranteed (as this would depend on the development of the correct light and humidity conditions and the availability of colonising spores). The advice from NatureScot is that it would be difficult to recreate ideal woodland assemblages by planting trees. Given this, planting in these areas was excluded from further consideration.

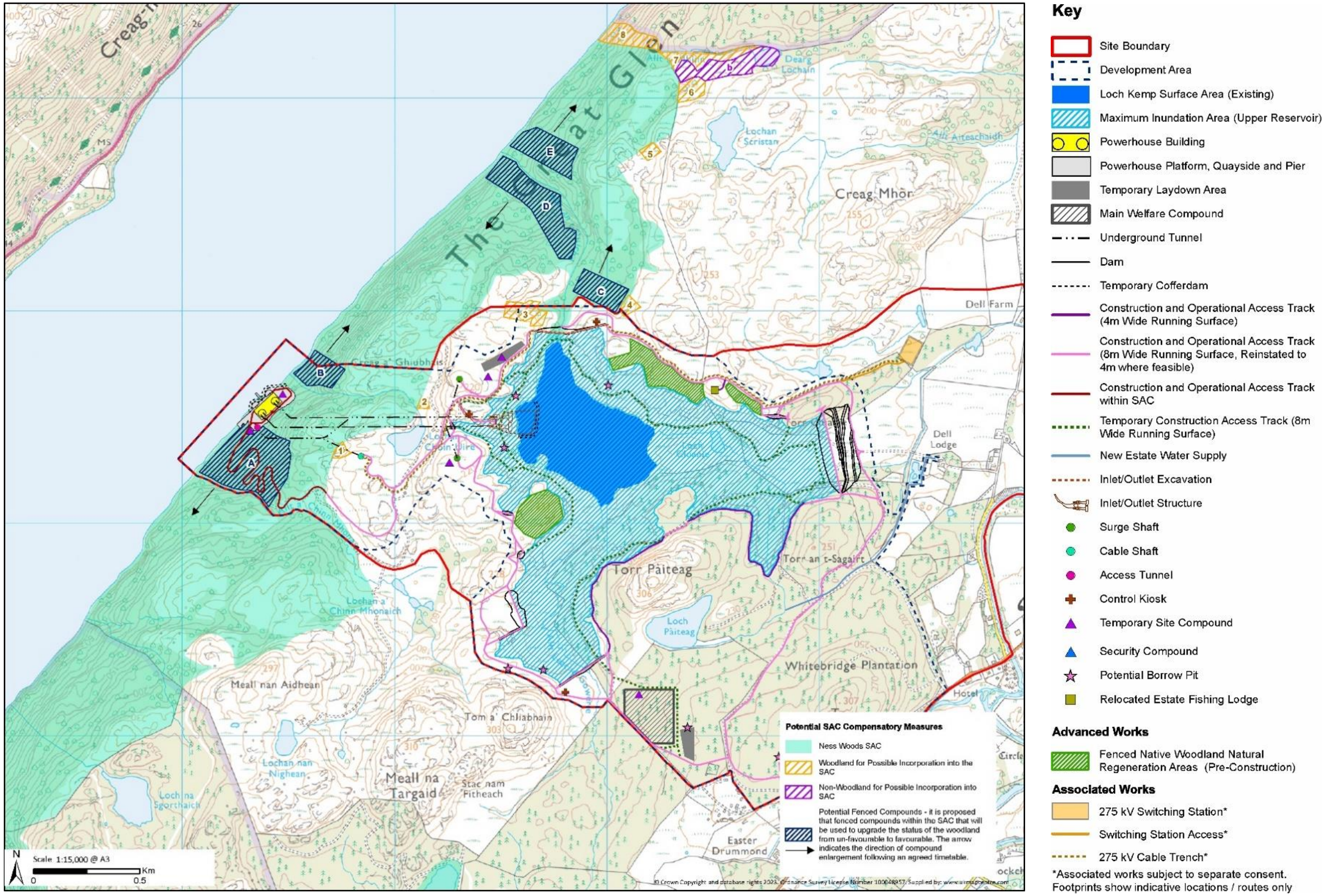

Figure 4-1 Ness Woods SAC compensation options

4.5.4 Planting was also considered as an option for Sites 1 to 3 and Sites 5 to 8 'Woodland for Possible Incorporation into SAC'. The soil types, depths and pH, as well as the landscape characteristics, of these sites are all within the desirable 'range' of biophysical attributes for western acidic oak woodland and mixed woodland on base-rich soils. Further, although they are areas of existing woodland, in general they are sparsely wooded, and additional planting could be undertaken within them (e.g., there are only a few trees present in Site 1 and no trees in Site 2). The total area encompassed by Sites 1 to 3 and 5 to 8 is 7.52ha.

4.5.5 Advice received from NatureScot, however, is that tree planting where the soils conditions match those of the SAC is unlikely to be necessary, provided grazing is controlled to the point where tree and shrub species can regenerate (see Measures 3 and 4). The woodland seed source does not appear to be a limiting factor and the results of monitoring suggest that regeneration is restricted by grazing levels (rather than other factors).

4.5.6 **Measure 3. Removal of bracken in the SAC**. Initially it was proposed that bracken could be removed, and grazing could be managed, in Areas A to E on **Figure 4-1** 'Potential Fenced Compounds' with the objective of improving the condition of the SAC from unfavourable to favourable with respect to its woodland features. The total area encompassed by Areas A to E is 25.63ha[53]. With the agreement of NatureScot, the size of these sites was to be increased in the future (notionally in the directions shown on the figure) to extend this management to a much larger area; and potentially 230ha (80% of the SAC in the Dell Estate) over 75 years, with the extent of management proposed limited by factors such as steep terrain, the loch edge and access road.

4.5.7 Advice received from NatureScot, however, indicated that the area proposed for management in the first instance (25.63ha) was not large enough for a conclusion of 'unfavourable recovering' condition to be reached for the woodland features in the Dell Estate. Concern was also expressed about an approach involving fencing alone (rather than deer culling) to control grazing, and the extent of bracken management proposed (which was considered to be unnecessary). The amount of bracken currently present in the SAC is believed to be the result of inadequate grazing management practices in the past and, thus, best managed by reducing grazing levels, rather than by trying to remove the bracken itself. NatureScot's preference is for bracken control to be only carried out where there is evidence that it is impeding regeneration.

4.5.8 **Measure 4. Removal of bracken outside the SAC**. The Sites numbered 1 to 8 on **Figure 4-1** are areas of existing woodland and grassland adjacent to the Ness Woods SAC, characterised by similar environmental conditions. It was proposed that these areas could be brought up to SAC standard through management that included the removal of bracken. As above, however, a better approach could be the control of grazing in these locations to allow for the natural restoration of woodland.

4.5.9 **Measure 5. Management of grazing in the SAC**. As set out above, it was initially proposed that grazing could be managed in Areas A to E on **Figure 4-1** to improve the condition of the SAC. However, because the key pressure leading to the unfavourable condition of the woodland features in the SAC is grazing and given NatureScot's concerns about the limited size of Areas A to E, it is now proposed that herbivore management is undertaken across the entire area of the SAC that falls within the Dell Estate. The approach to this would be to:

- Undertake a stocktake of the deer and goat populations in the SAC woodland habitat in the Dell Estate using thermal drone imagery.

[53] Note: there are areas in proposed enclosures D and E where there is an urgent need for hazel regeneration. The habitat is in a very poor condition and could be lost if hazel regeneration (basal vegetative regeneration of existing hazels and regeneration from seed) cannot be secured in these areas within 2-3 years. Temporary enclosure could assist in this regard.

- Agree the scale of a 'reduction cull'.
- Undertake a reduction cull for deer and an elimination cull for feral goats. Regular, heavy culling is likely to be necessary initially to secure the regeneration of palatables.
- Maintain lower levels of deer long terms in the SAC (Dell Estate) through stalking; with the numbers of deer to be targeted (culling intensity) to be determined through monitoring[54].
- Review levels of regeneration and determine if other measures also need to be undertaken (potentially Measures 3 and 1, in that order), e.g., whether and where targeted bracken control might also be beneficial[55].

4.5.10 A secured commitment would be made by the Applicant to manage the 234.76ha of the SAC that falls within the Dell Estate for 75 years (the proposed length of the lease for the pumped storage scheme). This includes 166.22ha of qualifying woodland habitat and 68.54ha of contiguous acid grassland, wet heath, dry heath, bog (non-qualifying habitat); which would all benefit from reduced grazing/browsing pressure.

4.5.11 **Measure 6. Management of grazing outside the SAC**. Primarily through the management of grazing, an effort could also be made to bring Sites 1 to 8 on **Figure 4-1** up to SAC standard. In due course, this could allow the SAC to be extended. The total area encompassed by Sites 1 to 8 is 8.57ha.

4.5.12 Tree tagging in Sites 1 to 8 (see **Figure 4-2**) has indicated the following:

- Very few trees (sparely scattered birch) are present in Area 1 (which the substation cables would cross) and no trees in Area 2. These sites are also small (at 0.29ha and 0.2ha respectively) and relatively distant from the other sites under consideration.
- Site 3 (1.9ha) is characterised by similar tree composition (being nearly exclusively comprised of downy birch of a similar age and makeup to the adjacent SAC), terrain and ground flora to the area north of the ford where trees would be lost within the SAC.
- Despite having peat soils, Site 4 (0.51ha) has the same characteristics as Site 3.
- Sites 5 (0.38ha) and 6 (1.13ha) are on sloping ground and home to birch and more of a heathy understorey compared to lower sections of the SAC closer to the shores of Loch Ness. Herbivore impacts here are less severe than in Sites 7 and 8, but still moderate.
- Site 7 (2.14ha) contains birch, including one silver birch, and shows promise regarding regeneration; however, non-native conifer regeneration may also have to be considered in this compartment given its adjacency to the Dearg Lochain woods.

[54] Salix caprea and ash are heavily targeted by even low numbers of deer, so would be good indicator species if their recovery is monitored regularly (these species are seen to the north of Area E).

[55] Note: reducing grazing will not reduce bracken until canopy cover increases.

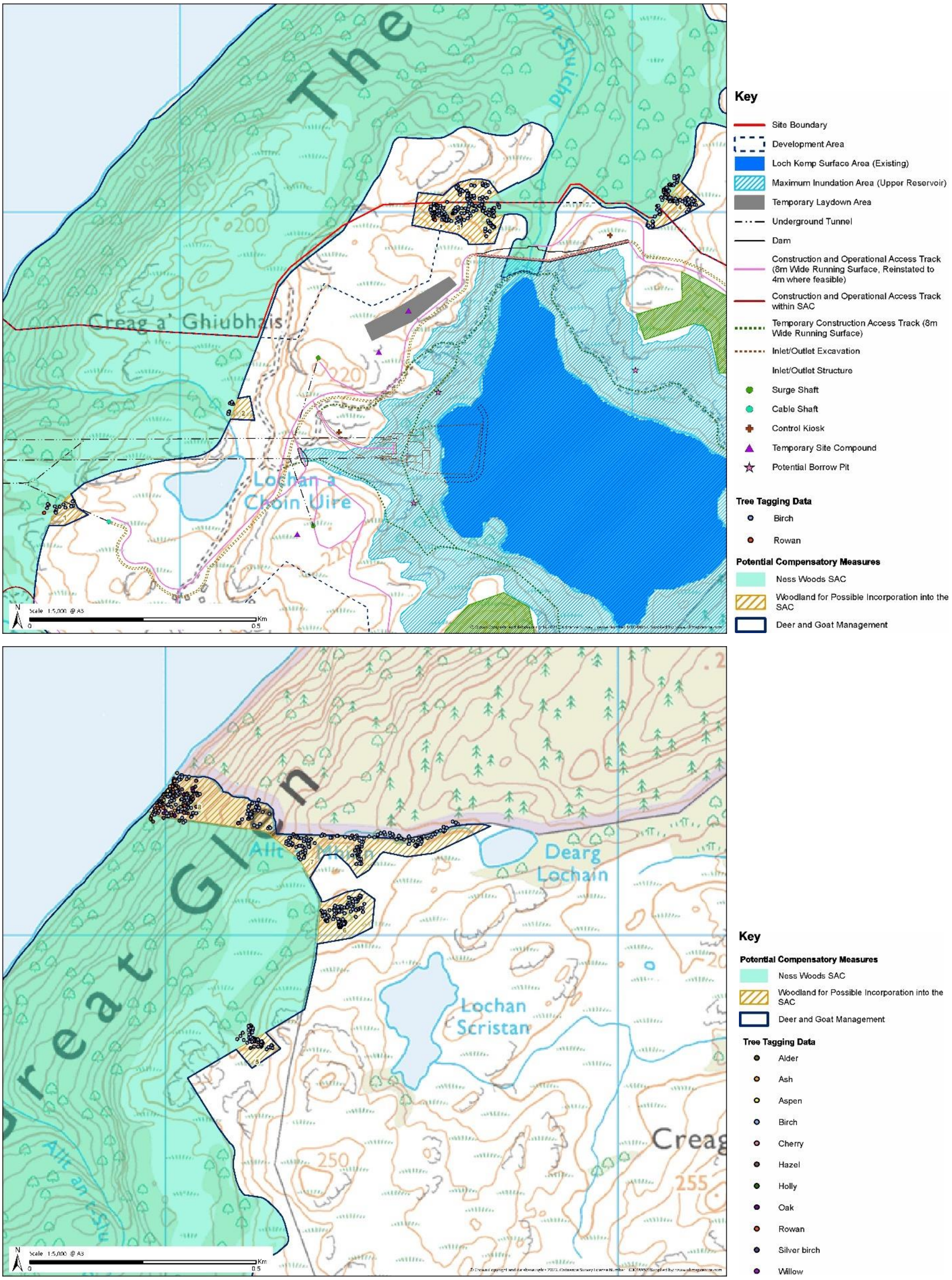

Figure 4-2 *Results of tree tagging in Sites 1 to 8*

- Site 8 (2.02ha) has the best potential, as it is most similar in terms of terrain, ground flora and tree composition to other areas of the SAC (including 125 birch, 28 hazel, 16 rowan, 13 ash, 7 oak and 2 alder trees, some of which have significant lichen coverage). Herbivore impacts from browsing and trampling pressures are high and measures to reduce these impacts (e.g., repairs to the existing fence line and/or management of herbivore numbers) would have positive effects on the potential for this area to recover and start regenerating. It includes a stand of Sitka spruce conifer plantation, but this area could be managed to SAC standard once they are harvested[56].

4.5.13 **New tree planting around Loch Kemp** is also proposed to be undertaken to offset the loss of trees due to the wider development, including commercial forestry within Whitebridge plantation, undesignated woodland that would be lost within the inundation area and woodland to be lost within the SAC, in line with the Scottish Government's Control of Woodland Removal Policy (which states that any trees felled for a development must be replaced). The new commercial forestry would not make any contribution in the context of the Habitats Regulations, but the planting of native woodland around Loch Kemp could do so.

4.6 Proposed Compensation Package

4.6.1 Based on the above analysis and advice, because the key pressure leading to the unfavourable (and declining) condition of the woodland features in the SAC is grazing/browsing, it is proposed that compensatory efforts are focused on managing these impacts across the entire area of the SAC that falls within the Dell Estate (see Measure 5). That is, promoting the regeneration of ash, hazel, wych elm, oak, birch and holly (in particular) through the control[57] of grazing/browsing (i.e., deer culling and goat eradication) to create good conditions for bryophytes and lichens and improve the connectivity of hazel groves. This would be additional to normal practice and would provide significant value given the known potential of the habitat.

4.6.2 Some targeted bracken control could also be helpful in the future to enhance the rate of regeneration where bracken stands are dense (if culling is not producing desired regeneration effect). The requirement for this would be determined based on the results of regeneration monitoring, where monitoring would be undertaken to determine both culling intensity and the requirement for additional measures. It would include measuring the recovery of palatables and specific species (e.g., hazel).

4.6.3 Targeted bracken control (if necessary) could be further supported by tree planting if natural regeneration does not occur or, for example, just favours certain species (e.g., birch). That is, if hazel or other more palatable species do not establish on ground suitable for mixed woodland, supplementary plant of such species in suitable locations could be undertaken. The aim being to achieve regeneration of desired species in desired locations as soon as possible.

4.6.4 The Applicant's commitment being to aim to restore all of the Ness Woods SAC in the Dell Estate through **'adaptive management'** focused, in the first instance, on the control of grazing, supported by the targeted removal of bracken and tree planting if and where necessary, to change the condition of the woodland from its current unfavourable to a favourable status.

[56] Increasing shade as they mature could affect lichens on veteran trees/hazels.

[57] Reduction, not removal.

4.6.5 This adaptive management would be based on monitored outcomes and guided by woodland specialists, including a lichenologist, and informed by a herbivore impact assessment; where by culling levels could be altered to achieve desirable (low) herbivore impacts and thickets around veteran hazels could be cut back if regeneration levels are too high.

4.6.6 In addition, it is proposed that adaptive management (as above), is undertaken on Sites 3 to 8 outside the SAC, to expand the SAC; and a Habitat Management Plan (HMP)[58] is in development for areas outside the SAC to replace all woodland that would be lost because of the Proposed Development (including the SAC woodland), as required under the Scottish Government's Control of Woodland Removal Policy[59]. The HMP would include deer control (for the 75-year lease period) and compensatory planting of native woodlands in other areas of the Dell Estate and would be implemented in parallel with the Habitats Regulations 'compensation' described herein.

4.6.7 **In summary**, the package of measures proposed to compensate for the loss of and potential change to up to 6.69ha of woodland, including some stands of and habitat with the potential to support acidic oak woodland and mixed woodland on base-rich soils, and the predicted loss of up to 957 trees and their associated assemblages of bryophyte and lichen (noting that these figures are highly precautionary) is:

- Restoration of the 4 x 4 track within the SAC to reintroduce hazel, oak, holly and birch to 0.26ha of the SAC with no current ecological value.
- The adaptive management (focused on managing grazing in the first instance) of 234.76ha of the Ness Woods SAC (all of the SAC in the Dell Estate) to improve its condition from unfavourable, to unfavourable recovering and, in due course, to favourable.
- The adaptive management of 8.08ha of land (Sites 3 to 8) adjacent to but outside the Ness Woods SAC, to bring these sites into the SAC in time.

4.6.8 This is illustrated in **Figure 4-3**.

4.6.9 The predicted **loss (and possible change) to gain ratios** associated with this are:

- For all habitat types, 1 to 36 - based on managing all 234.86ha of the SAC in the Dell Estate and 8.08ha outside the Estate.
- For qualifying habitat types, at least 1 to 26 - based on 166.22ha of the SAC in the Dell Estate being qualifying woodland habitat and the 8.08ha outside the SAC having the potential to be qualifying woodland habitat. Of this gain, it is acknowledged that 8.08ha would be new qualifying habitat (in due course) and 166.22ha would be restored condition qualifying habitat.
- For mixed woodland on base rich soils (and its associated lichen and bryophyte communities), of which there is 10.18ha in the SAC on the Dell Estate, at least 1 to 14.
- For western acidic oak woodland (and its associated lichen and bryophyte communities) and bracken with restoration potential, of which there is 156.08ha in the SAC on the Dell Estate (plus the 8.08ha), at least 1 to 27.

[58] An Outline HMP is included in Volume 4, Appendix 10.7: Outline Habitat Management Plan (non-SAC) of the EIA Report.
[59] Available at: https://forestry.gov.scot/publications/285-the-scottish-government-s-policy-on-control-of-woodland-removal/viewdocument/285

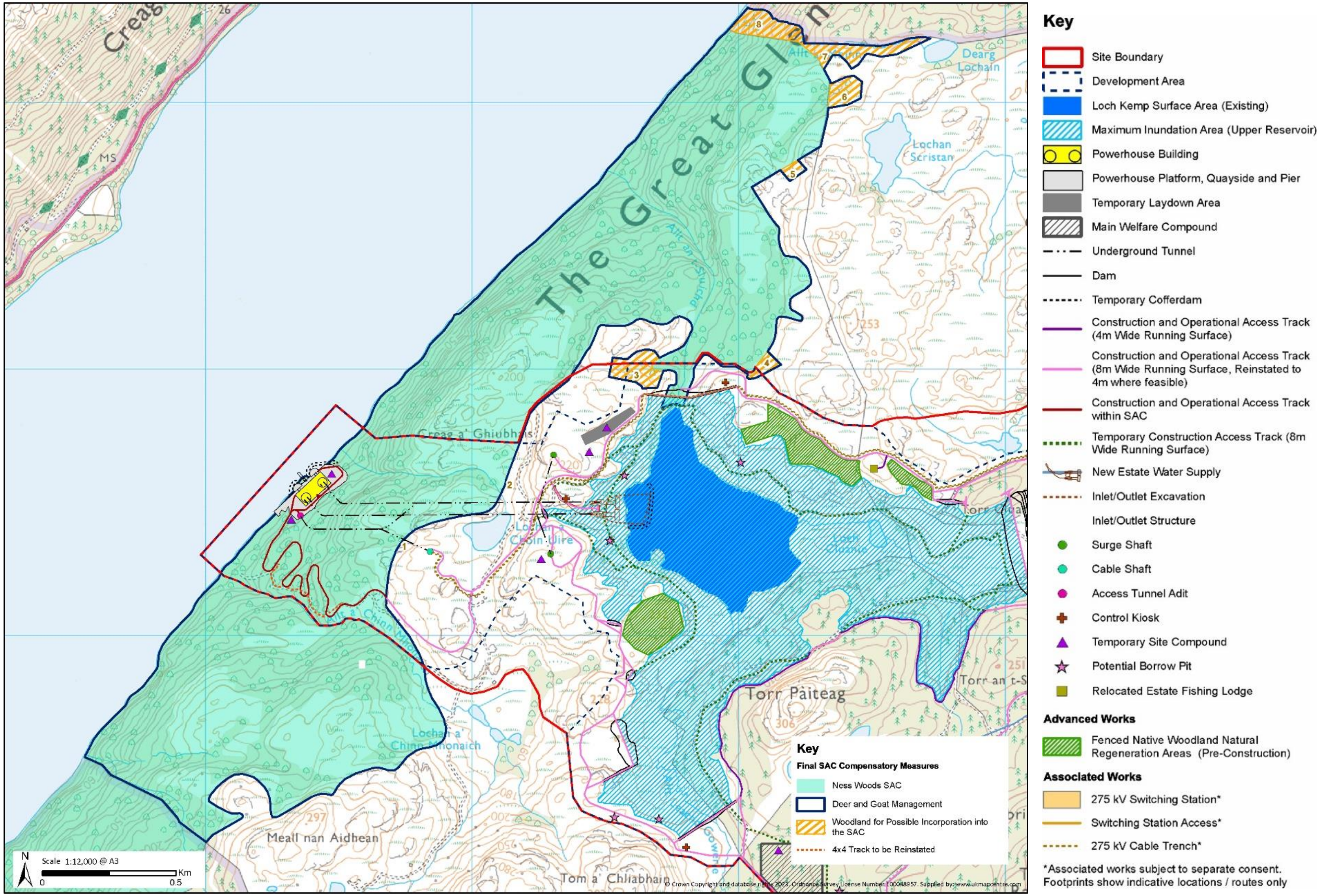

***Figure 4-3** Ness Woods SAC proposed compensation package*

4.6.10 These measures could be secured through a consent condition and a commitment to prepare and agree with NatureScot a detailed management plan, which would include detailed management prescriptions, monitoring and reporting requirements, for the delivery of the compensation package.

4.6.11 Regarding the COs of the SAC, the following would be achieved:

- Measures would be in place to move the site and its qualifying features (currently in unfavourable condition and believed to be declining) towards favourable condition and favourable conservation status.
- Measures would be secured to restore the integrity of the mixed woodland on base rich soils associated with rocky slopes qualifying feature by:
  - Restoring the extent and distribution of the habitat within the site – the loss and change of up to 0.73ha would be compensated for by the restoration of the SAC in the Dell Estate, including and targeting the 10.18ha of mixed woodland habitat in unfavourable condition.
  - Restoring the structure, function and supporting processes of the habitat – through the restoration of 235ha of the SAC.
  - Restoring the distribution and viability of the typical species of the habitat – through monitoring and the management of the restoration of 235ha of the SAC to secure the presence of viable ash, hazel and wych elm.
- Measures would be secured to restore the integrity of the western acidic oak woodland qualifying feature by:
  - Maintaining the extent and distribution of the habitat within the site – the loss and change of up to 6ha would be compensated for by the restoration of the SAC in the Dell Estate, including and targeting the 116.99ha of mixed woodland habitat in unfavourable condition, the 39.05ha of bracken with restoration potential, and the addition of 8.08ha to the SAC.
  - Restoring the structure, function and supporting processes of the habitat – through the restoration of 235ha of the SAC. The adaptive management be designed to achieve and maintain mixed age classes of trees, canopy cover, deadwood, understory, ground flora and epiphytic plants; large, long-lived trees; low levels of herbivore impacts; and an absence of invasive non-native species.
  - Restoring the distribution and viability of the typical species of the habitat – through monitoring and the management of the restoration of 235ha of the SAC to secure the presence of viable oak, birch, holly and hazel, and associated oceanic bryophyte flora and lichen mycota through the provision of a variable canopy and species mosaic.

4.6.12 With specific reference to bryophytes and lichens, by encouraging additional hazel (and other) trees, improving basal regeneration of existing moribund hazel, and sensitive management of existing and newly establishing hazel groves[60], conditions for old growth lichen and bryophyte establishment would be optimised. A variable, broken hazel canopy with gladed areas and open grown hazels/trees would be targeted, as these comprise important features for a diverse flora.

4.6.13 Management that encourages larger, more viable hazel populations would also improve connectivity between existing hazel grove clusters, which are currently scattered and fragmented. Establishing veterans of the future adjacent to and between existing veteran hazel groves, combined with long-term sensitive management of existing veteran hazel groves, would increase the distribution and connectivity of these populations, and in turn, strengthen the resilience and long-term viability of their lichen and bryophyte communities.

4.6.14 The commitment of the Applicant to manage, restore and enhance the SAC in the Dell Estate for 75 years means that compensatory measures would be secured to ensure the coherence of the Natura 2000 network. It is notable that this restoration would not occur “but for” the Proposed Development.

[60] Including managing shade levels and controlling dense thicket regeneration or bracken cover around the groves, based on long-term monitoring and adaptive management overseen by a lichenologist.

5 References

Aurora Energy Research (2022). *Long duration electricity storage in GB*. Aurora Energy Research for eNGie, SSE Renewables, National Grid ESO, CiP, Highview Power, Foresight, Gilkes Energy, DRAX, INVINITY Energy Systems, FIELD and Intelligent Land Investments Group, February 2022.

BEIS (2021). *Transitioning to a net zero energy system: smart systems and flexibility plan 2021.* Department for Business, Energy and Industrial Strategy, July 2021.

CCC (2023). *Delivering a reliable decarbonised power system*. UK Committee for Climate Change, March 2023.

DECC (2010). *Severn Tidal Power Report on Possible Compensatory Measures under Article 6(4) Habitats Directive*. Department of Energy and Climate Change, May 2010.

Defra (2012). *Habitats and Wild Birds Directives: guidance on the application of article 6(4) Alternative solutions, imperative reasons of overriding public interest and compensatory measures*. December 2012.

Defra (2021). *Habitats Regulations Assessments: protecting a European site*. Department of Environment, Food and Rural Affairs, London, February 2021.

DESNEZ & DBNIS (2020). *Energy White Paper: Powering our net zero future*. Department for Energy Security and Net Zero and Department for Business, Energy & Industrial Strategy, London, December 2020.

DESNEZ (2023). *Market Engagement on the second Hydrogen Allocation Round* (HAR2). Department for Energy Security and Net Zero, London, May 2023.

DTA Ecology (2016). *Advice regarding the approach to the derogation provisions under the Habitats Regulations relevant to tidal lagoon proposals*. Report to Tidal Lagoon Power, Natural England and Natural Resources Wales. Doc. Ref. 1003 Tidal Lagoons, 1 February 2016.

DTA Ecology (in press). *Advice to Marine Scotland on conservation measures, compensation and additionality*. Marine Scotland, 2023.

EC (1992). *Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora*. European Commission, Brussels.

EC (2012). *Guidance document on Article 6(4) of the 'Habitats Directive' 92/43/EEC.* European Commission, Brussels.

EC (2018). *Managing Natura 2000 sites. The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC*. Brussels, 21.11.2018 C(2018) 7621 final. European Commission, Brussels.

EC (2000). *Assessment of plans and projects significantly affecting Natura 2000 sites, methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive*. European Commission, Brussels.

ECJ (2006). *C-239/04 Decision and Advocate General's opinion*. European Court of Justice, The Hague.

IEA (2022). *Grid-Scale Storage*. IEA, Paris https://www.iea.org/reports/grid-scale-storage, License: CC BY 4.0.

Jacobs (2020). *Strategy for Long Term Energy Storage in the UK*. White Paper v14. Jacobs BPO00DF6. August 2020.

PINS (2017). *Advice Note Ten: Habitat Regulations Assessment relevant to Nationally Significant Infrastructure Projects*. Planning Inspectorate, November 2017, Version 8.

Scottish Government (2023). *Draft Energy Strategy and Just Transition Plan – delivering a fair and secure zero carbon energy system for Scotland*. Scottish Government Riaghaltas na h-Alba, January 2023.

Tyldesley, D. and Chapman C. (2013-2023). *The Habitats Regulations Assessment Handbook*, 2019 edition UK: DTA Publications Limited. Note that this publication is an on-line handbook that is updated periodically.

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