APPENDIX 2 – SITE VISIT REPORT

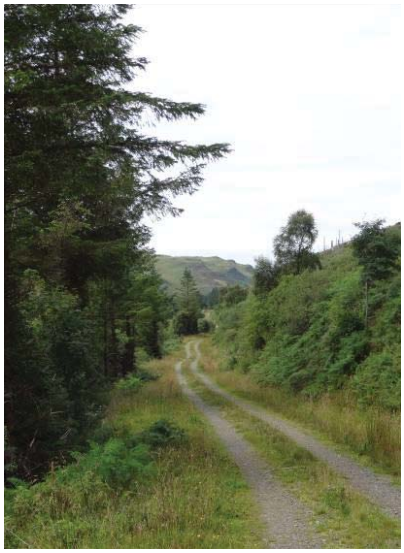
Stromeferry Bypass – Stage 2 Environmental Survey Report

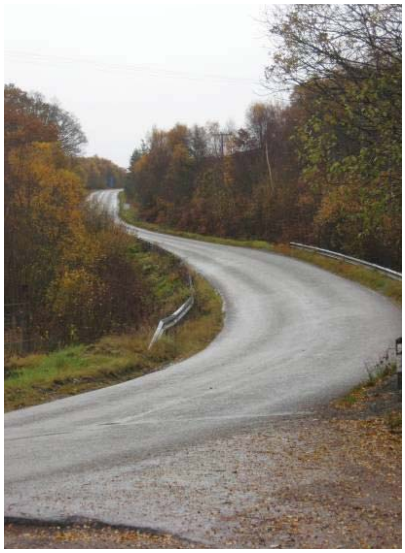
Final Report

November 2013

Prepared for:
Highland Council

UNITED KINGDOM & IRELAND





REVISION SCHEDULE					
Rev	**Date**	**Details**	**Prepared by**	**Reviewed by**	**Approved by**
1	October 2013	Draft Environmental Survey Report	Seán Fallon Planning Consultant	Seán Fallon Planning Consultant	Nigel Hackett Technical Director
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The methodology adopted and the sources of information used by URS in providing its services are outlined in this Report. The work described in this Report was undertaken between July and September and is based on the conditions encountered and the information available during the said period of time. The scope of this Report and the services are accordingly factually limited by these circumstances.

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[No allowance has been made for changes in prices or exchange rates or changes in any other conditions which may result in price fluctuations in the future. Where assessments of works or costs necessary to achieve compliance have been made, these are based upon measures which, in URS' experience, could normally be negotiated with the relevant authorities under present legislation and enforcement practice, assuming a pro-active and reasonable approach by site management.]

[Forecast cost estimates do not include such costs associated with any negotiations, appeals or other non-technical actions associated with the agreement on measures to meet the requirements of the authorities, nor are potential business loss and interruption costs considered that may be incurred as part of any technical measures.]

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1 INTRODUCTION

1.1 Purpose

Following on from the Environmental Assessment carried out as part of the STAG Part 1 / DMRB Stage 1 Stromeferry Appraisal Report (March 2013), URS have commenced evidence gathering for the Stage 2 study.

It was essential that environmental surveys were completed to ensure that the forthcoming Stage 2 Environmental Appraisal of Options is informed by robust baseline data. The purpose of this Report is to provide a record of the environmental walkover surveys undertaken for the route corridor options which are under consideration at Stage 2.

1.2 Scope of Surveys

The following walkover surveys were carried out:

- Planning and Environment;
- Landscape;
- Ecology & Nature Conservation; and
- Hydrology & the Water Environment.

Surveys were completed by all disciplines during August 2013. Prior to the site visit, survey corridors were agreed and these are shown in Appendix A - Survey Corridors.

Chapters 2 – 5 below provide a description of site walkovers for each of the above surveys.

While detailed peat depth surveys have not been carried out at this stage, a Briefing Note on Peat has been prepared to inform the Stage 2 study. This has been included in Appendix C.

For the purposes of this Report, it should be noted that Strome Wood (north) is an area of woodland located north of the loch between Lochcarron and Stromemore, while Strome Wood (south) is an area of woodland and managed walkways located to the west of Stromeferry.

1.2.1 Health & Safety

As required by URS, a Safe Work Plan (SWP) was prepared prior to the site visit for all project staff who visited the study area.

2 PLANNING AND ENVIRONMENT SITE WALKOVER

2.1 Site Walkover Preparation

A team meeting was held to establish which sites within the identified route corridors would be of particular interest and how the team could maximise time spent in the Stromeferry area. Access arrangements were also established prior to visiting the study area (i.e. landowner notification and identification of restricted areas).

2.1.1 Desk Study

Prior to the site walkover, a desk based review of the following information was undertaken:

- Stage 1 Report & Consultations;
- 'Emerging Route Options' Drawing from Stage 1 Report;
- Project meeting minutes to date;
- Ordnance Survey Mapping & Land Ownership Plan;
- Review of recent planning applications submitted in the study area;
- Highland-wide Local Development Plan; and
- Highland Council Wester Ross Local Plan & West Highland and Islands Local Plan.

2.2 Walkover Survey

A walkover survey was conducted by two qualified environmental specialists over a three day period between 20th and 22nd August 2013. With the exception of the S1, S3 and central section of the S4 routes, all survey corridors were assessed either by car or on foot. Selected parts of the S1 and S3 routes were accessed on foot in order to gain a broad perspective of the extent of existing receptors. All key highway junction points were also considered, including those onto the existing A890 which facilitate options S1, S3 and S4.

The following communities were also visited to obtain an overview of the scale and nature of surrounding settlements and to identify any associated environmental features to be considered in the Stage 2 study:

- Stromeferry
- Ardnarff
- Attadale
- Achintree
- Strathcarron
- Kirkton
- Lochcarron
- Stromemore
- Leacanasigh
- Ardaneaskan
- Plockton
- Braeintra
- Achmore
- Portchullin

Throughout the survey, all planning and environmental features and sensitive receptors were recorded, photographed and where applicable, confirmed against existing desktop studies allowing a comprehensive overview of the constraints associated with each corridor option.

2.2.1 *Survey Limitations*

Weather conditions were dry with good visibility throughout.

The southern corridor options are particularly remote in nature and characterised by dense forestry (S1 and S3) and difficult topography (S4). Visiting key strategic sections of these route corridors was considered to be sufficient to adequately consider the environmental features of the areas and associated constraints. The southern stretch of the S4 corridor route was surveyed from the junction with the A890 to the intersection of the S1 and S3 routes and, in the northern extent from Attadale to approximately 3km into the valley. A section of the Carn ne Creige forest track was also visited to provide insight in to the general area surrounding the proposed S1 and S3 Links.

Route option N9 was viewed primarily from the A896 and from the opposite shore, due to a lack of access available on forest tracks or paths.

2.3 Key Considerations

2.3.1 *General*

Each corridor option has a number of planning and environmental constraints, which will present a variety of associated challenges in the future design approach.

In terms of existing settlements, sensitive receptors that were identified throughout the site visit include: residential housing; local businesses such as hotels, guesthouses and restaurants, many of which support tourism in the area; recreational facilities including forestry walks; community resources such as local schools, a doctor's surgery and local library.

Agricultural and livestock farming activities were also identified, particularly around Achmore and in the Attadale valley.

A number of new build properties are not marked on existing plans, most notably, one residential property north of Achmore adjacent to route corridor N9 and one residential property north of Attadale where a change in the alignment of the existing online route corridor (A890) is proposed (west of Maman Hill). These properties will be considered as the Stage 2 study progresses.

A number of environmental constraints were also identified: Forestry (including ancient woodland), watercourses and designated features such as Strome Castle are located in the area. SSSI's at Attadale, Allt nan Carnan and Slumbay Island were also recorded. The 'Nature Conservation Designations' drawing in Appendix D indicates the designated sites within the study area.

Existing transport links such as roads, harbour slipways and the railway which follows the southern coast of Loch Carron will also require further consideration at Stage 2.

Note – Figure 2.1 Planning Walkover Survey Photograph Locations shows the location of photographs included in this chapter.

2.3.2 *North Shore Corridor (N6)*

The north shore corridor option N6 runs primarily along the existing road alignment on the north shore of Loch Carron. The existing route (A896) is a combination of single track and two way road.

The corridor passes through Lochcarron, which is the largest settlement in the study area. The existing road in this section (known as Main Street) has mixed development to the north and a pedestrian walkway and parking facilities to the south, which edge the shoreline and loch. The

central section of Main Street, which faces directly onto the loch, has a number of residential properties, hotels, restaurants and small retail units. Only two properties (a dwelling house and retail unit) are located on the southern boundary of the road throughout this central stretch of Main Street.

Travelling south-west along this route, the road moves away from the loch, with residential properties on each side before passing through Strome Wood (north) toward Stromemore and Leacanasigh, where a small collection of scattered residential properties are located.

To the north-east, the road continues towards Strathcarron Junction and varies between single track and two way provision. Lochcarron Golf Club and the Lochcarron Burial Ground are located along this section and are noted as sensitive receptors as shown in Photograph P01.

Photograph P01 – Lochcarron Burial Ground to the left and golf course to the right.

At the time of writing, option N6 includes a bridge or tunnel across Strome Narrows as part of the design. The crossing leaves the existing A890 alignment from the south side of the loch at the junction for Achmore and runs along the east side of Creag Mhaol. The route also runs through Strome Wood (south) which is a community managed, formal woodland walkway located to the west of Stromeferry, with paths leading to the shore and along the coast as shown in Illustration A.

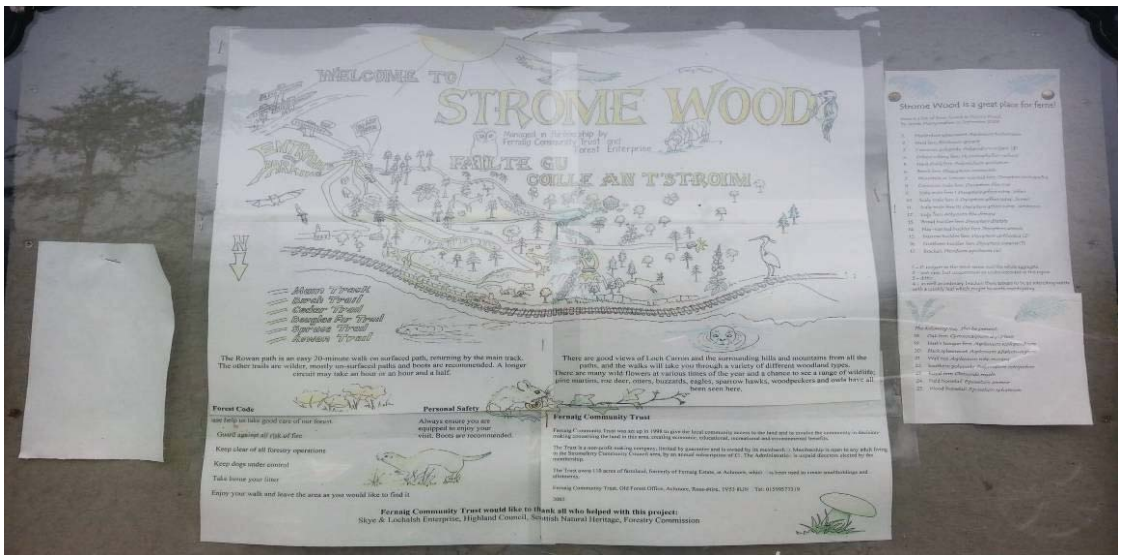


Illustration A – Stromewood Interpretation Board

The southern crossing alignment of option N6 is located near the settlement of Stromeferry and also crosses the existing railway line. Within Stromeferry itself, a small number of residential dwellings and guesthouses on steep topography were recorded, as well as

Stromeferry Train Station and an existing slipway. There are also two former churches (Church of Scotland Mission Church and Free Church) which are Category C Listed Buildings.

To the north of the loch, the proposed bridge crossing joins the existing road alignment at Leacanasigh. Strome Castle, which is a Scheduled Monument is located in close proximity (within 100m) of the proposed crossing. There are a number of scattered private dwellings located at Leacanasigh, as well as an existing slipway which will need to be considered as part of the environmental assessment associated with the Stage 2 study.

2.3.3 *North Shore Corridor (N9)*

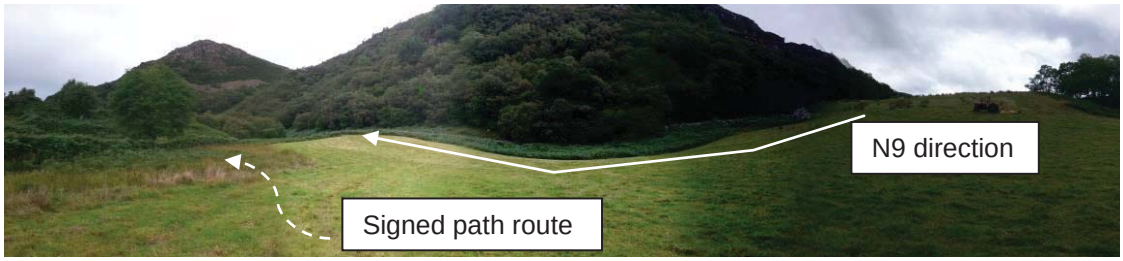
At the north side of the loch, option N9 follows a similar path to that of option N6 between Leacanasigh and Stromwood. However, the N9 alignment departs northwards from the existing road at Strome Wood (north) and across relatively open landscape of moorland and minor watercourses. This open landscape is highly visible from the south side of the loch and contributes to the open setting and natural boundary of Lochcarron.

It was also noted that a Scottish Water (SW) treatment plant is located in close proximity to the point where the proposed road alignment meets the A896 (see Photograph P02).

Photograph P02 – Scottish Water treatment plant (to the left) and looking north along A896 where the N9 alignment will join (to the right).

From the A896 the N9 alignment moves southwards across moorland, which includes a SSSI (Allt nan Carnan) and watercourse. It then travels through a forestry plantation adjacent to Kirkton before joining up with the existing road alignment c.250m to the west of Lochcarron Burial Ground.

As with option N6, option N9 includes either a bridge or tunnel crossing at Strome Narrows. From the south, the proposed alignment leaves the existing A890 in the vicinity of Achmore and travels around Creag Mhaol, a rocky feature rising from the landscape with dense woodland as shown in Photograph P03. The proposed alignment would run in close proximity to a small number of residential dwellings before reaching the existing railway line at the waterfront and crossing Loch Carron via bridge or tunnel. Part of the area surrounding Creag Mhaol is grazed by livestock and is densely wooded. A signed footpath is also located in the area (view from the path shown in Photograph P04). While not a designated Core Path or Right of Way, the path is protected under the Land Reform (Scotland) Act 2003.



Photograph P03 – Creag Mhaol viewed from the footpath

Photograph P04 – View north-west from Creag Mhaol toward Strome Narrows

The areas of Achmore, Portchullin and Plockton were also surveyed in order to determine any potential receptors with regard to option N9 and the crossings at Strome Narrows.

Achmore comprises of a small number of residential buildings (ranging from traditional stone-built cottages to new-build bungalows and 2-storey terraces), craft shops and farmland. A Forestry Commission Scotland depot is also located in the village. It was noted that there is a new property located within the N9 corridor south of Creag Mhaol which was not recorded during the desk-based survey. This will have to be taken into account as the study progresses.

Beyond Achmore to the north, the shoreline was accessed where the river Allt Cadh an Eas enters Loch Carron. The railway line runs around the coast north-east toward Stromeferry at this location and between the railway and the loch are a small number of dwellings/holiday homes which form a community known as Portchullin. These houses are located in close proximity to the shoreline and are modern-built cottages with small gardens.

Although located outwith the extent of the route corridor, it is considered that the traditional fishing village of Plockton (located to the south-west of Stromeferry) could be affected by the N9 proposal, specifically in terms of the potential visual impact. Properties located on the shoreline at Plockton primarily face north-east toward the Strome Narrows. While these are largely traditional, stone-built dwellings located along the main street, there are a number of more recently built houses scattered along the shoreline. A number of hotels and restaurants are also located within the village.

2.3.4 *Southern Corridor (S4)*

The southern corridor is located entirely to the south of Loch Carron in a largely undeveloped landscape. From the west, the S4 option departs the existing A890 and moves east along the route of the existing Gleann Udalain forest track (Photograph P05). The site walkover revealed that the forestry plantation immediately adjacent to the route as shown on Ordnance Survey mapping has been felled. A number of small watercourses are visible from the track, Allt Gleann Udalain being the most prominent.

Photograph P05 – Existing Gleann Udalain forestry track

Part of the proposed S4 route passes through the River Attadale valley (Photograph P06) and connects with the existing A890 where the River Attadale meets Loch Carron. This area forms part of the Attadale Estate and the valley exhibits varying features including: signed walking routes (shown in Illustration B); holiday cottages; the main Estate house; the Estate gardens which are a visitor attraction; areas of woodland and the River Attadale. The lower end of the valley toward the loch is fenced to allow livestock to graze.

Photograph P06 – River Attadale Valley

Illustration B – Signed paths in Attadale Estate

Please note that the section from Attadale to Strathcarron is described below in Section 2.3.5 (online corridor).

Southern Corridor (S1)

While the full extent of the S1 route option was not visited, the point where the proposed junction connects to the existing A890 was included in the walkover and is shown in Photograph P07. Given the dense woodland at this location, it is likely that tree felling and earthworks would be required to facilitate this route. Additional landscape/visual, ecological and hydrological receptors are discussed further throughout this Report.

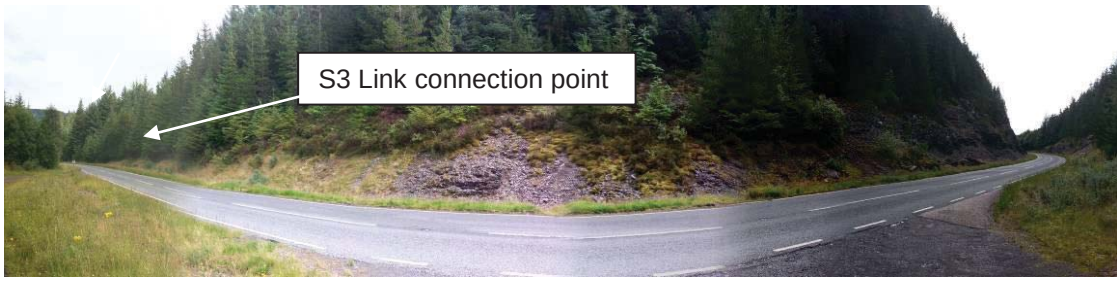
Photograph P07 – S1 Link Road at A890 connection point

Southern Corridor (S3)

Photograph P08 shows part of the existing forest track in the midway point of the S3 corridor. Photograph P09 shows where the S3 Link connects to the existing A890. Similar to the S1 Link above, it is likely that tree felling will occur and engineering earthworks would be required

to facilitate this route. Again, landscape/visual, ecological and hydrological receptors will also have to be considered in more detail in the Stage 2 Study.

Photograph P08 – Forest track at midway point of S3 Link



Photograph P09 – S3 Link connection point from A890

2.3.5 ***Online corridor (All – 02, 03, 04, 05, 07)***

The online options under consideration at Stage 2 all largely follow the existing road alignment with varying solutions proposed to improve the current route in certain areas.

The existing A890 between Stromeferry and Strathcarron is significantly constrained by Loch Carron to the north and a mixture of steep rock and forestry to the south. The existing railway line also runs between the loch and the road. Photograph P10 illustrates the constrained nature of the corridor showing the road, railway and rock face (looking north-east toward the existing avalanche shelter and Attadale beyond).

Travelling north-east from Attadale, the topography of the road ranges significantly by rising and then falling again to sea-level at Strathcarron. Similarly, the section between Ardnarff and Stromeferry ranges significantly in height.

There are a number of receptors located along the route, including businesses and dwelling houses in the most part at Strathcarron, Achintee and in the vicinity of the Attadale Estate. It was noted during the walkover that a dwelling house, not shown on OS mapping, is located west of Maman Hill where the new road alignment is proposed. A number of watercourses were also noted, many of which are culverted under the existing road. Section 5 discusses these in more detail.

Photograph P10 – Existing A890 looking north-east toward the avalanche shelter

URS

Key:

F01 Survey Photograph Locations

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Title: Figure 2.1 - Planning Walkover Survey Photograph Locations

Drawing Number: 47035084 - P001

Stromeferry Walkover Survey

3 LANDSCAPE WALKOVER

3.1 Site Walkover Preparation

In advance of undertaking the site walkover survey, a desktop study was undertaken to ensure that onsite work was targeted and effective. Other preparations included planning of survey routes, identification of safe stopping places and potential key receptor locations.

3.1.1 Desk Study

The pre-survey desk study involved the following key tasks:

- Review of Stage 1 Report & consultation responses;
- Review of aerial photography and Ordnance Survey mapping at various scales
- Review of the proposed route options to be evaluated (as shown in Appendix A); and
- Discussion with the project engineers to gain an understanding of the likely extent and nature of required works and structures for each of the scheme options.

3.2 Walkover Survey

The walkover survey was conducted by two experienced Chartered Landscape Architects over a four day period from the 12th to the 15th of August 2013, with a follow-up on the 28th and 29th October. It involved a combination of driving and walking sections of the routes and utilisation of vantage points to gain a detailed overview of each option. Site recording included a comprehensive photograph catalogue and annotation of drawings and survey notes.

The survey allowed the testing and verification of the desktop baseline overview undertaken as part of the Stage 1 assessment and involved identification of any key landscape or visual constraints and opportunities which could inform the Stage 2 assessments. The surveys included noting key landscape features and the differing physical attributes such as vegetation, land use, landform and settlement as well as perceptual attributes such as sense of enclosure, openness, remoteness and exposure experienced along the routes. Consideration was given to the potential impacts on the landscape character and visual amenity likely to occur from each option.

3.2.1 Survey Limitations

Surveys were undertaken in largely fair weather conditions, although occasional heavy showers and low cloud limited visibility for short spells. Limited timescales meant that walking the full length of each route was not possible. However, the entire length of the southern route was walked; the northern route N9 was surveyed from the nearest public road and other vantage points; and the northern route N6 and online options (O2, O3, O4, O5, O7) were all surveyed using the existing roads and other vantage points.

3.3 Key Considerations

3.3.1 General

This area exhibits a wide diversity of landscape character, from flat bottomed, enclosed strath, through large blocks of commercial forestry, to open and exposed rocky moorland. Each of the identified route options is likely to pass through or gain views of these differing landscape types, providing a varied experience for road users and requiring different design approaches. The landscape walkover survey confirmed that the findings of the desktop baseline study are accurate and representative of the existing site conditions.

Many of the route options follow the alignment of existing roads and tracks, with the southern route potentially providing the longest section of new route. Settlement in the area is concentrated along the loch sides and straths and consists of Lochcarron village, a number of small clusters of houses, such as at Stromeferry, Achmore, Ardaneaskan and Strathcarron, and occasional scattered farms and crofts.

Note – Figure 3.1 Landscape Walkover Survey Photograph Locations (included at the end of this Section) shows the location and orientation of photographs included in this chapter.

3.3.2 *North Shore Corridor (N6)*

This potential route largely follows the alignment of existing roads along the north shore of Loch Carron until reaching Stromemore, where it crosses over the loch. The initial section follows the existing A896 along the flat bottom of Strath Carron. This section of the route is a combination of single track and two way road. The adjacent land cover and land use is largely wet grassland and rough grazing with areas of moorland and scrubby woodland (largely birch and rowan), shelterbelts (larch, pine and spruce) associated with dwellings, and a golf course, as shown in Photograph L01.

Photograph L01 - A896 near Tullich Roads Depot, looking south-west

The route then enters the settlement of Loch Carron, which represents the largest group of potential visual receptors, many of which would look out across the road to Loch Carron as shown in Photograph L02. It then leaves the existing A896 and follows a minor, single track road through the western half of the village and along the lower slopes above Loch Carron. This section is likely to need upgrading and widening and there are a number of pinch points which would need careful consideration to minimise impacts.

Photograph L02 - A896 at Lochcarron, looking north-west

Upon leaving the village the route passes through Strome Wood (north), an area of commercial forestry plantation, some of which has been recently felled and replanted, followed by a section of more open broadleaved woodland and rough grassland. The commercial forestry consists largely of spruce and pine and the broadleaved woodland is predominantly birch, with occasional larger ash and oak. This section of the route cuts across a steeper slope and any upgrading and widening would require cutting into the slope which can increase visual impact and provide a more difficult landscape fit. It may also require the felling of forestry or broadleaved trees and this should be kept to a minimum, particularly on the loch side of the route. Replacement and supplementary planting could be introduced to help mitigate impacts.

The route then crosses over Loch Carron between Stromemore and Stromeferry (see Photograph L03) and is likely to result in impacts on the landscape character and on visual receptors on both sides of the loch. On the south side, the route ascends the steep slopes above the loch, through an area of commercial forestry and across a section of open moorland before connecting into the existing A890. The steep slopes are likely to provide a challenge and may involve substantial earthworks which could increase the potential landscape and visual impacts.

Photograph L03 - Looking south from Stromemore towards Stromeferry along alignment of potential crossing

3.3.3 *North Shore Corridor (N9)*

This route follows a similar alignment to N6, described above, although it effectively bypasses Lochcarron village and includes an alternative crossing at Strome Narrows.

The initial section between the A890 and the golf course follows the same alignment as the existing A896 and N6 as described above. To the east of the golf course, this route then diverges from the existing A896 and ascends the slopes above the loch, passing to the north of Lochcarron village. As shown in Photograph L04, this section of the route initially crosses an open field before entering an area of commercial forestry plantation, (consisting largely of spruce and pine) and emerging at the top of the slope onto an area of open moorland. The alignment and design of the route through the forestry would need careful consideration to minimise the extent of felling and balancing this with the risk of wind blow.

Photograph L04 - A896 near Kirkton, looking west along alignment of N9 route option

As the route crosses the open, rocky moorland (see Photograph L05) there is potential for impacts on the landscape character and also visual impacts on receptors on Loch Carron and the opposite shore. Careful consideration of the route design would be required to minimise potential impacts. This could include following existing topography where possible and reducing the need for cuttings, embankments and road furniture (signage, barriers etc.) in order to achieve the best landscape fit.

Photograph L05 - A896 above Lochcarron, looking east across rocky moorland

The route then follows the same alignment as N6 from Strome Wood (north) to Stromemore, as described above, but continues along the existing single track road west of Stromemore before crossing over Loch Carron (see Photograph L06). The crossing is an alternative to that described for N6, above, but is likely to have similar landscape and visual impacts, depending on the required height of the bridge structure. The option of a tunnel rather than a bridge crossing is also being considered and, depending on the design of the approaches and portal areas, is likely to result in reduced landscape and visual impacts.

Photograph L06 - Looking south-west to potential Strome Narrows crossing

On the south side of the crossing the route passes to the west of Creag Mhaol, on a high level shelf which traverses round the hill, before connecting into the existing A890. This section of the route makes good use of existing topography and woodland but is likely to result in landscape and visual impacts, particularly to properties at Achmore and the Kyle – Plockton Special Landscape Area. The woodland is predominantly birch on the upper slopes with other species such as oak and ash on the lower slopes. There may be an opportunity to provide additional woodland in this area to mitigate against potential impacts.

3.3.4 *Southern Corridor (S4)*

This route initially follows the existing A890 across Strath Carron and along the south side of Loch Carron between New Kelso and Attadale. As shown in Photograph L07, Strath Carron is a wide flat valley with semi-improved grassland used primarily for grazing, interspersed with patches of low woodland (alder, ash and birch) and occasional groups of larger trees around properties (including pine, beech and lime). Upgrades to this section of the route are likely to include widening of the existing road and potentially a realigned railway crossing. Where possible the route should avoid the need to fell existing mature trees adjacent to properties in order to achieve a good landscape fit.

Photograph L07 - A890 at bridge over River Carron, looking east

At Cam-allt the route moves away from the loch shore and climbs steeply over the edge of a low hill, before descending the steep slope back to the flatter loch shore and strath at Attadale. This section of road is partially enclosed by trees (predominantly birch with some oak and other species) as it ascends and descends the steep slopes, with open, elevated views over Loch Carron from the summit.

The route then diverges from the existing A890, travelling along flat grazing land on the south side of Attadale strath, as shown in Photograph L08.

Photograph L08 - Looking north-east across Attadale strath

Towards the head of the strath the route begins to ascend the southern slopes, before turning southwards and climbing out of the strath between two areas of commercial forestry alongside the Allt a'Ghiubhais burn (see Photograph L09).

Photograph L09 - Looking north, down Allt a'Ghiubhais along S4 route option

At the top of the woodland, which consists largely of pine, spruce and larch, the route emerges into an area of rocky moorland as shown in Photograph L10. The undulating nature of the topography provides a varying sense of enclosure, openness and exposure. Beyond the forestry there are fewer signs of human influence, with the exception of more distant hill tracks, and therefore this section has a stronger impression of remoteness and naturalness. Careful consideration of the route design will be essential in this section and should seek to follow the existing topography where possible, reducing the need for cuttings, embankments and road furniture (signage, barriers etc.) in order to achieve the best landscape fit and minimise impacts.

Photograph L10 - Looking south-east over rocky moorland near source of Allt a'Ghiubhais

The route connects to the upper reaches of Gleann Udalain and follows along the edge of an area of forestry, some of which has been recently felled, before reconnecting with the existing A890. This section of the route makes good use of topography and woodland along the upland glen to minimise the likely visual envelope (see Photograph 11). However, there are a few pinch points which would need careful consideration to ensure a good landscape fit can be achieved (see Photograph L12).

Photograph L11 - Gleann Udalain looking south-west along S4 route option

Photograph L12 - East of Carn na Creige, looking north-east through a narrow glen

S1 Link

This is an alternative alignment to the western end of the southern route (S4), passing to the north of Carn na Creige and along the forested slopes to the northwest, before reconnecting to the existing A890 to the south-east of Stromeferry. This option is within forestry for much of its length and the alignment and design of the route would need careful consideration to minimise the need for felling and risk of wind blow, which is evident in other areas of the forestry. This route would avoid the pinch point shown in Photograph L12, but would involve negotiating other steep slopes, particularly at the tie in with the existing road (see Photograph L13).

Photograph L13 - A890 south-east of Stromeferry, looking towards potential S1 Link connection point

S3 Link

Similar to the S1 Link, described above, this is an alternative alignment to the western end of the S4 route option. Like S1, this route passes to the north of Carn na Creige, but then follows the slopes to the west through the forestry. There are similar design constraints and consideration to this route as those described above, although this route is likely to cut across steeper slopes as shown in Photograph L14.

Photograph L14 - A890 near head of Strath Ascaig, looking east towards potential S3 Link route

3.3.5 *Online corridor (All – 02, 03, 04, 05, 07)*

A number of different options have been identified for this corridor and they generally follow a similar alignment to the existing A890. All of the online route options follow a similar alignment to that of the southern route (S4) between Strathcarron and Attadale, as described above. The online options then continue to follow the side of the loch at the base of the steep slopes and cliffs. This section is characterised by a narrow flat corridor along the base of the cliffs and includes the existing road and railway line, as shown in Photograph L15. The high cliff face, narrow corridor and presence of the railway provide significant constraints along this section of the route. Upgrading options include varying degrees of stabilisation of the slopes and rock face and road widening where possible. Other options include a possible tunnel or extension out into the loch in order to avoid the most problematic sections.

Photograph L15 - A890 near Ardnarff, looking north-east along existing route

The main impacts of this section are likely to be a result of removal of vegetation along the steeper sections and above the rock face and increased visual prominence of the rock face itself. There are a large number of visual receptors on the opposite side of the loch, including the main settlement of Lochcarron.

As the route approaches and passes Ardnarff the slopes become slightly less steep and are clothed in coniferous forestry. Although the existing road has a section of steep gradient, it is generally wider than single track and so upgrading requirements are more limited (see Photograph L16). If widening or realignment of short sections is required the design solution should seek to minimise the need for tree felling, cuttings and embankments which could increase the prominence of the road.

Photograph L16 - A890 south of Ardnarff, looking north-east down steep section of existing route

URS

Key:

L01 Survey Photograph Locations

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Title: Figure 3.1 - Landscape Walkover Survey Photograph Locations

Drawing Number: 47065084 - L001

Stromeferry Walkover Survey

4 ECOLOGY & NATURE CONSERVATION WALKOVER

4.1 Site Walkover Preparation

The prelude to the site walkover survey included a review of the Stage 1 Report and consultations, and information gained via a desk study as detailed below.

4.1.1 Desk Study

A desk study was undertaken to identify any statutory and non-statutory designated sites of nature conservation interest and to obtain information on the occurrence of protected species and / or species of nature conservation interest. The desk study comprised a review of literature and web-based resources and consultation, as described below.

4.1.2 Consultations

Consultations to date have largely taken the form of workshops, involving statutory and non-statutory conservation organisations and members of the local community. To date only limited information relating to the presence of statutory designated receptors, has been made available for this study, with a number of records relating to protected species having been obtained from the Nature Conservancy Council for Scotland (NCCS), though they are dated February 1992. Additional general information has also been received from Scottish Natural Heritage (SNH) relating to a number of protected sites / species known to occur within the study corridors.

4.1.3 Web Resources

The following resources were reviewed:

- The National Biodiversity Network (NBN) gateway website;
- The Multi-Agency Geographical Information for the Countryside website;
- Forestry Commission Scotland Map Viewer;
- Joint Nature Conservation Committee (JNCC) website;
- SNH Information Service; and
- UK Biodiversity Action Plan (UK BAP) website.

Ordnance Survey maps were also studied to identify potential habitat areas of nature conservation importance within the study area.

4.2 Walkover Survey

The walkover survey was conducted by an experienced ecologist over the period 13th to 23rd August 2013.

All route option corridors were accessed over the extended survey period.

Given the requirements of a Stage 2 options assessment, the site survey consisted of an Extended Phase 1 Habitat survey (based upon JNCC Methodology). The survey was undertaken with the following objectives:

- To classify and map the broad habitat types present within the route option corridors;
- To identify and describe any features likely to be of nature conservation interest; and
- Assess the potential of habitats present to support protected species.

The drawing outlined in Appendix E provides an overview of the habitat types recorded during the walkover. This data will be demonstrated in more detail as part of the Stage 2 Assessment.

4.2.1 *Survey Limitations*

Given the timing of the walkover survey, a number seasonality constraint issues are considered relevant to the investigation; namely, breeding birds and badger.

The survey was undertaken outwith the main breeding bird season and consequently, only limited information was collated. Additionally, the presence of dense vegetation particularly within both broadleaf and coniferous woodland is likely to have concealed field evidence relating to the presence of badger and possibly other protected mammal species.

4.3 Key Considerations

4.3.1 *General*

- To classify and map the broad habitat types present within the route option corridors;
- To identify and describe any features likely to be of nature conservation interest;
- Assess the potential of habitats present to support protected species; and

Note – Figure 4.1 Ecological Walkover Survey Photograph Locations (included at the end of this Section) shows the location and orientation of photographs included in this chapter.

4.3.2 *North Shore Corridor (N6)*

Semi-natural ancient woodland and coniferous plantation woodland, small areas of dry heath, damp *calluna* heath and acid grassland were recorded along the online section of the N6 route.

Field evidence relating to the presence of protected species including pine marten, otter, badger and breeding birds (seasonality) was also observed during the walkover survey.

4.3.3 *North Shore Corridor (N9)*

At the southern section of the crossing points (west of Stormeferry), semi-natural ancient woodland and long established woodland of plantation origin were recorded.

As shown in Photographs E01, E02 & E03, the two offline sections of this route option, located on the north shore of Loch Carron are within proximity of the following recorded habitat types:

- Dry Heath;
- Damp *Calluna* Heath;
- Coniferous Plantation Woodland; and
- Upland birch woodland comprising of the Allt nan Carnan SSSI.

Photograph E01 – Allt nan Carnan SSSI from above Lochcarron looking east toward Kirkton

Photograph E02 – Croft Land above Lochcarron

Photograph E03 – Mosaic of Damp Calluna Heath & Wet Heath above Lochcarron

Given the recorded field evidence, it is likely that these habitats provide foraging areas (food patches) for a number of protected species including badger, pine marten and breeding birds.

4.3.4 *Southern Corridor (S4)*

The S4 corridor is the most extensive offline route, crossing largely undeveloped and relatively undisturbed areas. The following habitat types were recorded (Photographs E04 and E05 refer):

- Semi-Natural Ancient Woodland;
- Coniferous Plantation Woodland;
- Dry Heath;
- Wet Heath; and
- Damp *Calluna* Heath.

Photograph E04 – View of Attadale valley

Photograph E05 –Conifer Plantation at western extent of S3 link

Given the recorded field evidence, the following protected mammal species are likely to be present:

- Bats;
- Pine Marten;
- Badger;
- Wild Cat (possible); and
- Red Squirrel.

Additionally, the following Schedule One Bird Species (Wildlife & Countryside Act 1981) were observed during the Stage 2 surveys:

- Golden Eagle;
- Black-throated Diver; and
- Red-throated Diver.

4.3.5 *Online corridor (All – 02, 03, 04, 05, 07)*

The online route is immediately adjacent to the Attadale SSSI which is located in close proximity to the existing avalanche shelter and is designated for structural and metaporphic geology (Photograph E06). Minor areas of semi-natural ancient woodland and coniferous plantation woodland are also located along this route.

Photograph E06 – Online Corridor looking towards the Avalanche Shelter

The proposals for the loch side viaduct should consider disturbance / destruction and or modification of benthic habitats within Loch Carron. Direct impacts to otter refuges and foraging areas are also considered likely.

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Key:

E01 Survey Photograph Locations

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Figure 4.1 - Ecology & Nature Conservation Walkover Photograph Locations

Drawing Number: 47065034 - E001

Stromeferry Walkover Survey

5 HYDROLOGY & THE WATER ENVIRONMENT WALKOVER

5.1 Site Walkover Preparation

The key information required to be gained from the site walkover was agreed within the team and survey sheets prepared. Maps were produced and equipment obtained including GPS to assist with locating and identifying watercourses from maps whilst in the field. An itinerary was prepared to ensure that as much of the required corridors could be covered by the survey in the time available.

5.1.1 Desk Study

- Review of Stage 1 Report & Consultations
- OS 1:25,000 maps studied and key watercourses identified
- Review of route options maps
- SEPA RBMP data sheets assessed

5.2 Walkover Survey

The walkover survey was conducted by two experienced hydrologists over 20th – 22nd August 2013.

The survey team assessed the Online Corridor, stopping at all visible watercourses (identified from maps). The survey started with the River Taodail at Strathcarron and concluded with the Allt Cadh an Eas at Achmore.

The northern end of the Southern Corridor route was assessed by walking from Attadale, along the left bank of the River Attadale, skirting the hillside in an easterly directions and taking note of the water features in the landscape, as far as the waterfall on the Allt a' Ghiubhais (NG 94430 37290).

The whole of the North Shore corridor was then assessed from Leacanasigh to the Strathcarron junction and the section of the Online Corridor from the junction to Strathcarron (the River Carron). The majority of visible watercourses were assessed along this route, including the N6 and N9 options.

The south-western part of the Southern Corridor was accessed, via the existing forestry road (route S4). The Allt Gleann Udalain was assessed at the point of the proposed crossing and watercourses on the hills opposite were assessed from a distance. The forestry road between the S4 and S3 Link routes was walked.

The visit allowed the identification and assessment of water bodies in the field. The size and characteristics of the watercourses and any relevant structures and modifications were recorded. The stability of each watercourse was assessed by the type of substrate, and any erosion or depositional features present. Consideration was given to the potential impacts on these watercourses from the proposed road building / upgrade. Potential flooding sites and issues were identified where possible.

5.2.1 Survey Limitations

A number of factors imposed limitations on the survey including access and time. The majority of watercourses on the North Shore and Online routes were assessed but a large section of the Southern Corridor was not accessed. This was due to the time required to access it as it was necessary to walk over rough, wet ground. Access to forestry tracks were restricted which meant it was not possible to visit some of the key watercourses along the

routes. Therefore parts of the route were accessed from either end but the middle section was not viewed.

5.3 Key Considerations

5.3.1 *General*

Watercourses within the survey corridors are generally stable, flowing over bedrock and with little sediment load. For both the North Shore and online routes, culverts and bridges already exist, with either extensions or a small number of new structures required. It was assessed that flooding may be possible from overland flow and some overtopping of small culverts but is generally confined to the larger watercourses where there is the potential for flooding of the road alignments in places.

The Southern Corridor route utilises the smallest length of existing road and therefore would have the greatest impact on water bodies, through the construction of new culverts and bridges and possible alteration of floodplains, flow routes and peatland by road embankments.

A number of larger rivers are present which display meandering planforms, with higher sediment loads and erosional and depositional features present. These include the River Carron, River Taodail and the River Attadale, and would be more vulnerable than minor watercourses to the impacts of the proposed scheme.

5.3.2 *North Shore Corridor (N6)*

Along this route there are a large number of small watercourses with small, narrow catchments flowing into Loch Carron. Culverts and bridges exist and are generally in reasonable condition. Two types of watercourse are identified for this route; steep, incised on bedrock, and low gradient, with sediment. All watercourses are unclassified under River Basin management Plans (RBMP) but there are three larger burns with more significant flow (Abhainn Bhuachaig, Allt nan Carnan and Allt Torr nan Daoine). All appear relatively stable, even those with a lower gradient although some bank protection exists in a number of locations. This route involves two possible loch crossings at the Strome narrows. The shoreline in this area is influenced by tides with currents of up to 3 knots and is dominated by exposed bedrock, making it relatively stable.

5.3.3 *North Shore Corridor (N9)*

Many of the same watercourses are encountered as in N6, except at higher elevations above Lochcarron and would require new crossings if this route were pursued.

5.3.4 *Southern Corridor (S4)*

This route includes the largest number of watercourses on any of the survey routes, with the majority free from any modifications or structures. The route is almost entirely offline and would require a large number of culverts and bridges to be constructed. Watercourses in the corridor are generally steep, incised and on bedrock, with the exception of the larger rivers in their lower reaches. Areas of peaty soils and bogs exist on the hillsides and upper plateaux and there are abundant flushes, pools and minor streams.

S1 Link

A crossing of the Allt Gleann Udalain would be necessary, and a possible further 6 crossings of tributaries to the Allt Cadh an Eas would also be required. It was not possible to view this route, although it is likely that there are steep gullies within a dense forest, making it hard to view some watercourses.

S3 Link

A crossing of the Allt Gleann Udalain would be necessary, and a possible further 3 crossings of tributaries to the Allt Cadh an Eas would also be required. It was not possible to view this entire route, and the density of forestry and incised nature of watercourses meant that little was visible from the forestry track.

5.3.5 *Online corridor (All – 02, 03, 04, 05, 07)*

This route crosses many small watercourses and a number of larger rivers. Pipes, culverts and bridges are in place on the existing route but some new structures would be required for the alternative route options. Watercourses are generally very steep, incised and on bedrock, with waterfalls above the existing road. The larger rivers (River Carron, River Taodail, River Attadale. Allt Cadh an Eas) carry sediment, with some erosional and depositional features visible from the road crossings. Flooding is likely in extreme events, with risk to the road in places. The section of shoreline likely to be impacted by proposed option O2 appears to be dominated by bedrock with rock armouring in places. Shoreline protection is in place due to the proximity of the rail line on some sections of this route.

6 SUMMARY AND KEY FINDINGS

Following completion of the walkover surveys by the environmental disciplines, the following key findings have been established in order to provide a framework for further assessment:

6.1 Planning and Environment

- Further to the detailed site walkover, it is apparent that each of the route corridor options will be likely to have a significant impact on a number of sensitive receptors.
- The southern corridor route will have minimal impact on existing properties but will involve disrupting established landscape which includes large areas of forestry, wetlands/watercourses and natural habitats facilitating a range of protected species.
- The online corridor on the southern side of Loch Carron is restrained by the loch and existing railway to the west and a significant change in topography to the immediate east. Any solution to upgrading this area of carriageway will therefore have to involve complex engineering solutions.
- The upgrading of corridor N6 through Lochcarron also presents challenges with respect to physical space, particularly given the established layout of the town and the number of dwellings and other properties located within the corridor route. It should be noted that Lochcarron itself is an important strategic hub for surrounding settlements, supporting the wider tourist industry in the area. The impact of the proposed N9 route which effectively bypasses Lochcarron to the north will therefore have to be considered with respect to the potential economic impact on the area. The landscape and visual impact of the northern N9 route is also likely to be significant as it is likely to be visible from the south shore.
- The western most crossing of Strome Narrows is likely to be visible from Plockton and surrounding communities to the west. Both proposed crossings are likely to have a significant impact on the siting of the Strome Castle scheduled monument, views to Skye in the west and the overall character of the Stromeferry area. There are also a number of residential properties on the shoreline west of Stormeferry and within Achmore which are likely to be affected by this proposed route.

6.2 Landscape

The landscape survey identified a number of constraints or areas of potential impact on each of the identified route options:

- There are a large number of visual receptors along the N6 route option that are likely to be affected, including much of Lochcarron village. N9 route option bypasses Lochcarron and although is less visible from the village its location further up the slopes mean it would be more visible from the surrounding area and is likely to have a greater impact on landscape character.
- The Strome Narrows crossing options are likely to result in significant visual impacts on properties at Stromemore and Stromeferry and significant impacts on the local landscape character. The tunnel option is likely to result in fewer significant impacts than a bridge crossing, provided careful consideration of the approaches is made.
- Along the southern corridor, there are potential impacts in relation to the realignment and railway crossing at Strathcarron and along Attadale strath, particularly near the head of the glen. Forestry and land form provide containment of this route option to the south of Attadale, and as such there would be few visual receptors. However, the

general lack of development and human influence in this landscape make it more sensitive to change. Careful design of this route, including mitigation planting, would be essential to minimising potential landscape impacts.

- The S1 and S3 link options are largely within commercial forestry and as such landscape and visual impacts are likely to be limited, although this would be heavily dependent on the extent of forestry clearance and design in relation to steep slopes.

- The online corridor options are heavily constrained by steep slopes and cliffs to the south and Loch Carron and the railway line. All options are likely to increase the prominence of the existing road and rock face to varying degrees with views from Lochcarron, which represents a large number of visual receptors.

6.3 Ecology & Nature Conservation

- Each of the route corridors will result in a number of impacts on habitats and species related to the route and design solution chosen. Impacts associated with design proposals will need to be considered and appropriate mitigation will be proposed in the Stage 2 environmental assessment report.

- The Southern corridor, being the most extensive route with long offline sections, would likely lead to a greater number of impacts on habitats and protected species including Schedule 1 Bird Species (Wildlife & Countryside Act 1981). The offline sections of the Northern corridor would likely lead to fewer impacts by virtue of their shorter distance, and the Online corridor would minimise potential impacts on protected species and habitats for most of its route (the exception being areas of any proposed viaducts).

- All crossing options at Strome Narrows could potentially have significant impacts on the marine environment depending upon design, and further detailed research in the field is required at the next stage.

6.4 Hydrology & the Water Environment

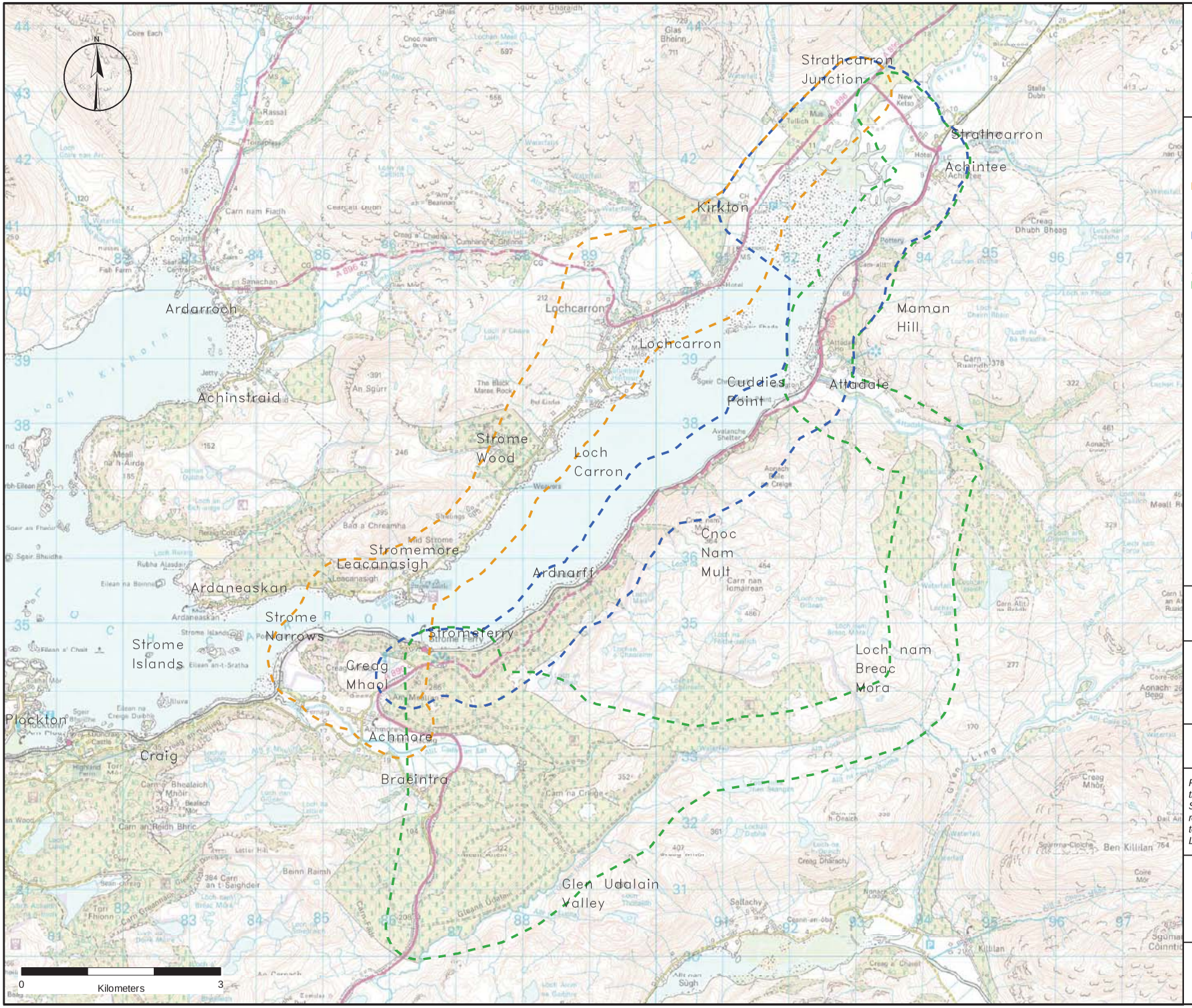
Pending further assessment, the key issues for hydrology identified from the site visit are as follows;

- The River Carron and River Taodail are likely to present challenges where new or upgraded crossings are required, due to the presence of erosion and deposition features.

- Flood risk is likely from larger watercourses and coastal flooding could be an issue in areas where the road is at lower elevations.

- The Southern Corridor utilises very little existing road and therefore many new structures on watercourses would be required and there is likely to be an impact on groundwater and surface water hydrology.

APPENDIX A – SURVEY CORRIDORS



URS

Key:

- Northern Routes Surveys Corridor (500m)
- Online Routes Surveys Corridor (500m) *Environmental Surveys*
- Southern Routes Surveys Corridor (500m) *Environmental Surveys*

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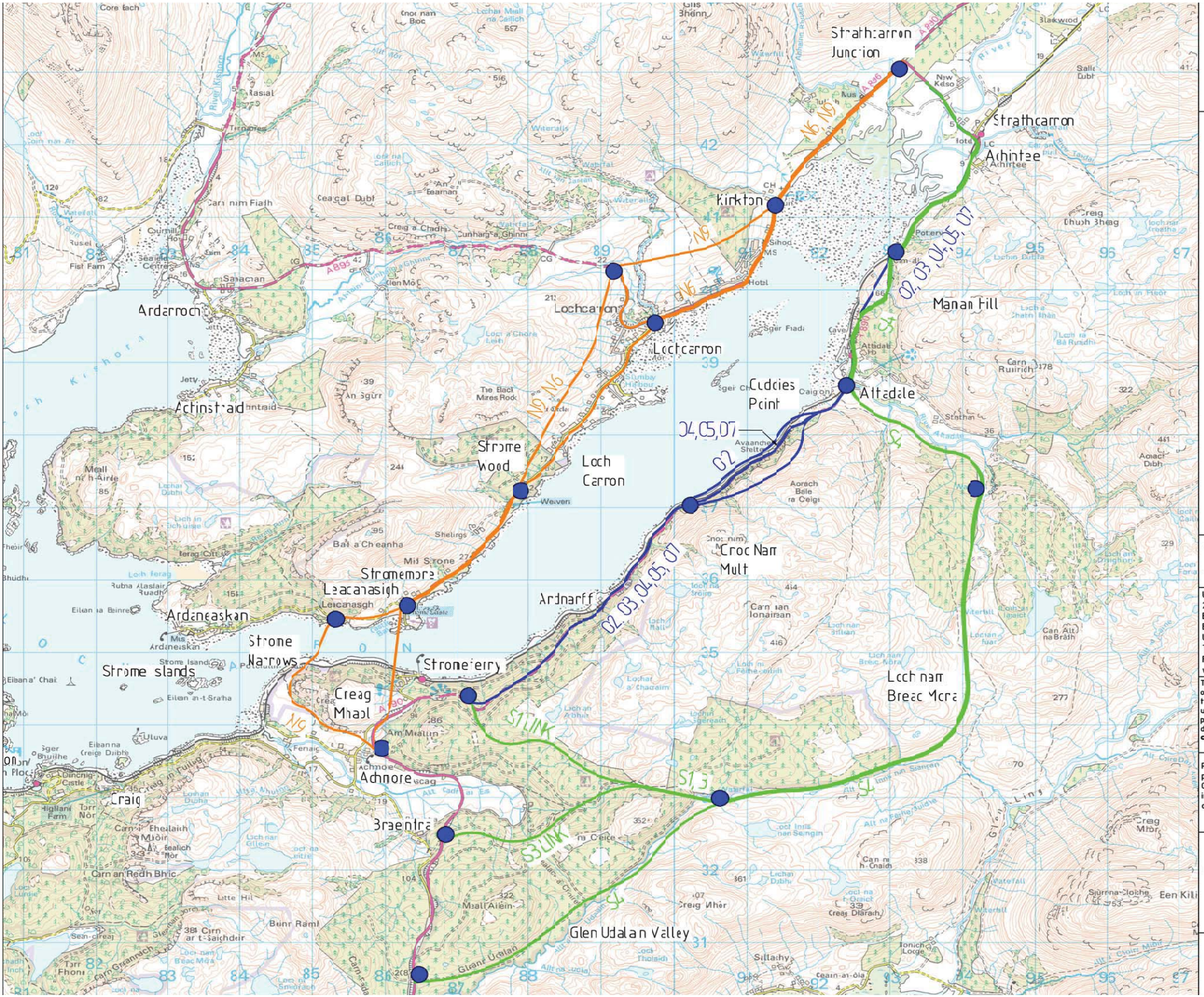
Title: Appendix 1: Survey Corridors

Drawing Number: 47065084 - APP1

Stromeferry Walkover Survey

APPENDIX B – EMERGING ROUTE OPTIONS



URS

Key:

- North Shore Corridor Route Option Prefix N
- Onine Corridor Route Option Prefix O
- Southern Corridor RouteOption Prefix S
- Route Junction Points

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Appendix 2
Emerging Route Options

Drawing Number
47061084 - ED01

Stromeferry Makeover Survey

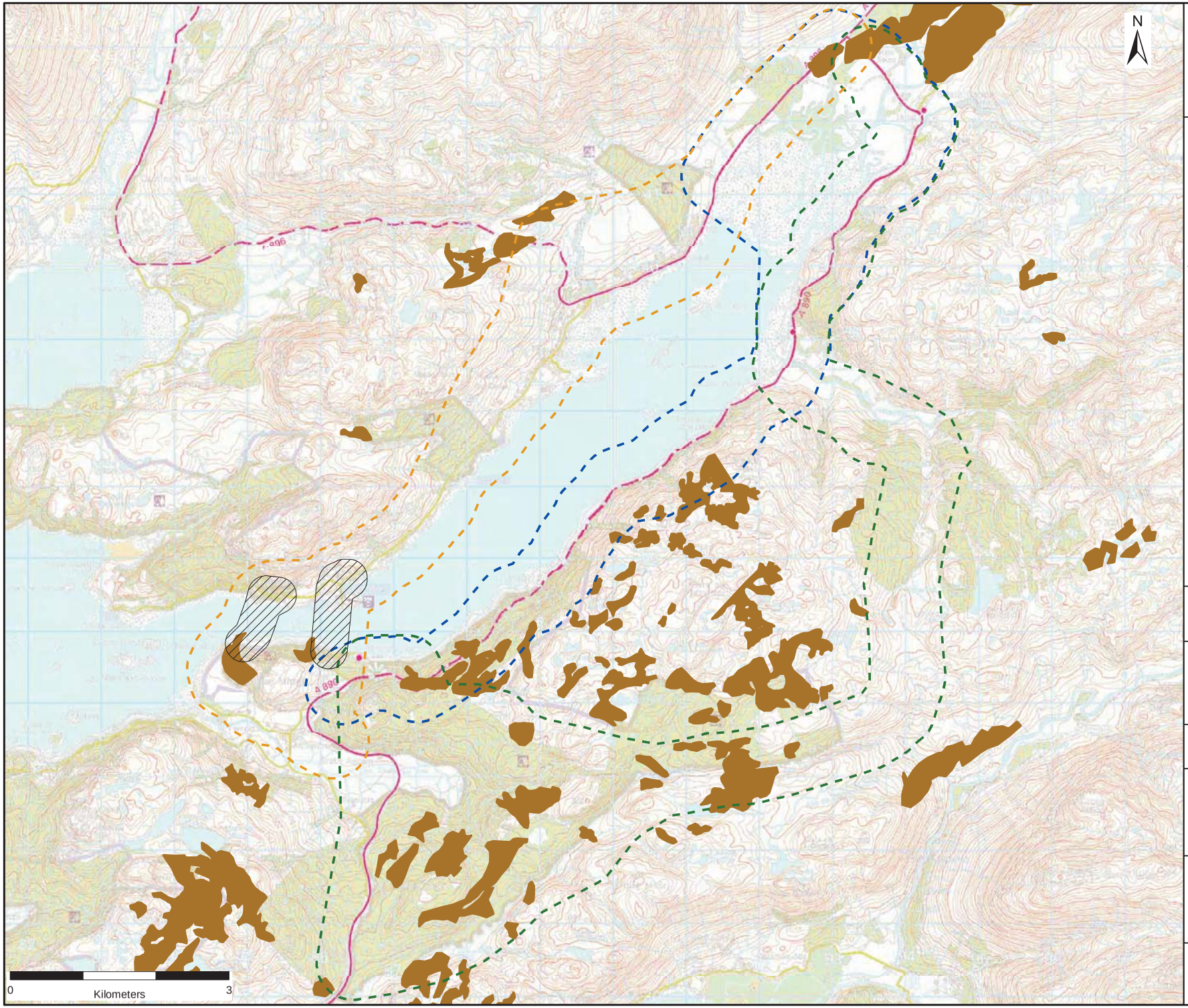
APPENDIX C – BRIEFING NOTES ON PEAT

The supporting drawing number 47065297 - JB1 has been developed using British Geological Survey (BGS) data and shows pockets of peat located throughout the Southern Route. In line with this, and as highlighted in the Hydrology and Water Environment chapter of this Report, areas of peaty soils and bogs were recorded on the hillsides and upper plateaux of the Attadale Valley as well as abundant flushes, pools and minor streams throughout the southern route corridor.

The BGS data also indicates the presence of peat in areas north of Lochcarron and at other localised points throughout the study area.

As detailed in section 6.8.5 of the STAG Part 1/ DMRB Stage 1 Report (May 2013), all of the route corridors will impact upon organic soils (described as basin and valley peats) and also alluvial soils around Strathcarron Junction. Additionally, all of the route corridors will impact upon the 'Lochinver' soil unit which is predominately made up of brown forest soils, humic gleys, peaty gleys, peat and humus iron podzols.

The results of the Phase 1 Habitat Survey, the BGS/Soil Survey data and responses from external stakeholders will inform a robust, high-level assessment of potential impacts on peat and other sensitive habitats during the Stage 2 Assessment. Should a preferred option be selected and taken forward by Highland Council, a more detailed assessment of impacts on sensitive receptors, including any associated mitigation measures would be likely to be carried out in the form of an Environmental Impact Assessment.



URS

Legend

- North Shore Corridor
- Southern Corridor
- Online Corridor
- Strome Narrows Crossings
- Peat (Reproduced from BGS Data)

Taken from http://www.bgs.ac.uk/data/mapViewers/

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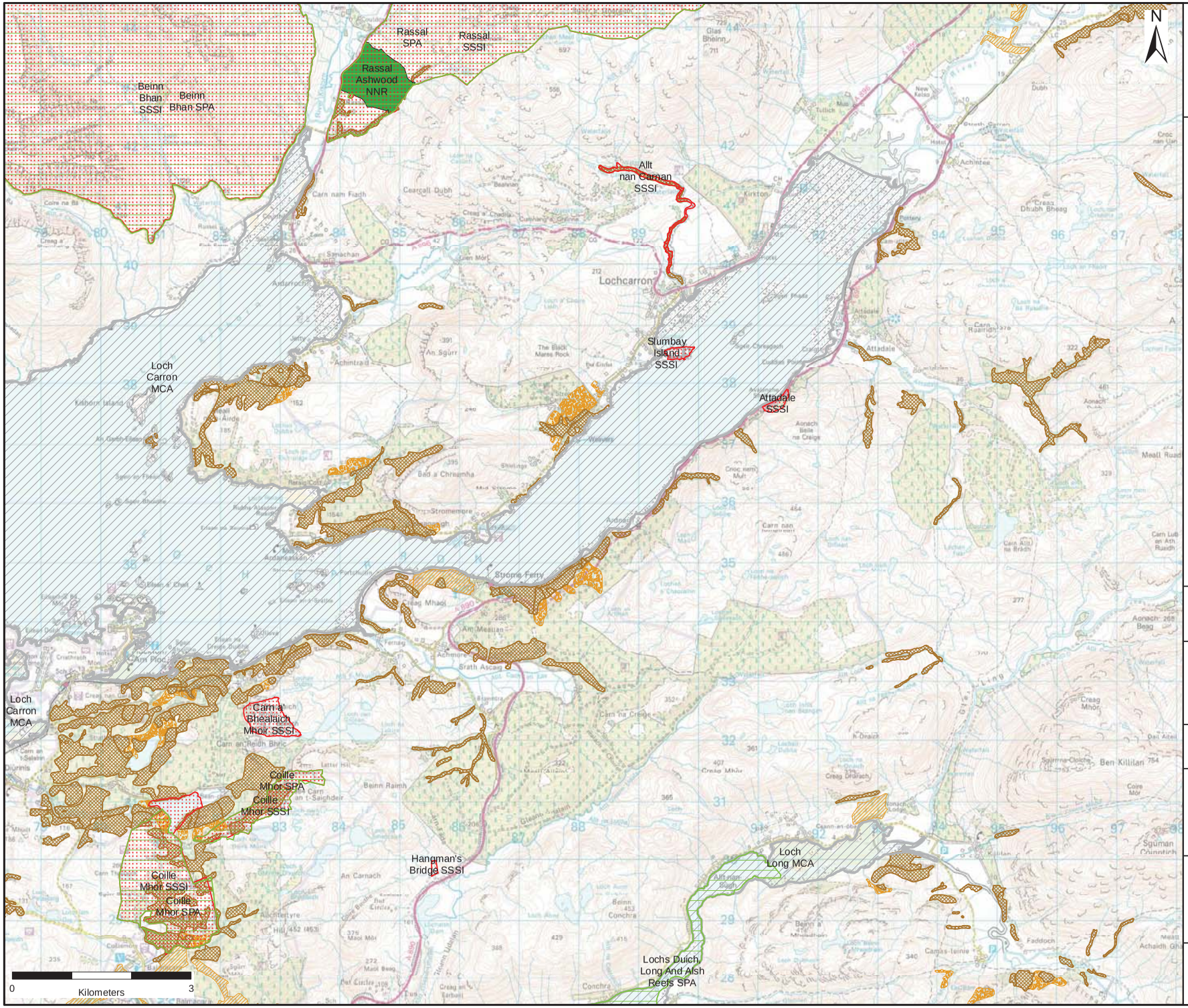
Appendix 3: Peat Locations

DWG 47065297 - JB1

Stromeferry Walkover Survey

APPENDIX D – NATURE CONSERVATION DESIGNATIONS



URS

Legend

- SAC — *Special Areas of Conservation*
- SSSI — *Site of Special Scientific Interest*
- MCA — *Marine Consultation Area*
- NNR — *National Nature Reserve*

Ancient Woodland Inventory (AWI) SCOTLAND

ANTIQUITY

- Ancient wood (semi-natural)
- Long-Estab'd. wood (plantation origin)
- Other ancient wood (on Roy map)

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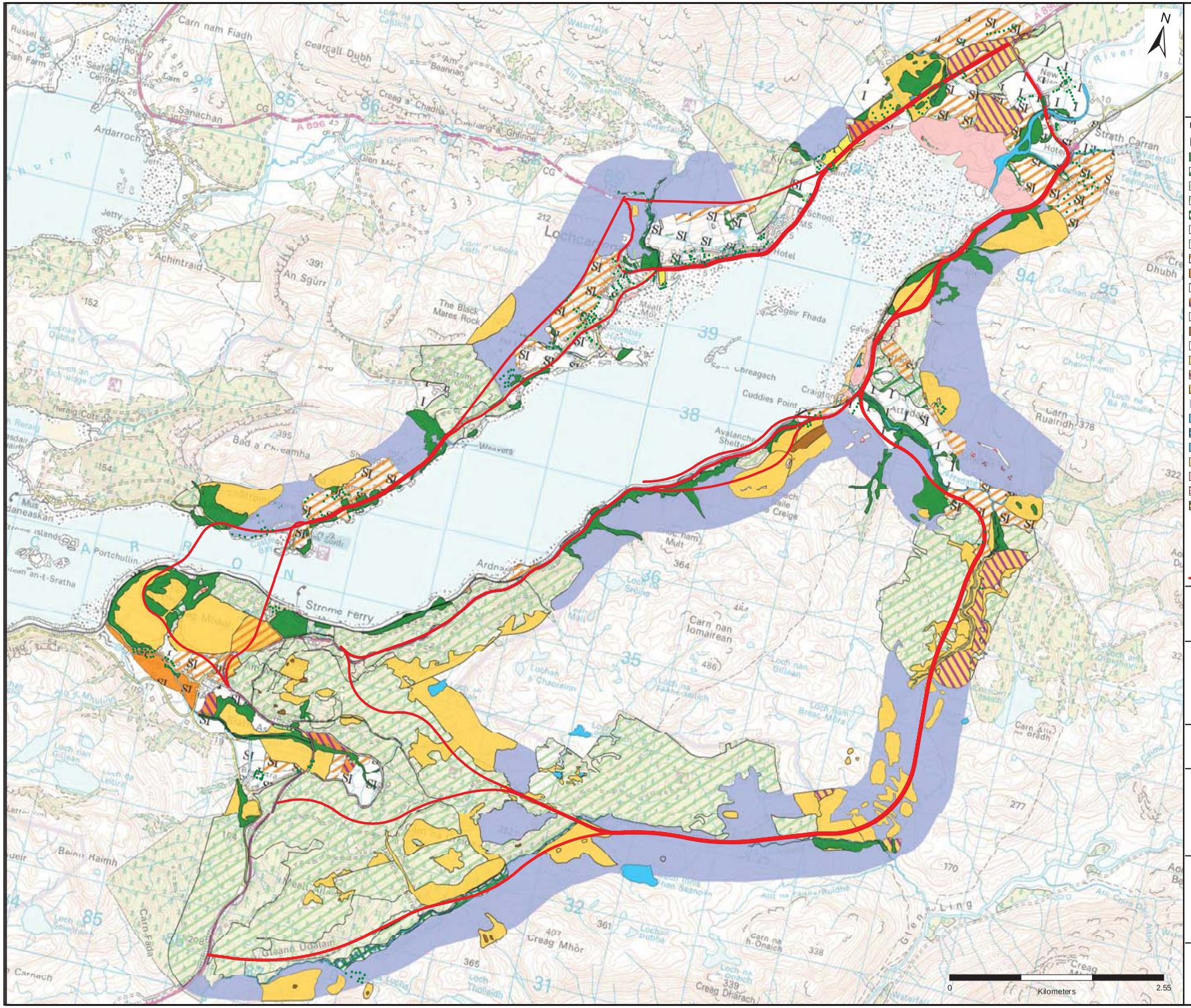
Appendix 4: Nature Conservation Designations

DWG 46065084.JB2

Stromeferry Walkover Survey

APPENDIX E – OVERVIEW OF HABITAT TYPES



URS

Legend

Phase 1 Habitat Codes

- A1.1.1 Woodland: broadleaved, semi-natural
- A1.1.2 Woodland: broadleaved, plantation
- A1.2.2 Woodland: coniferous, plantation
- A1.3.2 Woodland: mixed, plantation
- A2.1 Scrub: dense/continuous
- A2.2 Scrub: scattered
- A4.2 Recently felled woodland: coniferous
- B1.2 Acid grassland: semi-improved
- B2.2 Neutral grassland: semi-improved
- B4 Improved grassland
- B5 Marsh/marshy grassland
- B6 Poor semi-improved
- C1.1 Bracken: continuous
- C1.2 Bracken: scattered
- D1.1 Dry dwarf shrub heath: acid
- D2 Wet dwarf shrub heath
- D5 Dry heath/acid grassland
- Damp Calluna heath
- G1 Standing water
- G1.6 Standing water: brackish
- G2 Running water
- H1.2 Intertidal: shingle/cobbles
- H2.6 Saltmarsh: dense/continuous
- I1.1.1 Natural rock exposure: acid/neutral crags
- J1.2 Amenity grassland
- Scattered scrub
- Scattered broadleaf tree
- Scattered conifer tree
- Scattered bracken
- Routes

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Appendix 5 - Overview of Habitat Types

Stromeferry Walkover Survey

APPENDIX 3 – NATURE CONSERVATION TARGET NOTES

TN1	**B6 Species Poor Semi- improved Neutral Grassland.** **Habitat:** Area of largely species poor semi-improved neutral grassland occurring between the minor road and the cobble foreshore, grazed by livestock. Plant assemblages include cock's foot *Dactylis glomerata*, common bent *Agrostis capillaris*, yorkshire fog *Holcus lanatus* and white clover *Trifolium pratense*. Marsh woundwort *Stachys sylvatica* occurs within damp marginal areas.
TN2	**A1.1.1 Semi-natural Broadleaf Woodland** **Habitat:** An extensive area of semi-natural broadleaf woodland at the base and upper reaches of Creag Mhaol. Principal high canopy species are sessile oak *Quercus petraea* and silver birch *Betula pendula*, downy birch, ash *Fraxinus excelsior* and rowan *Sorbus aucuparia* also occur periodically. Understory species include immature high canopy species as well as hazel *Corylus avellana*, and holly *Ilex aquifolium*.

TN3	**D1 Dry dwarf Shrub Heath** **Habitats:** An extensive area of predominantly dry dwarf shrub heath occupying steep well drained ground. Principal species mature / senescent growth of heather *Calluna vulgaris* in combination with heath bedstraw *Galium mollugo*, tormentil *Potentilla erecta*, bilberry *Vaccinium myrtillus*, bell heather *Erica cinerea*, creeping bent *Agrostis stolonifera*, red fescue *Festuca rubra* and bracken *Pteridium aquilinum*.

TN4	**D1 Dry dwarf Shrub Heath** **Habitat:** An extensive area of predominantly dry dwarf shrub heath occupying steep well drained ground. Principal species mature / senescent growth of heather in combination with, tormentil, bilberry, bell heather, creeping bent, red fescue and bracken.

TN5	 **A1.1.1 Semi-natural Broadleaf Woodland** **Habitat:** A fragment of semi-natural broadleaf woodland (sessile oak) with a predominantly hazel understory boarded by in places by acid grassland and bracken. Silver birch, rowan, ash and hawthorn *Crataegus monogyna* also occur intermittently. It is considered likely given the periodic occurrence of such woodland fragments along the north shoreline of Loch Carron that this habitat type was once extensive.

TN6	**A1.1.1 Semi-natural Broadleaf Woodland** **Habitat:** Semi-natural broadleaf woodland consisting mostly of silver birch, though given the presence of a number of mature hazel specimens it is considered likely that this woodland once formed part of a more extensive area of sessile oak woodland (TN16), currently re-establishing with pioneer species. Several pine marten *Martes martes* scats were recorded within the woodland, occurring on the top of large moss covered rocks.

TN7

Damp Calluna Heath

Habitat: Damp calluna heath is regarded as a sub-category of D1 Dry dwarf shrub heath, occurring on shallow substrates consisting largely of peat (< 0.5m depth)with greater than 25% coverage of ericoids; namely heather Calluna vulgaris though distinct in terms of its lower growth composition than areas of dry dwarf heath.

Within the Stromeferry study area damp calluna heath occurs largely on moderately sloping ground, better drained than the flatter areas where Wet dwarf shrub heath was recorded, but less so than the steeper well drained slopes where Dry dwarf shrub heath is found.

Common plant assemblages included heather, cross-leaved heath *Erica tetralix*, deer grass *Trichophorum cespitosum*, purple-moor grass *Molinia coerulea*, *Sphagnum capillifolium*, bog myrtle *Myrica gale*, bog asphodel *Narthecium ossifragum* and tormentil *Potentilla erecta*.

Have mapped as damp calluna heath, although this habitat type is punctuated by small areas of dry heath on steep areas and wet heath occurring within small depressions, all too small to map.

TN8	 **H1.2 Shingle / Cobble** **Habitat:** In-addition to the saltmarsh habitat associated with the confluence of the River Carron, at low tide extensive shingle banks are exposed most of which are covered with brown algae, such habitat is likely to support an array of intertidal animal and plant communities. It is also considered likely that the shingle banks together with the adjacent saltmarsh are important foraging grounds for both migratory and over wintering wader and wildfowl species.

TN9	**D2 Wet Dwarf Shrub Heath** **Habitat:** An extensive area of wet dwarf shrub heath occupying an area of low lying poorly drained land. Principal species include cross-leaved heath, bog myrtle, *sphagnum fallax* and *sphagnum capillifolium*, Hare's-tail Cotton-sedge *Eriophorum vaginatum* occurs periodically.

TN10		**H2.6 Saltmarsh**

Habitats: An extensive area of saltmarsh habitat is present either side of the confluence of the River Carron. Principal species includes thrift and red fescue with saltmarsh rush frequent, other species includes sea plantain, sea aster and sea-arrowgrass *Triglochin maritimum*. Small pools of salt / brackish water occur throughout the saltmarsh area.

TN11	**B1.2 Semi-improved Acid Grassland** **Habitat:** A relatively extensive area of semi-improved acid grassland, bordered by semi-natural broadleaf woodland, dense scrub (gorse) and saltmarsh habitat. Plant species includes common bent, yorkshire fog, red fescue, tormentil, devil's-bit scabious; where damper soil conditions prevail tufted hair grass, soft rush and jointed rush occur. Yellow flag *Iris pseudacorus*, common spike-rush *Eleocharis palustris* and floating sweet-grass *Glyceria fluitans* were recorded within adjoining wet ditches. Heather and bog myrtle occur within discrete areas, too small to map. Numerous geese droppings were observed within the grassland area, indicating that the site is an important foraging area.

TN12	 **D2 Wet Dwarf Shrub Heath** **Habitats:** Extensive areas of largely flat ground with tussock forming heather and bog myrtle *Myrica gale*, some standing water is present in between the tussocks, *sphagnum capillifolium* and cross-leaved heath occur within the wetter areas. Other plant species include purple moor-grass *Molinia coerulea*, red fescue, tormentil, devil's bit scabious *Succisa pratensis* and meadow buttercup *Ranunculus acris*. Soft rush *Juncus effusus* occurs within ditches and marginal areas.

TN13	**A1.1.1 Semi-natural Broadleaf Woodland** **Habitat:** A fragments of semi-natural broadleaf woodland (sessile oak) with a predominantly hazel understory occurs within discrete locations throughout the commercial forestry plantations, particularly within ravines associated with minor watercourses. Other species recorded includes silver birch, goat willow *Salix caprea*, rowan, and ash. It is considered likely given the periodic occurrence of such woodland fragments that this habitat type was once extensive and has been felled and overplanted with commercial conifers.

TN14

On-line Route - General Views of the mosaic of broadleaf semi-natural woodland and commercial forestry plantations which occur along sections of the on-line route corridor.

TN15	 **B1.2 Semi-improved Acid Grassland, H2.6 Saltmarsh, H1.2 Shingle / Cobble & G1.6 Brackish Standing Water** **Habitats:** Acid grassland extending from the trunk road / railway line and merging into saltmarsh vegetation which is heavily grazed by sheep. Principal plant species includes common orache *Atriplex patula*, sea sandwort *Honckenya peploides*, thrift *Armeria maritima ssp. maritima* and red fescue with saltmarsh rush *Juncus gerardii* frequent, other species present includes sea plantain *Plantago maritima*, sea aster *Aster tripolium* and sea-milkwort *Glaux maritima*. Two large brackish water lagoons and several smaller ones occur between the saltmarsh and extensive shingle banks, dense and scattered scrub has formed within the most stable areas. Other observations within the location include the presence of loafing greylag geese *Anser anser*, curlew *Numenius arquata*, redshank *Tringa totanus* and oystercatchers *Haematopus ostralegus* within the confluence of the River Attadale. A pair of red-throated divers *Gavia stellata* flew onto Loch Carron opposite the shingle banks and began to forage, this pair are likely to be breeding on nearby lochans. Additionally, six black-throated divers *Gavia arctica* were also observed on the Loch foraging as a group, the birds are most likely to be non-breeders or failed breeders. No marine mammal observations were made.

TN16

D1 Dry dwarf Shrub Heath

Habitat: An extensive area of predominantly dry dwarf shrub heath occupying steep well drained ground. Principal species mature / senescent growth of heather in combination with heath bedstraw, tormentil, bilberry, bell heather, creeping bent, red fescue and bracken.

Scattered trees occur within discrete locations consisting of sessile oak, aspen *Populus tremula*, rowan and scots pine *Pinus sylvestris*.

TN17

B1.2 Semi-improved Acid Grassland

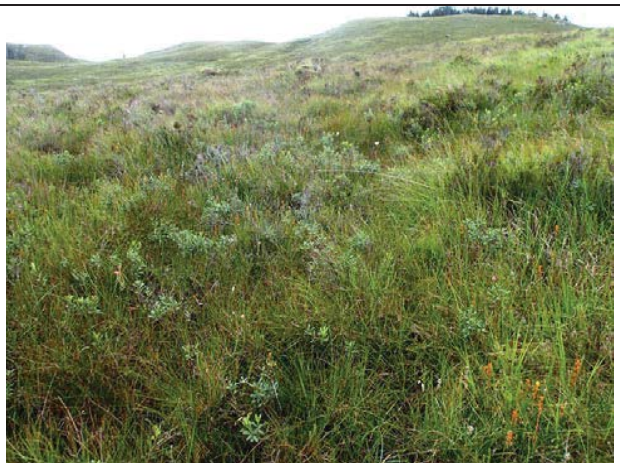
Habitats: A mosaic of semi-improved acid grassland with scattered bracken. Plant species includes common bent, yorkshire fog, purple-moor grass, tormentil, heath rush *Juncus squarrosus*, devil's-bit scabious, heath spotted-orchid *Dactylorhiza maculata*, yellow saxifrage *Saxifraga aizoides* and where damper soil conditions prevail tufted hair grass *Deschampsia cespitosa*, common butterwort *Pinguicula vulgaris* and soft rush occur.

TN18	 **B1.2 Semi-improved Acid Grassland, D1 Dry Dwarf Acid Heath with scattered Broadleaf and Conifer trees** **Habitats:** Consisting mostly of semi-improved acid grassland with bracken and developing broadleaf woodland consisting mostly of silver birch, with rowan and some scots pine, small pockets of dry dwarf acid heath occur on the steeper well drained ground, areas too small to map. Dry heath species include heather, bilberry and tormentil with some cowberry *Vaccinium vitis-idaea*.

TN19

Southern Route - General Views of the forestry plantations and open montane habitats occurring within the southern route corridor.

TN20



D2 Wet Dwarf Shrub Heath

Habitats: An extensive area of wet dwarf shrub heath occupying an area of low lying poorly drained land. Principal species include cross-leaved heath, bog myrtle, deer grass *Trichophorum cespitosum*, purple-moor grass, *sphagnum fallax*, *sphagnum capillifolium* and bog asphodel *Narthecium ossifragum*.

TN21

A1.1.1 Semi-natural Broadleaf Woodland

Habitat: An area of semi-natural broadleaf woodland occupying a very steep gorge, principal high canopy species consists of silver birch with sessile oak, self-seeded scots pine trees are also present within the gorge, having originated from a nearby commercial plantation.

APPENDIX 4 – CONSULTATION INFORMATION

Appendix 4a - Consultation responses

Appendix 4b - Public Exhibition Display Boards

Appendix 4c Supplementary Information Issued to SEPA:

Appendix 4a – Consultation responses

Scottish Natural Heritage
Dualchas Nàdair na h-Alba
All of nature for all of Scotland
Nàdair air fad airson Alba air fad

Sean Fallon
Consultant Planning and Environment
URS Infrastructure & Environment UK Limited
23 Chester St
Edinburgh
EH3 7EN,

7 November 2013

Our Ref: CNS/NTR/Stromeferry
Your Ref: 47065297 – Stromeferry Bypass Appraisal

Dear Sean

Stage 2 Options Assessment Report – Environmental Assessment
Stromeferry Bypass Appraisal

Thank you for your e-mail of 16 October 2013 seeking further comments in relation to the Stage 2 assessment of this project.

The main issues that we consider are relevant to the assessment were outlined in our initial scoping response dated 1 March 2013.

European Protected Species
It is not unlikely that otters, bats and wild cat will be found in the proximity of the various proposed routes and therefore it would be appropriate that surveys are undertaken to inform any assessment and to identify any appropriate mitigation or any licensing requirements.

Nationally Protected Species
Water Voles are known to occur in the general area where conditions are suitable and indeed quite a few upland populations have been discovered during survey work undertaken in support of proposed hydro schemes in the area. For example they have been found associated with the Uisge Dubh and the Strathan within the Attadale Estate. It would therefore be appropriate that surveys are undertaken to inform the assessment and identify any appropriate mitigation or any licensing requirements. Golden Eagles are known to breed in Gleann Udulain and there are significant badger populations along Gleann Udalain. Again surveys of these species would be needed to inform any assessment but at this stage it seems likely that badger mitigation measures (e.g tunnels) would be likely to be required for the Southern route.

Nationally Designated Sites
Allt Nan Carnan SSSI and Attadale SSSI could be affected by the proposals.

Details of the sites features of interest can be sourced though our website but as stated previously we also hold a detailed site dossier for Attadale SSSI which might provide some additional helpful information. You should note that the whole of the site at Attadale is considered critical to understanding its geological interest and that visibility is a key attribute when assessing the condition of the site.
Any assessment should consider impacts on the SSSIs and alternatives or mitigation to avoid those impacts.

Locally Designated Sites
The Lower River Kishorn and Kishorn Saltmarsh are recognised as Sites of Local Conservation Interest in the Wester Ross Local Plan 2006 and afforded local/regional policy protection.

Inventory of Ancient and Semi Natural Woodlands
There are fragments of Ancient Semi Natural Woodlands along both the north and south shores of Loch Carron. The precise location of these are mapped within the Wester Ross Local Plan 2006. They are afforded local/regional policy protection.
In addition the Wester Ross Local Plan 2006 also identifies and maps areas where amenity trees are afforded local/regional policy protection as well as areas where there are tree preservation orders in place. Assessment should take account of these interests.

Loch Carron Marine Consultation Area
There are extensive areas of flame shell beds (*Limaria hians*) and horse mussel beds (*Modiolus modiolus*) within the Strome Narrows. These are listed on the UK BAP and are included on the draft list of Priority Marine Features (PMFs) as being species of national importance. The Wester Ross LBAP identifies Strome Narrows as being of particular local importance on account of the presence of these habitats.
We hold some survey data collected as part of the Marine Nature Conservation Review survey and some data collected as part of staff training events. We would be happy to make this available to you if it would be helpful. You should note that whilst we have data points showing locations of flame shell and horse mussel beds, comprehensive surveys have not been undertaken so we do not have details of the extent of the beds. In addition there may well be other PMFs in the vicinity of the proposal.

In previous meetings we have discussed the national importance of these habitats and the implications of the development on them. Our advice is that damage to the flame shell and horse mussel beds, should be avoided, and therefore our preference would be for a route/crossing that does this. If this is not possible then you would need to ascertain if the potential damage to the beds would have an impact on the national status of these habitats. It is therefore essential that if there is any potential for the development to result in damage (direct or indirect e.g. through changing flows/siltation) to the flame shell and horse mussel beds then the assessment must establish the extent of such damage. This would require further surveys to be undertaken. Given the cryptic nature of flame shells within the beds, surveys by appropriately experienced biologists would be required. We would be happy to advise further on survey techniques if this was helpful.

We note that renewable energy solutions are being considered for the Strome Narrows crossing and if found feasible in principle may be considered as an add on to the Strome Narrows crossing at Stage 3. In our view it is important that a clear marker

is put down at this stage of the process about the potential, significant environmental issues that such a proposal might raise and the subsequent constraints there could be on such a development. It will also be important to ensure any proposals are discussed with SNH and MS at an early stage.

Landscape Character
The Ross and Cromarty Landscape Character Assessment 1999 provides information on the landscape types found in the area and some useful guidance on ensuring best fit with the different landscape character types.

Views over Open Water
The area below the road between Ardaneaskan and Slumbay is identified in the Wester Ross Local Plan 2006 as important in maintaining important views over open water and is afforded local/regional policy protection and is therefore relevant to any assessment.

Additional Information
We are aware that a large amount of environmental information was produced in support of four potential hydro schemes within the Attadale Estate. Some of this information may be relevant or helpful in relation to the southern route option. The reports were prepared by Hydroplan on behalf of the Ben Dronaig Hydro Ltd and it may be worth exploring the availability of the collected data with them

I hope this response is helpful to you. Please do not hesitate to get back to me if you have any queries on the information supplied or if you require further information.

Yours sincerely

Mary Gibson
Area Officer
Wester Ross (south)

marinescotland
science

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MS_Renewables@scotland.gsi.gov.uk.

Mr T Roberts
Licensing Operations Team
Marine Scotland
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Aberdeen
AB11 9DB

20 November 2013

URS - STROMEFERRY BYPASS ENVIRONMENTAL ASSESSMENT - STAGE 2 OPTIONS ASSESSMENT REPORT – MARINE SCOTLAND SCIENCE COMMENTS

MSS Advice

Marine Scotland Science has reviewed the submitted application and has provided the following comments.

Marine Scotland Science comments on marine mammals
Clearly, only the north shore route options would require consideration of marine mammal interests.

Our main concern would be construction works which give rise to noise underwater and which may disturb or injure marine mammals. Such works would include (but not be limited to) pile driving, rock blasting and dredging. We would also need to consider vessel movements and the potential for corkscrew injuries to seals (see http://www.smru.st-and.ac.uk/documents/1282.pdf).

Marine Scotland Science advise the applicant to consider the seal usage maps that are available on our website (http://www.scotland.gov.uk/Topics/marine/science/MSInteractive/Themes/seal-density), which represent our best understanding of seal distributions currently. We would also advise consideration of the SCANS-II surveys for cetaceans, although these may be at a scale too broad for this work. We have attached two research papers on the distribution of harbour porpoise in this area which may be useful.

The applicant should be aware that all cetaceans are European Protected Species and are protected by legislation which makes it an offence to disturb any individual. If noisy works are intended to be carried, it is likely that they would require an EPS licence, which could only be granted if it could be demonstrated that there is no satisfactory alternative to the construction and the methods proposed, as well as demonstrating no adverse impact on the favourable conservation status of the species in question.

Marine Scotland Science comments on marine fish ecology and commercial fisheries
Marine Scotland Science have reviewed the submitted documentation and would recommend the following be considered during the next stage of appraisal of this project in relation to commercial fishing and marine fish ecology.

Options 2-7 have low impact on both commercial fishing and marine fish ecology.

The North shore route would pose minimal impacts to marine fish ecology providing there is still adequate access left for fish to migrate in and out of the loch. The loch will be utilised as a nursery area for some fish and it has been shown that mature Common Skate (*Dipturus intermedia*) use the loch.

There would need to be consideration given to allow access by fishing vessels as there is creel activity for nephrops, brown crab, lobster and velvets in the area. There is also scallop dredge activity for queenies (*Aequipecten opercularis*) in the Strome Narrows. This activity can be seen in the Scotmap outputs which map fishing vessel activity for vessels under 15m. These can be downloaded from Marine Scotland Interactive at the following address: http://www.scotland.gov.uk/Topics/marine/science/MSInteractive.

All of these issues would also need to be considered should any renewables development be proposed within the Strome Narrows crossing.

Marine Scotland Science comments on benthic ecology
Marine Scotland Science have reviewed the submitted documentation and suggests the contractor should not only provide more information on the development but should also consider what these impacts might be. The construction of the bridge at the Strome Narrows might have an impact on the intertidal and subtidal benthic communities found there. Baseline data therefore required here with an assessment of impacts. The construction of a route along the coast from Strathcarron to Stromeferry may also impact intertidal communities along the shore. As stated above, baseline information at least is required.

Marine Scotland Science comments on physical environment
Strong tidal currents exist in the area of the proposed bridge construction at Strome Narrows. This needs to be investigated in detail if the bridge option is going to be pursued.

You can check the BODC website for potential available oceanographic data. Another reference can be the West Coast of Scotland Pilot 66.

The West Coast of Scotland Pilot 66 states: “Tidal streams in Loch Carron are weak except in Strome Narrows, where they run as follows: … the spring rate in each direction is from 2 to 3 knots. In the W entrance to the narrows the in-going stream sets towards the N shore; in the E entrance the outgoing stream sets towards the S shore.”

Issues: bridge pillars in a narrow passage would speed up the flow even more.

If the decision is made to go with the option that requires a bridge, if any parts of the bridge would be in the water, a comprehensive modelling study would need to be conducted to assess the impacts on the marine environment. Potential data collection, if no data is available at the site, might need to be considered.

Option 2, creation of a sidelong viaduct, would have less of an impact, but more details would need to be known.

Marine Scotland Science comments on diadromous fish
In relation to potential concerns relating to impacts on wild diadromous fish in the marine environment and associated fisheries for these, which could arise from progressing the various options.

As noted, it is particularly the North Shore route which would involve a bridge over Strome Narrows and option 2 with the construction of a sidelong viaduct alongside Loch Carron which would have clear issues to be considered.

At least the River Carron system and the River Attadale which run into Loch Carron have populations of salmon. Salmon smolts emigrating from the rivers to distant sea feeding grounds and adult salmon returning will pass through Loch Carron and in the case of returning salmon may spend some time in it. Salmon returning to other rivers may also enter the loch.

The rivers and streams entering Loch Carron also have populations of sea trout and sea trout from these rivers and streams and from other rivers and streams in the vicinity will be likely to use the loch for prolonged periods during the marine phases of their life histories.

At least the River Carron has a rod fishery for salmon and sea trout.

Some more detailed information on when and where in the loch salmon and sea trout might be expected to be present would be useful and also information on whether any net fisheries operate.

There is no District Salmon Fishery Board in place in this area, but the Wester Ross Fisheries Trust should be able to provide useful information. Declines in catches of salmon and sea trout were reported in the River Carron and there is a restoration project, the River Carron Restoration Project, in place under Inverness College UHI which involves rearing and release of fish. It should also be consulted.

Potential impacts which would need considered would include

- injury, disturbance or interference with migration from underwater noise from pile driving, blasting construction of rock revetments for example;
- effects on water quality during construction
- changes to physical habitat

If the new roads crossed any of the watercourses below head of tide, Marine Scotland would presumably be the regulator regarding ensuring that the construction work and completed bridges did not interfere with fish passage.

Finally there are no salmon SACs in the vicinity and no particular reason for thinking that salmon associated with salmon SACs further afield would be likely to be present in significant numbers. There we would suggest that no detailed HRA would need progressed with respect to salmon SACs

Marine Scotland Science comments on noise

Marine Scotland Science would request that note be taken of sound-sensitive areas within the construction area and means of mitigation - eg human habitation, fish farms, seal out-hauls, and fish migratory routes (though in this case it looks as though the only likely concerns will be about human habitation). Likely noise sources will be construction traffic (on land and at sea), construction processes (digging, drilling and blasting), and subsequent traffic noise on the bridge and road-ways

Marine Scotland Science comments on aquaculture

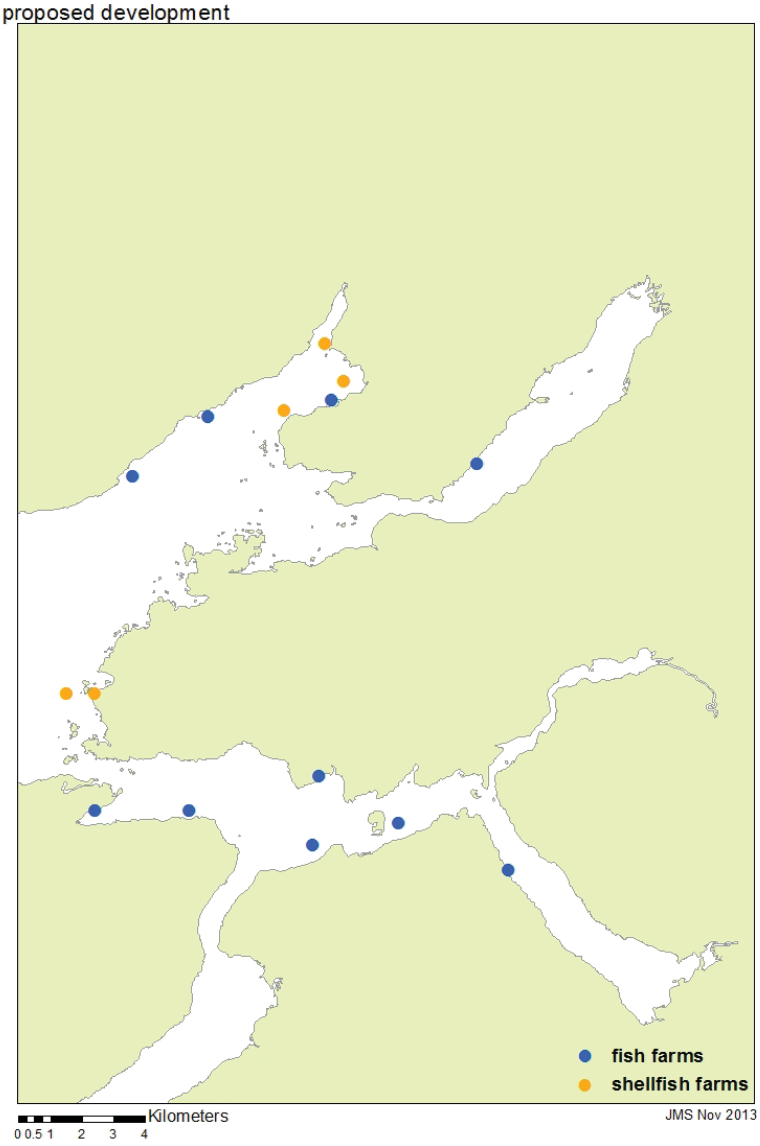
Marine Scotland Science have reviewed the application submitted, and offer the following comment:

There are a number of aquaculture sites within the location of the Stromeferry Bypass proposed by URS. There is one site located within Loch Carron which is within the vicinity of all the proposed route options for the Stromeferry bypass. The site is an active Atlantic salmon seawater cage site operated by The Scottish Salmon Company Ltd.

The next closest sites are located in Loch Kishorn. The first is situated approximately 2.7 km from where the proposed north shore route crosses Strome Narrows and is an inactive Common mussel site operated by Scottish Sea Farms (shellfish). The second is situated approximately 2.9 km from where the proposed north shore route crosses Strome Narrows and is an active Atlantic salmon seawater cage site operated by Scottish Sea Farms Ltd. The third is situated approximately 7.9 km from where the proposed north shore route crosses Strome Narrows and is an active Atlantic salmon seawater cage site operated by Scottish Sea Farms Ltd. The forth is situated approximately 9 km

from where the proposed north shore route crosses Strome Narrows and is an active Atlantic salmon seawater cage site operated by Scottish Sea Farms Ltd. The fifth is situated approximately 8.5 km from where the proposed north shore route crosses Strome Narrows and is an active Pacific and Native oyster site operated by Seafield Oysters. The sixth is situated approximately 10.5 km from where the proposed north shore route crosses Strome Narrows and is an active Pacific oyster site operated by Loch Kishorn Oysters.

Location of active and inactive fish and shellfish farms within the vicinity of the proposed development



Hopefully these comments are helpful to you. If you wish to discuss any matters further contact the MSS Renewables in-box MS_Renewables@scotland.gsi.gov.uk.

Yours sincerely

Paul Stainer
Marine Scotland Science
Marine Laboratory, PO Box 101, 375 Victoria Road,
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HISTORIC SCOTLAND
ALBA AOSMHOR

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Our ref: AMH/8481/10
Our Case ID: 201304358

6 November 2013

Mr Sean Fallon
URS Infrastructure & Environment UK Limited
23 Chester Street
EDINBURGH
EH3 7EN

Dear Mr Fallon,

Stage 2 Options Assessment Report – Environmental Assessment
Stromeferry Bypass Appraisal

Thank you for your letter of 16 October 2013 seeking our comments on the above proposal. We have considered it from our statutory remit and comment as follows.

The North Shore Route Option
I note that either a bridge or a tunnel is being considered to cross the Strome Narrows. As this route is located *c.* 1.3 km west of Strome Castle (Index No. 8481), the bridge option is likely to have an impact on the setting of the castle. I suggest that in addition to using the DMRB, you should refer to our setting guidance in assessing impacts on the castle: http://www.historic-scotland.gov.uk/setting-2.pdf

I also wish to highlight that any widening of the A 896 carriageway in the North Shore Route Option will need to avoid the legally protected (scheduled) area of Lochcarron Old Parish Church, 160m SSW of Lochcarron Parish Church (Index No. 8867), as the monument is located directly adjacent to the road.

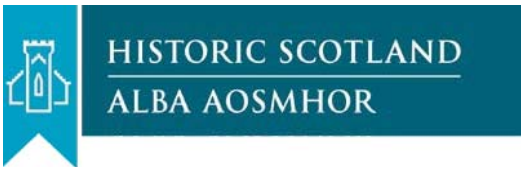
Other Route Options
We have no specific comments to make on any of the other route options, other than to advise that potential impacts on the historic environment should be avoided and assessed.

Please also contact Highland Council's conservation and archaeology service for their comments on the proposals.

I hope this is of assistance to you.

Yours sincerely,

Nicola Hall
Senior Heritage Management Officer, North Team


HISTORIC SCOTLAND
ALBA AOSMHOR

Fallon, Sean

From: Matheson, Liam <Liam.Matheson@forestry.gsi.gov.uk>
Sent: 06 November 2013 17:24
To: Fallon, Sean
Cc: Mitchell, Doug
Subject: Stromeferry Stage 2 - Environmental Assessment

Hello Sean

I am sending you a short holding response to the letter originally sent to our Lochaber District. We will come back to you with a formal reply but in short.

The Forestry Commission do hold a good deal of information on our land holding. This includes information on; timber crops and other land use, records of various species being sited, access routes on site and other safety information.

In addition to this spatial information our local staff may be able to offer additional information to support the assessment.

Regards
Liam

Liam Matheson
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If telephoning ask for:
Susan Haslam

12 November 2013

Sean Fallon and Anke Gunder
URS
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By email only to: Sean.Fallon@urs.com
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Timothy Roberts
Marine Scotland
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By email only to: Timothy.Roberts@scotland.gsi.gov.uk

Dear Mr Fallon, Ms Gunder and Mr Roberts

Stage 2 Options Assessment Report - Environmental Assessment
Stromeferry Bypass Appraisal

Thank you for consulting further SEPA on the above proposal by way of your letters and supporting information that we received on 16 October 2013 and 24 October 2013. We also thank your colleague, Fraser Blackwood, for providing other supporting information. The meeting yesterday was also very informative.

We have provided previous written advice on the issues which we consider the overall environmental appraisal should address by way of our letters to The Highland Council of 3 December 2012 (our reference PCS123331) and 13 May 2013 (our reference PCS126086). In relation specifically to the Stage 2 Options Appraisal we ask that the significant issues outlined below be covered by the relevant sub-criteria of the Environment section of the assessment, building on the information already collected at Stage 1.

Nature conservation

1. Impacts on wetlands

1.1 Thank you for providing a copy of the Phase 1 habitat information that has been collected to date. We note that the whole length of the Southern Corridor has not yet been surveyed and we highlight that we would expect this be carried out as part of the Stage 2 assessment.

1.2 The information collected to date demonstrates that all of the routes will impact on habitat types (in this case broadleaved semi-natural woodland, scrub, marsh/marshy grassland, wet dwarf scrub heath and damp Calluna heath) which are likely to contain groundwater dependant terrestrial ecosystems, types of wetlands protected by the Water Framework Directive.

1.3 The guidance A Functional Wetland Typology for Scotland should be used with the Phase 1 results to identify all wetland areas. A wetland appraisal should be presented which include

maps showing these results and then quantifies the likely direct and indirect impact the different routes could have on wetlands.

1.4 For your information we generally consider that roads, tracks or trenches within 100 m of groundwater dependent terrestrial ecosystems and borrow pits, deep foundations or cuttings within 250 m of such ecosystems will have indirect effects. While we appreciate this distance relates specifically to groundwater dependant terrestrial ecosystems and not wetlands generally we suggest these figures be taken into consideration when considering indirect effects on wetlands.

1.5 We then usually ask that National Vegetation Classification is carried out for the areas of wetland identified and the results of this and Appendix 2 (which is also applicable to other types of developments) of our Planning guidance on windfarm developments used to identify if wetlands are groundwater dependent terrestrial ecosystems, those types of wetland we are especially interested in. We would welcome it if this was carried out at Stage 2 but appreciate it may be seen as too detailed a level of assessment and left for Stage 3.

2. Marine ecological interests

2.1 We recommend that the Stage 2 assessment includes a baseline assessment of existing intertidal and subtidal habitats and species within the vicinity of the Strome Narrows works and for the Online Route, if this includes intertidal or subtidal works. This should include any UK Biodiversity Action Plan habitats and species (e.g. maerl, sea pens, eel grass, horse mussels). Additional information on the UK Biodiversity Action Plan is available at the Joint Nature Conservation Committee (JNCC) website.

2.2 Advice on designated sites and European Protected Species should be sought from SNH.

Road drainage and the water environment

3. Water Framework Directive and River Basin Management Planning

3.1 Having identified all River Basin Management Plan water bodies that will potentially be affected by the options a high level assessment should be presented outlining whether the proposal is likely to result in a deterioration in the status of the affected water body.

3.2 We consider that this will need most consideration for the options which include significant engineering works in the water environment, such as the bridging options for the North Shore Route Option (including any related renewable devices) and any of the Online Routes which would result in land reclamation. Depending upon the nature, scale and location of the proposed development the potential exists for there to be changes to coastal and sediment transport processes in the adjacent water body on completion of the development; this issue should be considered as part of the assessment.

4. Engineering activities in the water environment

4.1 A more detailed assessment of all potential impacts on the water environment also needs to be carried out for the options at this stage.

4.2 A site survey of existing water features and a map of the location of all proposed engineering activities/structural solutions in the water environment should be included for each route option. Activities could include, for example, bridges, dredging, culverts and land

reclamation works. It should also be outlined whether the works are completely new or whether they are the result of a need to replace existing infrastructure (for example the replacement of an existing culvert with a bridge). A systematic table detailing the type of activity, its scale and justification for it should also be included, preferably supported by suitable photographs. Justification for the location of any proposed activity is a key issue for us to assess whether the proposals are environmentally acceptable.

4.3 A number of the above works will require authorisation from SEPA under the Water Environment (Controlled Activities) (Scotland) Regulations (CAR) or a Marine Licence from Marine Scotland. It would be useful if the above table outlined the likely level of authorisation required for each work; this may also be useful for the cost analysis.

5. Impacts on groundwater

5.1 Roads, foundations and other construction works associated with large scale developments can disrupt groundwater flow and impact on groundwater abstractions. To quantify this risk a list of groundwater abstractions within a radius of i)100 m from roads, tracks and trenches and ii) 250 m from borrow pits, significant cuttings and large foundations should be provided accompanied, if relevant, by an assessment of likely impacts.

5.2 We refer you to section 2 of our letter of 13 May 2013 regarding general advice on groundwater assessment.

6. Sustainable surface water drainage (SUDS)

6.1 We will expect the road to be provided with at least two levels of SUDS treatment. While this will be common to all options we suggest it may be useful for the assessment at this stage to consider where it may present a particular challenge for any of the options. For example how will this be achieved where the road is directly adjacent to the sea?

7. Flood risk

7.1 As outlined previously we generally concur with the flood risk conclusions reached in the stage 1 report and the justifications provided for the preferred options. Each option should be assessed for flood risk from all sources. Our Indicative River & Coastal Flood Map (Scotland) is available to view online and further information and advice can be sought from your local authority technical or engineering services department and from our website.

7.2 Generally, crossings should be designed so that they do not interfere with any flood, up to and including the estimated 1 in 200 year event (0.5% annual probability), plus an appropriate freeboard allowance. Please note that these requirements also apply to small watercourses (i.e. those which are not incorporated into the indicative flood map - those with catchment areas < 3 km^2).

7.3 Consideration should also be given to the areas which are at risk of coastal flooding. Information should be presented on whether it is proposed to defend any sections of the option routes (for example along the south of Loch Carron) to ensure they can remain operational during times of flood.

7.4 For information, an approximate 1 in 200 year water level for the upper part of Loch Carron is 4.52 mAOD based on extreme still water level calculations using the Coastal Flood Boundary Method. This does not take into account the potential effects of wave action, funnelling or local bathymetry at this location. Please refer to our “Technical Flood Risk

Guidance for Stakeholders". This document provides generic requirements for undertaking Flood Risk Assessments and can be downloaded from www.sepa.org.uk/planning/flood_risk/policies_and_guidance.aspx. We understand from the meeting that you have already collected topographical survey information for the routes; we would be happy to provide more detailed flood risk advice having had sight of that.

8. Pollution prevention and environmental management

8.1 One of our key interests in relation to major developments is the avoidance of pollution during the period of construction. While in nearly all cases it can be ensured by suitable mitigation and environmental management that pollution does not occur, some projects by their location, design, or likely methods of construction are more environmentally risky that others. We ask that the assessment considers this. We suggest that pollution of the water environment seems most relevant, so consideration of the proportion of work within or adjacent to water may be a way of considering this issue. While not at issue in which we have expertise (although we are interested in the consequences) another relevant issue to consider would be risk of peat slide.

Geology and soils

9. Need for borrow pits

9.1 We suggest that this section would be an appropriate location to provide information on the likely aggregate requirement for the different options, providing an estimate of volumes of material required, likely source of the material and related environmental implications.

9.2 For example will all the materials required be won as part of the works, will new borrow pits be required in the vicinity of the works or elsewhere or will materials be sources from existing quarries in the area?

10. Peat disturbance

10.1 We ask that this element of the assessment specifically considers the potential impacts the options could have on peat, with a view to avoiding areas of deep peat. By adopting an approach of minimising disruption to peatland, the volume of excavated peat can be minimised and the commonly experienced difficulties in dealing with surplus peat reduced. The generation of surplus peat is a difficult area which needs to be addressed from the outset given the limited scope locally for re-use.

10.2 We ask that the Stage 2 assessment supplements the desk study information collected by including peat probing results (this should be to full depth) for each of the route corridors based on the first two stages (desk based study and low resolution "first pass") of the best practice outlined in *Developments on Peatland: Site Survey*, which is available from www.scotland.gov.uk/Resource/Doc/917/0120462.pdf. We ask that this information be provided by way of clear plans and tables.

10.3 The assessment should provide a very high level estimate or comparison of the quantity of peat that is likely to be disturbed by each route to help identify if management of peat is likely to be a significant environmental issue for each route. If relevant this will also form the basis from which the need for further analysis of the preferred option can be based to ensure that the final alignment minimises impacts as much as possible.

10.4 The disturbance of peat is also an issue in relation to the release of carbon and this should also be taken into consideration either as part of this assessment or perhaps as part of any global air quality work.

Other issues

11. Forest removal and forest waste

11.1 We also ask that the assessment consider the potential the different routes have for a requirement for forest felling and the likely use of felled material. We have a specific interest in relation to the use and disposal of felling waste, which is especially an issue for young plantations where it can be difficult to find a market for the material. Any proposals will need to comply with the *Felling resulting from construction activities on forestry land* section of our *Management of Forest Waste* guidance which is available from www.sepa.org.uk/planning/forestry.aspx.

Should you wish to discuss this consultation, please do not hesitate to contact me on 01349 860359 or planning.dingwall@sepa.org.uk.

Yours sincerely

Susan Haslam
Senior Planning Officer
Planning Service

Our ref: PCS/131859
Your ref: None

Sean Fallon
URS

If telephoning ask for:
Susan Haslam

By email only to: sean.fallon@urs.com

13 March 2014

Dear Mr Fallon

Stage 2 Options Assessment Report - Environmental Assessment
Stromeferry Bypass Appraisal

Thank you for your letter which SEPA received on 21 February 2014. This provided a response to the issues we highlighted in our previous letter, email and during the last stakeholder meeting in November. We thank you for taking the time to respond and update us on the issues we previously raised and we look forward to seeing the finalised Stage 2 report. There is only one issue which we feel it would be useful for us to clarify further at this stage and this is outlined below.

In relation to section 3.2 of our previous letter and your response then we are specifically concerned about the impact any proposals which incorporate a barrage could have on the water environment. We consider that such a proposal, no matter how it was designed, has the potential to result in a downgrade in the status of the local coastal water body, which would be against the requirements of the Water Framework Directive.

Our understanding is that the purpose of the Stage 2 assessment is to identify the factors to be taken into account in considering the options to allow a decision to be made on the preferred proposal and that the Stage 3 assessment concentrates on assessment of that preferred option. If this is the case then we consider that the fact that any barrage proposal could have a significant negative effect on the local coastal water body needs to be taken into consideration as part of the Stage 2 assessment as it should influence the decision making process.

Should you wish to discuss this letter please do not hesitate to contact me on 01349 860359 or planning.dingwall@sepa.org.uk.

Yours sincerely

Susan Haslam
Senior Planning Officer
Planning Service

Copy to: Anke.Gunder@urs.com

Disclaimer
This advice is given without prejudice to any decision made on elements of the proposal regulated by us, as such a decision may take into account factors not considered at the planning stage. We prefer all the technical information required for any SEPA consents to be submitted at the same time as the planning application. However, we consider it to be at the applicant's commercial risk if any significant changes required during the regulatory stage necessitate a further planning application and/or neighbour notification

or advertising. We have relied on the accuracy and completeness of the information supplied to us in providing the above advice and can take no responsibility for incorrect data or interpretation, or omissions, in such information. If we have not referred to a particular issue in our response, it should not be assumed that there is no impact associated with that issue.

Appendix 4b – Public Exhibition Display Boards

The Highland Council
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Stromeferry Bypass

Welcome to the Exhibition

Board No. 1

The purpose of this exhibition is to present an update of recent progress on the Stage 2 route options appraisal for the Stromeferry bypass. Information displayed is draft at this stage and will be updated in light of comments received today.

The first set of boards (2 - 5) provides some background information on the scheme, the process and stages of assessment, and outlines the route options that emerged from the Stage 1 work.

The second set of boards (6 - 11) displays the identified key environmental, engineering, traffic and ecomomic constraints, and solutions developed.

The third set of boards (12 - 13) provides a brief summary of the emerging results of the appraisal, scoring the route options against considered criteria.

The next set of boards (14 - 17) shows more details of the identified best route options for each of the three corridors (North Shore, Online and Southern) emerging from preliminary appraisal.

The final set of boards (18 - 21) provides further information and preliminary appraisal results, including indicative costings and potential phasing. Details of the next steps for the project are also provided.

We welcome your feedback on the current route options and invite you to fill in a comments sheet, provided at the end of the exhibition.

Further Information is available at: http://www.highland.gov.uk/yourenvironment/roadsandtransport/roads/stromeferry.html

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Stromeferry Bypass

Background and Need for Scheme

Board No. 2

Background

The existing Stromeferry Bypass is an approximately 12km long section of public road alongside the southern shore of Loch Carron. Since opening in 1970, a 4.5km section between Ardnarff and Cuddies' Point has been subject to a number of landslide and rock fall events causing temporary closures, requiring a 130 mile diversion.

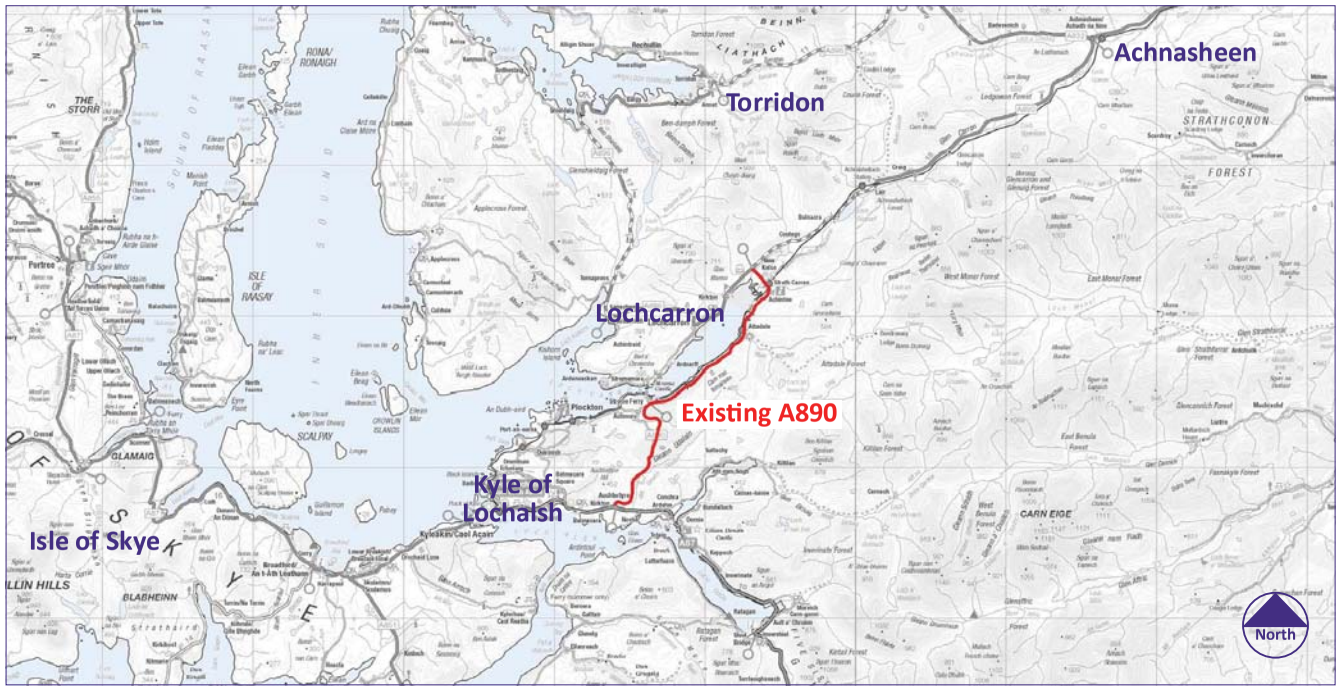
During the 1990s, several feasibility studies were undertaken to identify potential solutions, however, no final decision was reached. In response to a more recent rock fall event which closed the road for several months, a further options appraisal was commissioned. The initial stage of this appraisal included public and statutory consultation and input from technical experts to identify a number of options for further study.

A Stage 2 route options appraisal of the nine route options, emerging from the Stage 1 appraisal in May 2013, is currently underway in order to identify one preferred option.

Need for Scheme

- Landslides and rock falls causing hazards to road users and road closures
- Existing sub-standard road geometry
- Transport reliability and dependability
- Economic impact

Location Plan



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Stromeferry Bypass

Scheme Objectives

Board No. 3

- Safeguard and enhance access to the natural and built environment during construction, maintenance and operation of the scheme
- Minimise all risks during design, construction, operation and maintenance
- Ensure deliverability of scheme and 'Value for Money'
- Deliver a safe and reliable, two lane carriageway
- Ensure no increase in risk to and liability of the railway, maintaining access over the life of the scheme
- Keep the A890 and peripheral road network open during construction
- Maintain and improve social cohesion for the local population, making use of leisure, health and educational facilities and by improving accessibility for emergency services
- Maintain and improve choice of transport mode and integration of public transport links
- Take account of relevant local, regional and national planning policies during the design stage
- Maximise / improve network efficiency, sustainable connectivity and social cohesion in terms of journey times and journey reliability in the Wester Ross area
- Deliver a scheme that assists local businesses to maximise opportunities for sustainable development and economic growth

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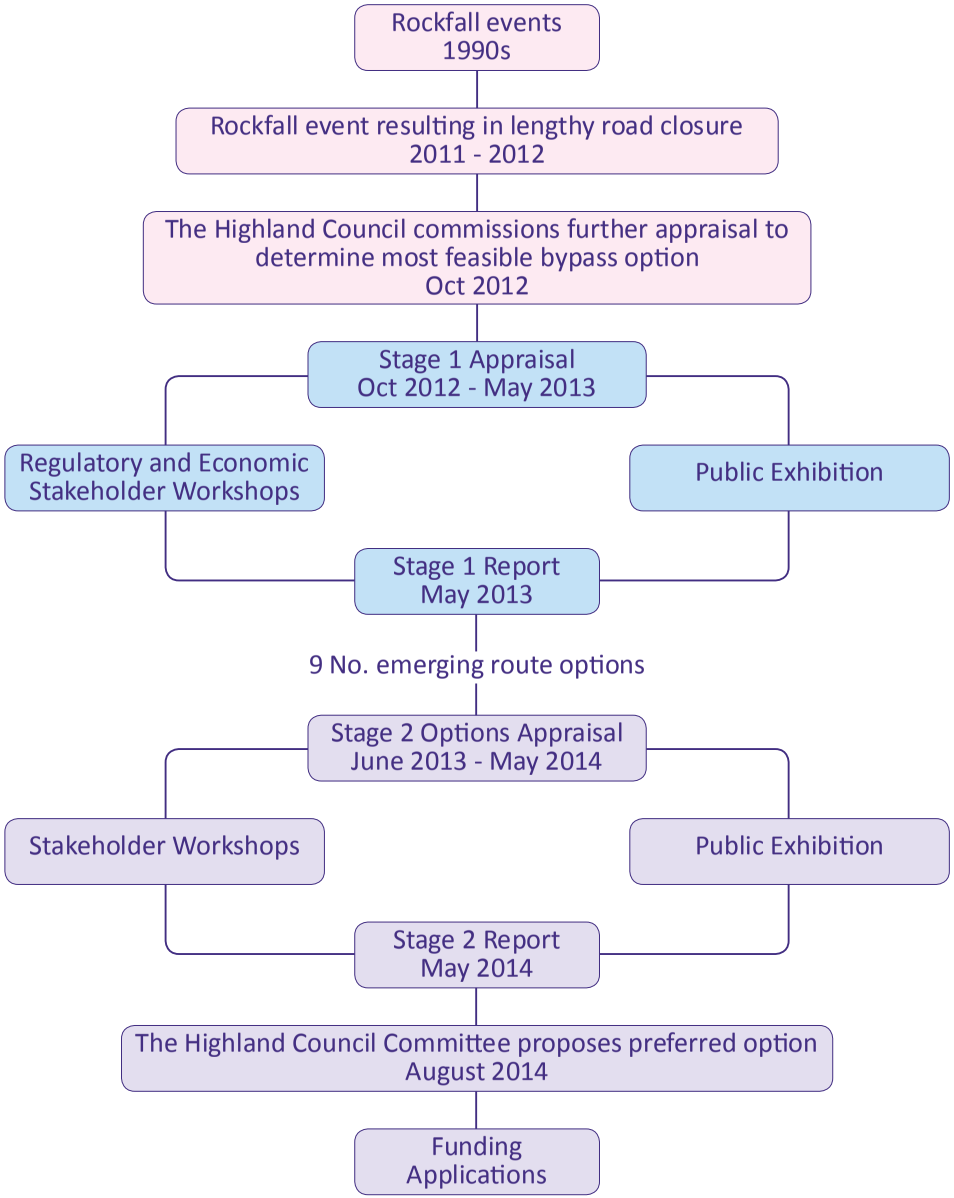
Stromeferry Bypass

Timeline of Events and Consultation

Board No. 4

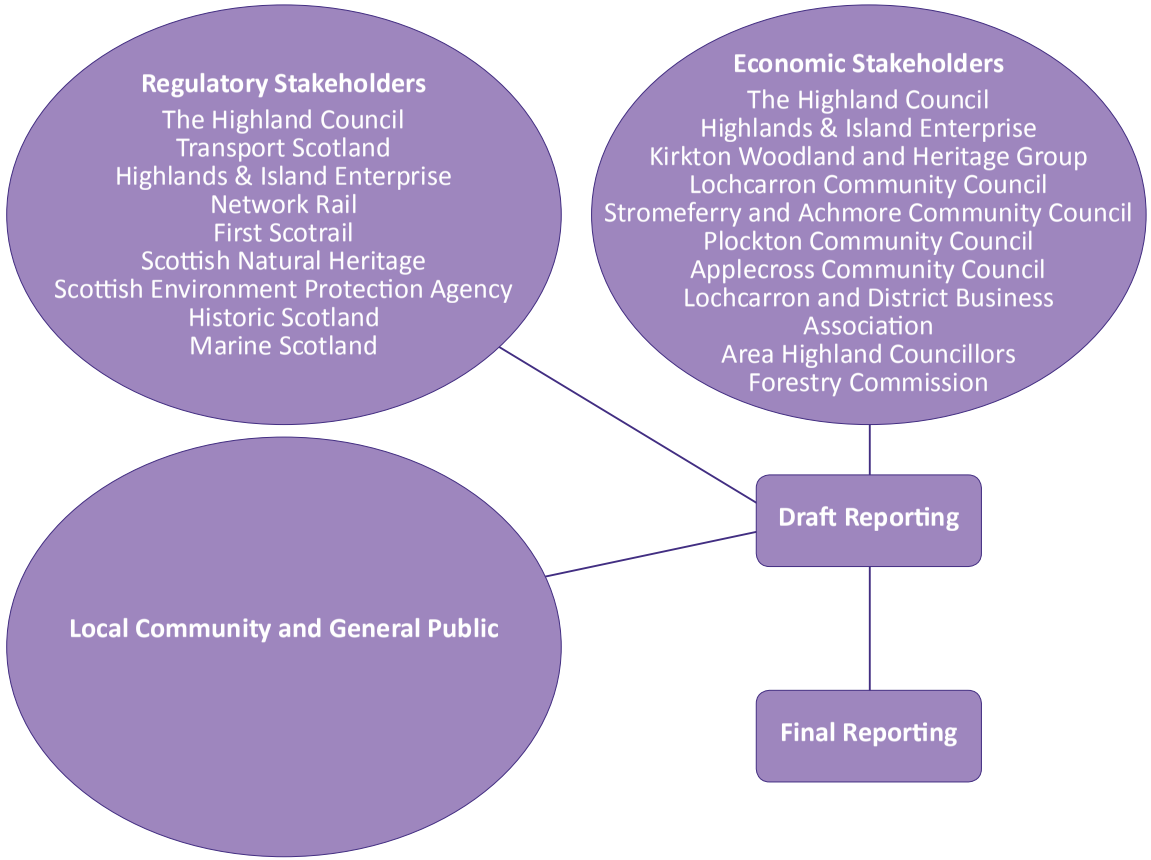


Consultation

Consultation and active engagement with Stakeholders has featured throughout the project and continues to inform the options assessment. As part of Stage 1 and Stage 2 a number of workshops with Regulatory and Economic Stakeholders and the local community have been undertaken.

Future Works

Further discussions with Key Stakeholders, including the local community, will be held at Stage 3 of the process and will include a public exhibition.



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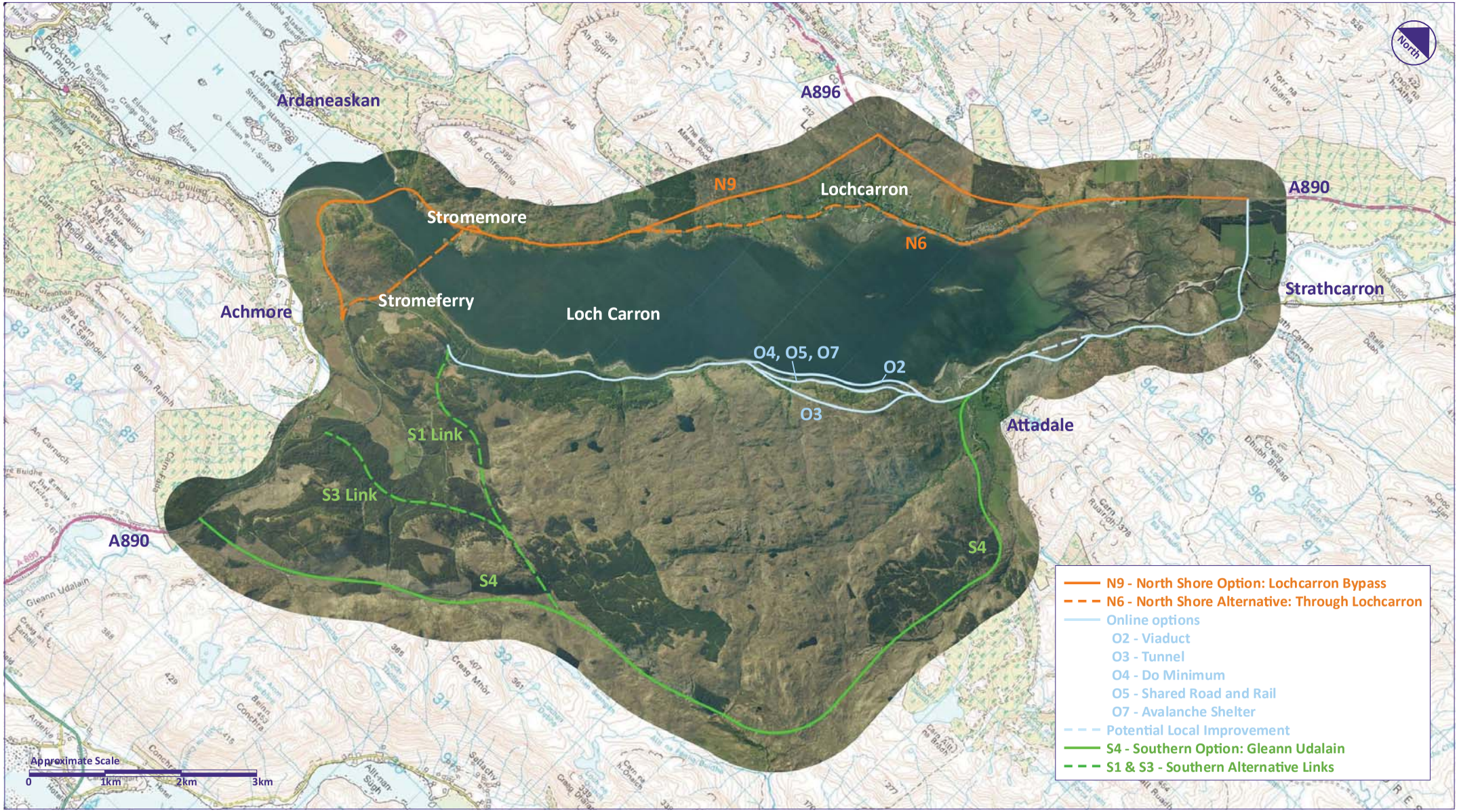
Emerging Route Options from Stage 1

Board No. 5



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Stromeferry Bypass

Key Environmental Constraints

Board No. 6

European designations

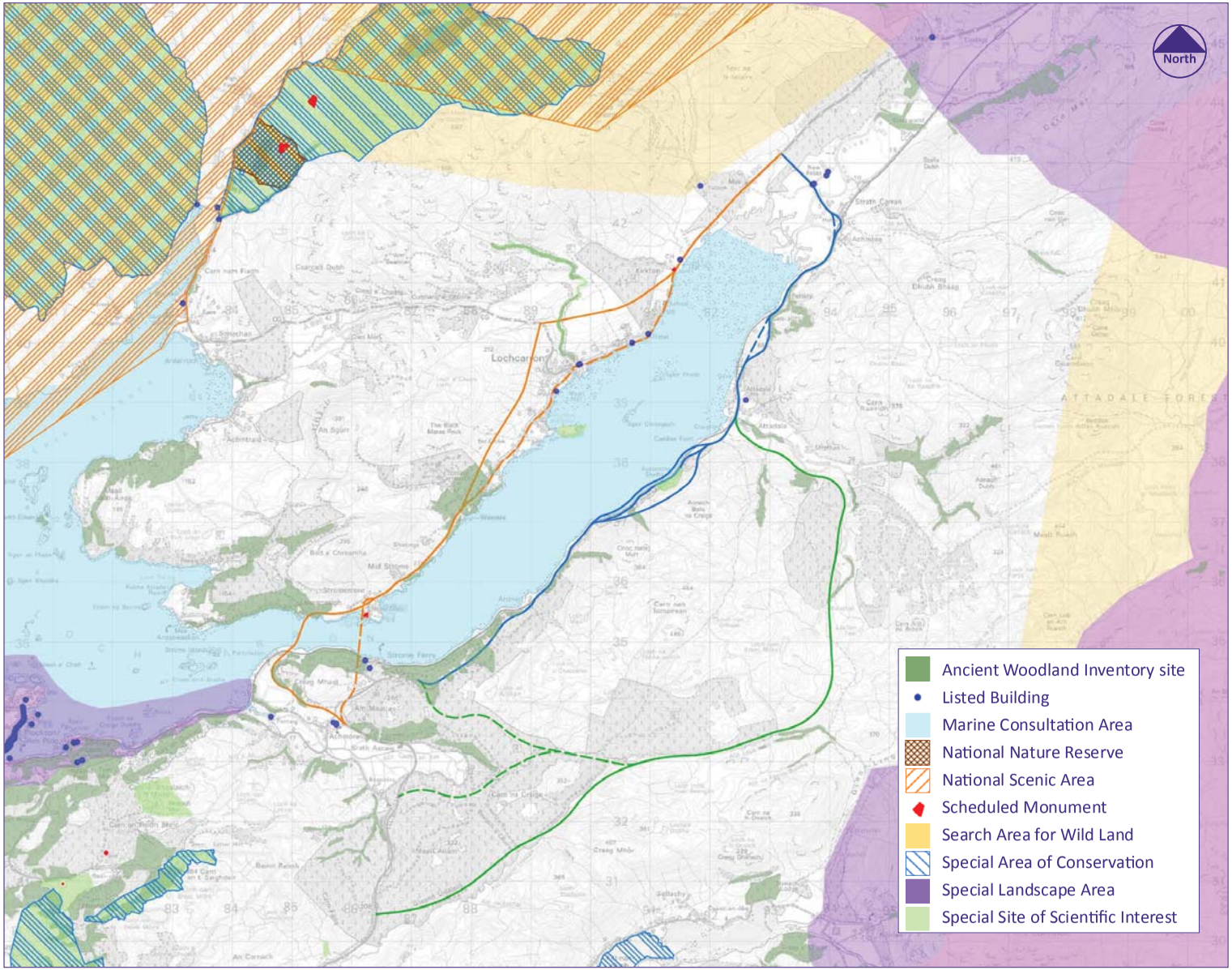
- Special Areas of Conservation
- A number of European Protected Species, including: Otter, Wild Cat, Cetaceans, and Bat species

National designations

- National Nature Reserve
- National Scenic Area
- Scheduled Monuments and Listed Buildings, including: Strome Castle and Lochcarron Old Parish Church
- Sites of Special Scientific Interest

Other designations or key constraints

- Ancient Woodland Inventory Sites
- Marine Consultation Area
- Search Areas for Wild Land
- Special Landscape Areas
- Views Over Open Water
- Diverse ground conditions and hydrology



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Key Engineering Constraints

Board No. 7

Alignments

- Topography
- Railway
- Level Crossings
- Existing settlements, properties and frontage activity
- Geometry of existing roads
- Existing structures
- Existing land use and ownership

Strome Narrows Crossing

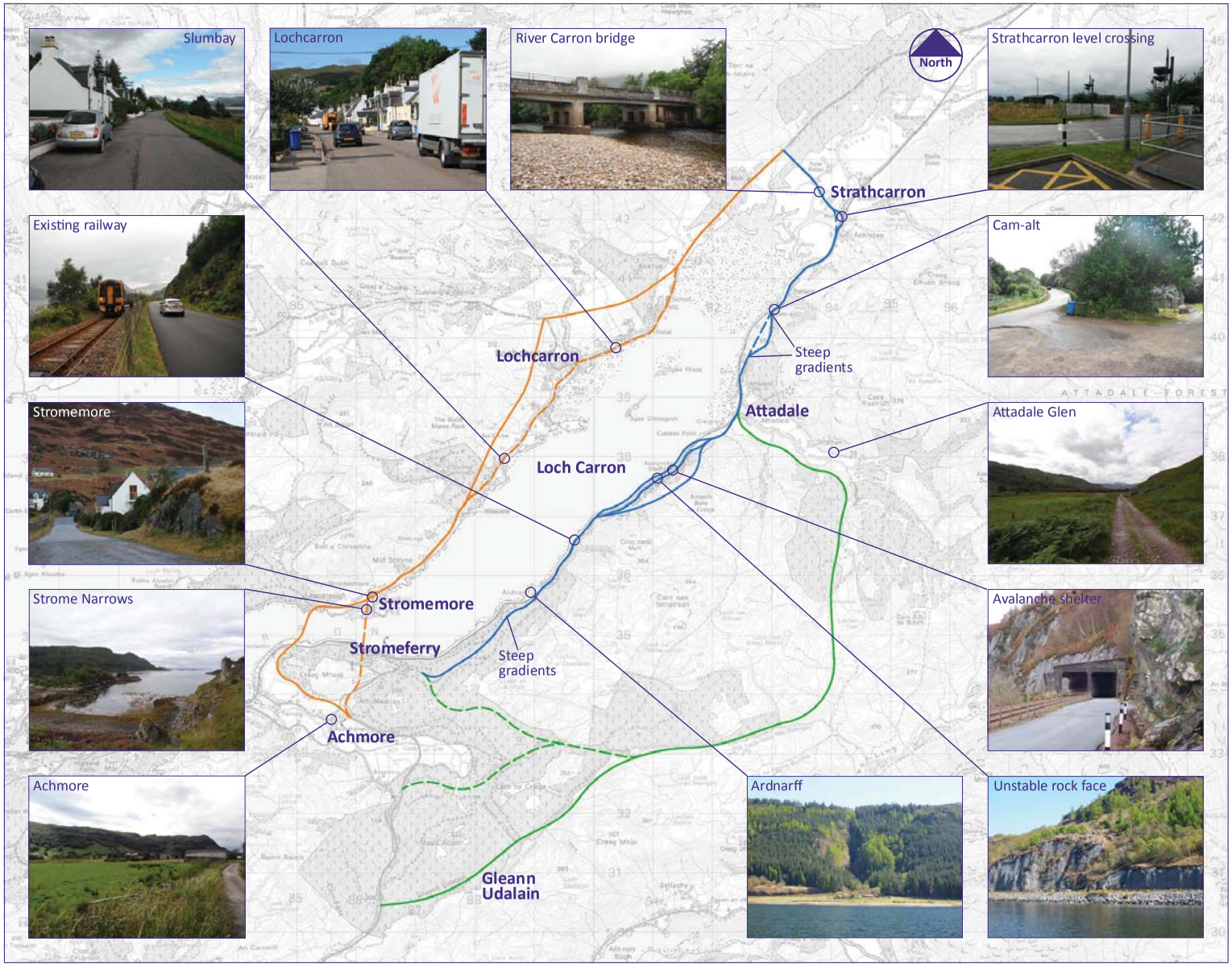
- Tidal range and currents
- Topography and make-up of seabed
- Length of structure required
- Navigational clearance requirements

Structures

- Requirements for major bridge or tunnel at the Narrows
- Retaining existing structures, if possible
- Existing avalanche shelter
- On-line viaduct/ shelter/ tunnel

Buildability

- Restricted road corridors
- Ground conditions
- Construction risks
- Unstable rock faces
- Potential requirement for road and rail closures
- Securing suitable scheme funding



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Stromeferry Bypass

Preferred North Shore Crossing Options

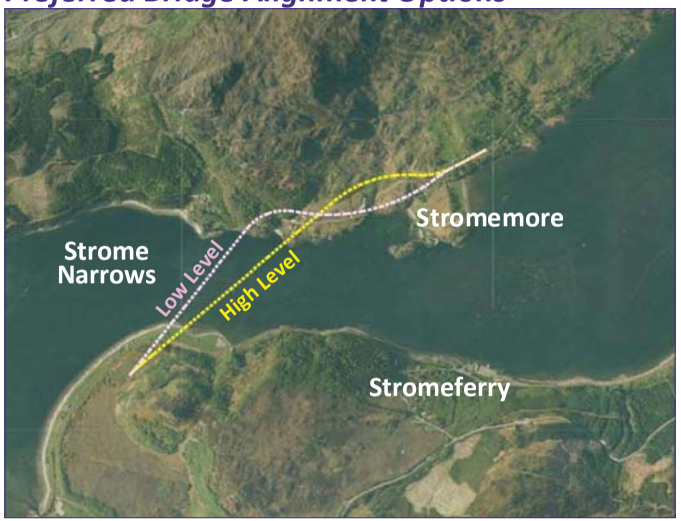
Board No. 8

Bridge Crossing

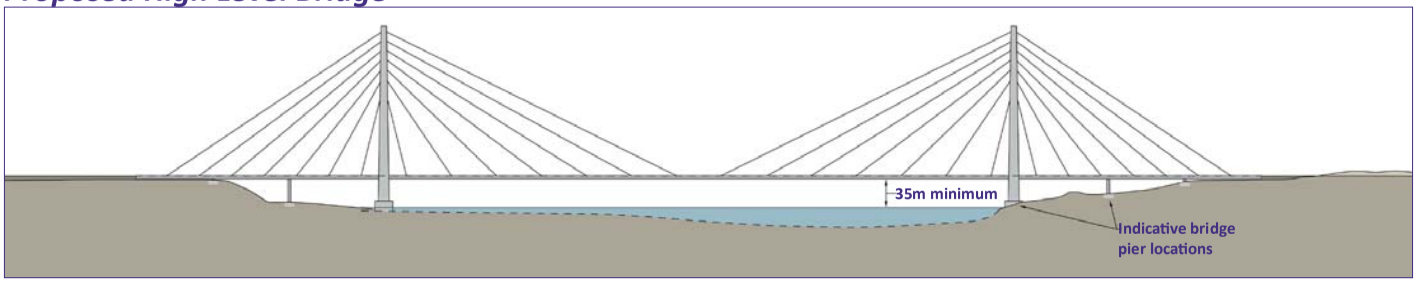
Five potential options for crossing the Strome Narrows, including a barrage, have been considered. The drawing to the right shows two indicative alignments that have emerged from the initial engineering assessment.

The options include a range of lengths and heights of bridge crossings, two of which are shown below. The high level bridge would have the highest structure and longest span of the options, while the low level bridge would have multiple and shorter spans. The engineering assessment has identified the low level bridge as the most feasible option.

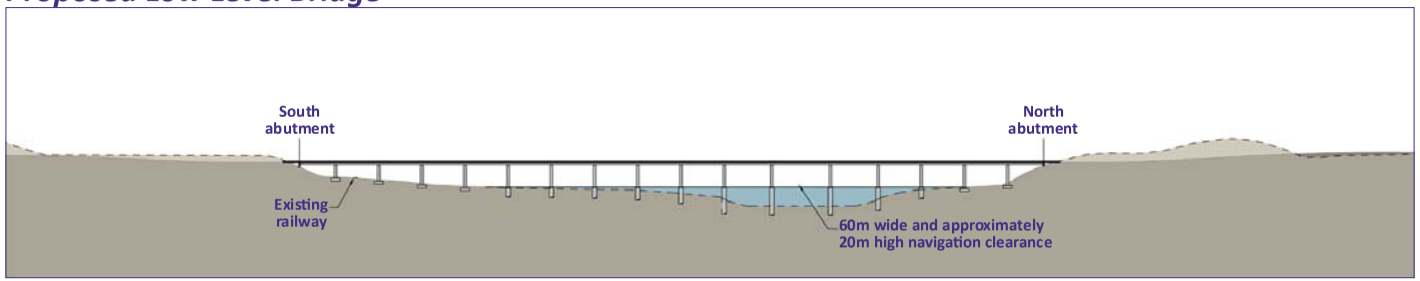
Preferred Bridge Alignment Options



Proposed High Level Bridge



Proposed Low Level Bridge

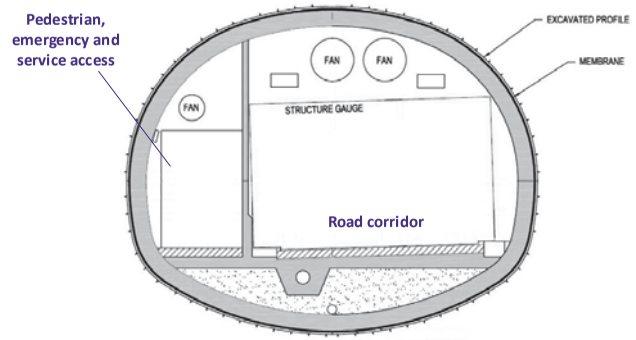


Tunnel

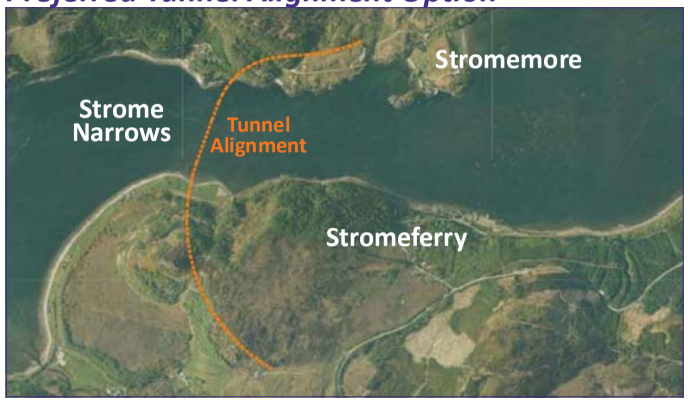
In addition to the identified bridge crossing options, a tunnel crossing under the Narrows has also been considered. The below drawings show a typical tunnel profile and a potential tunnel alignment.

The tunnel is likely to better satisfy environmental criteria but would be more costly and carry greater risks than a bridge crossing.

Typical Tunnel Profile



Preferred Tunnel Alignment Option



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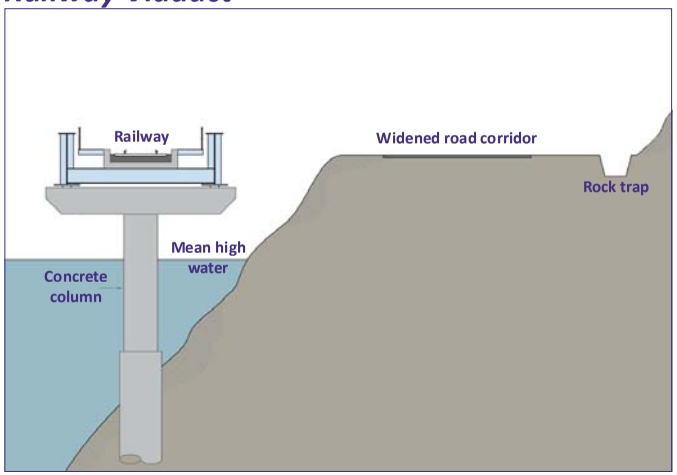
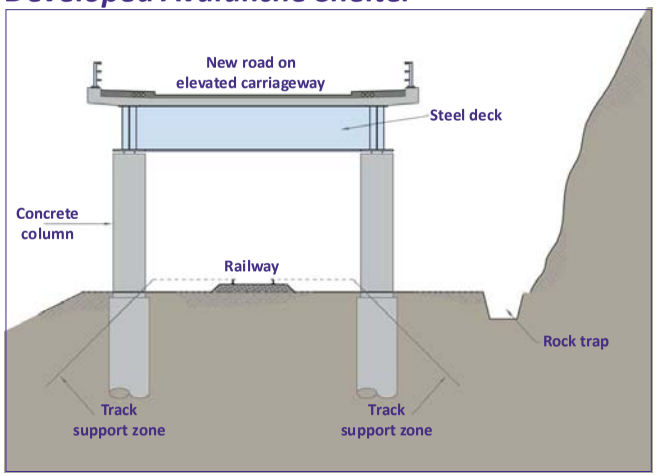
Considered Online Options

Board No. 9

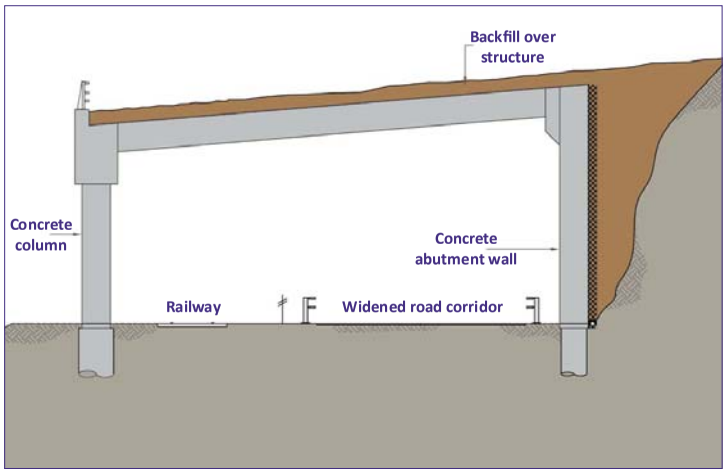
Railway Viaduct



Developed Avalanche Shelter



Extended Avalanche Shelter



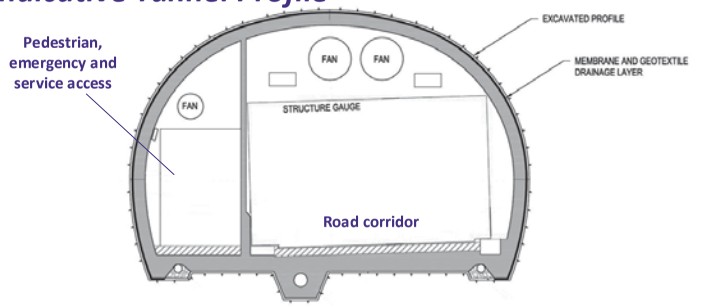
Shared Road and Rail

A number of different solutions have been considered for the online options to bypass the most problematic online section, between Cuddies Point and Ardnarff.

Potential options include:

- a **Railway Viaduct** along the edge of the loch, enabling a wider road corridor;
- a **Developed Avalanche Shelter**, providing an elevated carriageway above the existing railway;
- an **Extended Avalanche Shelter**;
- **Tunnel** options; and
- a **Shared Road and Rail** option.

Indicative Tunnel Profile



Example of a Tunnel Portal

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Stromeferry Bypass

Traffic and Economic Considerations

Board No. 10

A high level traffic and economic assessment is underway for each of the identified 9 routes. This has involved a review of historical and collected data, including:

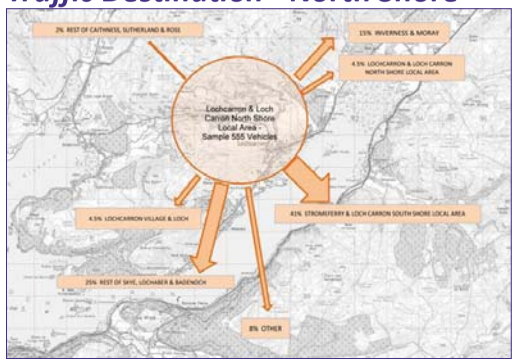
- Journey times
- Accident rates
- Traffic, volumes and mix
- Turning movements
- Roadside interviews
- Origin & Destination assessments
- Public Transport review

A cost benefit appraisal is currently being completed using an assessment of scheme benefits against up to date total scheme costs.

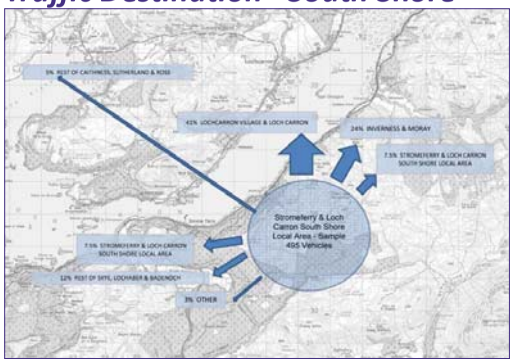
A review of the Economic Activity and Location Impacts is also being completed and includes a detailed Business Survey.

The assessment has also taken account of traffic that is likely to be generated should the Kishorn development go into full production.

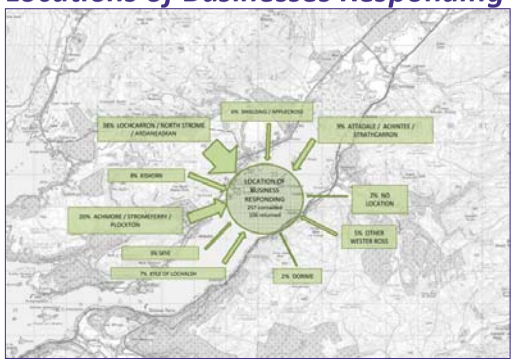
Traffic Destination - North Shore



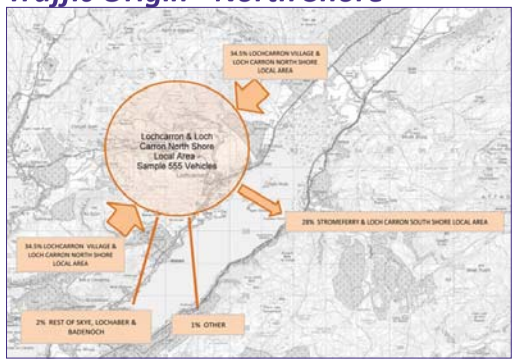
Traffic Destination - South Shore



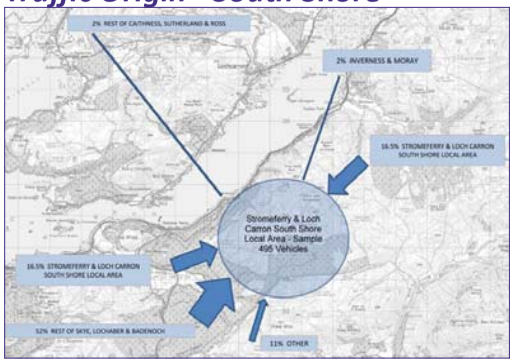
Locations of Businesses Responding



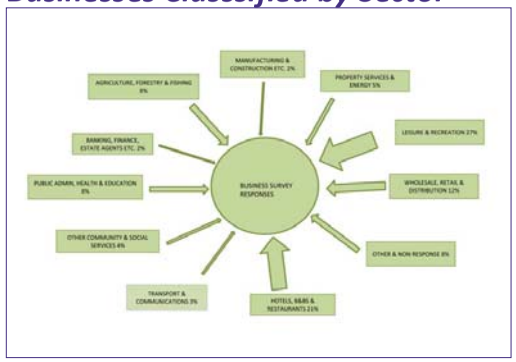
Traffic Origin - North Shore



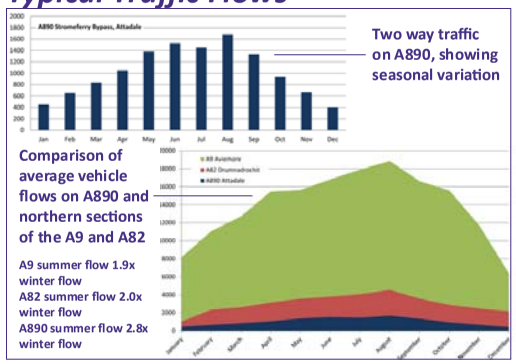
Traffic Origin - South Shore



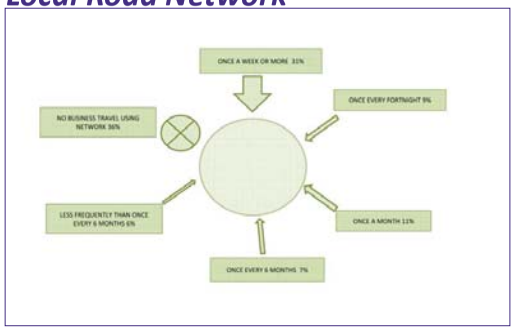
Businesses Classsified by Sector



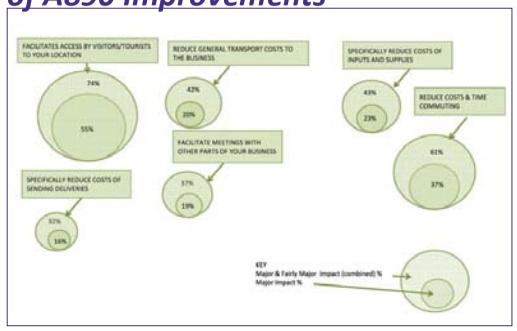
Typical Traffic Flows



Frequency of Business Travel using Local Road Network



Responses on Likely Business Impact of A890 Improvements



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Renewable Energy Options

Board No. 11

The Strome Narrows is considered to have a significant tidal resource and as such Renewable Energy was investigated as a means to offset some of the construction costs. The following three tidal technologies have been considered in some detail as part of the Stage 2 study:

- **Tidal Barrage**, a dam across the Narrows, catching the tides and there after working like a hydro scheme.
- **Tidal Stream Device**, stand alone turbines fixed to the sea bed.
- **Tidal Bridge**, an array of smaller turbines across the Narrows, fixed to a bridge structure.

In conclusion, a tidal bridge is the preferred option. However as the technology is not well developed it is suggested further work on renewable energy as a mechanism for off-setting construction cost is deferred and revisited closer to the construction start date when technologies, revenue generation, incentives and funding models will be more mature.

Summary of Potential Output and Costs

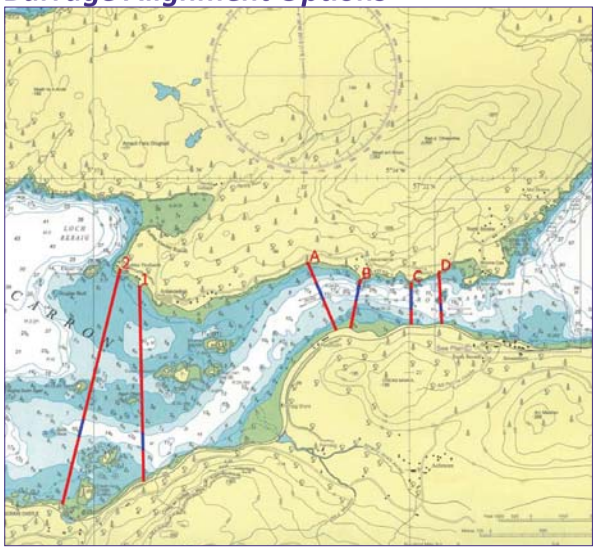
Criteria	Tidal Barrage	Tidal Stream Devices	Tidal Bridge
Capital Cost (£m)	113	13.8	29.9
Yearly Generation (MWh)	35,474	245	6,100
Net Annual Revenue (£k)	3,908: yr 1-50 822: yr 50-120	65	1,628
Operating and Management Cost (£k/per annum)	987	30	15
Payback Period (Years)	30	20	19
Operating Life (Years)	120	20	20
Breakeven Price (£MWh)	56	2,490	247

Evaluation of Technologies

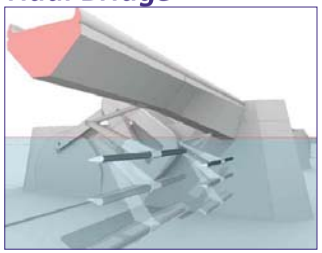
Criteria	Tidal Barrage	Tidal Stream Devices	Tidal Bridge
Environmental Risk			
Construction Risk			
Technology Maturity Risk			
Planning Risk			
Generation Output			
Cost			

Considered feasible Considered unfeasible

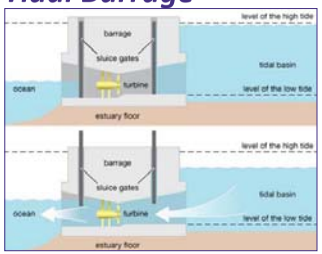
Barrage Alignment Options



Tidal Bridge



Tidal Barrage



Tidal Stream Device

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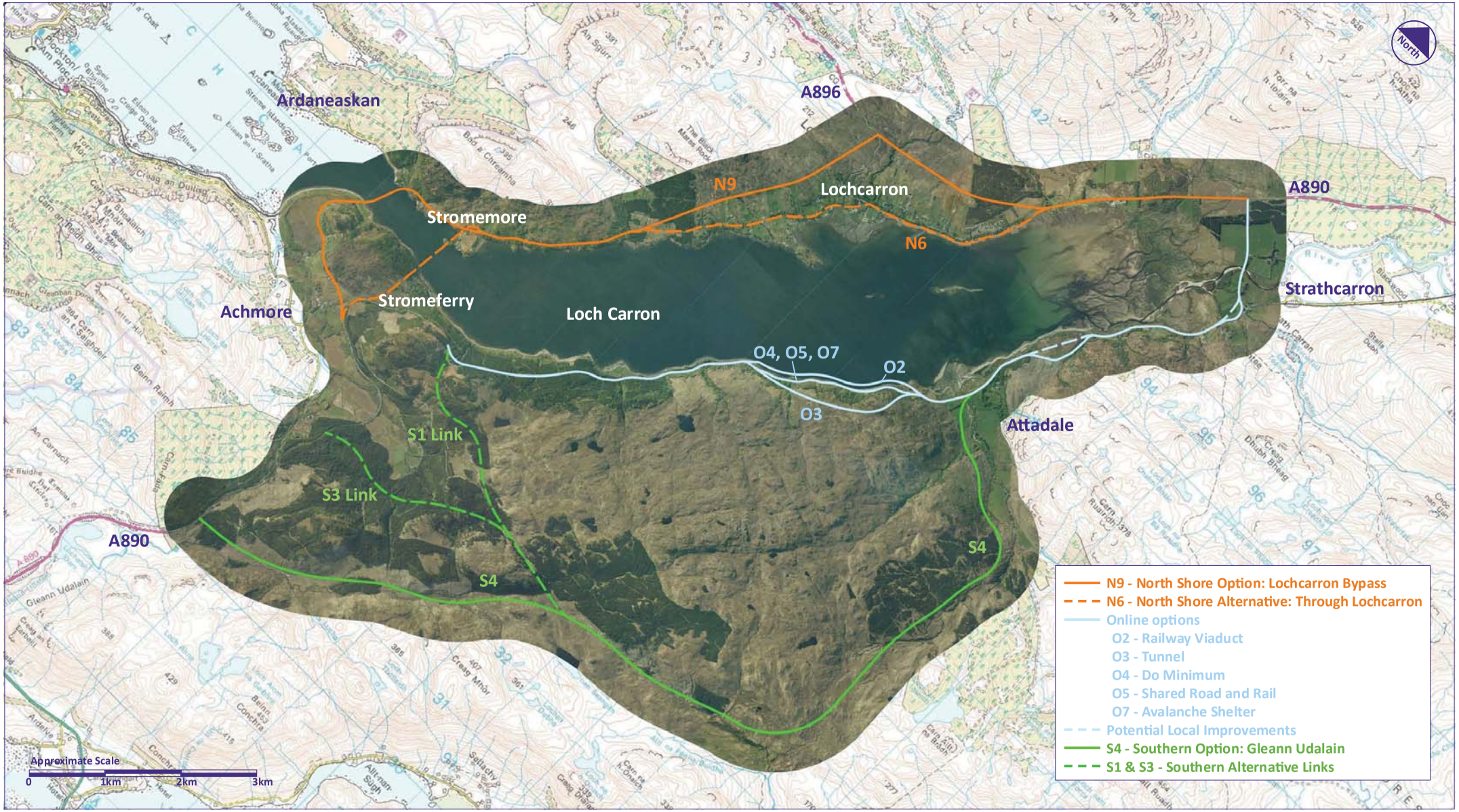
Selected Route Options from Stage 1

Board No. 12



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Draft Options Appraisal Results

Board No. 13

Scottish Transport Appraisal Guidance Criteria	North Shore		Online					Southern
	N6 Through Lochcarron (low level bridge)	N9 Lochcarron Bypass (low level bridge)	O2 Railway Viaduct	O3 Tunnel	O4 Do-minimum	O5 Shared Road and rail	O7 Developed Avalanche Shelter	S4 Gleann Udalain
Scheme Objectives	Good linkage, but online through Lochcarron	Delivers on scheme objectives	Some buildability and environmental issues, limited road closures	Some buildability issues, road/ rail closures required	Does not satisfy objectives	Issues with safety and not delivering required road standard	Significant buildability issues for road and railway, closures inevitable	Environmental intrusion and lengthened journey, but safe and deliverable
Environment	Potential marine, ecology, landscape and visual, cultural heritage, air quality and noise impacts	Potential ecology, landscape and visual, cultural heritage, air quality and noise impacts	Potential marine environment, ecology and landscape and visual impacts	Considerable waste material, but reduced hydrology, ecology and landscape and visual impacts	No change	Reduced impacts on landscape and visual	Potential Landscape and visual impacts	Potential landscape, ecology, peat and hydrology impacts
Safety	Increased traffic flow through Lochcarron village and conflicts due to frontage activity	Safe and secure route	Railway realigned on viaduct and road on existing embankment, protected by rock trap measures	Existing route made safe but tunnels not as safe as other structures	Potential for further rock falls	Road/ rail conflicts	Existing route made safe	Safe route but more remote
Economy (generally a benefit to cost ratio greater than 1 indicates a scheme resulting in economic benefit)	Benefit to cost ratio: 0.73	Benefit to cost ratio: 0.71	Benefit to cost ratio: 0.63	Benefit to cost ratio: 0.43	Benefit to cost ratio: n/a	Benefit to cost ratio: 1.1	Benefit to cost ratio: 0.66	Benefit to cost ratio: 0.76 (community link S1/ S3: 0.60)
Integration	Opens up north/ south corridor and enhanced linkage to Kishorn	Opens up north/ south corridor and enhanced linkage to Kishorn	Safeguards existing connections	Safeguards existing connections	Safeguards existing connections, but potential for delays associated with road closures	Requires traffic control which results in potential delays	Safeguards existing connections	Longer route, but of high quality
Accessibility/ Social Inclusion	Traffic through Lochcarron, but disbenefits Strathcarron area	Benefits Lochcarron, but disbenefits Strathcarron area	Improved existing route	Improved existing route	Reluctance to use route due to threat of road closures	Improved existing route	Improved existing route	Route lengthened for strategic and local traffic
Cost to Government (construction, land preparation, supervision and 20% optimism bias)	£97 Million	£100 Million	£115 Million	£171 Million	£43 Million	£61 Million	£110 Million	£88 Million With community link S1/ S3: £111 Million
Risk and Uncertainty	Ground conditions for bridge and marine environment	Ground conditions for bridge and marine environment and Lochcarron bypass	Ground conditions for structure, marine environment and working from barges	Rock quality for tunnel and portals, buildability: portals adits, compound, spoil	Potential further rockfall events can be managed	Road/ rail conflicts, not acceptable to Network Rail	Significant buildability issues and potential closures	Peat identified but otherwise little engineering/ construction risk
Best Route Options		Best north shore route option	Best online route option					Best southern route option

Significant Benefit | Minor Benefit | Negligible Effect on key characteristics, features or elements | Minor Adverse | Significant Adverse

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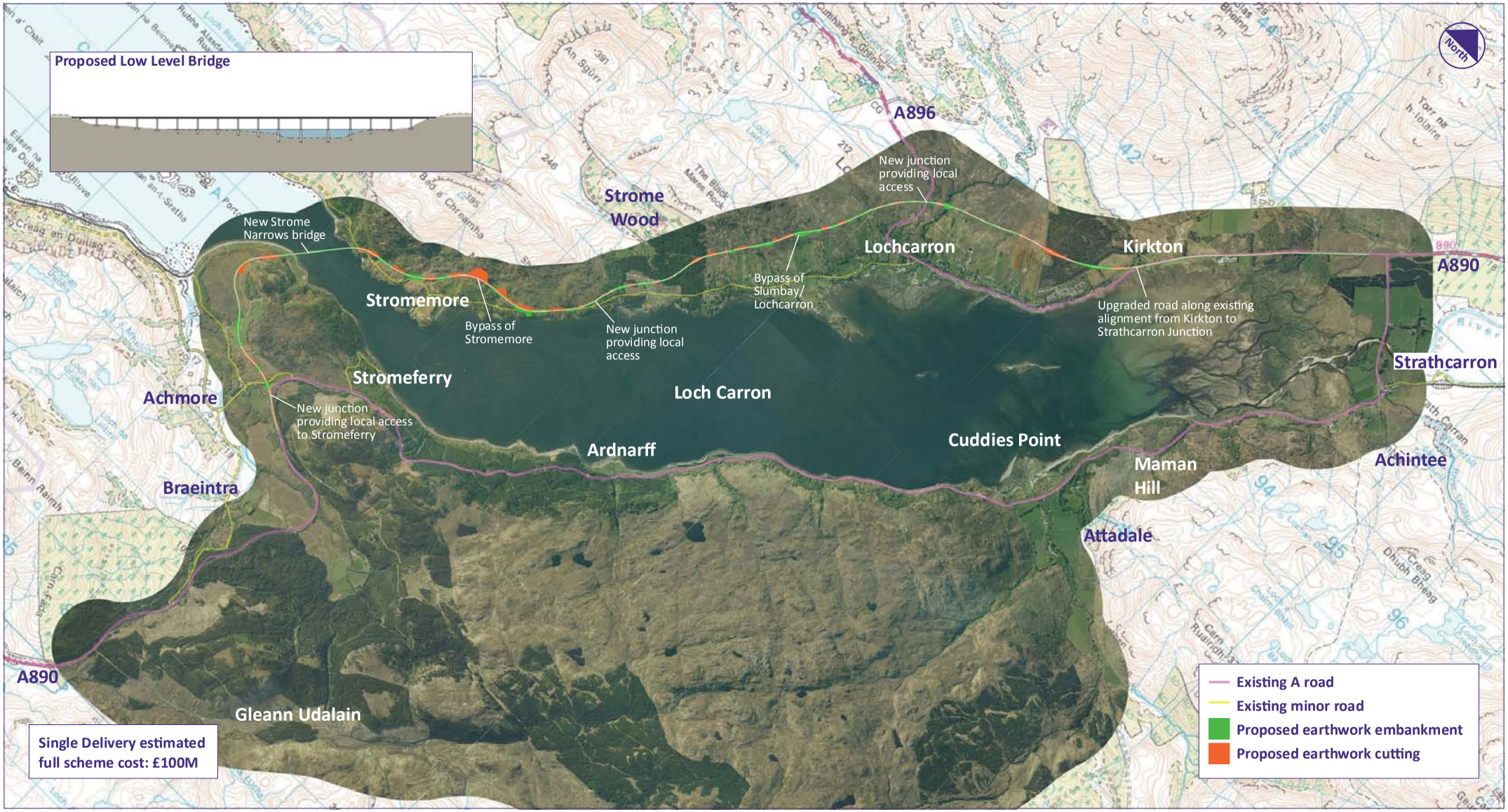
Best North Shore Option

Board No. 14

Lochcarron Bypass



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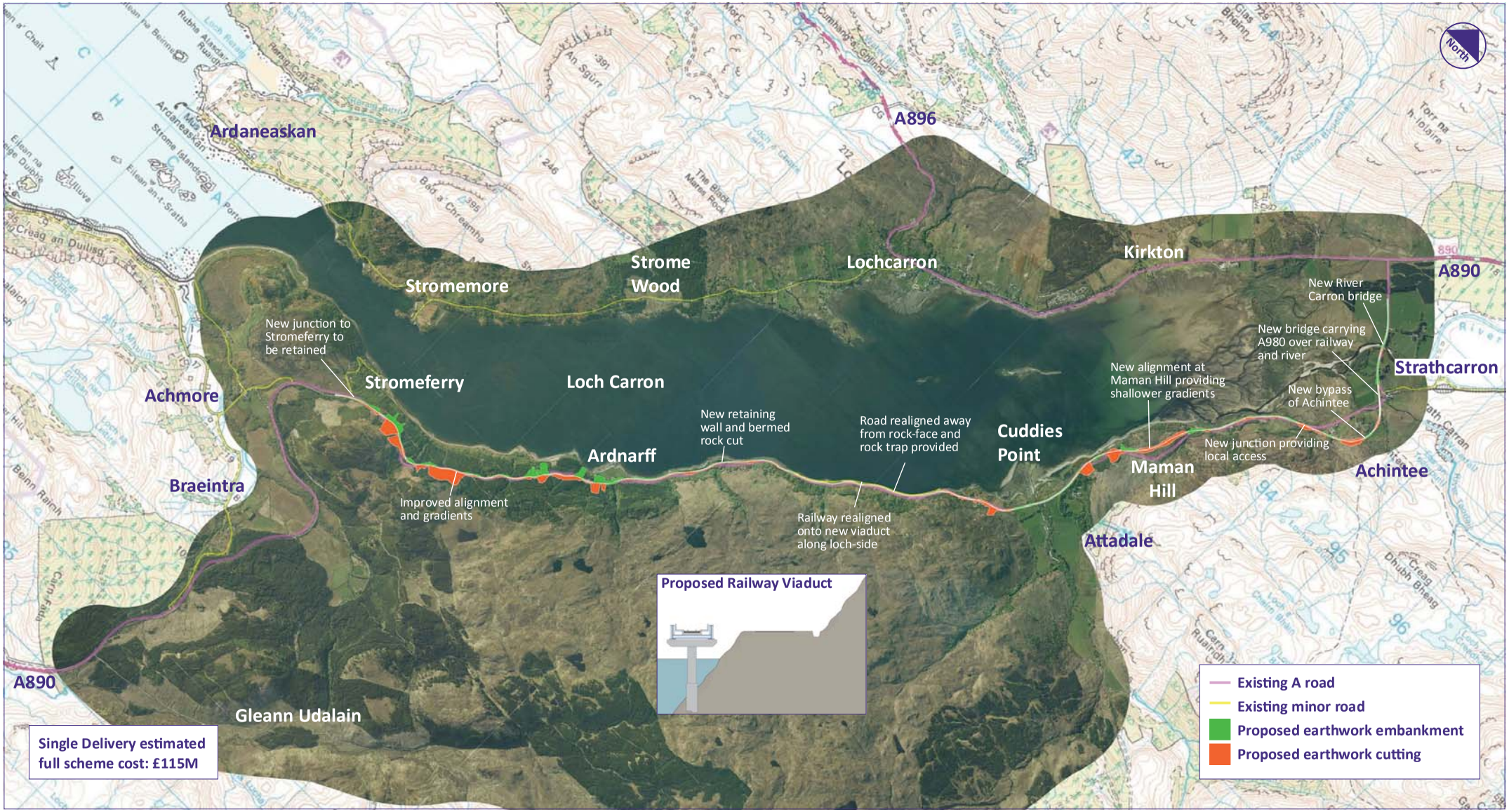
Best Online Option

Board No. 15

Railway Viaduct



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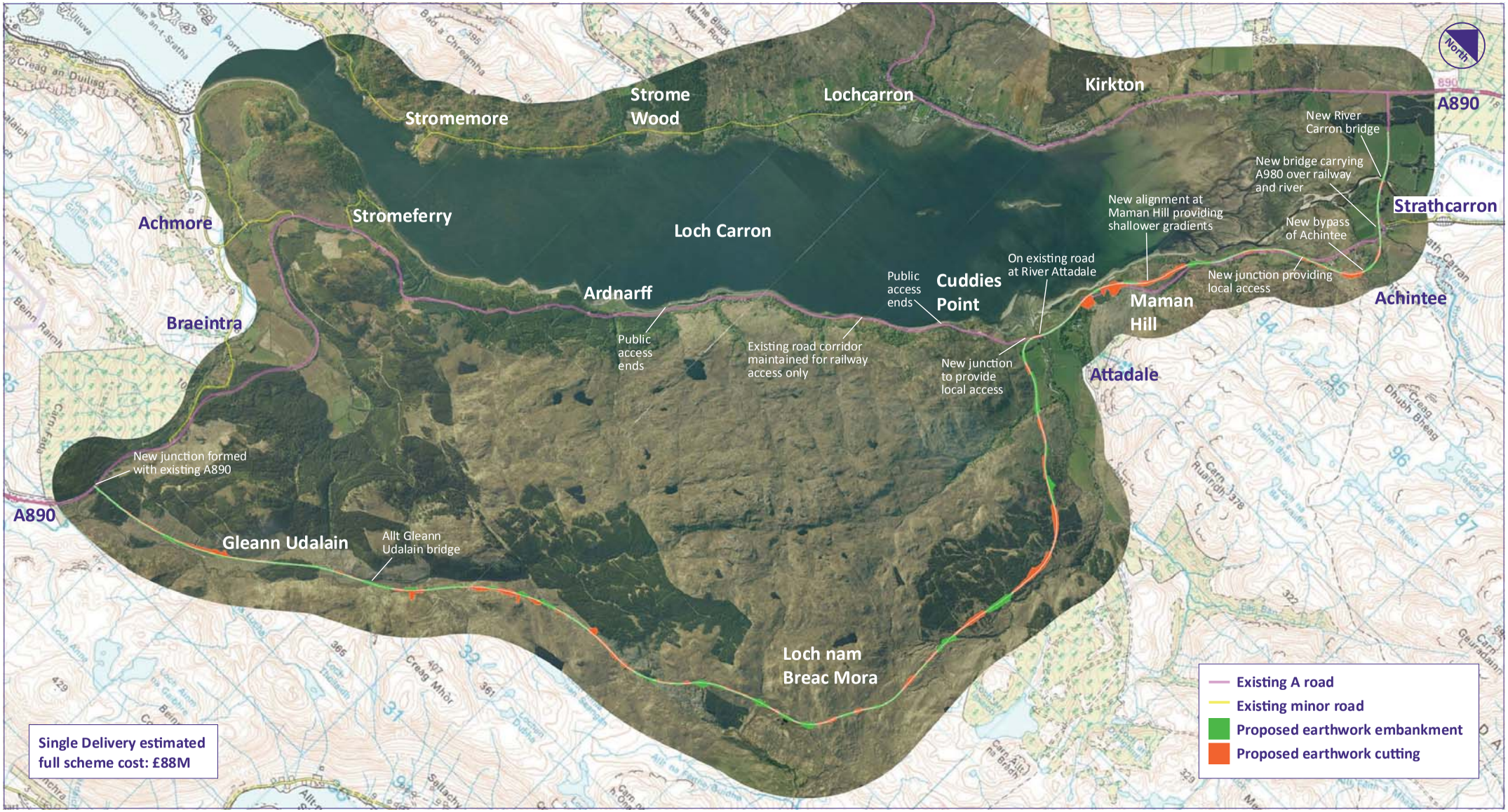
Best Southern Option

Board No. 16

Gleann Udalain



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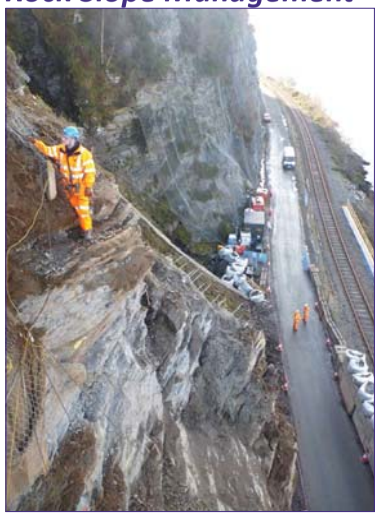
Do Minimum: Contingency Measures

Board No. 17

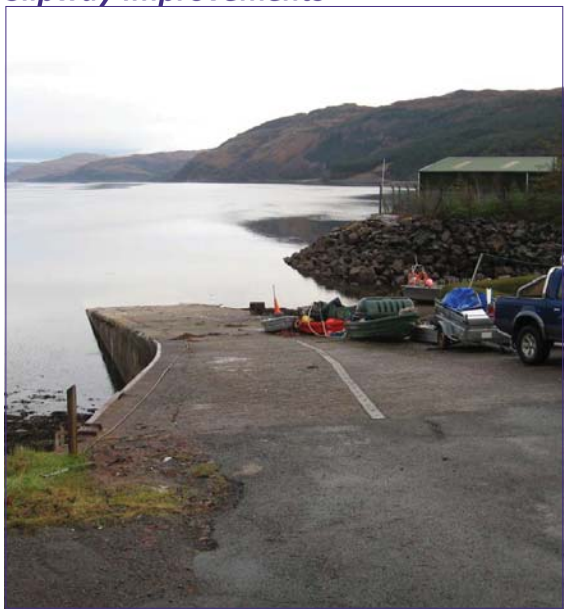
The 'Do-minimum' Option provides the baseline on which all other route proposals are measured. This retains the existing A890, without any improvements, and as such would involve the following considerations:

- Rock slope management and maintenance to help prevent future uncontrolled rockslope failures;
- Slipway and marshalling improvements for ferry operations during road closures, as and when required;
- Shared use of railway corridor, if lengthy road closures required;
- Contingency planning to coordinate works in the event of a rock fall which closes the road; and
- Reactive repairs to reopen the road in the event of a rock fall.

Rock Slope Management



Slipway Improvements



Temporary Shared Use of Railway

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Best Options Against Scheme Objectives

Board No. 18

Scheme Objectives	North Shore N9 Lochcarron Bypass	Online O2 Railway Viaduct	Southern S4 Gleann Udalain	Baseline O4 Do-minimum
Safeguard and enhance access to the natural and built environment during construction, maintenance and operation of the scheme				
Minimise all risks during design, construction, operation and maintenance				
Ensure deliverability of scheme and 'Value for Money'				
Deliver a safe and reliable, two lane carriageway				
Ensure no increase in risk to and liability of the railway, maintaining access over the life of the scheme				
Keep the A890 and peripheral road network open during construction				
Maintain and improve social cohesion for the local population, making use of leisure, health and educational facilities and by improving accessibility for emergency services				
Maintain and improve choice of transport mode and integration of public transport links				
Take account of relevant local, regional and national planning policies during the design stage				
Maximise / improve network efficiency, sustainable connectivity and social cohesion in terms of journey times and journey reliability in the Wester Ross area				
Deliver a scheme that assists local businesses to maximise opportunities for sustainable development and economic growth				

Successfully meets objective Partially meets objective Does not meet objective

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Summary of Best Options Appraisal

Board No. 19

Scottish Transport Appraisal Guidance Criteria	North Shore N9 Lochcarron Bypass (low level bridge)	Online O2 Railway Viaduct	Southern S4 Gleann Udalain	Baseline O4 Do-minimum
Scheme Objectives				
Environment				
Safety				
Economy				
Integration				
Accessibility/ Social Inclusion				
Cost to Government				
Risk and Uncertainty				

Significant Benefit | Minor Benefit | Negligible Effect | Minor Adverse | Significant Adverse

The best options have been abstracted from Board No. 13 and are summarised here by means of a simple 'traffic light' system.

- The best north shore option is a Lochcarron bypass, crossing Strome Narrows on a low level bridge.
- The best online option is bypassing the rockfall area by means of transferring the railway to a viaduct.
- The best southern option is via Gleann Udalain.

The following provides a brief commentary of the initial findings of the options appraisal:

- North Shore option performs better than Online option;
- Southern option performs better than Online option;
- Online option is not likely to be taken forward;
- North Shore option has slightly more benefits than Southern option;
- Southern option has less adverse impacts than North Shore option; and
- The Southern option and North Shore option are evenly matched however overall the northern option performs marginally better.

We are keen to get your feedback and we invite you to fill in a comments sheet.

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Stromeferry Bypass

Phasing and Costs

Board No. 20

- A section of the A890, east of Strathcarron Junction, is currently in The Highland Council's programme of works and funding for the development of the Stromeferry Bypass Project is within the 10-year Strategy
- The aim of this project is to deliver a full scheme between Strathcarron junction and the A890 south of Achmore
- Phasing of the scheme has been considered to help meet required affordability criteria for delivery
- The First phase would involve scheme development to bypass the rockfall area as a minumum

Conclusion – considering cost only

For Phased Delivery, costs for the Online and Southern options are similar (£64M - £65M). The Southern option gives better value for money in cost and benefits

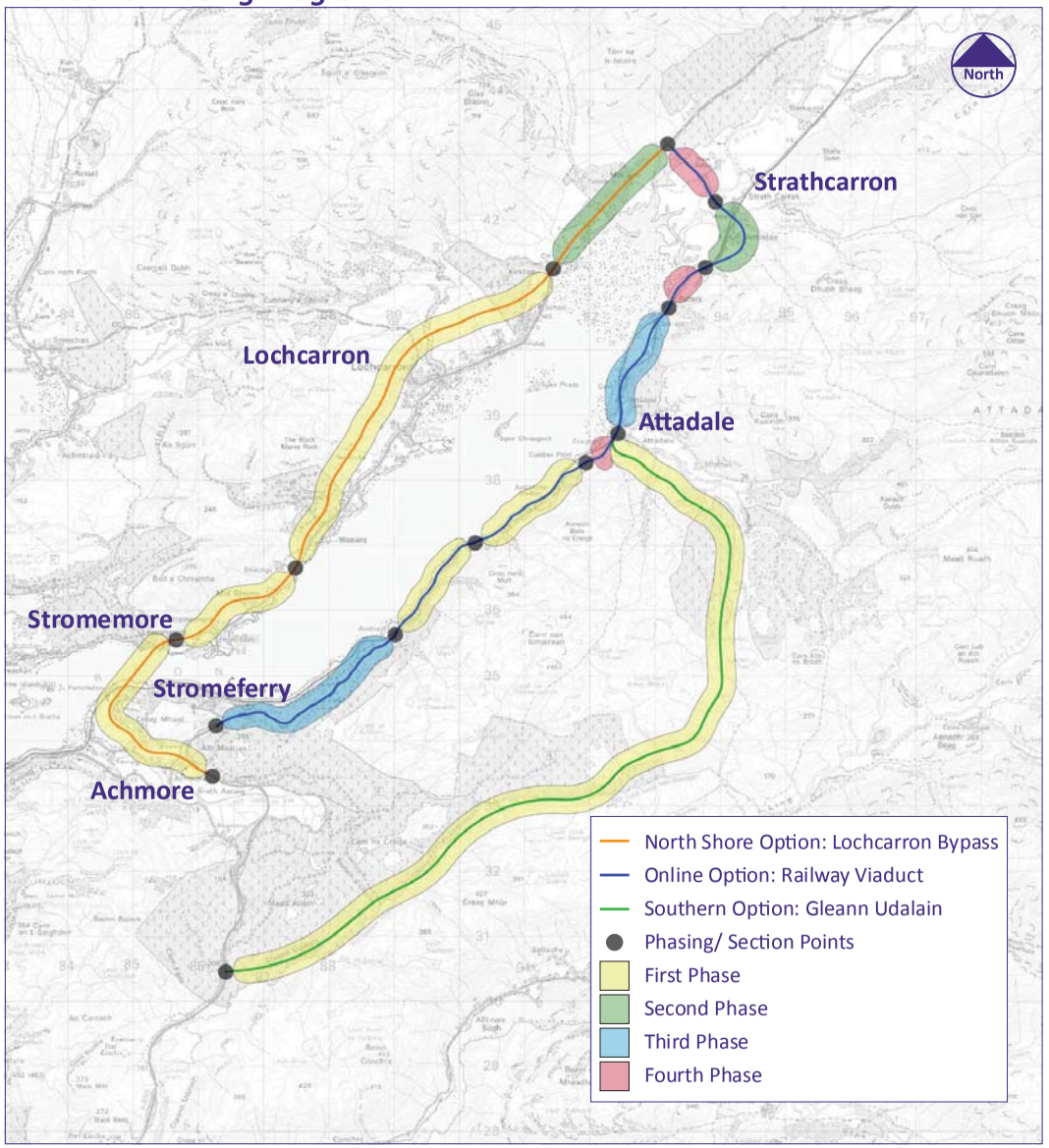
For Single Delivery or Total Phased Delivery the Southern option, at £94M, gives better value for money in cost and benefits. The North Shore option does not match value for money, but performs better than the Online option.

Indicative Construction Cost Summary

Delivery	Single Delivery			Phased Delivery		
	North Shore	Online	South	North Shore	Online	South
Single Delivery (2017)	100	115	88			
Phase 1 (2017)				97	65	64
Phase 2 (2022)				4	17	17
Phase 3 (2027)				n/a	41	11
Phase 4 (2032)				n/a	5	2
Total Scheme Cost	100	115	88	101	128	94

All above costs are indicative and all values are in £Millions.

Indicative Phasing Diagram



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What Happens Next?

Board No. 21

Your Comments

If you have any particular questions please come and talk to the exhibition staff before you leave.

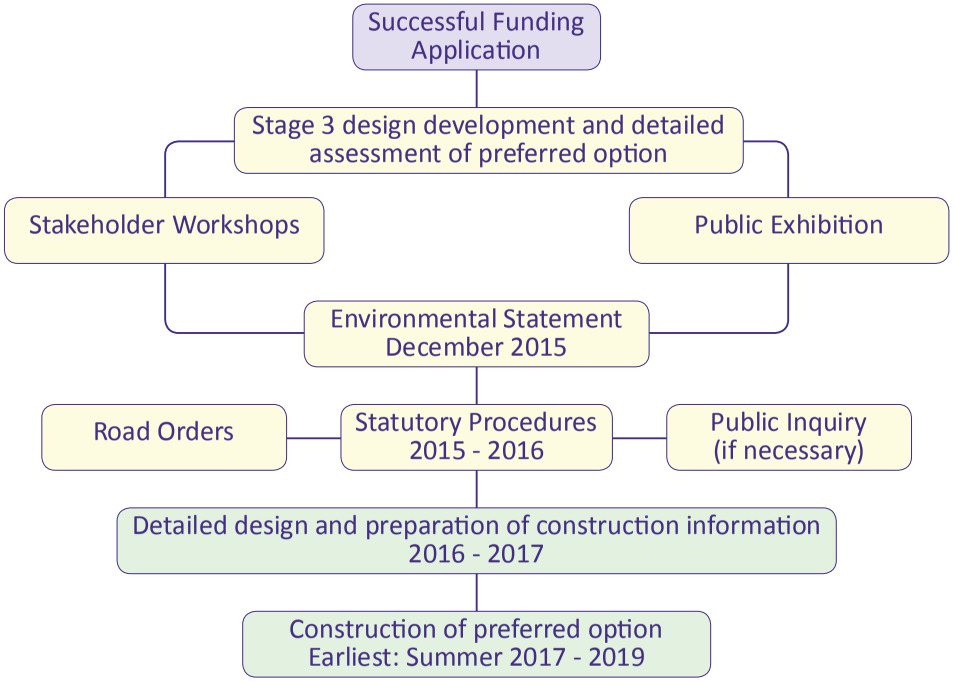
Feel free to take a copy of the exhibition leaflet which provides a summary of the scheme to date. We welcome your feedback and invite you to complete a comment sheet which can be left in the box provided or returned by post. If returning by post please do so no later than 11 April 2014.

Next Steps

The Highland Council will consider all the views expressed during this exhibition as they finalise the route option selection.

Further design and environmental work will continue to be undertaken, incorporating your comments, and will feed into the Stage 2 report, leading to the selection of a perferred option. It is anticipated that the Stage 2 report will be delivered in May/ June 2014, with The Highland Council selecting their preferred route in August 2014.

Future Work



Appendix 4c – Supplementary Information Issued to SEPA:

- Constructing Roads Over Peat and Peat Management, Technical Note
- Matrix of Proposed Peat Treatments
- Watercourse Crossings Based on Proposed Route Alignments (at January 2014)

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A890 Stromeferry Bypass

Constructing Roads Over Peat and Peat Management, Technical Note

February 2014

Prepared for:
The Highland Council

UNITED KINGDOM & IRELAND

REVISION SCHEDULE					
Rev	**Date**	**Details**	**Prepared by**	**Checked by**	**Approved by**
1	February 2014	Constructing Roads Over Peat and Peat Management, Technical Note	Richard Allan Engineering Geologist	Peter Morgan Associate	David Taylor Technical Director

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TABLE OF CONTENTS

1. INTRODUCTION

1.1 Background

The A890 serves as the main link road down the west coast of Scotland and is also a significant transit for east-west traffic travelling between the Isle of Skye and Inverness. The A890 is mainly single carriageway but frequently reduces to single track with passing places along the stretch between Attadale and Ardnarff.

The road was opened in 1970 following the excavation of a number of rock slopes for the road alignment. There has been a long history of rockfall at the site since, resulting at times in a road closure and a 140 mile diversion and as such, various re-route options are currently under review, including a route to the north (requiring a bridge crossing), several online route options (such as a sidelong viaduct across Loch Carron, an inland tunnel, avalanche shelter extension, etc.) and a southern route option along Glen Udalain Valley.

1.2 Scope of Work

The scope of this Technical Note is to provide a summary of:-

- The geotechnical constraints peat can have on road construction;
- Current guidance / best practice for the construction of roads in areas of peatland to assist in the appraisal of the re-route options;
- Guidance on the management of peat; and
- Ground investigation works that may be required to investigate peat conditions within the selected road alignment corridors.

1.3 Objectives

The objectives of this Technical Note are to provide the following:-

- A brief summary of the realignment options with regards to location and peat conditions;
- A description of peat and the geotechnical constraints associated with this soil type;
- A summary of guidance on Scottish Environment Protection Agency's (SEPA's) regulatory position with regards to development on peat;
- Guidance on peat management before and during the construction phase;
- A list of guidance documents for road construction within peatlands; and
- Information on ground investigation works required to investigate peat.

While the Design Manual for Roads and Bridges (DMRB) does not contain specific information on constructing public highways through peat or on peat management, it is essential that potential impacts on peatlands are considered from an early design stage.

Development of upland areas and peat has increased in recent years, mainly due to the development of wind farms. Typically issues with peat are considered within the following design guidance documents generally used during the detailed design process:-

TABLE 1.1:- PEAT DOCUMENTS	
Document	**Description**
Peat Stability Assessment (PSA)	Assesses the risk of peat slides occurring at the site prior to and following construction and identifies areas within the site at a higher risk of peat instability, thus areas where development should be avoided. Peat probing and coring is required as a minimum to inform the assessment.
Geotechnical Risk Register (GRR)	Usually contained within the PSA as an appendix. A GRR is a tool used as a means of identifying and recording peat conditions and an aid to assessing the risk of peat failure at the specified site. It is a dynamic document, which should be created at an early project stage and updated throughout the GI / construction phase as more information relating to peat becomes available / is measured.
Peat Management Plan (PMP)	A PMP is a tool used to establish how peat excavated during construction will be managed to avoid or minimise disturbance to the peat and to maximise the re-use. It can also provide estimated calculations (based on ground investigation information) of the volume of peat required to be excavated and re-used. Recommended mitigation measures for use during construction are included.

The PSA and GRR may be required to assist in the finalised road alignment. A PMP should be produced once the proposed road alignment has been finalised, at DMRB Stage 3.

It should be noted that this document only discusses the Peat Management Plan appropriate for a Stage 2 Feasibility Study, and no detailed site investigation / peat probing has been carried out / is proposed at this stage. Dealing with peat has been included within the overall project Risk Register.

2. ROUTE LOCATIONS AND GEOLOGICAL CONDITIONS

2.1 Location

The potential realignment options which will allow a stretch of the A890 adjacent to Loch Carron in the Scottish Highlands to be bypassed, consist of three corridors which are generally 1km in width (locally wider).

The routes are centred on Loch Carron and generally connect the A890 at Achmore to the A890 at Strathcarron Junction. The approximate site centre is at National Grid Reference 190891, 838781.

The northern corridor options follow the A890 from Achmore to Craeg Mhaol before crossing Loch Carron to Leacanasigh via a new bridge or tunnel, and then follow an existing road to Strome Wood. The route is then proposed either to continue along the existing road where it joins the A896 at Lochcarron to the Strathcarron Junction; or head northeast and off-line along a new section of road, crossing the A896 to the north of Lochcarron and then continue on the new road between the A896 crossing point and Kirkton, where it re-joins the A896 to the Strathcarron Junction.

The 'online' corridor follows the existing route along the A890 between Stromeferry and the Strathcarron Junction with a proposed upgrade of the existing route, with either an extended avalanche shelter, viaduct / embankment along Loch Carron, localised proposed tunnel or remediated rock slopes.

The southern corridor connects the A890 from Achmore / Braeintra to the A890 at Attadale via an inland diversion through the Glen Udalain, Glen Ling and River Attadale Valleys.

2.2 Geology

Information regarding the geological conditions at the site was obtained from available published geological sheets (Ref. 1) and a peat map (Ref. 2, included in Appendix B) and is summarised below for each of the corridor options:-

1 BGS 1:50,000 Solid and Drift Geological Sheet 81E, Loch Torridon and 82, Lochcarron.

2 URS (2013). *Stromeferry Walkover Survey, Appendix 3: Peat Locations* (Drawing Ref. 47065297 – JB1). Reproduced from BGS Data taken from *http://www.bgs.ac.uk/data/mapViewers/*

TABLE 2.1:- GEOLOGY	
Route Name	**Geological Description**
Northern Route Corridor	Where mapped, the superficial deposits along the majority of the northern corridor are recorded to comprise moraine and undifferentiated drift and some peat, with the exception of the stretch from Kirkton to Strathcarron Junction, which is recorded to be underlain by freshwater alluvia. No indication of the depth of the superficial deposits is given; however they are not consistently mapped across the site indicating that they may be thin or absent. Geological maps record peat in various areas along the route including to the west and northeast of Creag Mhaol in the southwest of the corridor; to the north of Lochcarron in the northern-central section of the corridor; and near the Strathcarron Junction in the northeast of the corridor. Around Stromeferry and Ardnarff the solid strata is changeable with massive and foliated pyroxenic hornblendic and micaceous gneiss affected by post-Cambrian movement; epidiorite and hornblende-schist affected by post-Cambrian movement; and flaggy quartz-feldspar granulite being recorded. Around Stromemore the routes were recorded to be underlain by massive and foliated pyroxenic hornblendic and micaceous gneiss affected by post-Cambrian movement and epidiorite and hornblende-schist affected by post-Cambrian movement. Beyond that, myolonite was recorded up to, and around, Slumbay Island, with the remainder of the routes being underlain by undifferentiated granulitic schists of the Moine Series. The solid strata were generally recorded to dip towards Loch Carron at an unspecified angle.
Online Route Corridor	Where superficial deposits are mapped they are generally recorded to comprise moraine and undifferentiated drift and some peat. Beneath the head of Loch Carron, the superficial deposits are recorded to comprise marine alluvia. No indication of the depth of the superficial deposits is given; however they are not consistently mapped across the site indicating that they may be thin or absent. Geological maps record peat between Stromeferry and Ardnarff in the southwest of the online corridor; surrounding the summit of Cnoc Nam Mult hill in the south of the central section of the site; and around Strathcarron Junction in the north of the corridor. It should be noted that the peat in the southwest and central areas of this corridor are shown on the hillside above the existing road and therefore are unlikely to be impacted on this option unless remediation of the rock slope profile results in rock cuttings up-slope. Peat around Strathcarron Junction may still be impacted on this option. The solid strata vary across the route. Around Stromeferry and Ardnarff in the southwest of the route the strata is particularly changeable with massive and foliated pyroxenic hornblendic and micaceous gneiss affected by post-Cambrian movement; epidiorite and hornblende-schist affected by post-Cambrian movement; and flaggy quartz-feldspar granulite being noted. Along the remainder of the route, granulitic schists of the Moine series are noted to underlie the route. However, the strata immediately to the south of the route along Loch Carron are recorded to comprise acid and hornblendic gneiss, amphibolite; and pelitic gneiss. The recorded dip direction varied from southeast, to east, to northeast. No angle of dip was recorded.

TABLE 2.1:- GEOLOGY	
Route Name	**Geological Description**
Southern Route Corridor	Where mapped, the superficial deposits along the routes are recorded to comprise morainic deposits with some undifferentiated drift and peat. No indication of the depth of the superficial deposits is given; however they are not consistently mapped across the site indicating that they may be thin or absent. Geological maps record peat several extensive areas of peat in the southwest of this corridor. These are typically located around the hill Meall Ailein and to the north and south of Carn na Creige hill. A large area of peat is recorded to extend across the full width of the proposed development corridor to the north of Loch Innis nan Seangan in the south of the corridor. Peat is also recorded at Strathcarron Junction in the north of this corridor. The solid strata were recorded to comprise undifferentiated granulitic schists of the Moine Series, and were noted to dip to the south east at an unspecified angle.

It should be noted that peat is generally only identified on maps where the material is in excess of 1m thick and other areas of unrecorded peat may be present in the proposed route corridors.

3. DEFINITION OF PEAT AND GEOTECHNICAL CONSTRAINTS

3.1 Definition

Peat is a biogenic soil comprising partially decomposed plant remains and organic matter. It exhibits low bulk density and high carbon content which, when fully saturated, can comprise up to 90-95% water with 5-10% solid matter. It can be particularly sensitive to changes in rainfall and subsequent surface and groundwater changes.

Some properties of peat are similar to the behaviours of clay, but due to the extremely high water content of the peat, simple relations with material strength cannot be easily established.

Due to its high compressibility, low tensile strength and degenerative nature, the material is not considered to be a suitable medium for most developments, with some exceptions (such as floating roads constructed for forestry and wind farm developments).

3.2 Geotechnical Constraints Associated with Peat

The following geotechnical constraints are associated with construction within peat and may require consideration when designing the proposed route:-

TABLE 3.1:- GEOTECHNICAL CONSTRAINTS ASSOCIATED WITH PEAT

Constraint	Comments
High compressibility	Results in rapid and unacceptable settlement conditions.
Very low shear strength	The shear strength of peat is dependent on the moisture content and degree of humification (decomposition) of the soil. However, peat typically has a very low shear strength, which affects the stability of the deposits. Due to the variable nature of peat, the difficulties in obtaining acceptable representative samples and difficulties transporting back to a laboratory for analysis without deterioration of the structure of the peat, obtaining meaningful shear strength values is difficult. In addition, in situ field tests also have their limitations. Literature reports a great variation of shear strength for peat, however MacFarlane (Ref. 3) suggests the in-situ shear strength will generally be within the range of 4kPa to 20kPa.
pH & sulphate	pH and sulphate concentrations of the peat could be aggressive to concrete structures in contact with peat and the concrete class will therefore be required to be established throughout the vertical extent of the peat. Peat can be highly variable over relatively short distances (both vertically and laterally) and this should be taken into consideration when considering ground investigation design and testing in peat.
Gas generating potential	Peat can produce high concentrations of gas, which could be a risk to workers during the construction phase or sub-surface structures.
High water content / saturated peat	Deep excavations may require pumping / dewatering.

3 MacFarlane, I.C. (1969). *The Muskeg Engineering Handbook,* National Research Council of Canada.

TABLE 3.1:- GEOTECHNICAL CONSTRAINTS ASSOCIATED WITH PEAT	
Constraint	**Comments**
Stability	Due to the high moisture content and low shear strength, peat deposits can be unpredictable and may result in peat slides / bog bursts. Human activities can increase the risk of instability of peat deposits if not suitably managed and if relevant mitigation measures are not employed during construction.
Excavated peat	Peat can only be reused on-site if there is a specific purpose (e.g. turfs used for landscaping slopes). It may also be possible to re-use peat off-site on schemes where there is a deficit of landscaping material. However this would require to be approved by SEPA and the Local Authority. The remaining excavated peat is waste and requires to be taken to an offsite registered landfill.
Low internal angle of friction	The low friction angle of this material means that it can be unstable even at relatively shallow angles. This has to be taken into consideration when designing cut slopes through peat or using peat to dress cut / fill slopes.

4. AVAILABLE GUIDANCE DOCUMENTS

4.1 Available Guidance Documents

The Design Manual for Roads and Bridges (DMRB) does not contain specific information on constructing public highways through peat.

A number of sources of information relating to best practice construction methods and peatland surveys for forestry roads and wind farms are available. Although these may not be directly related to the construction of public roads, following the relevant methodologies, procedures and employing mitigation measures relevant to the development and construction activities should reduce risks to the environment and human health and reduce costs during the construction phase, subject to acceptance by the overseeing highways authority. These sources are as follows:-

- *Guidelines for the Risk Management of Peat Slips on the Construction of Low Volume / Low Cost Roads Over Peat* (Ref. 4);
- *SEPA Regulatory Position Statement – Developments on Peat* (Ref. 5);
- *Floating Roads on Peat* (Ref. 6);
- *Good Practice During Wind Farm Construction* (Ref. 7);
- *Guidance – Developments on Peatland: Site Surveys* (Ref. 8).
- *Developments on peatland: guidance on the assessment of peat volumes, reuse of excavated peat and the minimisation of waste* (Ref. 9).
- ROADEX Network website (Ref. 10).

4 Forestry Civil Engineering (January 2006). *Guidance for the Risk Management of Peat Slips on the Construction of Low Volume / Low Cost Roads Over Peat.*

5 SEPA (February 2010). *SEPA Regulatory Position Statement – Developments on Peat.*

6 SNH and Forestry Commission Scotland (FCS) (August 2010). *Floating Roads on Peat.*

7 Scottish Renewables, Scottish Natural Heritage (SNH), Scottish Environment Protection Agency (SEPA) and FCS (October 2010). *Good Practice During Windfarm Construction.*

8 SNH, SEPA, Scottish Government and James Hutton Institute (August 2011). *Guidance – Developments on Peatland: Site Surveys.*

9 Scottish Renewables and SEPA (2012). *Developments on peatland: guidance on the assessment of peat volumes, reuse of excavated peat and the minimisation of waste.*

10 http://www.roadex.org/

5. OPTIONS FOR ROAD CONSTUCTION

Section 3 of this document demonstrates that peat is not generally considered a suitable medium for the construction of foundations and roads either within, or above, due to its highly compressible and degenerative nature. The DMRB (which provides official standards, advice notes and other documents relating to the design, assessment and operation of roads in the UK) does not contain specific guidance on constructing public highways through peat.

There is support for the construction of floating roads over peat for 'low volume' roads, typically consisting of temporary private roads constructed on forestry and wind farm sites (Ref. 4, 6, 7 & 10), largely due to the reduction of the carbon off-set for these environmentally sensitive projects. However this is generally not considered to be a suitable option for the construction of public highways as the variable, unpredictable loadings could result in floating sections sinking, cracking or failing completely and therefore require regular inspection of the condition and repair of sections susceptible to settlement.

Furthermore, this could result in unacceptable and dangerous driving surfaces and for these reasons is generally not considered an appropriate option for the construction of public roads.

The method of construction is typically site specific and selected following the detailed design stage. The method of construction may also depend on Contractor design and approach to risk. However, potential options for the construction of roads, along with an assessment of the suitability of the option are provided in Table 5.1 below:-

TABLE 5.1:- CONSTRUCTION TECHNIQUE		
Technique	**Options**	**Comment / Considerations**
Avoid areas of peat	The most favourable (and possibly cheapest) approach would be to obtain sufficient ground investigation information to design the road alignment to avoid areas of peat (where possible). Total avoidance may not be possible, but robust GI information should help to avoid the deepest peat and therefore minimise disturbance to the peat.	Robust GI required to delineate the extent of peat (both vertically and laterally across the routes) to assist in the design of the best route. See Section 9 for more details. **Avoidance of peat / avoidance of deepest areas of peat (where possible) is considered the best option. It is advised that this is considered in the design of the road at the detailed design stage. It is understood, however, that other considerations (such as ecological, ornithological, visual impact, etc.) will also be required to be taken into account when considering the proposed route.**

TABLE 5.1:- CONSTRUCTION TECHNIQUE		
Technique	**Options**	**Comment / Considerations**
Excavate peat	Remove all peat and any other organic, soft or otherwise unsuitable material from beneath the proposed road and embankments and replace with suitably compacted granular fill up to the proposed road level.	The total volume of peat to be excavated will require consideration. Cognisance will also be required of the possibility of other organic, soft or otherwise unsuitable material beneath the peat, the extent of the embankments and excavation carried out at an angle such that instability of the peat is not an issue. Drainage design may require approval from SEPA and should demonstrate that the use of free draining material shall not cause excessive drainage of some areas and oversaturation of other areas. It may also need to demonstrate that it will not affect the hydrology of raised bogs / blanket bogs / wetlands. Proposals for the on-site re-use of peat will require approval from SEPA (See Section 6.3). Waste peat shall require to be disposed of. SEPA should be contacted in this regard (See Section 6.5). On-site management of excavated peat is detailed in Section 7.4. Gas generation of the peat may be an issue for personnel working within excavations. Gas monitoring will be necessary before and during construction. Although Contractors views may differ, and site specific conditions will likely be of influence, an arbitrary depth of 5m for initial costing purposes can be considered as the maximum depth to which a Contractor will excavate. **Excavation of peat and founding the road directly on top of suitable underlying or imported material is considered to be an option. However, consideration of the re-use of excavated peat on-site will be required to minimise waste peat being taken to an off-site landfill and therefore minimise the environmental impact of the proposed scheme.**

TABLE 5.1:- CONSTRUCTION TECHNIQUE		
Technique	**Options**	**Comment / Considerations**
Piling	Piles are used to transmit loads through soil strata of low bearing capacity to deeper soil or rock strata having a high bearing capacity.	Piles are commonly used for road projects. They will reduce the volume waste peat produced during construction and minimise the disturbance to the peat. **Piles are considered to be a suitable option for constructing peat over deeper areas of peat (generally where peat is in excess of 5m), where avoidance of deeper peat is not possible. The requirement for piling can be specific to the ground conditions and Contractor methodologies.**
Floating	Floating roads over the peat using geotextiles to spread the load of the road and traffic.	Typically used in low volume traffic, private or temporary roads. Highly compressible peat along with variable loadings of the proposed road are likely to result in settlement / cracking / failing of the road and therefore unsafe driving conditions. On-going inspections and maintenance works would be required. **Floating roads method of construction has generally not considered to be suitable for public roads given these limitations.**

TABLE 5.1:- CONSTRUCTION TECHNIQUE		
Technique	**Options**	**Comment / Considerations**
Vibro-replacement	*Vibro-stone columns:-* Vertical boreholes drilled into the ground and filled upwards with gravel compacted by means of a vibrator.	For soft soil layers of less than 4m or in excess of 20m, other techniques are likely to be more effective. In very soft soils (c_u <15kPa) stone columns are not applicable due to the lack of lateral support of the soil. As stated in Section 3.2, the shear strength of peat is generally between 4kPa and 20kPa and can vary considerably over short distanced both vertically and horizontally. Vibro-replacement is therefore not likely to be achievable through peat. Because of the high compressibility of peat and organic soils, little lateral support may be developed and large vertical deflections of the columns may result. When the thickness of the organic layer is greater than 1 to 2 stone column diameters, vibro-replacement should not be used. The lack of lateral resistance associated with the very soft soils may result in the column displacing into the peat and therefore be rendered unsuitable for use. **Vibro-replacement methods are generally not considered to be a suitable option for ground improvement through peat.**
	Vibro-concrete columns:- Using a special auger, grout is added to the gravel of the columns. Thus, the column stiffness and resistance is higher.	

In summary, the avoidance of peat is considered to be the best option where this is possible. Where it cannot be avoided, excavation of peat and founding the road on suitable underlying / imported material may be considered. The depth of excavation will depend on a number of factors (such as the design of the road and the Contractor) however an arbitrary maximum depth of 5m excavation may be considered appropriate at this stage. Beyond a depth of 5m, a piled solution may be considered.

It should be noted that a combination of suitable construction methods may be required across the length of the development for all options.

6. THE WASTE HIERARCHY

6.1 General

The definition of waste given in the Waste Framework Directive (75/442/EEC) is: *'any substance or object in the categories set out in Annex 1 which the holder discards or intends or is required to discard'*.

Where potential re-use options for peat have been identified at a site, the excavated peat is not always suitable for the proposed uses (for example due to instability / slide risk; peat may be too liquid for re-use; re-use option may not demonstrate an ecological benefit to the area; etc.). In such cases, peat may be regarded as a waste in law, meaning regulatory controls must be applied to its storage, treatment recovery and / or disposal.

Article 4 of the Revised Waste Framework Directive introduces the waste hierarchy which is to be applied as a priority order in waste prevention and management legislation and policy.

The waste hierarchy is as follows:-

1. Prevention;
2. Preparing for re-use;
3. Recycling;
4. Other recovery e.g. energy recovery; and
5. Disposal.

Where peat does not have a genuine, identified and legitimate re-use, it is likely that the peat will be classified as a waste material. Decisions on whether a particular substance, object or material is a waste must be considered on a case by case basis.

6.2 Prevention

Preventing the disturbance to peat can be managed by designing the proposed road alignment adequately. Following the *'Guidance – Developments on Peatland: Site Surveys'* guidance note (Ref. 8), this may involve a phased ground investigation approach, usually carried out at DMRB Stage 3, once the preferred route corridor is identified, as follows:-

Phase 1

Peat probing across the corridor on a 100m grid. This will allow a peat contour plan to be created, which will help to identify thicker areas of peat to avoid and assist the development of a preliminary route alignment.

Phase 2

Additional targeted peat probing and coring along the proposed road alignment at 50m centres along the preliminary route alignment and either side within a micro-siting corridor. This more targeted probing / coring will help to micro-site the route alignment. The phase 2 peat survey can be carried out at the same time as the detailed ground investigation for design, but should be noted that any micro-siting of the road alignment may require further ground investigation to be carried out.

A phased approach as outlined above should provide comprehensive information on the peat conditions at the site.

Compilation and use of a site specific Site Waste Management Plan (SWMP) can also help to reduce peat disturbance, as well as the production of a Peat Management Plan (PMP).

Where thick peat deposits are unavoidable, suitable construction techniques (such as piling) may be an option to minimise peat disturbance.

6.3 Re-use

Developers should attempt to re-use as much peat as is possible. Re-use strategies for excavated peat should be identified and SEPA should be consulted on any proposed re-use activities to determine whether these should be classified as waste activities and what regulatory requirements are associated with the proposals (e.g. exemptions, permits, etc.).

SEPA will seek to ensure that there are no risks to the environment or human health associated with the proposed activities.

The fact that materials have a potential re-use within the site boundary is not sufficient in itself to say that they are not waste. For example, where there is no justified requirement or demonstrable need for the peat to be used or it is clearly not suitable for the intended use, it will likely be classed as a disposal operation and the proposed activity will require authorisation from SEPA accordingly.

Examples of where peat may be re-used on a site include (following approval from SEPA, SNH, Local Authority, etc. as required):-

- Restoration of road edges, embankments and cut slopes (to reduce the visual impact of the construction works). This will generally be limited to the use of the peat turves and upper acrotelmic material and will not general fall under waste management controls as the peat turves would not be classified as waste in these circumstances.
- Drainage ditch blocking as part of restoration proposals for raising water tables to restore blanket or raised bog, carried out in accordance with existing guidance and advice from SNH.
- Used to cover the base of borrow pits once quarrying has ceased. The developer must, however, demonstrate that the use of waste peat will have an ecological benefit. A waste exemption may be applicable in this case.

The re-use of waste peat shall not be permitted in the following circumstances:-

- To create excessive ‘shoulders’ on road edges or cut slopes.
- Spreading across existing vegetation or recently felled areas of woodland as there is no ecological benefit and smothers the existing vegetation.
- To fill borrow pits (unless carried out under a Pollution Prevention and Control (PPC) Permit – see *Disposal* section below).

6.4 Recycling / Recovery / Treatment

Examples of recycling / recovery / treatment of waste peat include the following:-

- Use as a fuel for personal or commercial purpose;
- Use as a compost / fertiliser; and
- Stabilisation of waste peat by mixing with other substances (such as cement binder). However there can be environmental disadvantages to this option.

These activities will likely require approval from SEPA.

6.5 Disposal

Where none of the above options is practicable and waste peat is identified at the site, the only remaining option may be disposal.

Any intention by the developer to dispose of waste peat, for example, into an on-site borrow pit, will require a PPC Landfill Permit.

Another disposal option available to developers is disposal of waste peat at a commercial, permitted landfill off-site. This option would require the developers to take into consideration landfill tax, transport costs, etc.

If the peat loses much of its integral structure, it may be classed as a 'liquid waste'. If this occurs, SEPA would not issue a PPC Permit for either on-site or off-site disposal without some form of pre-treatment.

Where there is no justified requirement or demonstrated need for peat to be re-used or where the peat is unsuitable for the intended use it is likely to be classified as a waste and any activity involving it classed as a disposal activity.

SEPA should be consulted on any disposal proposals at as early a stage as possible.

7. PEAT MANAGEMENT GUIDANCE

7.1 General

On sites where significant peat is proposed to be excavated and re-used or otherwise disturbed, a Peat Management Plan (PMP) should be created to identify the methodology of excavation and outline the proposed re-use options. The document should provide site specific information on peat conditions at the site (such as thicknesses, morphology and descriptions from ground investigation, etc.), approximate volumes of peat that may be excavated during the construction operation, how the peat will be handled, and where the peat will be reused, if anywhere.

The following sub-headings provide some information on the PMP and mitigation measures. However, additional information should be collected and used to create and compile a site specific PMP prior to the construction phase.

7.2 Note on the Classification of Peat

Peat generally consists of two distinct soil layers: the upper acrotelm and the underlying catotelm.

The acrotelm is the upper layer in which water table fluctuations generally occur. Its thickness usually varies between 0.3 m and 0.5 m, depending on the habitat (some literature quotes thicknesses of up to 1m).

The catotelm is the lower layer of peat that is permanently below the water table. Under these anaerobic conditions, microbial activity and peat decomposition is very slow. The catotelm comprises relatively decomposed compacted peat, and water movements are slow.

To further categorise peat, the 'von Post' scale of humification provides guidance on how to classify peat based on the degree of decomposition (ranging from H1 (completely undecomposed) to H10 (completely decomposed)). It also provides a visual field description of water content (B1 (very low moisture content) to B5 (very high moisture content)).

Information should be collected on the morphology of peat during the ground investigation phase. This information should be supplemented with additional information collected during the construction phase, which can be fed into a Geotechnical Risk Register (GRR) as the construction works progress.

7.3 Peat Conditions

Peat conditions should be determined through a site walkover and ground investigation information. Information on recorded peat thickness and morphology of the peat together with any laboratory test results for the peat should be reported within the PMP.

It should be noted that peat can be highly variable in nature and can vary considerably in thickness and characteristics across relatively short distances, both vertically and laterally.

Within areas of deeper peat, the soils are likely to have generally higher moisture content and layers of fibrous through to amorphous peat may be present within the soil profile.

Information from the ground investigation will allow a peat thickness plan to be created to give an indication of peat thicknesses along the corridor routes and would assist in the final design layout.

7.4 Excavation and Reuse Volume Estimates, and Reuse Requirements

7.4.1 *Peat-generating Activities*

The following activities are may generate volumes of peat and / or disturb the peat during the development of this project:-

- Excavations for the road alignment;
- Construction of road embankments / cuttings;
- Construction of parking laybys and viewpoints;
- Service trenches;
- Drainage systems; and
- Piling construction methods.

7.4.2 *Estimated Peat Volumes Generated*

An estimate of the volume of peat that may be excavated should be calculated. This should use ground investigation information obtained along the route in the calculations. The calculations should provide estimated volumes of acrotelmic and catotelmic peat as well as the overall volume of excavated peat.

It should be noted that the volume that will be provided will only be an estimate based on the average peat thickness between probe locations and topography over the length of the proposed road.

7.4.3 *Use of Peat in Borrow Pit Restoration*

Should borrow pits be used to win aggregate for the development of the road (as opposed to importing rock from a local quarry), peat may be re-used within borrow pits for the purpose of their restoration. However, the method of re-use and final restoration profile must be in keeping with the overall habitat, environmental reinstatement objectives and requirements at the site and present no residual risks from pollution to the environment or harm to human health.

Restoration should be carried out in a manner that promotes re-growth and prompt re-generation of the peat used for reinstatement. Methods should include placing acrotelmic material at the surface, turf-side up. Re-seeding may be carried out if approval is given by the site Ecologist prior to undertaking, to ensure that an appropriate seeding mix is used and is in keeping with the surrounding habitats.

All necessary measures, such as periodic wetting, should be carried out to prevent desiccation of the peat, which leads to carbon loss.

Only the quantity necessary for landscaping / peatland restoration should be used and the use of excessive volumes should be avoided.

Containment should be assessed to ensure that peat used in the restoration of borrow pits will not slide / creep from the location of placement. Potential environmental receptors downslope of the borrow pits due to be restored should be identified.

Care should be taken in the transportation and placement of peat so as to not cause unnecessary degradation to the peat. If the peat loses much of its integral strength and degrades into a ‘liquid’ form, treatment will be required prior to re-use.

The thickness of peat within the borrow pit restoration will not exceed 1m at any point within the borrow pit.

As noted in Section 6, the proposed re-use of peat at borrow pits will require to be approved by the relevant regulators, such as SEPA, THC and SNH, before being carried out and it is advised to consult with them at as early a stage as possible.

7.4.4 *Use of Peat for Other Purposes*

Consideration should be given to all potential re-uses for peat in accordance with current guidance and best practice.

In terms of the potential peat re-use options (in addition to re-use within borrow pits), the following options may be suitable:-

- Reinstatement of road verges, cut slope faces and embankments; and
- Restoration of degraded raised bogs (an Ecological survey would be required to identify areas, if any, where this would be an option).

Any proposals for the re-use of peat will require to be approved by SEPA, SNH and THC before being carried out. It is also recommended that a site Ecologist is consulted before and during the construction works.

Where an excess of peat exists, the excess may be required to be taken off-site and into landfill.

7.4.5 *Handling Excavated Materials*

The following should be considered when handling peat:-

- Where cut-and-fill techniques will be used, superficial materials, including peat / peaty soils should be excavated out to a suitable bearing strata. Superficial materials should be separated carefully during excavation, to keep peat (and peaty soils) and other soil materials (e.g. weathered rock, gravels and clays) apart. Turves of peat (approximately 0.3m to 0.5m thick) should be cut and stored temporarily nearby, where possible. These peat turves may then be used to re-vegetate side slopes (turves shall be placed vegetation-up).
- Where peat is in excess of 0.5 m thick, the acrotelmic and catotelmic materials shall be separated, with the acrotelmic material being retained for surface *in-situ* reinstatement. No catotelmic peat is to be used at the surface.
- Care should be taken when excavating peat to ensure that the acrotelm and catotelm layers are not mixed during stripping and storing.
- Handling peat can cause the internal structure to deteriorate and therefore make it more of a hazard when stored. It is therefore recommended that haulage distances should be kept to a minimum. Ideally, peat should be used as close to where excavated as is practical.
- The removal of peat from the site is considered to be the least desirable environmental option, and should be avoided if at all possible.
- The principal contractor will be required to implement all necessary pollution prevention and drainage measures prior to commencement of any works on site.

7.4.6 *Temporary Peat Storage*

The following should be considered by the principal contractor (once appointed) when storing peat:-

- Where peat is excavated for road construction, the upper acrotelm will generally be able to be side-cast until the track has been constructed and then pulled back over to dress any exposed cuttings.
- When peat is required to be stockpiled for longer periods of time, it is best practice to stockpile on ground that does not consist of peat. Areas of ground covered by only a thin layer of peat should be scraped away prior to use as a storage area, so that the peat is stored directly on the underlying superficials / rock. When peat is required to be stockpiled directly on deeper peat accumulations, these areas are required to be fully risk assessed, documented in a GRR and agreed between the local authority, Geotechnical Technical Advisor and Ecologist. No peat should be stored on marginally stable ground or on any other area identified as 'at risk'.
- Where possible the peat should be excavated, stored and reused as turves. If this is not possible, the peat should be re-seeded with a seed mix sympathetic to the local plant life when it is re-used.
- It is considered best practice to place the catotelm down first and to carefully lay the acrotelm (vegetated-side up) on top. This will help promote growth and reduce drying out.
- Peat should not be stockpiled above a height of 2.0m, as this can lead to stability issues within the peat stockpile itself and on any underlying peat. The approximate height of peat stockpiles should be recorded on the GRR to ensure that this is monitored.
- Peat stockpiles should be stored with as shallow a side slope as possible, but no steeper than 1:4, due to the low internal angle of friction of peat soils. This will reduce the likelihood of peat stockpile side slopes from slumping / failing. The angle will depend on the nature of peat being stored.
- Peat should be stored and reused as close to the source of excavation as possible to reduce the haulage distance.
- Due to the programming of the works there may be a need for the temporary storage of peat spoil prior to its final deposition. Peat should generally not be stored for more than 3 months.
- To maintain the integrity of the peat while it is in storage it may be necessary to water it, particularly during hotter, drier months. Wherever possible, water should come from a local source (abstracted and piped / transported from a stream nearby (with necessary approvals)). Care should be taken to water the peat with a fairly fine spray to avoid run-off and / or oversaturation.
- Cut-off ditches and suitable treatment systems such as settlement ponds should be constructed where peat stockpiles are constructed. This will ensure that leachate and sediment from the peat will not reach a watercourse.
- Where peat is to be re-used in large quantities, consideration should be given to the placement of catotelmic materials in layers to the bottom of the excavation, with the more competent acrotelmic materials to the top.

Generally the Principal Contractor will be responsible for acquiring all necessary permits. Storage of peat will require a Waste Management Licence as a minimum and potentially a PPC Permit.

7.4.7 *Estimated Peat Volumes for Re-use*

An estimate of the volume of re-usable peat should be included within the PMP.

Peat re-use volume may vary from those quoted in the PMP during the construction works, depending on local variations in peat thickness and the quality of peat, and taking cognisance of the construction methods adopted during the works. However, minor changes in peat volumes can be easily incorporated into the works during the construction period.

8. MITIGATION MEASURES

To reduce disturbance to peat and minimise waste peat generation, the following mitigation measures should be implemented. It is recommended that the principal contractor is aware of these measures when working on site.

Prior to confirming final road alignment

- Sufficient ground investigation information is collected to allow the preparation of a peat contour plan to assist in the final alignment design and the compilation of a PMP (and PSA and GRR).
- The road alignment should be positioned in areas to avoid where peat is thickest.

During Detailed Design

- The drainage design will need to ensure that the hydrological regime is not significantly altered to the detriment of the peat on site.
- Consideration should be given to the use of peat as restoration / reinstatement material for road verges / cuttings where appropriate.

During Construction

- Stockpiles of peat will be used for reinstatement purposes as soon as possible to avoid drying out of peat;
- Peat haulage distances will be kept to a minimum and reuse of peat should take place as near to the site of excavation as possible;
- The upper turves of peat will not be mixed with the underlying catotelm and the turves will always be placed on top, vegetated-side-up, to encourage growth and rapid recovery;
- Stockpiles of peat can be no more than 2m in height, and should be placed away from any areas of *in situ* materials known to be unstable;
- Stockpiles of peat will be positioned a minimum of 10m from any watercourse (approval may be required from site Ecologist and / or SEPA);
- All mitigation measures applicable to construction will be monitored regularly to ensure they continue to be effective;
- The condition of all stockpiled peat materials will be monitored regularly and watered as appropriate to prevent desiccation of the peat soils;
- All areas of reinstatement / restoration, will be monitored and reviewed regularly to establish the success (or otherwise) of such measures, and to implement any recovery strategies as appropriate.

Other Measures

- On-going assessment of ground conditions will be undertaken during construction; the results of this will be input into a GRR. If a risk of peat failure is identified, monitoring of ground conditions using suitable geotechnical instrumentation (e.g. inclinometers, etc.) as recommended by the approved geotechnical personnel should be undertaken.

- When finalising the detailed design it is recommended that there are consultations between all relevant parties in relation to peat management at the site (e.g. Principal Contractor, Ecologist, Geotechnical Technical Advisor, Highways Authority, SEPA, SNH). This will ensure that contingencies can be planned and agreed to ensure site works can progress with minimal disruption due to unforeseen events.

9. FURTHER WORKS

In order to assist in the detailed design of the scheme layout and construction methods through areas of peatland, sufficient ground investigation works shall be required. The ground investigation will not only allow a PMP for the site to be produced, but will also inform and be used within the PSA and GRR. This should be done once the preferred route option corridor has been selected.

As DMRB does not provide guidance on peat, it is advisable to carry out peat probing where peat is likely to be present at DMRB Stage 3, following a similar phased approach as is recommended in the *'Guidance – Developments on Peatland: Site Surveys'* document (Ref. 8) as outlined below:-

Phase 1 – probe the areas on a schematic 100m^2 grid within the route corridor. This will allow a peat thickness contour plan to be produced which can be used for the initial conception layout.

Phase 2 – following the design freeze, probes at 50m centres along the centreline of the proposed route and at approximately 25m either side of the centreline (depending on agreed micro-siting corridor). Approximately 10% of the probed locations should be cored (using Russian Peat Coring equipment) to allow samples of peat to be obtained for logging and testing. This will allow micro-siting of the alignment to avoid deeper pockets of peat.

Note:- Peat probing should be carried out using Mackintosh probes and the full depth of peat should be probed.

The first phase of probing allows an initial road alignment to be designed, which avoids the deepest areas of peat, and therefore reduces the overall disturbance to the peat. The second more targeted phase of peat probing allows the initial road alignment to be micro-sited, where required.

It is proposed that any ground investigation for the detailed design of the proposed development includes allowance for intrusive investigation of the peat soils. The aim of the intrusive peat investigation works will be to obtain a better understanding of the nature of the peat soils as well as groundwater conditions beneath the site.

The investigation should include (as a minimum) the following elements:-

- Machine excavated trial pits for detailed examination and logging of peat soils;
- Window sample probe holes or boreholes to obtain information on the deeper peat deposits and the nature of the peat / substrate boundary;
- Installation of standpipes for groundwater monitoring; and
- Laboratory testing of peat soils including undisturbed samples if possible.

The phase 2 probing can be carried out at the same time as the ground investigation for detailed design (DMRB Stage 3). However, it should be noted that additional ground investigation may be required if significant micro-siting of the road alignment takes place. Information collected from the peat probing (and coring) and ground investigation should be used to compile a PMP (and PSA and update the GRR) for the site.

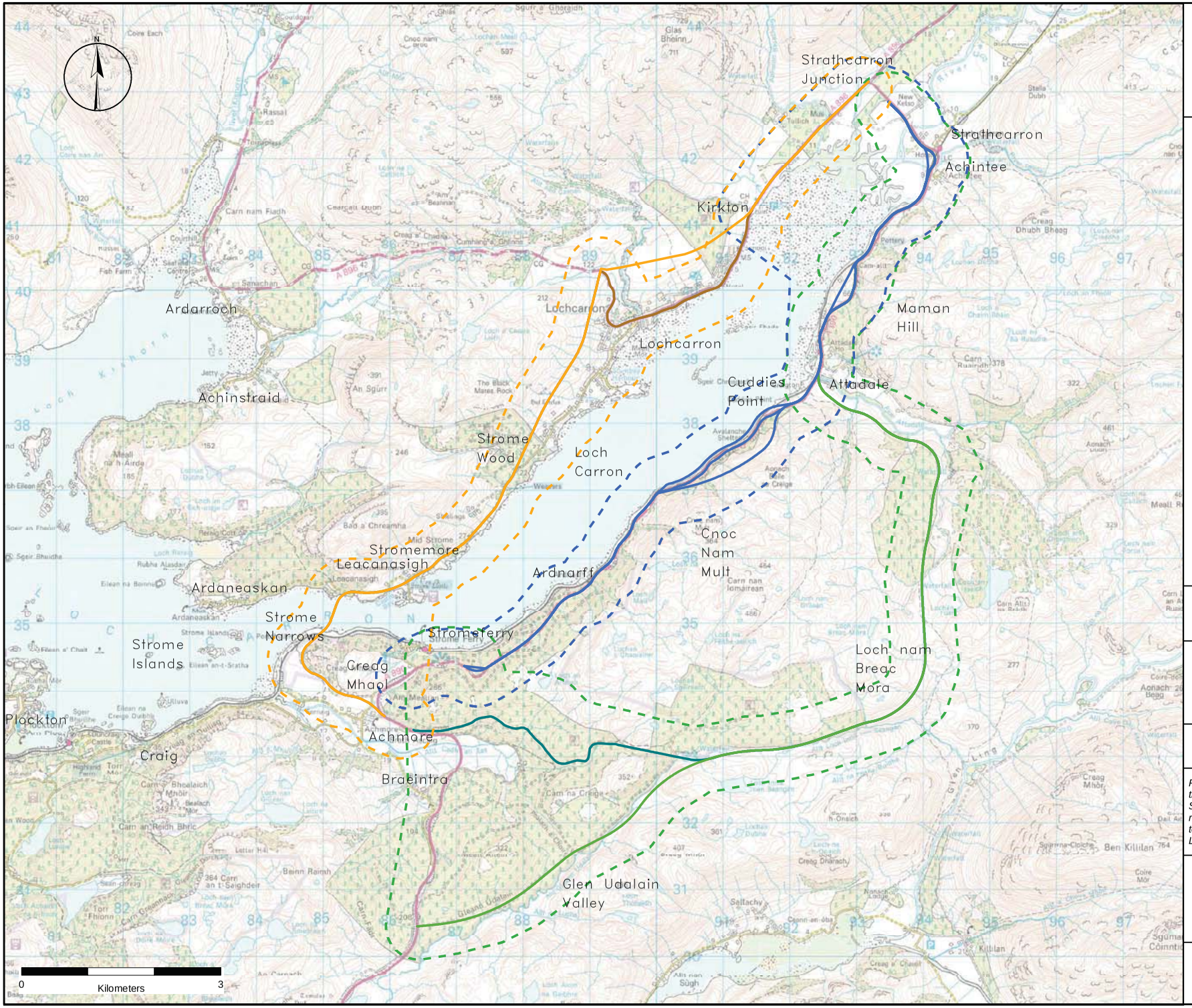
10. CONCLUSIONS

A summary of the conclusions are as follows:-

- Peat is an organic deposit that exhibits low bulk density, high carbon content, high water content, high compressibility and low tensile strength. Due to these limitations, it can be a difficult material to work with and should be managed appropriately.
- Peat is recorded on geological maps at discreet locations within all three corridor options and will require careful consideration for the chosen option during the detailed design stage.
- The DMRB does not contain specific information on construction roads through peat or on peat management. However, following documents relating to best practice construction methods for forestry roads and wind farms should reduce risks to the environment and human health and reduce costs during the construction phase.
- Various options for the construction in areas of peat have been discussed within this Technical Note; however the following options may be considered the most appropriate:-
  - *Avoidance of peat.* This is considered the best option wherever possible. It is recognised that total avoidance may not be possible.
  - *Excavation of peat.* Where it cannot be avoided, excavation of peat and founding the road on suitable underlying / imported material may be considered. The depth of excavation will depend on a number of factors.
  - *Piled solution.* Should the peat be considered too deep for excavation, a piled solution may be considered.
- Alternative solutions for construction of roads over peat, which have been applied to low volume or temporary roads elsewhere, such as floating and displacement techniques, may offer benefits to cost (although possibly only in the short term) and environmental impact. The limitations of these construction techniques would require careful consideration by designers, contractors and the Client.
- A combination of suitable construction methods may be required across the length of the development for all options.
- To assist in the design of the road layout and construction options, a phased peat probing / coring exercise should be undertaken along the chosen route option at DMRB Stage 3. Ground investigation works for the detailed design of the road should also collect information on peat.
- Where excavation of peat is proposed, careful consideration for the re-use of peat should be carried out and proposals discussed with SEPA. If no acceptable re-use options are identified, or if there is surplus peat following re-use of the material, it may be considered waste and disposal may be required. SEPA should be consulted on any disposal proposals.
- A matrix outlining proposed construction methods could be developed, based on various peat conditions recorded during the detailed ground investigation; such as peat thickness, peat morphology, length of section of road to be constructed through the area of peat, etc.
- A Peat Management Plan should be prepared (at DMRB Stage 3) which provides details on the peat conditions at the site, estimated volumes of peat generated, re-use proposals,

storage and handling of the material and mitigation measures to reduce the disturbance and minimise the generation of waste peat.

APPENDIX A - PRELIMINARY ROUTE OPTIONS PLAN



Key:

- Northern Routes Surveys Corridor (500m) — *Environmental Surveys*
- North Shore Route
- North Shore Alternative Route
- Online Routes Surveys Corridor (500m) — *Environmental Surveys*
- Online Routes
- Southern Routes Surveys Corridor (500m) — *Environmental Surveys*
- Southern Route
- Southern Alternative Link Route

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Title: Appendix 1: Survey Corridors

Drawing Number: 47065084 - APP1

Stromeferry Walkover Survey

APPENDIX B - PEAT LOCATIONS PLAN

URS

Legend

- North Shore Routes
- Southern Routes
- Online Routes
- North Shore Route 250m buffer
- North Shore Alternative Link Route 250m buffer
- Southern Route 250m buffer
- Southern Link Route 250m buffer
- Online Routes 250m buffer
- Peat (Reproduced from BGS Data)

Taken from http://www.bgs.ac.uk/data/mapViewers/

Client

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Appendix 3: Peat Locations

DWG 47065297 - JB1

Stromeferry Walkover Survey

STROMEFERRY BYPASS- MATRIX OF PROPOSED PEAT TREATMENTS

(*Note – Based on visual assessment and desk top research)

PROPOSED MATRIX FOR PEAT TREATMENT		
Estimated Depth	Treatment Type	Comment
0 – 5m	**A**: Excavate peat, replace with free draining rockfill to maintain drainage regime. Re-use peat for landscaping/verges.	Issues with supporting side slopes, consider end tipping/peat displacement with surcharge or lime stabilisation. Proposals for the re-use of peat will require to be approved by SEPA. Drainage design may require to be approved by SEPA to demonstrate that the use of free draining material won't cause excessive drainage of some areas and oversaturation of other areas. It may also need to demonstrate that it will not affect the hydrology of raised bogs / blanket bogs / wetlands.
Depth > 5m	**B:** Avoid area of peat and consider re-alignment of road corridor if possible	This will be the first consideration assessed, if peat depths of greater than 5m are encountered during peat probing of the proposed routes
5m to 10m	**C**: Develop floating road design with geo-grids/lightweight fills. Develop maintenance plan with possible interventions.	Drainage paths maintained
5m to 10m	**D**: Develop displacement solution with free draining rock fill, where suitable. Making use of surcharge, lightweight fills combined with band drains, maintains drainage paths.	Consider combination of lime stabilisation with surcharge. Drainage network to be considered. Drainage design may require to be approved by SEPA to demonstrate that the use of free draining material won't cause excessive drainage of some areas and oversaturation of other areas. It may also need to demonstrate that it will not affect the hydrology of raised bogs / blanket bogs / wetlands.
10m +	**E**: Develop pile solution, driven or CFA	Drainage paths maintained

(cont'd)

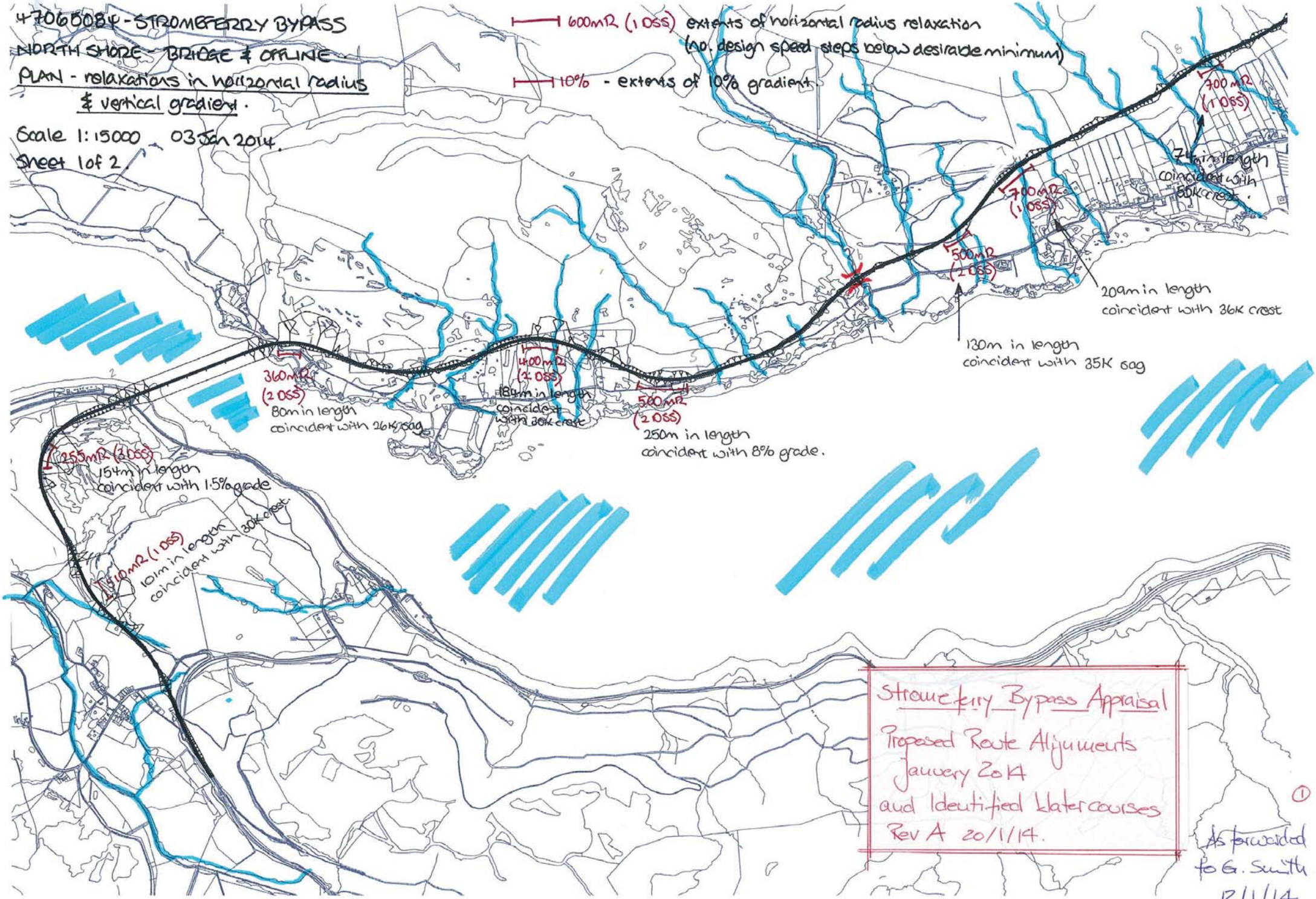
NORTHERN ROUTE			
Chainage	Estimated Depth	Treatment Type	Comment
1,920 to 2,370m	0 – 5m	**A**.	West of Creag Mhaol; sidelong slopes, route in cutting 1,700 to 2,000m
14,030m to end	5m to 10m	**B, C or D**	Section between Balnaglash bridge and Strathcarron Jct. Low lying wet area
ON-LINE ROUTE			
Chainage	Estimated Depth	Treatment Type	Comment
0,800 to 1,200m	0 – 5m	**A**	Steep hillside, potential stability issues, re-aligned road on fill
14,000 to 14,500m	5m to 10m	**-**	Section New Kelso to Strathcarron Jct. Assumed adopt existing carriageway.
SOUTHERN ROUTE			
Chainage	Estimated Depth	Treatment Type	Comment
1,940 to 2,120m	0 – 5m	**A**	Sidelong slopes, approx. 800m in cut, within forestry area
3,770 to 3,860m	0 – 5m	**A**	Localised area of peat in low lying ground, water crossing
4,670 to 5,040m	0 – 5m	**A**	Localised area of peat in low lying ground, water crossing
5,940 to 6,440m	approx. 10m +	**E**	Large area of peat, assume very deep and wet due to low lying ground, water crossing
7,400 to 7,600m	5m to 10m	**A or C,** depending on side slopes	Slightly steeper sidelong slopes, road on fill at watercrossing
14,000 to 14,500m	5m to 10m	**-**	Section New Kelso to Strathcarron Jct. Assumed adopt existing carriageway.

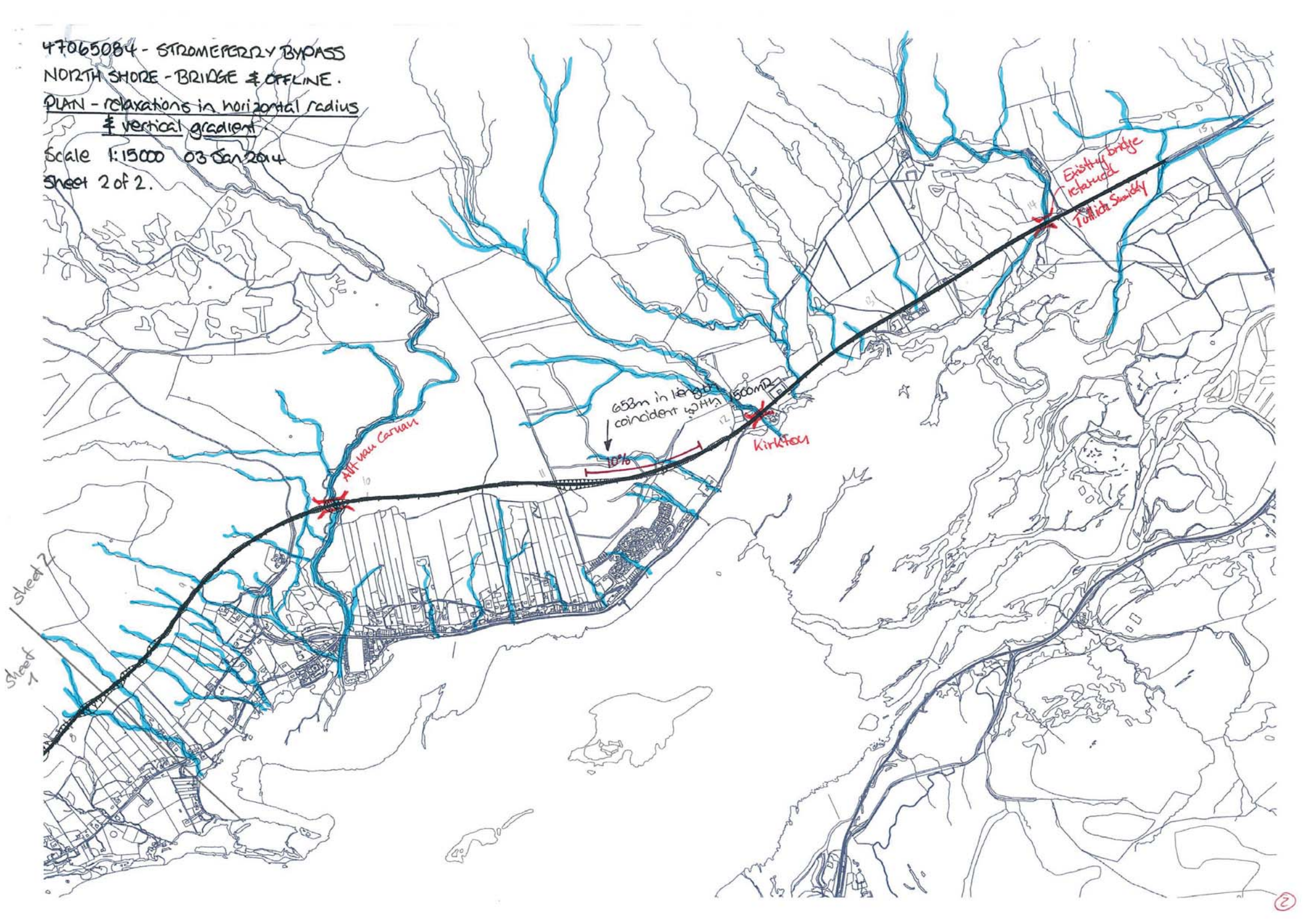
Assumptions:

1. Sections affected by peat in table above based on Drawing 47065297-JB1, Peat Locations
2. Assumptions to be verified by detailed ground investigation to define extent and depth of peat;
3. Possible minor route realignment following ground investigation where feasible;
4. Road embankments to be less than 3m in height.

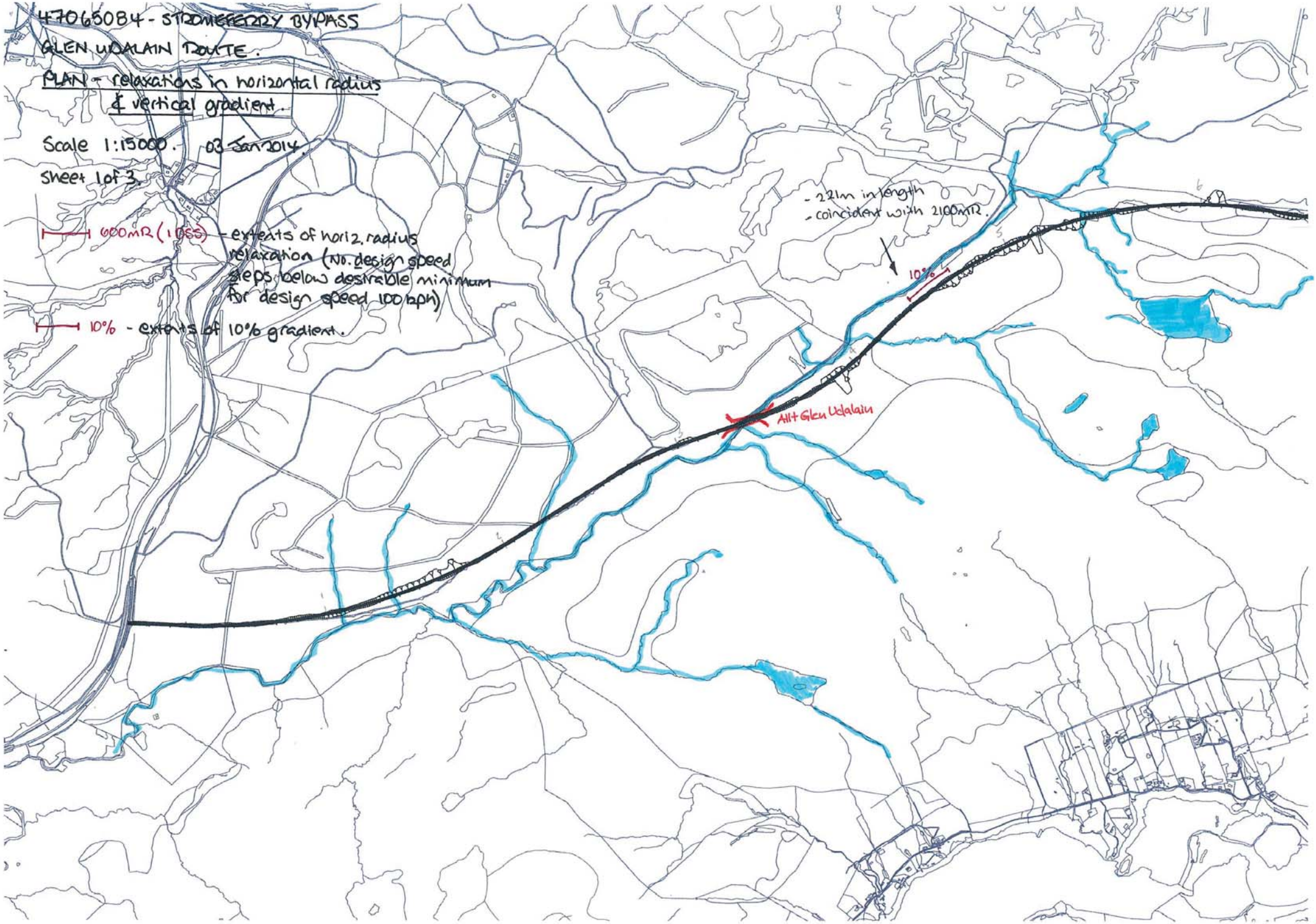
Watercourse Crossings based on proposed route alignments (January 2014):

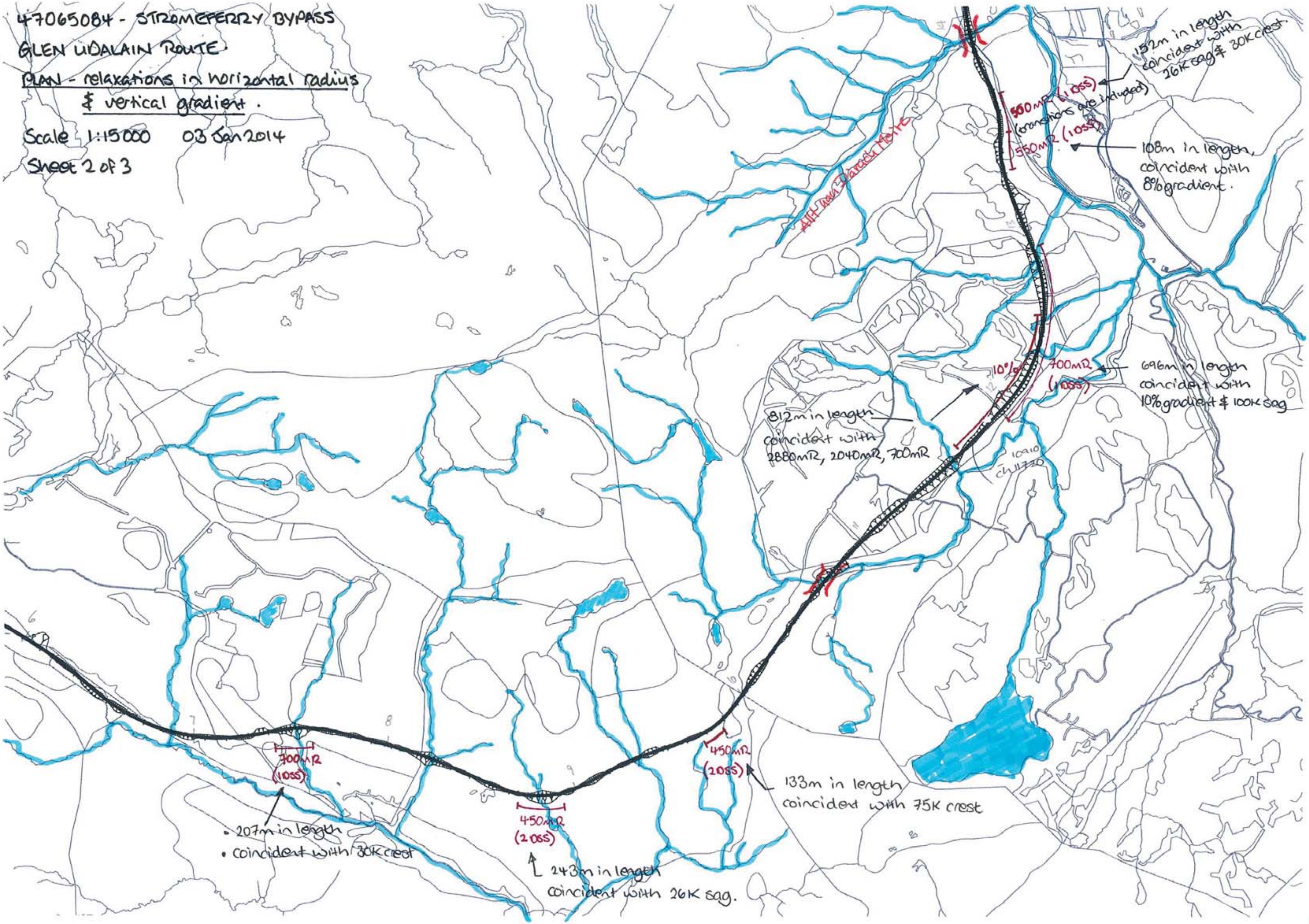
STROMEFERRY OPTIONS APPRAISAL – IDENTIFIED WATERCOURSE CROSSINGS					
		Crossing			
No.	**Reference**	**Minor Pipe Culvert Single pipe to 1.0m dia (not shown on 1:50,000 OS)**	**Small Culvert or Bridge Single span 2m to 5m (identified on 1:50,000 OS)**	**Large Bridge Length > 5m**	**Major Bridge**
1	**North Shore Route**, Sheet 1 (Achmore to Slumbay North, approx. 8km)	Assumed 20 No.	17 No.	Allt Torr nan Daoine (Weavers)	Strome Narrows Crossing
2	North Shore Route, Sheet 2 (Slumbay North to Strathcarron Jct, approx. 7km)	Assumed 15 No.	14 No.	Allt nan Carnan (approx. 10m span) Kirkton bridge (approx. 6m single span) Tullich Smiddy (retain existing 10.3m single span structure)	-
3	**On-Line Route**, sheet 1 (Stromeferry to Attadale, approx. 8km)	25 No noted between Ardnarf and Cuddies Point during site inspection, 400mm to 900mm dia. Assume additional 10 No for remainder of this section	18 No.	-	-
4	(Attadale to Strathcarron Jct, approx. 6.5km)	Assumed	4 No. 1.5m dia Camm-Allt culvert east of Maman Hill Carron Pottery bridge (4.10m single span structure retained) 1 No.	Attadale River (retain 3 no multispan, 30m overall length structure) Strathcarron bridge (58m, 5no multi span bridge over river Carron)	River Taodil bridge (multi span over river, tributary and railway)
5	**Southern Route**, sheet 1 (A890, Glen Udalain to Ch 6,000, approx. 6km)	Assumed 20 No.	6 No.	Allt Glen Udalain (assume single 10 to 15m span)	-
6	Southern Route, sheet 2 (Ch 6,000 to Attadale, approx. 9km)	Assumed 25 No.	10 No.	Approx Ch 10,700m (assume single 10m span) Allt nan Darach Moire (assume difficult single span, maybe large diameter corrugated steel arch culvert below embankment)	-


4706608 - STROMEFERRY BYPASS
NORTH SHORE - BRIDGE & OFFLINE
PLAN - relaxations in horizontal radius & vertical gradient.
Scale 1:15000 03 Jan 2014.
Sheet 1 of 2
600mR (1 DSS) extents of horizontal radius relaxation (no design speed steps below desirable minimum)
10% - extents of 10% gradient
700mR (1 DSS)
74m in length coincident with 50K crest.
700mR (1 DSS)
500mR (1 DSS)
209m in length coincident with 36K crest
130m in length coincident with 35K sag
400mR (2 DSS)
184m in length coincident with 30K crest
360mR (2 DSS)
80m in length coincident with 26K sag
500mR (2 DSS)
250m in length coincident with 8% grade.
255mR (3 DSS)
154m in length coincident with 1.5% grade
710mR (1 DSS)
101m in length coincident with 30K crest
Stromeferry Bypass Appraisal
Proposed Route Alignments
January 2014
and Identified Watercourses
Rev A 20/1/14.
As forwarded to G. Smith 13/1/14.

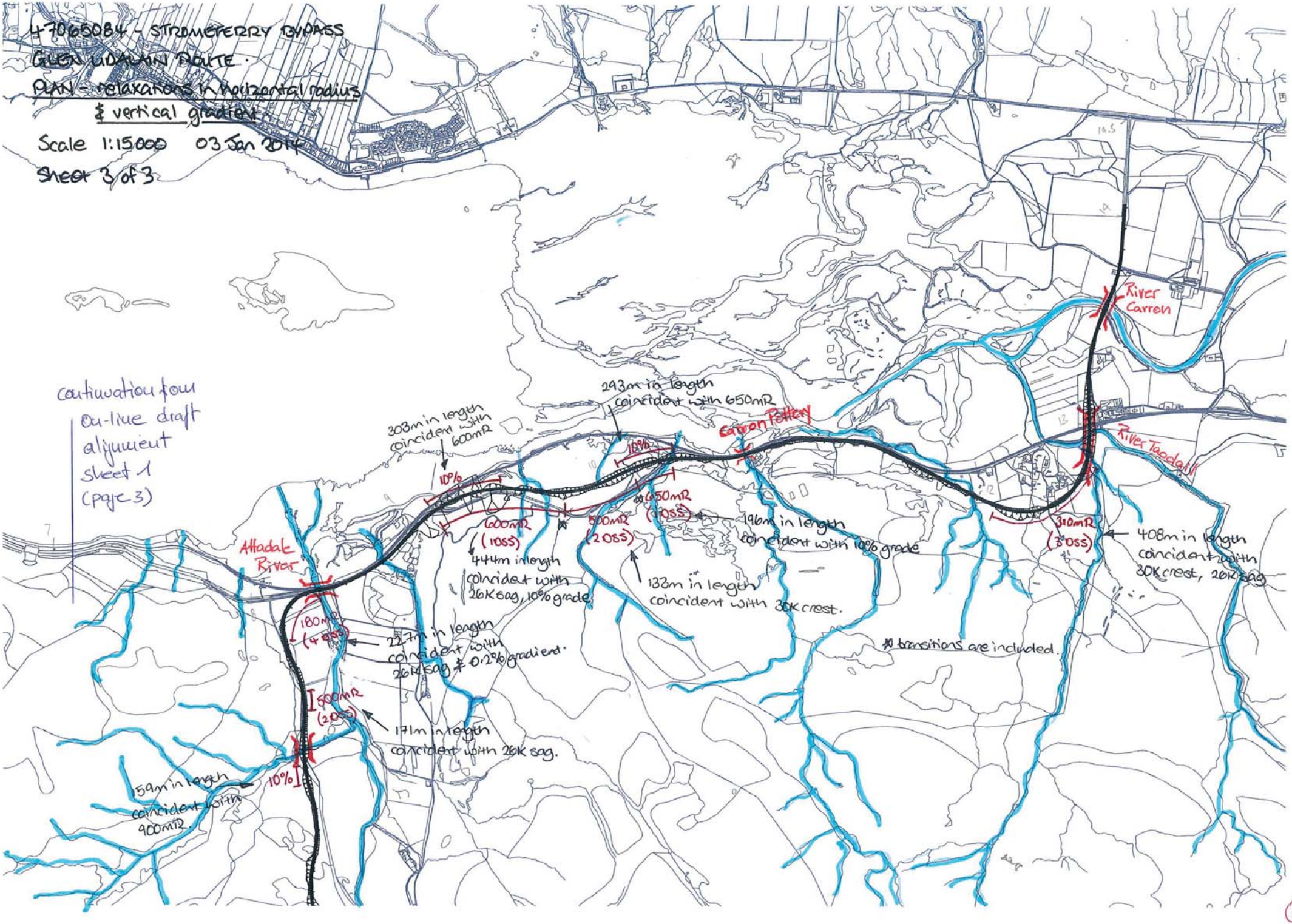

47065084 - STROMEFERRY BYPASS
NORTH SHORE - BRIDGE & OFFLINE.
PLAN - relaxations in horizontal radius & vertical gradient
Scale 1:15000 03 Jan 2014
Sheet 2 of 2.
Existing bridge retained
To Kyle of Lochalsh
658m in length coincident with 1500m R
10%
Kirkton
Aff-van Caravan
Sheet 2
Sheet 1
2


4706508A - STROMEFERRY BYPASS
ONLINE TUNNEL (DRAFT ALIGNMENT.)
PLAN - relaxations in horizontal radius & vertical gradient.
Scale 1:15000 03 Jun 2011
Sheet 1 of 1.
online follows existing horizontal geometry, therefore majority of horizontal curves are less than desirable minimum (720m R)
10% - extents of 10% gradient.
(tunnel alignment to be confirmed)
10%
Continuation on Sheet 3
Udalaru Route
3


4706508A - STRONEFERRY BYPASS
GLEN UDALAIN ROUTE.
PLAN - relaxations in horizontal radius & vertical gradient.
Scale 1:15000. 03 Jan 2014.
Sheet 1 of 3.
600MR (1DSS) - extents of horiz. radius relaxation (No. design speed steps below desirable minimum for design speed 100kph)
10% - extents of 10% gradient.
- 221m in length
- coincident with 2100MR.
10%
Allt Glen Udalain


47065084 - STROMEFERRY BYPASS
GLEN UDALAIN ROUTE
PLAN - relaxations in horizontal radius
& vertical gradient.
Scale 1:15000 03 Jan 2014
Sheet 2 of 3
152m in length coincident with 26K sag & 30K crest.
500mR (1055)
(transitions are included)
550mR (1055)
108m in length, coincident with 8% gradient.
10%
700mR (1055)
696m in length coincident with 10% gradient & 100K sag
812m in length coincident with 2880mR, 2040mR, 700mR
10910 Ch11720
700mR (1055)
• 207m in length
• coincident with 30K crest
450mR (2055)
243m in length coincident with 26K sag.
450mR (2055)
133m in length coincident with 75K crest

5


4706608A - STROMEFERRY BYPASS
GLEN UDALAIN ROUTE
PLAN - relaxations in horizontal radius & vertical gradient
Scale 1:15000 03 Jan 2014
Sheet 3 of 3
continuation from on-line draft alignment sheet 1 (page 3)
River Carron
Carron Pottery
River Taodaidh
Attadale River
293m in length coincident with 650mR
303m in length coincident with 600mR
10%
10%
600mR (10SS)
650mR (10SS)
500mR (2SS)
444m in length coincident with 26K sag, 10% grade
133m in length coincident with 30K crest.
196m in length coincident with 10% grade
310mR (3SS)
408m in length coincident with 30K crest, 26K sag
180mR (4SS)
227m in length coincident with 26K sag & 0.2% gradient.
500mR (2SS)
171m in length coincident with 26K sag.
159m in length coincident with 900mR.
10%
* transitions are included.
6