URS

A9 Berriedale Braes Improvement

Environmental Report

Non – Statutory DMRB Stage 3 Environmental Report

November 2014

47066861

Prepared for:
Transport Scotland

REVISION SCHEDULE					
Rev	**Date**	**Details**	**Prepared by**	**Reviewed by**	**Approved by**
First issue Final Issue	05-09-14 07-11-14	Draft Environmental Report Environmental Report	John Bacon Assistant Environmental Consultant John Devenny Senior Landscape Architect Keith Ross Principal Ecologist Nick Dadds Ecologist Laura Garcia Cultural Heritage Consultant Sally Homoncik Hydrologist Suzanne Scott Associate Noise Consultant	Zoë McClelland Principal Environmental Planner	Nigel Hackett Technical Director

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GLOSSARY AND ABREVIATIONS

This table provides a glossary of the main terms and an explanation of the key abbreviations used in this Environmental Report.

Environmental Assessment Process	
Baseline	The current environmental conditions against which potential impacts/effects are identified.
Baseline Study / Survey	The process of research and fieldwork by which the current baseline conditions are established.
Construction	Any activities, which take place during the construction phase, including temporary land take.
Effect	The result of an impact on a particular resource or receptor.
Environmental Impact Assessment (EIA)	A process for identifying and evaluating the likely effect of a proposed development on the environment. EIA normally forms part of the consent procedure.
Environmental Statement	A document or series of documents which reports the findings of the EIA
Impact	A physical or measurable change to the environment attributable to the Scheme.
Infrastructure	The facilities, services and businesses in a defined area.
Magnitude of effect	The actual change taking place to the environment, for example, the extent of land take or predicted change in noise levels.
Operation	Any activities forming part of or associated with the operation of the Scheme.
Permanent Land take	The permanent occupation of land by Scheme infrastructure, including physical features such as buildings.
Receptor	A component of the natural, created or built environment such as a human being, water, air, a building or a plant that is affected by an impact
Resources	Physical or qualitative features of the environment which are capable of identification and evaluation, and which are often the subject of some form of protective planning designation.
Scope	The extent of coverage of EIA.
Significance of impact	The product of an impact's magnitude and the sensitivity, importance or value of the relevant receptor or resource
Sources of Effect	The Scheme activities or components, which give rise to environmental effects, as defined below.

Types of Effect	
Cumulative Effect	An effect resulting from the accumulation of a number of effects. A cumulative effect may result from: The combination of different effects at a particular location; The recurrence of effects of the same type at different locations; The interaction of different effects over time or The interaction between the Scheme and other projects.
Direct Effect	An effect arising from an impact attributable to a project component or activity.
Environmental Effect	Identification of the possible range and location of potential impact, the words impact and effect have been used interchangeably
Indirect Effect	An effect arising from additional development works which are as a result of the Scheme.
Non-significant Effect	An effect, which is unlikely to have an influence on the decision-making process.
Permanent Effect	An effect, which is irreversible or likely to persist for the foreseeable life of the Scheme.
Residual Effect	An effect, which is likely to remain after the application of mitigation measures.
Secondary Effect	An effect, which may arise as a consequence of a primary effect, particularly between different environmental topics (e.g. reduced amenity of a community facility due to noise and disturbance).
Significant Effect	An effect, which, in isolation or in combination with other effects, is likely – in the opinion of

Types of Effect

	the EA team – to have an influence on the decision-making process.
Temporary Effect	An effect which is of limited duration, due to either the cessation of the impact giving rise to it or the ability of the environment to accommodate or recover from it.
Unavoidable Effect	An effect which is an inevitable consequence of the Scheme and which cannot be removed or rendered insignificant by mitigation.
Mitigation	Measures adopted to reduce, ameliorate or avoid significant effects.

Engineering Terms

Construction Compound	A defined area (usually fenced off) where construction activity takes place
Permanent Land take	A requirement for land that will be needed as part of the operation phase of the Scheme
Temporary Land take	A requirement for land that will be needed during the construction phase of the Scheme only, and can be returned to other use afterwards

Noise and Vibration Abbreviations and Glossary

L_{Aeq}	The equivalent continuous A-weighted sound pressure level, it is a single number that represents the total sound energy measured over that period. It is the sound level of a notionally steady sound having the same energy as a fluctuating sound over a specified measurement period.
$L_{A10,18h}$	L_{A10} is the noise level exceeded for 10% of the measurement period, it is generally used to describe road traffic noise. Defined in CRTN as the arithmetic average of the individual 1 hour $L_{A10,1h}$ levels between 06:00-00:00.
L_{den}	L_{den} is defined in terms of the equivalent continuous A-weighted sound pressure level levels (L_{Aeq}) during the daytime, evening, and night-time, and applies a 5 dB penalty to noise in the evening and a 10 dB penalty to noise in the night.
L_{night}	The equivalent continuous A-weighted outdoor sound pressure level (L_{Aeq}) during the 8 hour night-time period (23:00-07:00)
L_w	Sound power level, sound power (the sound energy radiated by a sound source per unit time) measured on the decibel scale.
dB	Decibel, unit of noise measurement.
dB(A)	A - weighted decibel. The human ear system does not respond uniformly to sound across the detectable frequency range and consequently instrumentation used to measure noise can be weighted to represent the performance of the ear, this is known as the 'A weighting'.
BNL	Basic Noise Level, term used in CRTN to refer to the traffic noise level ($L_{A10,18h}$) at 10m from the road
CRTN	Calculation of Road Traffic Noise
DMRB	Design Manual for Roads and Bridges
HGV	Heavy Goods Vehicles
NISR	Noise Insulation (Scotland) Regulations
AAWT	Annual Average Weekday Traffic
Ambient Noise	Ambient noise is the total noise in a given location, usually composed of many sources, near and far, such as road traffic noise, railway noise, birdsong, wind rustling vegetation etc.
Free-field	The noise level in the open without any reflections form any vertical surfaces such as buildings
Facade	The noise level at 1 m from a building façade. Noise is reflected from hard surfaces, such as a building façade, producing a slightly higher noise level than if the building was not there. CRTN specifies a façade correction of +2.5 dB

The following is an explanation of some of the abbreviations used in this Environmental Report

DMRB	Design Manual for Roads and Bridges
SEPA	Scottish Environment Protection Agency
SNH	Scottish Natural Heritage
AC	Aberdeenshire Council
SAC	Special Area of Conservation
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest
NSA	National Scenic Area
RoD	Record of Determination
BAP	Biodiversity Action Plan
HGV's	Heavy Goods Vehicles
SPP	Scottish Planning Policy Statement
CAR	Controlled Activities Regulations
IEEM	Institute of Ecology and Environmental Management
IEMA	Institute of Environmental Management and Assessment
WCA	Wildlife and Countryside Act

1 INTRODUCTION

1.1 Introduction

The A9 at Berriedale Braes has been identified by Transport Scotland as a location requiring intervention in accordance with the output from Strategic Transport Projects Review (STPR). The Scheme is on the A9 in Caithness, north of Helmsdale and south of Dunbeath and its purpose is to remove the hairpin bend and improve the alignment.

In April 2013 URS was appointed by Transport Scotland to provide services to consider improvement options at Berriedale Braes. A Stage 2 Design Manual for Roads and Bridges (DMRB) Scheme Assessment Report was published in March 2014. The Stage 2 report considered a number of options and identified a preferred option for improving the A9 at Berriedale.

In April 2014 a Record of Determination was prepared that determined that an Environmental Impact Assessment (EIA) under the Environmental Impact Assessment (Scotland) Regulations, 1999 (as amended) was not required and further details on this are provided in Section 1.3.

This Environmental Report has been prepared in line with DMRB Volume 5, Section 1 – Scheme Assessment Reporting (TD37/93, Highways Agency 1993). As a statutory EIA is not required by legislation this non –statutory Environmental Report has been prepared to accompany the Stage 3 Scheme Assessment Report. A Scheme Summary Report has been prepared to accompany the Stage 3 Reports and this provides a non-technical summary of this Environmental Report.

1.2 Need for Improvement of the A9 at Berriedale Braes

Berriedale Braes is located north of Helmsdale and south of Dunbeath on the A9 trunk road in Caithness and forms part of the strategic roads network north of Inverness. The existing A9 at Berriedale Braes includes a tight hairpin bend northeast of Berriedale in order to negotiate steeply sloping topography. A location plan is shown in, Figure 1.1; General Environmental Constraints is shown in Figure 1.3, Local Receptors are shown in Figure 1.3 and the Proposed Scheme is shown in Figure 2.1.

The existing hairpin bend on the A9 at Berriedale Braes entails that two HGVs travelling in opposite directions cannot pass on the hairpin bend, as one vehicle requires the use of most of the carriageway to successfully negotiate the bend. This existing substandard geometry is a safety concern and accident records indicate a near miss where an athletics bus collided with the barrier.

1.3 Need for Environmental Impact Assessment

The formal requirement for EIA of Trunk Road projects is set out in the Roads (Scotland) Act 1984 (c.54, Sections 20A and 55A) as amended by Part III of the Environmental Impact Assessment (Scotland) Regulations 1999, The Environmental Impact Assessment (Scotland) Amendment Regulations 2006 and the Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2011 which consolidate, update and replace part II of the 1999 Regulations as amended.

The A9 Berriedale Braes Improvement Scheme falls within Annex 2 of the EIA Directive given that the works exceed 1 hectare taking into account both the permanent and temporary works.

To determine whether a formal Environmental Impact Assessment is required under the Environmental Impact Assessment Regulations identified above, the project has been subject to screening using the Schedule 3 criteria of the EIA Regulations.

Consultation was undertaken with the Local Authority; The Highland Council and also statutory bodies; Scottish Natural Heritage, Scottish Environment Protection Agency and Historic Scotland. Based on the consultation responses received, Transport Scotland as the competent authority determined that a statutory EIA under the EIA Regulations was not required. Full copies of the consultation responses are included in Appendix 1- Copy of Consultation Responses, in addition to all other consultations received relating to the Scheme throughout the Stage 2 and 3 assessments.

Determination that a-statutory EIA and ES was not required was published in a Record of Determination (April 2014). This environmental report provides an assessment on the likely effects of the proposed Scheme and its purpose is to act as a targeted report on the main likely impacts and proposed mitigation measures to be taken forward to the construction contract.

1.4 Purpose of Environmental Report

The purpose of the non-statutory Environmental Report is to ensure that the environmental effects of the proposed development are fully considered, together with the economic or social benefits of the development. The report will provide supporting information for the publication of statutory orders. From this point forward, the A9 Berriedale Braes Improvement will be referred to as 'the Scheme'. It should be noted that the improvement layout shown in this report is a preliminary design and will likely be subject to further detailed design prior to construction on site. The main aims of this environmental report process are:

- To ensure that there will be a full consideration of the likely environmental effects of the Scheme in a way that enables both the importance of the environmental effects and the scope for mitigating these to be properly evaluated;
- To allow environmental considerations to have an influence on the Scheme design; and
- To allow the public, statutory organisations and other bodies to comment on the proposals, taking account of their environmental concerns.

1.5 Scheme Objectives

An Inception Workshop for the scheme was held on 15 May 2013 at Transport Scotland, Buchanan House. The principal purpose of the workshop was to set scheme specific objectives to allow improvement options to be identified and assessed in an open and transparent manner.

Final Scheme Objectives from Inception Workshop were as follows:

A. Operations

Except during periods of maintenance, the improvement scheme shall ensure that all vehicles are able to travel on the A9 through the study area without having to stop or give way to vehicles travelling in the opposing direction.

The improvement scheme shall also:

- Minimise the impacts of disruption to the existing route during construction;
- Minimise the risk and potential serious consequences of errant vehicles leaving the carriageway; and
- Ensure one lane remains open during periods of maintenance and vehicle breakdown.

B. Economy

The improvement shall recognise that the A9 at this location is a lifeline route and shall contribute to sustaining and enhancing the social and economic development of Caithness, Orkney and northern Sutherland.

The improvement shall maximise the economic transport user benefits while taking cognisance of the capital and future operation and maintenance costs.

C. Environment

The environmental impact of the improvement scheme shall be minimised and, where possible, shall provide opportunities for enhancing the natural and built environment. In particular attention shall be paid to:

- Ecology;
- Visual impact; and
- Landscape impacts.

D. Deliverability

The improvement scheme shall gain support from stakeholders, including the local community, to enable a smooth passage through the statutory process thereby minimising potential delay to implementation.

1.6 Location

The scheme is located on the A9 Trunk Road, North of Helmsdale and South of Dunbeath. The A9 in this area is characterised by demanding topography with steep gradients and tight bends on either side of the village of Berriedale. Heading north towards the village, the road drops down by 130m as it enters the valley of the Langwell and Berriedale Waters and then rises back up by approximately the same amount on the north side of the valley.

1.7 Description of Study Area

The study area is a 500m buffer from the centre road line unless specified differently within each assessment topic. There are a number of environmental designations within the vicinity of the Scheme, which range from international to local importance. These are shown on Figure 1.2 - General Environmental Constraints and described in Table 1.1.

Table 1.1 – Environmental Designations

Designation	Features	Importance
Berriedale and Langwell Waters Special Area of Conservation (SAC)	Atlantic Salmon	International
East Caithness Cliffs Special Protection Area (SPA)	Aggregations of Breeding Birds	International
East Caithness Cliffs Special Area of Conservation (SAC)	Vegetated sea cliffs (habitat)	International
Berriedale Cliffs Site of Special Scientific Interest (SSSI)	Aggregations of Breeding Birds	National
Berriedale Water Site of Special Scientific Interest (SSSI)	Upland Birch Woodland	National
Langwell Lodge Garden and Designed Landscape	Designed Landscape (Historic Environment)	National
Langwell Castle Scheduled Monument	Scheduled Monument (Historic Environment)	National
Berriedale Castle Scheduled Monument	Scheduled Monument (Historic Environment)	National

Designation	Features	Importance
17. no Listed Buildings	Listed Buildings Categories A, B & C (Historic Environment)	National/Regional/Local

There are a total of 22 residential properties contained within the study area, two of which are within in 50m of the A9 (The White House and Strathview). Industrial/business premises are limited to the Welbeck Estates office and Post Office, both reside within the Portland Estate Office, and another unspecified building. Community facilities within the study area include Berriedale Church (no longer in ecclesiastical use) Portland Hall (formerly Berriedale School) and Berriedale Cemetery. There are a number of Core Paths and footpaths within the study area. See Figure 1.3 – Local Receptors for locations of the residential, commercial and community facilities.

The local plan for the area is the Highland Wide Local Development Plan (HWLDP April 2012) which identifies the need for the A9 Berriedale Braes Improvement in the vision for Caithness and Sutherland in order to be 'a connected and accessible place' (page 15). There are a range of general policies within the HWLDP which are relevant to this assessment, for example, policies relating to Natural, Built and Cultural Heritage, Species and Habitats, Landscape etc. Reference to individual policy considerations are made where relevant within each of the technical chapters.

1.7.1 *Topography*

The topography of the study area varies from steep slopes and cliffs along the coast, to undulating farmland along the coastal strip and moorland slopes and hills further inland. The study area is constrained by the sea cliffs and coast to the east and the Berriedale Water to the south.

1.7.2 *Climate and Snow Considerations*

The climate at Berriedale can be described as a changeable, temperate climate however in comparison with Scottish averages the area receives a higher hourly average of sunshine and a lower average level of rainfall.

Details from the Met Office indicate:

- The average low temperature of the area (Wick Airport) is 5ºC;
- The average high temperature is 11ºC.;
- The monthly mean wind speed at 10m is 11 knots.; and
- The average yearly precipitation is approximately 800mm.

1.7.3 *Land Ownership and Land Use*

The majority of the land adjacent to the existing trunk road is owned by Welbeck Estates. The only exception to this is the ownership of the White House (listed building) just north of the lay-by to the north west of the cemetery. Further to the north there is another dwelling called "Strathview" within Welbeck Estate's land, owned by Welbeck Estate.

With the exception of the White House and Strathview, the only land use of any note is the field to the east of the road, bounded by the road, the cemetery, the White House and Strathview, and the Berriedale Cliffs to the east. This field is used by Welbeck Estates for grazing sheep and cattle.

Immediately south of the hairpin bend and down to the Berriedale village the land adjacent to the road is moorland.

1.7.4 ***Agricultural Activity***

Agricultural activity in the vicinity of the existing road and within the study area is limited to the field used for grazing by Welbeck Estates.

The Crofting Commission was consulted with and they made the following statement

'We do not have records of any crofts or Common Grazings in the areas of Plots 1-9 on your plan. This is not to say that there isn't any crofting land here – our records have only a small proportion of croft boundaries. Also the Common Grazings boundaries we hold in this area are indicative only.'

However, title searches have indicated that there may be some common grazings in the area.

1.7.5 ***Roadside Features***

The following is a brief summary of roadside features provided within the study area:

a) A lay-by is located just north of the hairpin bend in the north bound verge;

b) An historic cemetery is located some 12m above road level and immediately to the north of the hairpin bend, with access taken from the lay-by;

c) Two residential properties have direct access off the A9 Trunk Road from the southbound verge:

   I. The White House (Listed Building); and

   II. Strathview.

d) There are no designated bridleways, cyclepaths or footpaths;

e) There is currently no road lighting; and

f) There is no trunk road communication apparatus in the verges.

1.7.6 ***Existing Structures***

There are two structures within the study area as follows:

- A gravity retaining wall with masonry facing supporting the fill to the road at the hairpin bend. This wall is 176m long and has a maximum height of 4.6m; and
- A gravity retaining wall with masonry facing supporting the cemetery above the road level; The wall is 60m long and the height varies from 0.4-3.6m.

1.7.7 ***Safety Barrier***

To restrain errant vehicles double rail open box beam safety barrier is provided at the outside of the hairpin bend on north side of valley.

A hardened verge has been provided on the inside of the hairpin bend to accommodate vehicle over-run.

1.7.8 ***Existing Drainage and Watercourses***

No 'As Built' record drawings are available for the existing A9 Trunk Road. Information is available on the existing road drainage based on what is visible above ground from site walkovers and a detailed topographical survey of above ground features. These indicated the majority of the road is kerbed, with drainage by means of gullies.

These are assumed to be connected to roadside carrier drains, or short sections of pipe, which in turn discharge onto the adjacent moorland. At the northern section of the scheme, adjacent to the White House and Strathview, the gullies appear to feed into a carrier drain. This carrier drain appears to cross the road south of the White House into the western verge where a culvert is visible. This then discharges into the adjacent moorland.

South of the aforementioned culvert, drainage is again achieved by gullies and filter drains. This appears to cross the carriageway adjacent to the cemetery steps and appears again at the commencement of the French drain south of the hairpin. It appears this drainage continues down the verge until it reaches the 55m radius bend adjacent to Berriedale Village where it enters the Berriedale Water via a natural depression in the ground.

1.8 Traffic Conditions

The existing A9 carries a mixture of trips including long distance HGV, commuters, tourist traffic and agricultural traffic.

1.8.1 *Traffic Surveys*

No traffic surveys have been carried out for this assessment as it is considered that none of the improvements proposed will promote any change to the existing traffic volumes.

Transport Scotland maintains an Automatic Traffic Counter (ATC) in the area and data from this has been provided. Data is available for years 2007-2012 but this is incomplete and figures are available for the whole year for 2010 only.

The existing A9 carries a mixture of vehicles for various types of trips including HGV, commuters, tourist traffic and agricultural traffic. The Annual Average Daily Traffic is approximately 1900 vpd, with some seasonal increases in the summer to approximately 2700 vpd.

Traffic data for the A9 at Helmsdale obtained from surveys in the year 2003 indicated an Annual Average Daily Flow (AADF) of 1764 vehicles but during the summer months this was significantly higher with a Seasonality Index of 1.44 i.e. peak holiday period flows of 2540 vehicles daily. The combination of higher flows, unfamiliarity with the route and gradients frequently result in traffic platoons forming, making overtaking manoeuvres more difficult, particularly for northbound traffic.

The following figures are based on 2010 traffic data for the ATC at Berriedale:

Cars	Twin Wheeled Motor Vehicles	LGVs	OGV1s	OGV2s	PSVs
67.3%	1.1%	17.3%	6.1%	7.2%	1.0%
All figures for 2010. 1,900 AADT with 12% cv/d Seasonality Index =1.44 give adjusted peak holiday period flows of 2700					

1.8.2 *Accident History*

Accident statistics have been provided by Transport Scotland for the period January 2001 to December 2013. There were five accidents within this period:

- December 2001 at the access to Berriedale Church, some 650m north of the hairpin bend – category slight.
- June 2005 at the hairpin bend. One vehicle collision with one casualty. Conditions were wet/damp with rain (without high winds) - category slight.

- February 2006 at the junction with the access to Berriedale village. One vehicle (goods vehicle) collision with one casualty. Conditions were frosty/icy - category slight.
- May 2010 at the hairpin bend. One vehicle (public service vehicle) collision with one casualty. Conditions dry and fine (without high winds). Vehicle failed to stop at bend. - category serious.
- May 2013 at the hairpin bend. Two vehicle collision (both cars) with three casualties. Day time incident in wet/damp conditions – category slight.

The above have been taken from formal records for the A9 at Berriedale. However a further 3 accidents have been noted in 2014 in close proximity to the Berriedale Braes, but none of these were on the hairpin bend. One fatal accident was reported south of the Berriedale Waters on 18 September 2014.

1.9 Environmental Considerations

Each of the technical chapters in this Environmental Report describe the likely environmental impacts that will arise in the local and wider area as a result of the Scheme being constructed and completed, while mitigation measures are suggested to minimise these impacts where possible.

1.10 Report Structure

This Environmental Report reports on the findings of this process and provides the following:

- a description of the proposed Scheme, including details of the site and the road design and land-use requirements during construction and operation;
- an outline of the main alternatives and the main reasons for the choice of the preferred Scheme, taking into account environmental effects;
- a description of the aspects of the environment likely to be significantly affected by the proposed Scheme;
- a description of the likely significant effects of the proposed Scheme on the environment, including direct and any indirect, secondary, cumulative, short, medium and long term, permanent and temporary, positive and negative effects, and a description of the methods used to assess the effects on the environment;
- a description of the measures envisaged to prevent, reduce and where possible offset any significant adverse effects on the environment;
- an indication of any difficulties encountered in compiling the required information; and
- a non-technical summary of the above information.

The contents of this Environmental Report are shown in Table 1.2 below:

Table 1.2 – Structure and Content of the Environmental Report

Environmental Report Section	Description
Non-technical summary (NTS)	
Provided at the front of the ES	Summary of the Report in non-technical language. Also available as a separate document.
Volume 1	

Environmental Report Section	Description
Chapter 1 – Introduction	This chapter provides the project background and the structure of the Environmental Report.
Chapter 2 – The Proposed Scheme	This chapter provides information on the Scheme proposal and explains the alternative options that were considered prior to selecting the preferred option.
Chapter 3 – Scoping and Consultation	This chapter provides a summary of consultation carried out throughout the assessment process. *Accompanied by Appendix 1- Copy of Consultation Responses*
Chapter 4 – Assessment Methodology	This chapter describes the assessment methodology employed.
Chapter 5 – Landscape and Visual	This chapter provides a landscape and visual assessment of the Scheme proposals along with landscape mitigation proposals.
Chapter 6 – Nature Conservation	This chapter provides an assessment of the Scheme proposals on ecological receptors and details mitigation measures to minimise negative impacts. *Accompanied by Appendix 2 – Screening Report to inform Habitats Regulations Assessment*
Chapter 7 – Cultural Heritage	This chapter provides an assessment of the cultural heritage features that may be affected by the Scheme proposals and details mitigation measures required to protect cultural heritage features. *Accompanied by an Appendix3 – Heritage Asset Tables*
Chapter 8 – Road Drainage & the Water Environment	This chapter provides an assessment of the potential effects on the water environment as a result of the Scheme improvements and recommends mitigation measures required to offset any significant effects.
Chapter 9 – Noise & Vibration	This chapter provides an assessment of potential effects relating to noise and vibration which may be caused by the Scheme. *Accompanied by an Appendix 4 – Noise Appendix*
Chapter 10 – Materials	This chapter provides an assessment of the potential effects relating to material resource requirements of the Scheme and waste which may be caused by the Scheme.
Chapter 11 – Summary of Effects and Mitigation	These provide tabulated summaries of the main potential impacts identified, the mitigation proposed, and the key residual impacts remaining after implementation of mitigation.
Chapter 12 – Schedule of Environmental Commitments	This section sets out the environmental commitments proposed in the Environmental Report for the Scheme. The purpose of these environmental commitments is to mitigate potentially adverse impacts that have been identified in each section of the Environmental Report.
Figures (accompanying all chapters)	Graphics supporting the Environmental Report chapters, illustrating the proposed Scheme and environmental information. Figure reference corresponds to the relevant Environmental Report chapter (e.g. Chapter 7 refers to Figure 7.1 et seq.).

A glossary of terms and a list of abbreviations are provided at the front of the main report.

This Environmental Report presents the assessment of the proposed Scheme as described in Chapter 2 – The Proposed Scheme. The design of the proposed Scheme may be refined but will still be deemed to comply with this Environmental Report provided that such refinements to this design will be subject to environmental review to ensure that the residual impacts will be no worse than those reported in this Environmental Report.

Some aspects of the proposed Scheme design and details of aspects such as construction methods and traffic management will depend on the Contractor's construction proposals which are not yet available. Assumptions have therefore been made based on the professional judgement of the EIA practitioners, and are stated in the Environmental Report, to allow predictions of likely impacts.

2 THE PROPOSED SCHEME

2.1 Introduction

This chapter provides a description of the proposed Scheme, including information on the project background, the Scheme alternatives and the layout of the proposed Scheme, which is shown on Figure 2.1 – The Proposed Scheme.

2.2 Consideration of Alternatives and Options Development

There have been numerous options considered for the A9 Berriedale Braes Improvement Scheme throughout the stages of the DMRB Assessment. The following sections summarise the option development process and outline the decision behind preferred Scheme selection.

2.2.1 *DMRB Stage 2*

Inception Stage

At the Inception Workshop on 15 May 2013 the Objectives (see Chapter 1 – Introduction, Section 1.5) for the scheme were agreed and issued with the Inception Report on 4 July 2013.

Options Workshop

Following on from the Inception Report, a Stage 2 Workshop was held on 7 August 2013 when 8 improvement options were initially put forward for consideration. Following discussions at the workshop a further 2 options were included.

The Options were scored against the criteria set out at the Inception Workshop and the outcome of the workshop was reported in the 'Record of Workshop & Findings' paper issued 16 August 2013.

In summary this concluded that

- Options 1, 3, 6 and 8 should not be considered further;
- A high level crossing of the rivers was not acceptable on economic and environmental grounds and that no river crossing should be considered further;
- Options 2, 4a, 4b, 5a, 5b and 7 were to be considered in more detail (with no river crossing) to reduce to 2 or 3 options to be taken forward to full Stage 2 Assessment Study. A plan showing these options is given on drawing Figure 2.2- Alternative Options Stage 2 Assessment.

Stage 2 Options

Following the recommendations of 'Record of Workshop & Findings' paper the 7 remaining options were assessed and reported in the Stage 2 Options Paper issued in October 2013. Reference 47066861/DOC/7

Full details can be found in the report but Table 2.1 and the Conclusion of the report are repeated below for ease of reference.

Table 2.1 – Option Summary *(Stage 2 Options Paper reference)*

Option / Objective	2	4a	4b	5a	5b	7a	7b
Operations	Fail	✓✓	✓✓	✓	✓✓	0	X
Economy	Not scored	✓	✓	X	✓	XX	XXX
Environment		X	XX	XX	XX	XXX	XXX
Deliverability		✓✓	X	0	✓	X	XX
Comments	Fail	Note 1	Note 2	Note 3	Note 4	Note 4	Note 4

NOTES

1. Shortest route, least environmental impact
2. Splits properties and safety issue of approach to bend at graveyard
3. Safety issue of longer approach to bend at graveyard
4. Safety issue of long straight on approach to bend at graveyard

✓✓✓	**Very Positive,**	✓✓	**Positive,**	✓	**Slight Positive**
		0	**Neutral**		
X	**Slightly Adverse,**	XX	**Adverse,**	XXX	**Very Adverse**

Conclusion of the Stage 2 Options Paper

Option 2 has been discarded as it does not achieve the Scheme Objective of keeping two way traffic flowing at all times.

Based on the level of study to date and from Table 2.1 above, Option 4a scores best against the Scheme Objectives and would appear to be emerging as the favoured option. However it is considered that Option 5b, which scored similar to Option 4a on the operational and economic objectives, should remain on the table at this stage.

Based on the above it was recommended that Options 4a & 5b should be taken forward to full Stage 2 Assessment Study.

2.3 Preferred Option Selection

A preferred option was selected at the end of the Stage 2 process. Various assessments on both options were carried out including engineering, environmental, traffic and economic assessments and then considering all the options against the Scheme specific objectives. Option 4a was announced as the preferred option in Spring 2014 and following on this, the preferred option was taken forward to DMRB Stage 3 Assessment.

2.4 Preferred Scheme Development

The preferred Scheme is shown on Figure 2.1- The Proposed Scheme. Selection of the preferred option enabled the design process to move forward to DMRB Stage 3 where the design elements are examined in more detail.

Throughout this period the design of the Scheme was continuously evolving. This involved some further design development and consultation with the environment team and others including:

- Additional topographical survey of the Scheme extents;
- Additional Ground Investigation;
- Design review of the mainline and layby geometry;
- Departures applications – liaison with TS Standards Branch;
- Further direct access rationalisation – liaison with TS and Landowners;
- Drainage Design –liaison with SEPA/SNH/ Caithness District Salmon Fishery Board;
- Liaison with TS Standards Branch;
- Liaison with Utility Companies;
- Prepared papers on cut slope gradients and provision of access/layby;
- General consultation with other interested parties including the emergency services and local transport companies; and
- Preparation for the Stage 1 Road Safety Audit.

2.4.1 *Scheme Description*

The Scheme consists of 530m of single carriageway with mainly offline construction. The Scheme will require the compulsory purchase of farmland. It will require a piled sub-structure and a reinforced soil embankment. The Scheme will not require the demolition of any property.

The main Operational Objective, established at the Inception Workshop in May 2013, is to ensure that all vehicles are able to travel on the A9 through the study area without having to stop or give way to vehicles travelling in the opposite direction. Essentially this means that the current 13m hairpin bend, with steep gradients up to 11%, needs to be replaced with a curve that will allow the passage of 2 vehicles at all times, except during periods of maintenance. Consequently the scheme design criteria is to bypass the hairpin bend and reduce gradients as much possible before going back onto the existing road alignment as soon as possible.

The overall length of the Scheme is approximately 530m and commences just south of the existing hairpin bend to bypass the existing hairpin with a new curve with radius of approximately 55m. This curve goes around the cemetery on the north side, part on a new embankment and part in cut.

Due to the steeply sloping ground, the construction of the new embankment on the Right Hand Side (RHS) ch.65-110m will be of reinforced soil construction since the side slope will be of the order of 60 degrees to be able to fit into the steeply sloping ground before the ground slopes down to the Berriedale Cliffs. This slope will be approximately 6.5m high at ch. 90-100m. On the Left Hand Side (LHS) from chainage 120-185m the cutting slope also needs to be steepened to avoid disturbing the cemetery. To do this the slope is steepened to 50o in soil, with soil nail reinforcement and 60o in rock, with rock bolts and rock fall netting. A 3m berm is also provided at the rock/soil interface.

West of the cemetery more gentle side slopes have been adopted with 1 vertical to 2 horizontal (1v:2h) in rock and 1 vertical to 3 horizontal (1v:3h) in soil, with a varying width of berm at the soil/rock interface for drainage and maintenance.

The road is relatively straight for approximately 100m before going into a right hand bend of 120m radius and then overlying the existing road, before the tie-in at Ch530m. Prior to the tie-in the design takes the new road to the west and away from the access to the White House in order to improve visibility from the access to the new trunk road.

The existing lay-by at the cemetery is replaced by a new lay-by in the northbound verge at approximate chainage 300m. The lay-by is designed to be a Type B lay-by in accordance with TD69/07 and is the minimum allowed by this standard with 3.6m wide x 30m long parking area. The new lay by is will allow slow moving northbound HGVs to pull over to allow faster vehicles to pass and will also serve as a parking area for visitors to the cemetery and a rest area/view point. .Access to the cemetery and rest area/viewing area is provided by means of a new 2m wide footpath from the rear of the layby to the entrance of the cemetery.

The redundant section of the road will be grubbed up and re-profiled to tie in the existing landscape topography; this area will be landscaped to help integrate the Scheme with the surrounding landscape.

Drainage of the new road is by means of filter drains at the edge of the carriageway, leading to a cascade and then to a basin prior to discharge into the Berriedale Waters. Land drainage is provided in a separate system and discharges to a similar cascade and then directly to the Berriedale Waters. The location of the basin and outfalls to the Berriedale Waters is downhill of the road improvements and is provided in the land between the existing road and the Berriedale Waters.

There is no lighting proposed for the scheme. Fencing and safety barriers will be required where appropriate.

Landscape proposals have been developed for the Scheme and these are described in more detail in Chapter 5 – Landscape and Visual, and are shown on Figure 5.5 – Indicative Landscape Plan.

2.5 Construction Information

The following sections describe the construction involved in the Scheme and also outlines any maintenance issues. It should be noted that this is subject to change following further design development by the appointed Design and Build Contractor. In addition a full constructability audit has been undertaken with Transport Scotland Construction Branch prior to the publication of the Draft Orders to ensure sufficient land take has been identified in order to build the road safely.

It is expected that construction of the Scheme would take place through 2016 and open towards the end of 2016 provided all the statutory consents have been gained in a timely manner and funding is available.

The main issues for consideration are the likely impacts the construction will have on the existing A9 trunk road. The Scheme will have a degree of disruption, but this disruption will be minimised as much as possible. As the majority of the Scheme is offline, this will result in less disruption overall to the local residents and the road users, with the main disruption arising during construction of the tie-ins to the existing A9.

Access to properties and land will be maintained throughout construction but some degree of disruption will be necessary when the accesses are being constructed.

The Scheme may involve night working and details of this will be made available to local residents. Standard construction working hours will be (08:00-18:00 Monday – Friday, and 08:00-12:00 on Saturdays) unless otherwise agreed with The Highland Council.

The majority of the Scheme can be completed offline and without any disruption to the existing A9. The tie-ins will require some disruption to the A9 in that traffic management and single lane working will be required at times. A few full overnight closures of the road will be necessary to be able to complete the tie-ins.

Construction of the Scheme will consist of several stages, programmed to ensure disruption and road closures are minimised, with the likely stages as follows:

- Establish site compound(s) and site clearance;
- Construct offline works;
- Construct online tie-in works to the north and south; and
- Finishing works.

2.5.1 ***Site Setup and Site Clearance***

During this stage of the works the site compound will be installed and setup. Site clearance will be undertaken at this stage along with securing the site and setting up the car park. It is not envisaged that any closures will be required as part of the site setup.

2.5.2 ***Main offline works***

The main section of the works will be constructed offline so the majority of activities will not affect road users.

2.5.3 ***Construction of Online Tie-in Works to the North and South***

Each tie-in will be constructed separately with temporary traffic management put in place during construction of the tie-ins with one way working traffic. The existing pavement will be removed and replaced with new pavement construction. Associated earthworks are likely to be required, along with the installation of new safety barriers and public utilities in the verges.

2.5.4 ***Finishing Works***

The finishing works will consist of installing fencing, safety fencing, traffic signs, road markings, finishing of the SUDs basin, landscaping and other required elements. During this time, the traffic management may consist of alternating one-way flow for short periods; however this will be kept to a minimum once pavement is ready to be trafficked. On completion of the finishing works, all traffic management will be removed.

2.5.5 ***Maintenance***

The proposed road is single carriageway and therefore any maintenance to the road pavement will require one way working which cannot be avoided.

3 SCOPING AND CONSULTATION

3.1 Introduction

As part of the consultation process, a screening report was prepared (A9 Berriedale Braes Improvement Environmental Impact Assessment Screening Report, March 2014). This report identified key issues to enable the scope of the EIA to be determined. It was recognised that adverse impacts are likely to occur during the construction and operation of the proposed Scheme. Some impacts will be short term, for example during construction, and others may be permanent, for example landscape and visual, or some may occur as a result of the operation of the Scheme, such as ecological effects. As a result mitigation measures have been incorporated in to the Scheme design to reduce adverse environmental impacts. The potential environmental issues identified during the screening process are shown in Table 3.1 below. The process of identifying and mitigating impacts has continued beyond scoping to complement the development of the engineering design.

Table 3.1 – Potential Environmental Issues considered

Environmental Issue	Construction	Operation
Landscape and Visual Effects	X	X
Nature Conservation	X	X
Cultural Heritage	X	X
Effects on All Travellers	X	✓
Community and Private Assets	X	O
Geology and Soils	X	O
Road Drainage and the Water Environment	X	X
Air Quality	X	O
Noise and Vibration	X	X
Materials	X	O
Cumulative Effects	X	X

O No significant likely effect

✓ Positive effect likely

X Negative effect possible

N/A Not applicable

The Screening Report identified that the Landscape and Visual Effects, Nature Conservation, Cultural Heritage, Road Drainage and the Water Environment, Noise and Vibration and Materials topics as those which further study regarding their environmental impact. Air Quality was originally included but on further consultation with SEPA it was agreed this could be scoped out of the assessment.

3.2 Topics Scoped out of the Environmental Report

The EIA Screening Report identified those to be scoped out of the assessment. It was determined that Effects on all Travellers, Community and Private Assets, Geology and Soils, Air Quality and Cumulative Effects should all be scoped out of the assessment and following consultation no consultees objected to this. The reason for scoping out the above topics is detailed below:

3.2.1 *Effects on All Travellers*

The Stage 2 Assessment identified that within the defined study area pavement provision was limited to a small stretch at the centre of the village. There are two core paths identified within the study area. Two core paths have been identified within the study area and other off-road pedestrian access includes the shore at Berriedale and an unmade rough footpath heading towards Berriedale Castle. There are no sign-posted cycle routes within, or crossing, the study area within this section of the A9 Trunk Road, although the baseline A9 does provide a cycling route opportunity. Additionally there are also no bridleways and no riding centres within or immediately adjacent to the Scheme. There is a vehicle lay-by situated immediately adjacent to the Scheme.

It is likely that the overriding issue causing driver stress at the current time in the vicinity of A9 at Berriedale Braes is due to fear of potential accidents when approaching the hairpin bend . This will cease to be an issue, once the Scheme is constructed as the existing situation will be improved.

Therefore it is not considered that the Scheme would have a significant impact on travellers and it is therefore recommended that the issue of travellers should be scoped out of the Environmental Report.

3.2.2 *Community and Private Assets*

The Stage 2 Assessment identified that within the defined study area there are a total of 24 residential properties, two of which are within 50m of the Scheme (The White House and Strathview), which both gain direct access from the A9.

The Land-use in the study area is predominantly agricultural and there are also large areas of commercial forestry and native woodland and scrub.

Industrial and business premises are limited to the former café and the Welbeck Estates office and Post office. The community facilities within the study area include Berriedale Church, Portland Hall and Berriedale cemetery.

The Stage 2 Assessment identified that there would be no direct impacts on access to private property or community assets. No loss of private property (non-agricultural) or future development land, and minor impacts upon agricultural land due to land-take and access disruption.

Therefore it is not considered that the Scheme would have a significant impact on community and private assets and it is therefore recommended that the issue of community and private assets should be scoped out of the Environmental Report.

3.2.3 *Geology and Soils*

The Stage 2 Assessment identified that within the defined study area the natural superficial deposits are Till and Boulder Clay with an underlying solid geology comprising of Berriedale Flagstone and Berriedale Sandstone. The Berriedale Cliffs SSSI and East Caithness SPA and SAC are also noted to be of geological interest. There are a number of potential sources of contaminated land throughout the study area.

The Stage 2 Assessment identified there would be moderate to negligible adverse impacts of the Scheme upon on the geomorphology, agricultural soils, drift geology, bedrock, hydrology and hydrogeology. In addition, the assessment noted that appropriate mitigation e.g. Environmental Method Statement with consent from controlling authorities, will be required, primarily during construction, to ensure that potential impacts are minimised wherever possible.

In addition, there is a geotechnical report being produced as part of the DMRB Stage 3 Assessment which should be read alongside this environmental report.

Therefore it is not considered that the Scheme would have a significant impact on Geology and Soils and it has therefore been scoped out of this Environmental Report.

3.2.4 *Air Quality*

The Stage 2 Assessment identified that within the defined study area the average concentration of all pollutants are well below their respective Air Quality objectives in 2012. Therefore air quality across the study area is of a very good standard.

The Stage 2 Assessment identified that there is a potential for fugitive dust impacts at nearby residential and ecological receptors from construction but that this impact was not significant and could be mitigated through best practice construction methods. .Potential impacts upon ecological receptors are anticipated to be neutral.

Therefore it is not considered that the Scheme would have a significant impact on air quality and it is therefore recommended that the issue air quality assets should be scoped out of the Environmental Report.

3.2.5 *Cumulative Effects*

A search was carried out of local planning policy and planning applications to determine if there are any other major proposals within the area that could contribute to cumulative effects. Consultation was also carried out with Highland Council and it was determined that there were no proposals within the area and a cumulative assessment with other developments was not required. Where necessary individual chapters have addressed in-scheme cumulative impacts.

3.3 Consultation

A number of statutory and non-statutory bodies were consulted as part of Stage 2 DMRB Assessment, the EIA Screening Process and this Environmental Report process.

In addition, a public exhibition was also held as part of the Stage 2 Assessment in Berriedale on Wednesday 2nd April 2014.

A summary of responses that were received from organisations consulted are shown in Table 3.2 and Table 3.3 below. Copies of all consultation responses are included in Appendix 1 – Copy of Consultation Responses.

Table 3.2- Summary of Consultation Responses		
Stage 2 Consultation Summary		
Consultee	**Date of Response**	**Summary of response**
SEPA	24/07/2013	We welcome pre-application consultation and would be very happy to provide detailed and specific advice on the proposals once more information is provided to us. In the interim we attach a scoping response we recently provided to Transport Scotland regarding the A9 duelling works as this outlined the types of issues we have an interest in and how they should be considered in the design of road schemes. We hope will be helpful to you. The only issue the attached letter does not seem to cover which may be relevant here is the use and disposal of any waste wood, but we can provide advice on this aspect if it looks as if the proposals will disturb wooded areas. A9 Dualling — Generic Scoping (29th May 2013), this covers: • Flood Risk • Engineering Activities in the Water Environment • Surface Water Drainage • Existing Groundwater Abstractions • Contaminated Land • Dewatering • Disruption to Wetlands including Peatlands • Peat Management • Disturbance and re-use of excavated Peat or Soils • Pollution Prevention and Environmental Management • Borrow Pits • Air Quality
	28/10/2013	In relation to environmental information we hold please I can direct you to the following page of our website - www.sepa.org.uk/about_us/access_to_information/how_to_access_information.aspx - which outlines the types of information we have.
	31/10/2013	We welcome the opportunity to be involved with the project and provide the following advice. 1. Based on the information available at this stage we consider that the two options being brought forward are likely to have very similar effects on the aspects of the environment in which we have an interest. 2. The only aspect which we think may differ significantly between the routes is the amount of aggregate required for construction. We suggest that the Stage 2 assessment include an estimate of the construction material required for each route accompanied by information on where this material will be sourced from (e.g. won from the site, new borrow pit on site or elsewhere, use of existing quarry) and likely environmental implications. 3. We refer you to our previous response of 24 July 2013 for a copy of a scoping letter outlining the information we would generally expect to be considered as part of any EIA. We would be very happy to provide more targeted scoping advice on this project on request.
Scottish Natural	05/07/2013	There are several designated sites in this area and impacts on these sites would be our primary concern. As such there are potential natural heritage interests of national importance associated with this development which may require further consideration.

Table 3.2- Summary of Consultation Responses

Heritage		1 European Interests 1.1 East Caithness Cliffs SPA We recommend that an assessment is carried out to determine the likely impacts of the proposal on the SPA species. 1.2 East Caithness Cliffs SAC We recommend that an assessment is carried out to determine if there is connectivity between this proposal and the SAC. 1.3 Berriedale and Langwell Water SAC We recommend that an assessment is carried out to determine the likely impacts of the proposal on Atlantic salmon. We would also advise that pollution prevention measures are implemented (following SEPA best practice guidance) and that construction works are carried out in accordance with a Construction Environmental Management Document (CEMD). 2. Sites of Special Scientific Interest (SSSI) Berriedale Cliffs SSSI. This overlaps with the East Caithness Cliffs SAC and SPA and is designated for the same species and habitats as discussed above. Berriedale Water SSSI. Based on the current map of the proposal it is unlikely that this SSSI will be affected and so no further consideration is required. 3. Protected species We recommend an assessment on the risks to habitats and species is undertaken. We are also aware that Killarney Fern grows in the Berriedale area. Otters, bats and the Killarney Fern are all European Protected Species (EPS) and therefore protected under the Habitats Regulations 1994 (as amended in Scotland). If any protected species are present then we would recommend a Species Protection Plan which should any mitigation that might be required. 4. Landscape and visual impact Berriedale lies within the “Flow Country and Berriedale Coast” Special Landscape Area. This is a Highland Council landscape designation. We recommend that you contact the Highland Council regarding this designation. 5. Conclusion We recommend that the designated sites (and their features of interest) and protected species listed above are used to inform the suitability of the various engineering options and in determining the best route option for this project.
	30/10/2013	Both of the options 4a and 5b are in a similar area to our previous comments, so generally, our view at this stage is unlikely to change from our letter dated 5 July 2013. For more detail please see this previous response.
Historic Scotland	13/11/2013	Please also seek information and advice from the relevant Council’s archaeological and conservation service. **Potential Direct Impacts** Based on the information provided of Options 4a and 5b, it would appear unlikely that either of these options would result in direct impacts on assets within our statutory remit. **Potential Indirect Impacts** The potential impact of the proposed development on the setting of surrounding assets should be considered. In particular, the following assets are within the surrounding area of the proposed development and should be considered in terms of impact on their setting: Scheduled Monuments · Berriedale Castle (Index no. 3438)

Table 3.2- Summary of Consultation Responses

		Gardens and Designed Landscapes · Langwell Lodge Any assessment to be produced for this development should consider impacts upon these assets and any others in the wider area which may experience significant impacts. The assessment should contain a full appreciation of the setting of these heritage assets and the likely impact on their settings. In terms of Berriedale Castle, photomontages should be used to inform the assessment of impacts. The layout options identified in the consultation are likely to have an impact on the appreciation of the views from the castle as the road will cut across the hillside to the north, above the castle. **Potential Cumulative Impacts** I would recommend that the potential cumulative impacts of the proposed development in combination with other developments in the vicinity, be assessed. This should assess the incremental impact or change when the proposal is combined with other past, present and reasonably foreseeable developments.
The Highland Council TEC Services	20/11/2013	Preference for option 5b due to shallower gradients Replacement lay by required. Curve widening to inside of hairpin bend or alternatively provision of HGV over run area may still be required. Traffic calming eg SDR to try to reduce excessive downhill speeds and signing/road markings Stop up ex road for vehicular traffic but leave access to church/cemetery with enhanced turning head. Allow through movement for cyclists & pedestrians on de-trunked section. Consider anti-skid surfacing at bend for downhill traffic.
The Caithness District Salmon Fisheries Board	28/10/2013	Routes are equivalent in terms of the risks posed. Any risks to fish or fisheries are likely to arise from the construction methods to be used. These are not yet known but the Board will welcome the opportunity to comment in due course. Holdings of data are restricted to survey data for 2013 of juvenile salmonid populations in both the Rivers Berriedale and Langwell. A report is currently being prepared and it is scheduled for mid-January. The report is likely to show that both rivers are fully stocked. The Board could probably arrange to make a preliminary assessment of the data available to you before the January date if needed sooner.
Caithness Chamber of Commerce (Caithness Transport Forum)	30/10/2013	As noted in the consultation letter, the current situation causes particular difficulty for long and heavy vehicles, and this is a major concern given the potential for jobs and business to be created in industries such as oil and gas servicing and marine renewables. Such industries are likely to be reliant on the ability of heavy traffic to travel in and out of the county with relative ease. For this reason, the Forum feels that Option 5b is to be preferred, as it straightens out the climb for such vehicles. It was also felt that this option is likely to provide better passing facilities, reducing the frustration for drivers of getting stuck behind slow-moving vehicles and thereby increasing safety.
NDA		No response
The Highland Council Transport		No response

Table 3.2- Summary of Consultation Responses		
SG Governance & Communities Directorate		No response
SG Enterprise, Environment & Digital Directorate		No response
HITRANS		Acknowledged consultation request letter
Sustrans Scotland		No response
EIA Screening Consultation Summary		
SEPA	24/03/2014	Thank you for consulting SEPA on the screening opinion for the above development proposal by way of your email which we received on 4 March 2014. We understand that you are carrying out the screening process on behalf of Transport Scotland. We consider that with respect to our interests EIA is not required for the proposal. Nonetheless we agreed that there is a need for the Order process to be supported by an environmental assessment and in this regard we provide the following advice. We would be keen to see a copy of the draft assessment so that any issues we might have can be flagged up and addressed early in the process. Provided detailed advice regarding: • Surface water drainage • Existing groundwater abstractions • Disturbance and re-use of excavated peat or soils • Pollution prevention and environmental management • Borrow pits • Direct impacts on the water environment
Scottish Natural Heritage	24/03/2014	At this stage it is difficult to know the significance of the impacts of this proposal on the environment. Based on the information available, it is likely that any significant effects on the environment can be avoided through mitigation and careful design. Additional information will be necessary to assess the impacts to the European designated sites and inform a Habitats Regulations Appraisal. Appraisal of the impacts of the proposal and our advice Potential for impacts on several designated sites. The proposal lies close to Berriedale and Langwell Water Special Area of Conservation (SAC) and the East Caithness Cliffs Special Protection Area (SPA) and SAC. Consequently Transport Scotland is required to consider the effects of the proposal on the SACs and SPA before it can be consented

Table 3.2- Summary of Consultation Responses

		(commonly known as a Habitats Regulations Appraisal). There are still some uncertainties to the significance of the impacts on these sites, however it is likely that most of these impacts can be reduced through mitigation and careful design. Potential for landslide, or movement of material downslope, onto the East Caithness Cliffs SAC and/or the Berriedale and Langwell Water SAC should be fully investigated. This could affect the designated species/habitats in both protected areas. Any mitigation to avoid this should be clearly stated in the environmental report. Should Transport Scotland determine that an EIA is required, we believe that the information can be provided in a focussed Environmental Statement, concentrating on the impacts to protected areas. Alternatively, if it is decided that an EIA is not required, the information could be provided in the form of a targeted environmental report.
Historic Scotland	28/03/2014	List of designated heritage assets in close proximity to the scheme including Scheduled Monuments and Gardens and Designed Landscapes Content that the proposed works are unlikely to have significant adverse effects on the setting of the above assets, or on others within the surrounding area. Should Transport Scotland determine that an EIA is not required, we would request that an assessment of potential direct and indirect impacts on assets within our remit be undertaken within the non-statutory environmental assessment. We advise that reference be made to our guidance note on 'Setting' as well as the guidance contained in the DMRB, and that the assessment be supported by visualisations. Recommend that the mitigation measures identified in the screening report be put in place, to reduce potential adverse effects on the cultural heritage assets identified above.
The Highland Council	05/02/2014	I have no particular preference for one option over the other. Both would require a non-invasive professional field survey to identify historic environment assets and archaeological potential, regardless which route is chosen. We do have a number of features recorded on the Highland Historic Environment Record in this area, including the remains of a building (first depicted on the 1st edition OS map c.1874) to the south of the cemetery and a defensive military structure, which both routes would potentially impact. There may also be the remains of a township along Option 5b, as well as a series of field boundaries and small historic (18th-19th century) structures. I would foresee some archaeological mitigation being required in either case, although the nature and extent of which would depend on the results of the field survey and the expected landtake of the new road.
	28/03/2014	I do not consider that the scheme warrants the submission of a formal EIA. This conclusion is based on the fact that the proposal is relatively minor in nature in that it only affects a short section of road, the long term impacts (if there are any) are local and the impacts if any can be adequately mitigated during the construction of the new section of the road.
Sustrans Scotland	05/03/2014	National Cycle Network route 1 which runs from Dover to the Shetland Isles is designed so it runs from Lairg to Tongue and then on to Thurso so it avoids the A9. Strong likelihood that reasonably large numbers of cyclists will use the A9 due to the large growth in 'end to enders' i.e people cycling from Lands End to John o Groats or vice versa with peak in numbers will likely be in the summer months. A9 is not a formal cycle route but there could be > 5,000 cyclists attempting this every year. Most will be competent road cyclists and would need no special measures. Most favourable route is likely to be 5B because it will be a straighter section and possibly lesser gradients allowing for vehicles to overtake cyclists and other vehicles safely. Option 4a looks to have a tight bend which may not allow for this. I don't think there would be any merit in

Table 3.2- Summary of Consultation Responses		
		having additional cycle lanes for such a short section of road, given there are no facilities either side of this. I think if the road can be constructed to allow cars/HGV's to pass cyclists safely, then that should be sufficient.

3.4 Additional Consultation during the Environmental Report

Consultations with statutory bodies and scheme stakeholders has been continued throughout the production of this Environmental Report in a comprehensive and open manner, ensuring that the views of all parties are properly heard, recorded and taken into consideration during the study and development of the Scheme.

A summary of the Consultation Responses received during the preparation of this Environmental Report are detailed below in Table 3.3.

Table 3.3 - Environmental Report Consultation Responses Summary

Consultee	Date of Response	Summary of response
SEPA	19/05/2014	No concerns regarding your proposal to scope out Air Quality and Geology and Soils if the Materials assessment includes, as you propose, a soils/peat balance for the works. This should demonstrate how much material will be disturbed and how and where it can be reused, either on or off site.
	30/07/2014	Discussed the proposals with SNH and they are content that two different levels of SUDS treatment – as per best practice for roads – is sufficient in this case. Based on the drawings that you sent then this would take the form of a filter trench discharging to a basin with high level overflow to the river. As a small reminder, separate construction SUDS will also be required. Please also note we do not provide advice on the water quantity aspect of SUDS. Previously asked for clarification on the filter drains and swales of the proposed scheme.
	25/07/2014	Clarified position on waste exemptions.
	30/09/2014	**Comments on draft Environmental Report:** Thank you for your consultation letter dated 8 September 2014 which SEPA received on 11 September 2014. We very much welcome the opportunity to provide advice on the draft Environmental Report (ER) prior to its formal submission. 1. We are content with the proposal that two levels of SUDS treatment will be gained via filter trench and basin. As outlined previously, please note we will not provide comments on the quantity aspects of SUDS. Please also note that a Water Environment (Controlled Activities) (Scotland) Regulations (CAR) licence will be required if the drainage to one outfall is greater than 1 km. 2. We welcome the clear setting out as mitigation the requirement for the contractor to produce and then agree with us a Construction Environmental Management Document and Site Management Plan. It may be helpful if somewhere in the document there was a clear requirement for the CEMP/SMP to adhere to the other mitigation measures outlined in the ER. This is just to ensure that all the measures outlined are actually delivered on the ground.

Table 3.3 - Environmental Report Consultation Responses Summary

Consultee	Date of Response	Summary of response
		3. We note that Chapter 10 identifies approximately 60,000 m3 of surplus excavated materials. No information on the fate of this material seems to be provided. We would ask that the finalised ER confirms what will be done with the waste. We would encourage you to find a beneficial use for the material. If it is soil then our *Sustainable Reuse of Greenfield Soils in Construction* may apply but do note that if the material is peat then reuse options can be more difficult and proposals should comply with our *Regulatory Position Statement - Developments on Peat*. Both documents can be found from www.sepa.org.uk/planning/sustainable_waste_management.aspx.
Scottish Natural Heritage	05/06/2014	As this is a non-EIA development which is unlikely to affect the integrity of any national landscape designations (e.g. NSAs) or search areas of wild land, we do not intend to give detailed comments on the landscape impacts of this proposal.
	13/06/2014	SNH confirmed that they would like to be involved in discussions regarding drainage treatment for the proposed scheme as it is likely to require a Habitats Regulations Assessment.
	12/08/2014	**Response to HRA Screening** I have had a read through your HRA report, and I am in general agreement with the conclusions. The mitigation that you are proposing does look appropriate and it will be important that these are implemented. The breeding bird surveys provide useful information on the location and status of breeding SPA birds in the area, and it is interesting to see them at this point. **I have not completed a full appraisal** so I should make it clear that these comments are given without prejudice to the views which we may wish to express at a later stage in response to a formal consultation on the full proposal. I don't think there is any need for us to see a draft of your Environmental report. We usually resist from commenting on draft environmental reports unless there are particularly important reasons for such a request being made. For example if there are particularly complex issues relating to the natural heritage, or if there are new issues that we need to provide advice on. We will, of course, be interested to see the final report when it is ready for consultation. In the meantime please let me know if you need more information or advice.
	12/08/2014	Clarification on consultation on the Draft Orders
The Highland Council	22/05/2014	I confirm that I am satisfied with the scope of the areas of study for the assessment and the areas that are out of scope. Copied in Iain Moncrieff and Campbell Stewart regarding drainage and Anne Cowling the landscape officer.
	25/09/2014	**Comments on draft Environmental Report:** I have had a brief read through the draft cultural heritage chapter which I found to be a detailed and thorough assessment. I can confirm that I am happy to accept the overall conclusions with regard to heritage assets and we are content that, where impacts are predicted, these can be mitigated effectively through

Table 3.3 - Environmental Report Consultation Responses Summary		
Consultee	**Date of Response**	**Summary of response**
		the strategies outlined. No further comments were received on the ER.
Historic Scotland	18/09/2014	**Comments on draft Environmental Report:** We note that draft ER provides a good account of all of the assets we would wish to see assessed as part of the assessment. The baseline is comprehensive and the methodology is clear and consistent and conclusions reached appear to be reasonable. You may wish to consider reconsider the 'medium value' given to Langwell Lodge garden and designed landscape on page 27 of the Cultural Heritage Chapter. The GDL is included in the Inventory of garden and designed landscape as an asset of high value of national importance, including for its outstanding scenic value. This will also ensure consistency with the draft Landscape Chapter which recognises the high sensitivity of Langwell Lodge GDL
Caithness District Salmon Fisheries Board	15/10/2014	Thank you for your email of 3 October. The Board's science consultant has had a look at the documents received regarding the proposed improvements to Berriedale Braes. Our consultant wishes to raise only a single issue. This regards drainage from the site and, more generally, from the entire road system around Berriedale - recognising that the latter aspect is not specifically relevant to the current proposal. While it is true, as the documents state, that drainage from the proposed improvements will have the potential to impact only on the small part of the Berriedale and Langwell SACs downstream of the A9; it is worth pointing out that this is an extremely important part. It is used by the entire populations of both rivers on their return as adults and, when river flow is low and fish are unable to make their way upstream, large numbers of adult fish are confined to the area in question for prolonged periods. Indeed, large congregations of fish can often be observed in the sea-pool during summer low flows. Under these conditions, large parts of the potential spawning populations of both rivers are at high risk from any material that may find its way from the road to the river through the proposed SUDS drainage system. While the SUDS system may deal adequately with particulate or insoluble materials, the system described does not appear to deal with the range of other soluble pollutants or hydrocarbons that can be envisaged to arise from the proposed works, general road use or accidental spillage from commercial vehicles exacerbated by the road's high gradient. The road drainage system around Berriedale will have evolved over many years as the road system has developed but has probably lagged behind other aspects of road design. In view of this, we suggest that the proposed development offers a one-off opportunity to improve the overall picture by routeing road drainage in the vicinity of the proposed works away from the river. We would ask you to note the concerns above and look forward to receiving reassurance that fish will not be at risk from site drainage. If you have any queries or would like to discuss further please do get in touch.
	29/10/2014	*Please note URS responded to the letter from the Caithness District Salmon Fisheries Board (CDSFB) and offered to provide an additional proprietary system to treat the outfall from the drainage basin in addition to the two levels of SUDS which are included as part of the Scheme design (URS response is also Included in Appendix 1)*
	03/11/2014	Thank you for the detailed correspondence regarding the proposed improvements to the north section of Berriedale Braes on the A9.

Table 3.3 - Environmental Report Consultation Responses Summary		
Consultee	**Date of Response**	**Summary of response**
		As you know, the Board previously raised a query concerning the routeing of drainage away from the Berriedale/ Langwell SAC because salmon often congregate in the short stretch of river below the SUDs outfall near the road bridge when water conditions are unfavourable for getting further upstream. Your proposal to install a third stage of treatment using a Downstream Defender appears to answer the Board's concerns regarding the possible effects of contaminated road wash on the river environment. While the specific context for this correspondence relates only to the new road section, it is of interest to the Board to know whether all the drainage for North and South Braes passes through the same SUDs station before discharging to the river. It would be helpful if you are able to answer this point.

4 ASSESSMENT METHODOLOGY

4.1 Methodology

The Highways Agency (HA) is currently modernising Volume 11 (Environmental Assessment) of the Design Manual for Roads and Bridges (DMRB). The Aims and Objectives of Environmental Assessment (DMRB, Vol.11, Part1: HA 200/08) identifies in Table 1.1 the Environmental Impact Assessment Topics. At present only some of the topics have published updated guidance and some topics rely on previous historic guidance. 'Materials' is listed as a topic heading and draft guidance has been prepared for this topic, therefore an assessment has been undertaken as part of this report.

The topic headings in this Environmental Report have followed the new headings as set out in DMRB Volume 11 Environmental Assessment and the report is structured as shown in Chapter 1 – Introduction, Table 1.2.

This Environmental Report contains chapters for each of the specialist environmental topics, namely Landscape; Nature Conservation; Cultural Heritage; Road Drainage and the Water Environment; Noise and Vibration and Materials. It should be noted that some of the DMRB topic headings have been scoped out and more detail on this is provided in Chapter 3 – Scoping and Consultation. Each specialist environmental topic chapter follows the same format and assessment hierarchy for ease of comparison, unless otherwise indicated within the topic chapter:

- Introduction – introduces the environmental topic.
- Approach and Methods – describes the methodology that has been used in the assessment of the environmental topic. Unless specified as otherwise, the methodology used is drawn from the Design Manual for Roads and Bridges, Environmental Assessment, Volume 11.
- Baseline Conditions – describes the study area used for the topic as well as the baseline information obtained and the date of any surveys undertaken. The baseline also takes into account any changes, which have been identified as likely to occur either prior to construction or prior to the operation of the Scheme
- Predicted impacts – identifies the possible range and location of potential impacts before mitigation comprising:
  - Effects of construction
  - Effects of operation
  - Significance of environmental effect – generally set out in tabular format.
  - Consideration of the 'nature of the effect' (positive, neutral and negative effects are identified and evaluated for both the construction and operational stages and whether or not the effects are direct or indirect; secondary; cumulative; short, medium and long-term; permanent and temporary).
  - The 'magnitude of effect' (this considers the scale of change, the degree to which the environment is affected, the likelihood or probability of an effect occurring and the implications of any cumulative effects). For this Environmental Report, the magnitude of impact is based on a scale comprising 'Major' (an acute change to the environment), 'Moderate' (a moderate change to the environment), 'Minor' (a small change to the environment), 'Negligible' (a negligible change to the environment) and 'No change'.
  - The 'sensitivity of the receptor' to the effect based on a scale comprising 'Negligible', 'Low (or Lower)', 'Medium', 'High' and 'Very High'.

- Mitigation – provides a hierarchy of measures to avoid adverse impacts to features where possible (e.g. by modifying the design or location), and where this is not possible then to minimise the scale, significance or degree of impact and finally to offset or compensate impacts where possible e.g. provision of new opportunities for access.

- Disruption due to construction – outlines the likely environmental impacts that will arise during the construction phase of the Scheme.

- Residual impacts – describes the impacts, which are likely to remain after the application of mitigation measures, measured at the year of opening and 15 years after construction.

- Compliance with plans and policies

- Summary – provides a brief summary of the assessment.

- References – each chapter provides a list of any information sources referred to within the chapter text.

In order to determine the 'significance of environment effects' of the proposed Scheme, consideration has been given to both the magnitude of effect and the sensitivity of the receptor.

DMRB, Volume 11, Section 2, Part 5 (HA 205/08) provides guidance on determining significance of environmental effects. Table 4.1 below provides typical descriptions for assigning environmental value (or sensitivity).

Table 4.1 – Environmental Value (or Sensitivity) and Typical Descriptors

Value (sensitivity)	Typical descriptors
Very High	Very high importance and rarity, international scale and very limited potential for substitution.
High	High importance and rarity, national scale, and limited potential for substitution.
Medium	High or medium importance and rarity, regional scale, limited potential for substitution
Low (or Lower)	Low or medium importance and rarity, local scale
Negligible	Very low importance and rarity, local scale.

Table 4.2 provides typical descriptors and criteria which define the magnitude of an impact of a project.

Table 4.2 – Magnitude of Impact and Typical Descriptors

Magnitude of Impact	Typical criteria descriptors
Major	Loss of resource and/ or quality and integrity of resource; severe damage to key characteristics, features or elements (ADVERSE) Large scale or major improvement of resource quality; extensive restoration or enhancement; major improvement of attribute quality (BENEFICIAL)
Moderate	Loss of resource, but not adversely affecting the integrity; partial loss of/damage to key characteristics, features or elements (ADVERSE)

Magnitude of Impact	Typical criteria descriptors
	Benefit to, or addition of, key characteristics, features or elements; improvement of attribute quality (BENEFICIAL)
Minor	Some measureable change in attributes, quality or vulnerability; minor loss of, or alteration to, one (maybe more) key characteristics, features or elements (ADVERSE) Minor benefit to, or addition or, one (maybe more) key characteristics, feature or elements; some beneficial impact on attribute or a reduced risk of negative impact occurring (BENEFICIAL)
Negligible	Very minor loss or detrimental alteration to one of more characteristics, features or elements (ADVERSE). Very minor benefit to or positive additional of one or more characteristics, features or elements (BENEFICIAL)
No change	No loss or alteration of characteristics, features or elements; no observable impact in either direction.

The approach to assigning significance of effect relies on reasoned argument, professional judgements and taking on board the advice and views of appropriate organisations. For some disciplines, predicted effects may be compared with quantitative thresholds and scales in determining significance. Assigning each effect to one of the five significance categories enables different topic issues to be placed upon the same scale, in order to assist the decision-making process at whatever stage the project is at within the process. These five significance categories are set out in Table 4.3.

Table 4.3 – Descriptors of the Significance of Effect Categories

Significance category	Typical descriptors of effect
Very Large	Only adverse effects are normally assigned this level of significance. They represent key factors in the decision-making process. These effects are generally, but not exclusively, associated with sites or features of international, national or regional importance that are likely to suffer a most damaging impact and loss of resource integrity. However, a major change in a site or feature of local importance may also enter this category.
Large	These beneficial or adverse effects are considered to be very important considerations and are likely to be material in the decision-making process.
Moderate	These beneficial or adverse effects may be important, but are not likely to be key decision-making factors. The cumulative effects of such factors may influence decision-making if they lead to an increase in the overall adverse effect on a particular resource or receptor.
Slight	These beneficial or adverse effects may be raised as local factors. They are unlikely to be critical in the decision-making process, but are important in enhancing the subsequent design of the project.
Neutral	No effects or those that are beneath levels of perception, within normal bounds of variation or within the margin of forecasting error.

It is important to note that significance categories are required for positive (beneficial) as well as negative (adverse) effects. The five significance categories give rise to eight potential outcomes. Applying the formula, the greater the environmental sensitivity or value of the

receptor or resource, and the greater the magnitude of impact, the more significant the effect. The typical, significance categories are presented in Table 4.4.

Table 4.4 – Significance of Environmental Effect Matrix (areas in grey are considered significant effects)

Magnitude of Impact	Sensitivity of Receptor				
	Very High	**High**	**Medium**	**Low**	**Negligible**
Major	**Very Large**	**Large or Very Large**	**Moderate or Large**	Slight or Moderate	Slight
Moderate	**Large or Very Large**	**Moderate or Large**	Moderate	Slight	Neutral or Slight
Minor	**Moderate or Large**	Slight or Moderate	Slight	Neutral or Slight	Neutral or Slight
Negligible	Slight	Slight	Neutral or Slight	Neutral or Slight	Neutral
No Change	Neutral	Neutral	Neutral	Neutral	Neutral

Where authors have used a different assessment table this is clearly explained in the chapter.

A glossary of the main terms used throughout this Environmental Report is provided at the front of the Environmental Report to ensure a clearer understanding of the technical language. A separate Non-Technical Summary has also been prepared, which provides a brief summary of the Scheme and the principal findings of the environmental assessment in non-technical language.

5 LANDSCAPE AND VISUAL

5.1 Introduction

The following section provides an assessment of potential landscape and visual effects relating to the proposed A9 Berriedale Braes Improvements Scheme.

The assessments describe and evaluate the landscape resource and visual amenity of the study area, report on the proposed change and make informed predictions of the likely effects. The assessment process also involves consideration of opportunities to mitigate potential negative landscape and visual effects.

5.2 Planning Policy Context

The landscape and visual assessments have been undertaken with reference to national, regional and local planning policy and guidance.

- National Planning Framework 3 (NPF3);
- Scottish Planning Policy (SPP); and
- Planning Advice Note (PAN) 60: Planning for Natural Heritage.

In addition to the above national policy and advice, a review of the Highland wide Local Development Plan for the study area has been undertaken. The following provides an overview of the key objectives and policies set out in the plan, of relevance to the proposed Scheme and specifically in relation to landscape character and visual amenity aspects.

5.2.1 *Highland wide Local Development Plan, 2012*

The vision of the development plan sets out a number of goals and ways that these will be met. The following outlines those of particular relevance to landscape and visual and the proposed Scheme:

- safeguarding the environment by *'ensuring that the special quality of the natural, built and cultural environment in Highland is protected and enhanced'*; and
- supporting a competitive, sustainable and adaptable economy by *'helping to deliver, in partnership with Transport Scotland and other transport bodies, transport infrastructure improvements across the area'* this includes recognition of the need for *'A9 improvement schemes, including Berriedale Braes'*.

The following provides an overview of policies relevant to landscape character and visual amenity considerations set out in the development plan.

Policy 28 – Sustainable Design states that *'the Council will support developments which promote and enhance the social, economic and environmental wellbeing of the people of Highland.'* The policy also sets out a list of points against which development will be assessed for compliance, including the level of effect on certain resources such as landscape and scenery and the need to *'demonstrate sensitive siting and high quality design in keeping with local character and historic and natural environment and in making use of appropriate materials'*.

Policy 29 – Design Quality and Place Making states that *'new development should be designed to make a positive contribution to the architectural and visual quality of the place in which it is located'* and that *'Applicants should demonstrate sensitivity and respect towards the local distinctiveness of the landscape, architecture, design and layouts in their proposals'*.

Policy 36 – Development in the Wider Countryside outlines a set of criteria against which development outwith the main settlements will be assessed. This includes the need to ensure that development is compatible with the landscape character and capacity.

Policy 57 – Natural, Built and Cultural Heritage outlines protection for important natural, built and cultural heritage assets designated at the local/ regional, national and international level. For local and regional level designations it states that *'we will allow developments if it can be satisfactorily demonstrated that they will not have an unacceptable impact on the natural environment, amenity and heritage resource'*. For sites of a national importance, the policy states that the council *'will allow developments that can be shown not to compromise the natural environment, amenity and heritage resource. Where there may be any significant adverse effects, these must be clearly outweighed by social or economic benefits of national importance. It must also be shown that the development will support communities in fragile areas who are having difficulties in keeping their population and services'*.

Policy 61 – Landscape states that *'new developments should be designed to reflect the landscape characteristics and special qualities identified in the Landscape Character Assessment of the area in which they are proposed. This will include consideration of the appropriate scale, form, pattern and construction materials, as well as the potential cumulative effect of developments where this may be an issue. The Council would wish to encourage those undertaking development to include measures to enhance the landscape characteristics of the area. This will apply particularly where the condition of the landscape characteristics has deteriorated to such an extent that there has been a loss of landscape quality or distinctive sense of place. In the assessment of new developments, the Council will take account of Landscape Character Assessments, Landscape Capacity Studies and its supplementary guidance on Siting and Design and Sustainable Design, together with any other relevant* design guidance'.

5.3 Approach & Methodology

The landscape and visual assessments have been undertaken in accordance with the Guidelines for Landscape and Visual Impact Assessment (GLVIA), Third Edition, 2013, published by the Landscape Institute and the Institute of Environmental Management and Assessment. Reference has also been made to Design Manual for Roads and Bridges (DMRB) Volume 11 Section 3 Part 5 and other best practice guidance.

As recommended by GLVIA, the assessments of landscape character and visual amenity, although closely related, are undertaken separately.

The assessments have been undertaken in accordance with the following broad structure.

- Establishment of the Baseline;
- Appreciation of the Proposed Scheme; and
- Assessment of Effects.

5.3.1 *Establishment of the Baseline*

A baseline study has been undertaken through a combination of desk based research and site appraisal in order to establish the existing conditions of the landscape and visual resources of the study area. Desk based research has involved a review of mapping and aerial photography, relevant planning and policy documents, as presented in Section 5.2, above, the Caithness and Sutherland Landscape Character Assessment and other relevant documents and publications. The site appraisal is carried out in conjunction with the desk based research in order to verify the initial findings.

The landscape baseline study identifies landscape designations and distinct landscape types within the study area and helps define their key characteristics and value. Landscape value is often defined with reference to designations, such as National Park or National Scenic Area. However, the absence of a designation does not necessarily imply a lack of quality or value as other factors such as local scarcity or accessibility can result in a landscape of high value as a local resource.

The visual baseline aids in the identification of potential visual receptor locations and provides a description of the nature of the existing views and their inherent value.

5.3.2 *Appreciation of the Proposed Scheme*

In order to be able to accurately assess the full extent of likely effects on landscape character and visual amenity it is essential to develop a thorough and detailed knowledge of the proposed Scheme. This includes a comprehensive understanding of its location, nature and scale and is achieved through a review of drawings and visualisations, and discussion with the project engineers. This helps to establish the potential extent of visibility and influence of the proposed Scheme and aids in identifying areas for further targeted survey and analysis. A detailed description of the proposed Scheme is provided in Chapter 2 – Scheme Description.

5.3.3 *Assessment of Effects*

The landscape and visual assessments seek to identify, predict and evaluate the significance of potential effects to landscape characteristics and established views. The assessments are based on an evaluation of the sensitivity to change and the magnitude of change for each landscape or visual receptor.

The assessments acknowledge that landscape and visual effects change over time as the existing landscape external to the proposed Scheme evolves and proposed planting establishes and matures. The assessments therefore report on potential effects during construction, operation (year 1), and in the long term (year 15).

Landscape Sensitivity to Change

The evaluation of landscape sensitivity to change involves consideration of the nature of the landscape and its ability to accommodate change without compromising its key elements or characteristics. Landscape sensitivity is defined through an appraisal of value, as identified in the baseline, and landscape susceptibility. Landscape susceptibility relates to the ability of a landscape to accommodate the proposed Scheme and considers the nature, scale and complexity of the landscape.

Landscape sensitivity to change is defined using a three point scale as outlined in Table 5.1, below.

Table 5.1 – Landscape Sensitivity to Change

Landscape Sensitivity	Classification Criteria
High	Landscape of particularly highly valued character, considered very susceptible to relatively small changes e.g. within a designated National Scenic Area, National Park, Garden and Designed Landscape or recognised as an iconic or important feature of the Scottish landscape.
Medium	Landscape of regional or local value or rarity, exhibiting some distinct features, considered tolerant of some degree of change e.g. within a Special Landscape Area.
Low	Landscape with few distinctive elements or valued characteristics and considered tolerant of a large degree of change e.g. outwith any designated areas or within a degraded

Landscape Sensitivity	Classification Criteria
	landscape.

Visual Sensitivity to Change

The evaluation of visual sensitivity to change involves consideration of the viewing expectation, or value placed on the view, as identified in the baseline, and its susceptibility to change. Visual sensitivity to change is defined using a three point scale as outlined in Table 5.2, below.

Table 5.2 – Visual Sensitivity to Change

Visual Sensitivity	Classification Criteria
High	Locations where receptors experience a highly valued, impressive or well composed view, with no detracting features and where changes would be highly noticeable.
Medium	Locations where receptors experience a valued view which generally represents a pleasing composition but may include some detracting elements and is tolerant of a degree of change.
Low	Locations where the view is incidental but not important to the receptors and the nature of the view is of limited value or poorly composed with numerous detracting feature and is tolerant of a large degree of change.

Magnitude of Landscape Change

Magnitude of landscape change refers to the extent to which the proposed Scheme would alter the existing characteristics of the landscape. Changes to landscape characteristics can be both direct and indirect. Direct change occurs where the proposed Scheme would result in a physical change to the landscape. Indirect change occurs where the proposed Scheme would become a feature in the landscape but would be physically located in a different landscape area. Magnitude of landscape change has been evaluated using the four point scale and criteria outlined in Table 5.3, below.

Table 5.3 – Magnitude of Landscape Change

Magnitude	Classification Criteria
High	The proposed Scheme would result in considerable change in landscape characteristics over an extensive area or very intensive change over a more limited area.
Medium	The proposed Scheme would result in a noticeable change in landscape characteristics over an extensive area or intensive change over a more limited area.
Low	The proposed Scheme would result in a small, but perceptible change in landscape characteristics over a wide area or notable change over a more limited area.
Negligible or None	The proposed Scheme would result in a barely perceptible or not discernible change in landscape characteristics.

Magnitude of Visual Change

Magnitude of visual change relates to the extent to which the proposed Scheme would alter the existing view and has been evaluated using the four point scale and criteria outlined in Table 5.4, below.

Table 5.4 – Magnitude of Visual Change

Magnitude	Classification Criteria
High	The proposed Scheme would result in considerable change in the existing view, occupying a very large part of the view and becoming a prominent feature.
Medium	The proposed Scheme would result in a noticeable change in the existing view, occupying an important part of the view and distracting from the existing focus.
Low	The proposed Scheme would result in a small, but perceptible change in the existing view, occupying a small or unimportant part of the view, likely to be missed by the casual observer.
Negligible or None	The proposed Scheme would result in a barely perceptible or not discernible change in the existing view, occupying a small and unimportant part of the view.

Level of Effects

Determination of the level and significance of landscape and visual effects has been undertaken by employing professional judgment to combine and analyse the magnitude of change against the sensitivity to change. The levels of effects are described using the four point scale outlined in Table 5.5, below. For the purpose of this assessment, effects of moderate or above are considered to be significant.

Table 5.5 – Level of Effects

Level of Effect	Classification Criteria
Major	Where the proposed Scheme would become a prominent and detracting element in a highly sensitive landscape or view, resulting in a fundamental change to its character.
Moderate	Where the proposed Scheme would introduce some detracting elements into a highly sensitive landscape or view, or prominent and detracting elements in a landscape or view of medium sensitivity, resulting in a change to the impression of its overall character.
Minor	Where the proposed Scheme would form a perceptible but not detracting element within a landscape or view of medium or high sensitivity, or some detracting elements in a less sensitive landscape or view, resulting in a limited, or very localised, change to the impression of its character.
Negligible or None	Where the proposed Scheme would form a barely perceptible or not discernible element within a landscape or view, resulting in very limited and localised or no change to the impression of its character.

5.3.4 *Consultations*

Consultation with a number of statutory consultees, including The Highland Council, SNH and Historic Scotland, has been undertaken. At stage 2, SNH identified that the scheme options are within a Special Landscape Area and Historic Scotland identified the need to assess the potential effects on the Langwell Lodge Garden and Designed Landscape. Both landscape designations have been included in this assessment. No other landscape and visual issues have been identified by consultees. See Chapter 3 –Scoping and Consultation and Appendix 1 – Copy of Consultation Responses, for full details of consultation responses.

5.3.5 ***Study Area***

A study area of 2km from the proposed Scheme has been identified for the landscape and visual assessments. This extent, as shown on Figure 5.1 - Landscape Designations, has been defined through a review of maps and aerial photographs, in conjunction with on site appraisal. The 2km extent allows for a good overview of the landscape and visual context to be achieved and covers all receptors considered to have the potential to be significantly affected by the proposed Scheme.

5.4 Establishment of the Baseline

5.4.1 ***Landscape Character***

Landscape Designations

Landscapes can be given international, national, regional or local designations in recognition of their importance, outstanding scenic interest or attractiveness. Langwell Lodge Garden and Designed Landscape (GDL) and the Flow Country and Berriedale Coast Special Landscape Area (SLA) are partially within the study area, as shown on Figure 5.1- Landscape Designations.

Langwell Lodge GDL

An inventory of Gardens and Designed Landscapes was first compiled in 1987 in order to identify nationally important sites, to raise awareness of their significance and provide information for future management. The Scottish Historic Environment Policy 2011 sets out criteria for the selection of sites for the inclusion in the inventory and provides statutory protection to those selected.

Langwell Lodge GDL is located along the Langwell Water to the west of Berriedale and constitutes Langwell House, the site of the former Langwell Castle, extensive woodland along the Langwell Water and glen sides, and a walled garden. The existing A9 follows the southern boundary of the GDL southwest of Berriedale.

The house was originally developed as a shooting lodge and positioned on the hilltop to maximise the views over the coastal hills and out to the North Sea. There is an area of enclosed parkland surrounding the house and a small formal garden adjacent to the house. The policy woodland is a mix of hardwood and softwood with occasional ornamental conifers, such as Monkey Puzzle. Much of the wider area of woodland is now coniferous plantation, particularly on the north side of the glen, with scrubby native Birch and Rowan woodland on the southern slopes. The walled garden is located at the western edge of the estate, at some distance from the main house, and is set out in a formal layout.

The heavily wooded nature and steep sided slopes provide a strong sense of enclosure from much of the GDL, with the exception of Langwell House which is located on the hilltop above the glen. Langwell Lodge GDL is of national importance and contributes to the scenic quality of the area, contrasting strongly with the surrounding landscape. Landscape value is therefore considered to be high.

The Flow Country and Berriedale Coast SLA

Special Landscape Areas are a local level designation and have been identified by The Highland Council through the Highland wide Local Development Plan, 2012. An assessment of each of the SLAs within the highland area was undertaken in 2011 in order to provide a description of each area, highlighting the key characteristics and special qualities and the sensitivity to landscape change.

The Flow Country and Berriedale Coast SLA covers an extensive area, from the coastal cliffs near Berriedale and Badbea in the south to Loch More in the north. This area comprises a range of contrasting landscapes, including wide expansive peatlands of the Flow Country; Knockfin Heights and the highly distinctive hills of Morven, Maiden Pap and Scaraben; and the raised coastal shelf and cliffs near Berriedale.

The landscape is characterised by an overriding simplicity and horizontal emphasis with a strong sense of remoteness and wildness within the interior. The hills in the south form a distinctive skyline which is visible from much of Caithness. These hills are bound by the glens along the Berriedale Water and Langwell Water and offer expansive panoramic views over the flow country and to the North Sea. The two glens are steeply incised along their middle and lower reaches, providing a sense of shelter and enclosure which contrasts strongly with the surrounding open and exposed landscape. This contrast and sense of enclosure is reinforced by the extensive woodland in the lower reaches of the glens, which combine to form the largest area of semi-natural broadleaved woodland in Caithness. The existing A9 and an overhead line introduce locally detracting features.

The Assessment of Highland Special Landscape Areas, The Highland Council, 2011 has identified the following special qualities within the Flow Country and Berriedale Coast SLA:

- Distinctive mountain and moorland skyline;
- Exposed peaks, vast openness and intimate glens; and
- The historic landscape.

The Flow Country and Berriedale Coast SLA is of local and regional importance and is representative of a range of landscapes, some of which exhibit a strong impression of remoteness and wildness. It is therefore considered that this area is of Medium landscape value.

Landscape Character Types

A detailed review and classification of the landscape areas and types of Scotland has been undertaken by SNH and partner Councils. The study area for the proposed Scheme is covered by the Caithness and Sutherland Landscape Character Assessment. This report provides a detailed classification of the landscape character of Caithness and Sutherland, dividing it into 21 Landscape Character Types (LCTs) and sub-types.

The following five LCTs have been identified within the study area, as shown on Figure 5.2- Landscape Character Types.

- Coniferous Woodland;
- High Cliffs and Sheltered Bays;
- Moorland Slopes and Hills;
- Small Farms and Crofts; and
- Strath.

The detailed boundaries of the above LCTs have been altered slightly to reflect the findings of on-site appraisal. Figure 5.2- Landscape Character Types, shows the revised LCT boundaries and a series of representative photographs, included for illustrative purposes.

<u>Coniferous Woodland LCT</u>

This character type is found in numerous locations throughout Caithness and Sutherland, including a small area to the south of Berriedale, and is defined by large blocks of coniferous

forestry. The forestry tends to smooth out underlying landform, disguising any local landmarks and bringing uniformity to the landscape. The hard edges and geometric shapes of the forestry blocks are often unrelated to the underlying topography and contrast with the pattern of native woodland found along the adjacent straths. This LCT is considered to be of low landscape value.

High Cliffs and Sheltered Bays LCT

This character type is found in a number of locations along the coast of Caithness and Sutherland, particularly in the north and northwest. Within the study area it is found along the coast to the north and south of Berriedale and consists of a narrow strip of land and sea, divided and defined by a line of sea cliffs. This landscape is open and exposed with a strong connection with the sea, which brings movement and sound from breaking waves. Settlements and roads tend to run parallel with and are set back from the coast a short way and as such tend to be located in adjacent landscape types. Active land use is very limited, with some areas of rough grazing. Land cover tends to be grassland which forms a green strip along the cliff top, where the soil is thinner and more fertile, often contrasting with adjacent land cover and character. The Berriedale coast is identified as an important feature of the wider landscape and as such is considered to be of high landscape value.

Moorland Slopes and Hills LCT

The Moorland Slopes and Hills LCT is one of the most prevalent landscape types within Caithness and Sutherland and covers the more elevated areas of the study area. This landscape is characterised by sloping, open moorland and is of large scale. Topography is generally undulating or gradually rising, forming broad, low hills which can locally alter the generally overriding sense of openness and exposure. Settlement is very limited throughout this area and consists of occasional scattered houses found along the fringes. Land cover is predominantly heather moorland vegetation which often demonstrates signs of management, resulting in a mosaic of different ages of heather regeneration. There are also a number of areas of forestry plantation and shelterbelts within this and adjacent landscapes and these can have a strong influence on the impression of its character locally. The shelterbelt planting tends to border the existing A9 road, which passes through part of this character area to the south of Berriedale. This LCT acts as setting to the distinct hills further in land and a transition to the peatland of the Flow Country, contrasting with the more settled coastal edge. It is therefore considered that this area is of medium to high landscape value.

Small Farms and Crofts LCT

This landscape type is generally found along the coast and wider straths throughout Caithness and Sutherland. Within the study area it is generally restricted to the coastal fringe, particularly to the northeast of Berriedale. The character of this landscape is defined by occupation and activity and has strong ties to traditional crofting and farming. However, more recent agricultural practices have moved away from these traditional land management techniques and has led to a greater variety of characteristics at a local level. The overall pattern of the landscape elements is similar throughout this character type, with scattered houses and farm buildings, linear fields defined by post and wire fences, and remnant woodland and groups of trees and scrub. Land division tends to relate to the coast, providing a clear pattern and linear repetition, which is particularly evident at Newton in the north of the study area. The existing A9 somewhat disturbs this pattern, introducing a strong linear element cutting through and across the grain of the underlying landscape pattern. It is therefore considered that this area is of Medium landscape value.

Strath LCT

The Strath LCT is found in a number of locations throughout Caithness and Sutherland and follows the main river valleys extending inwards from the coast. Within the study area this

landscape type is found along the Berriedale Water and Langwell Water to the north and west of Berriedale. The Strath LCT is characterised by a relatively steep sided glen with an undulating base through which a river meanders. There is a strong sense of lateral enclosure and linearity, which contrasts with the more open and exposed nature of the surrounding landscape. Land cover is a mix of grassland native broadleaved woodland and forestry plantation, with occasional arable fields along the more fertile strath floor. Settlement is sparse and generally concentrated at the main bridging point at Berriedale, where the two glens meet. There are a large number of cultural heritage features within the glens, including numerous scheduled monuments, which indicate historic settlement of this landscape. This wealth of historic features, strong sense of enclosure and contrast with the surrounding character indicates that the Strath LCT has a high landscape value.

5.4.2 *Visual Amenity*

Settlement within the study area is relatively limited, with the main concentration being at Berriedale and the scattered farms and crofts along the coast to the north. Views from properties in Berriedale tend to be restricted and enclosed by surrounding topography. There are more open views from the farms and crofts to the north, which tend to be focused towards the coast and North Sea beyond. The existing A9 is the principle route through this area, with only occasional other roads and local paths.

A series of viewpoints have been identified within the study area and these form the basis of the assessment of potential visual effects resulting from the proposed Scheme. The viewpoint locations, shown on Figure 5.3- Viewpoint Locations, provide a representational cross section of the main visual receptor types and locations found within the study area. The following provides a brief description of the existing baseline view and visual resource associated with each viewpoint location. Figures 5.4 – Viewpoint Photography and Photomontages (sheets 1 to 7) provide photographs of the existing view from each location, with sheets 2, 4 and 6 also providing photomontages of the proposed Scheme.

Viewpoint 1 – Windy House

This viewpoint has been selected to be representative of the view from Windy House. Windy House is located in an elevated position along the top of the sea cliffs and as such the views are open and panoramic. The main focus is along the sea cliffs to the south, and eastwards across the North Sea. There are also some views along the coast to the north, while views inland are partially restricted by local topography and planting. The existing A9, and associated traffic, are visible in the main view to the south, descending southwards towards Berriedale and then climbing back up the south side of the glen. Value of the view is considered to be medium.

Viewpoint 2 – Portland Hall

Located adjacent to Portland Hall, this viewpoint is representative of views from the north, including visitors to the hall, and to a lesser extent, residents at the adjacent houses east of the existing A9. The main views from this location and orientated to the south along the coast. Views are slightly elevated, open and panoramic over rolling farm and crofting land. The existing A9 and associated traffic are visible in close proximity to the southwest and more distant as it climbs southwards from Berriedale. Value of the view is considered to be medium.

Viewpoint 3 – The White House

This viewpoint is located in the grounds of The White House. There are two main views from the house, southwards towards the coast and westwards to Langwell and along Berriedale Strath. Views west are slightly elevated and include the existing A9 and associated traffic in the immediate foreground, with more distant views partially filtered by adjacent trees. Views south are more open, although partially screened and framed by a stone wall and planting

along the boundary. Views north and east are more heavily filtered and screened by mature planting within the garden. Traffic on the existing A9, immediately adjacent to the west, detract from otherwise attractive, although partially restricted views. Value of the view is considered to be medium.

Viewpoint 4 – Langwell House

This viewpoint is representative of views from elevated locations within Langwell Lodge GDL and particularly from Langwell House. The house is located on the upper slopes above the Langwell and Berriedale Glens and as such has elevated, open and panoramic views. The house and views are orientated to the southeast, over Langwell glen and the settlement of Berriedale, to the coast and the sea beyond. There are glimpses of traffic on the existing A9 on the opposite side of Langwell glen, and more open, oblique views of the A9 as it ascends northwards from Berriedale. Value of the view is considered to be medium.

Viewpoint 5 – Portland Terrace

This viewpoint, located on Mill Road, is representative of views from Portland Terrace and the adjacent Core Path. Views from this location are low level and orientated to the northeast, across Berriedale Water, to the shore cottages and sea beyond. The extent of views is variable with many being heavily restricted or contained by adjacent steeply sloping topography. The existing A9, associated structures and traffic are a prominent feature on the upper slopes of the opposite side of the glen, although oblique to main view. Value of the view is considered to be medium.

Viewpoint 6 – Berriedale Castle

Viewpoint 6 is located on the site of Berriedale Castle and is representative of higher level views at the eastern end of Berriedale glen and of visitors to the castle ruins. Due to its location on the top of a sea cliff, views from this location are elevated and relatively open. Views are largely focused over the beach, along the coast and across the sea. There are also views northwest, up the Berriedale Water and towards the distant hills beyond. The existing A9, associated structures and traffic are visible to the north and northwest. Value of the view is considered to be medium to high.

Viewpoint 7 – Beacon Tower

This viewpoint is located at the beacon tower on the edge of the sea cliffs above Berriedale and is representative of high level views from the south. This viewpoint has also been selected as it provides a good overview of identified site area. Views from this location are elevated and panoramic and are primarily focused along the coast to the north but also include views over Berriedale village, Langwell and the more distant hills to the west. The existing A9 and associated structures and traffic are visible as the road winds up the north side of the glen. Value of the view is considered to be high.

5.5 Assessment of Effects

5.5.1 *Landscape Character*

Landscape Designations

Langwell Lodge GDL

As outlined in the baseline this landscape is considered to be of high landscape value. The enclosed nature of much of the area somewhat reduces the susceptibility to change. However it is considered that Langwell Lodge GDL is of high sensitivity.

The proposed Scheme is located outwith Langwell Lodge GDL and therefore potential change would be indirect. The heavily wooded and therefore enclosed nature of this landscape would limit the extent of potential indirect change to the more elevated, open locations, such as around Langwell House. Much of the proposed Scheme would be in cutting and as such indirect change would be limited further. Due to the presence of the existing A9 and associated traffic and the limited areas of the GDL potentially affected, the magnitude of change during construction, operation and in the long term is considered to be negligible.

It is therefore anticipated that the proposed Scheme would result in negligible effects on the landscape character of Langwell Lodge GDL during construction, operation and in the long term.

The Flow Country and Berriedale Coast SLA

This part of the SLA found within the study area has been identified in the baseline as of medium value. The presence of the existing A9, associated traffic somewhat reduces the susceptibility to change, resulting in a medium sensitivity to change.

The proposed Scheme would be located within the SLA and as such is likely to result in both direct and indirect change. Direct change would be very limited and would largely be as a result of changes to landform and vegetation. Indirect change would result from visibility of the proposed Scheme from the adjacent area, and is also likely to be relatively limited. Magnitude of change during construction is likely to be higher, due to loss of vegetation, earthworks and temporary storage of materials and is anticipated to be locally high in the areas directly affected and negligible on the SLA as a whole. Following completion of construction, including planting and seeding operations the extent of direct and indirect change would be reduced.

Where directly affected, and in the immediate surroundings, it is therefore anticipated that the proposed Scheme would result in locally major negative effects during construction, locally moderate negative effects at operation, and locally minor effects in the long term. Due to the limited extent of direct and indirect change, effects on the landscape character of the SLA as a whole are anticipated to be negligible during construction, operation and in the long term.

Landscape Character Types

Coniferous Woodland LCT

The proposed Scheme would be located over 1km north of this LCT and as such potential change would be indirect. The forested and enclosed nature of this LCT would limit the potential for indirect change. It is therefore considered that the proposed Scheme would result in no effects on the character of this LCT.

High Cliffs and Sheltered Bays LCT

This LCT is of high landscape value and due to the nature of the topography and coastal location is considered to be highly susceptible to direct change. However, the strong connection to the sea and the nature of the topography result in a low susceptibility to indirect change from the landward side. Sensitivity to change in relation to the proposed Scheme is therefore considered to be low.

The proposed Scheme would be located outwith this LCT and therefore potential change would be indirect. The outward orientation, towards the sea, and nature of the topography of this LCT would limit the potential for indirect change. There may be some indirect change, in the form of increased activity and noise in close proximity to this LCT during construction, resulting in a locally low magnitude of change. Magnitude of change during operation and in the long term would be negligible or none.

It is therefore anticipated that the proposed Scheme would result in locally minor effects on the character of this LCT during construction and negligible effects at operation and in the long term.

Moorland Slopes and Hills LCT

The Moorland Slopes and Hills LCT is considered to be of medium to high landscape value. The presence of an Overhead Line and the large scale, relatively uniform character of this landscape indicate a medium susceptibility, resulting in a medium sensitivity to change.

The proposed Scheme would be located outwith this LCT and as such change would be indirect. This landscape is often characterised by a lack of built elements, which provides a contrast to the more inhabited and managed landscape types along the coastal fringe. Therefore change in these adjacent landscapes can often have little influence on the impression of the character of this LCT. Any change would be seen in the context of the existing A9 and associated traffic.

During construction, change would be as a result of increased activity, vegetation clearance and earthworks in the adjacent landscape character type. This would be reduced during operation and in the long term as planting establishes. Due to the relatively small scale and indirect nature of the change and the presence of the existing A9 within this and the adjacent landscape, effects on the Moorland Slopes and Hills LCT are anticipated to be negligible during construction, operation and in the long term.

Small Farms and Crofts LCT

The baseline study has indicated that this LCT is of medium value. The presence of the existing A9 and associated traffic within this landscape reduces the susceptibility to change. Landscape sensitivity to change is therefore considered to be medium.

The proposed Scheme would largely be located within this LCT and as such would result in direct and indirect change. Direct change would be as a result of vegetation removal, earthworks operations, and during construction, temporary storage of materials etc. Indirect change would also be relatively limited, and largely confined to the immediate surroundings to the north and to a larger extent to the south.

Due to the relatively limited extent of the change and the presence of the existing A9 within this LCT the overall effects on the impression of this LCT would be minor during construction and operation and negligible in the long term. However, where direct change occurs, and in its immediate surroundings, there are likely to be localised major negative effects during construction, reducing to moderate negative effects at operation and minor negative effects in the long term.

Strath LCT

The Strath LCT is considered to be of high landscape value. The steeply sloping sides and resultant strong sense of lateral enclosure increases the susceptibility to change. It is therefore considered that this LCT has a high sensitivity to change.

The majority of the proposed Scheme would be located outwith this LCT. However the SUDs pond and cascades would be located within this area and as such would result in direct change. The extent of direct change would be very limited and be as a result of minor loss of vegetation and land re-profiling. Due to the steeply sloping sides and prevalence of woodland along the Straths, indirect change would also be very limited. Magnitude of change during construction is likely to be negligible for the majority of this LCT, and locally high where directly affected. Magnitude of change would be reduced at operation and further still in the long term.

Due to the very limited extent of change it is anticipated that the proposed Scheme would result in localised moderate negative effects on a small part of this LCT, and negligible effects on the overall impression of the character during construction. Effects at operation and in the long term are anticipated to be negligible.

5.5.2 *Visual Amenity*

As indicated in the baseline, the majority of potential visual receptors found within the study area would not gain visibility of the proposed Scheme. The following provides an assessment of potential visual effects on a selection of representative viewpoint locations.

Viewpoint 1 – Windy House

The baseline study identified views from this location as of medium value. This is an impressive scenic view. However, the presence of the existing A9, associated traffic and other buildings in the view somewhat reduces the susceptibility to change. It is therefore considered that the visual sensitivity to change is medium.

The proposed Scheme would be located approximately 1.4km to the south, within the main view. Construction vehicles, earthworks activities, and storage of materials are likely to be visible, although confined to a relatively small, but central, part of the view. This would result in a low magnitude of change during construction. At operation and in the long term the proposed Scheme would not be visible and as such there would be no change.

Due to the relatively small, but important part of the view affected during construction, visual effects on receptors at Windy House are anticipated to be minor negative. Due to a lack of visibility there would be no visual effects at operation and in the long term.

Viewpoint 2 – Portland Hall

Views from Portland Hall are considered to be of medium value. There is a pleasing visual composition, with only a few detracting features, leading to a medium susceptibility to change. Visual sensitivity of receptors at this location is therefore considered to be medium.

The proposed Scheme would be located in close proximity to the south of this location. During construction, earthworks operations, movement of plant and equipment and temporary storage of materials is likely to be visible. These elements would be present in the mid-ground, central to the main views. Magnitude of change during construction would therefore be medium. As the proposed Scheme is largely in cutting visibility at operation and in the long term, would be limited to the boundary fence at the top of the cut slope, and as such the magnitude of change would be negligible.

It is therefore anticipated that the proposed Scheme would result in moderate negative effects during construction, reducing to negligible effects at operation and in the long term.

Viewpoint 3 – The White House

Views from The White House are considered to be of medium value. There is a generally pleasing visual composition, although the presence of traffic on the A9 in the foreground to the west reduces the susceptibility to change. It is therefore considered that the visual sensitivity to change is medium.

The proposed Scheme would be located in close proximity to the south and west. During construction, earthworks operations and movement of plant and equipment are likely to be prominent in views south and southeast, and to a lesser extent to the west. Magnitude of change during construction would therefore be high. At operation the proposed Scheme would be less visible. However, there may be glimpsed and filtered views of tops of vehicles in close proximity to the south. This would result in a medium magnitude of change. In the long term as

the Scheme weathers in and mitigation planting matures it is anticipated that the magnitude of change would reduce further, to low.

It is therefore anticipated that the proposed Scheme would result in major negative effects on receptors at the White House during construction, moderate negative effects at operation and minor negative effects in the long term.

Viewpoint 4 – Langwell House

The baseline study identified that views from this location are of medium value. This is a wide panoramic and scenic view. The presence of the existing A9 and associated traffic reduces the susceptibility to change. It is therefore considered that the visual sensitivity to change is medium.

The proposed Scheme would be located in relative close proximity to the west and would be oblique within the main view. During construction, earthworks operations, movement of plant and equipment and the temporary storage of materials are likely to be visible, although occupying a small part of the overall view. Magnitude of change during construction would be medium to low. At operation, visibility of the scheme would include the upper part of the grassed cutting slope on the north side of the new carriageway and parts of the access path to the Cemetery and viewpoint. Woodland and scrub planting, included as part of the scheme, would reduce visibility further in the long term. There may be a slight reduction in the visibility of traffic as a result of the proposed Scheme.

Do to the small part of the view affected and the relatively limited extent of change, it is anticipated that the proposed Scheme would result in minor to moderate negative effects during construction. At operation and in the long term, visual effects are anticipated to reduce to minor or negligible.

Viewpoint 5 – Portland Terrace

Views from this location have been identified as of medium value. The low level partially contained and framed views towards the beach and to the sea area well composed and scenic. However, the presence of the existing A9 and associated traffic and large retaining wall reduce the susceptibility to change. It is considered that the visual sensitivity to change is medium.

The proposed Scheme would be located in close proximity to the north, oblique to the main views, and would largely be screened by intervening topography. Earthworks operations and movement of plant and equipment are likely to prominent during the construction phase, resulting in a high magnitude of change. At operation the increased visibility of traffic, occupying a slightly large part of the view than the existing A9 would result in medium magnitude. Planting proposed as part of the Scheme would help reduce visibility in the long term leading to a low magnitude of change.

It is therefore anticipated that the proposed Scheme would result in major negative effects during construction, reducing to moderate negative effects at operation and minor negative effects in the long term.

Viewpoint 6 – Berriedale Castle

Views from Berriedale Castle are identified within the baseline as of medium to high value. The presence of the existing A9 and associated traffic and large retaining walls reduce the susceptibility to change. It is therefore considered that the visual sensitivity of receptors at this location is medium.

The proposed Scheme would be located in close proximity to the north and would largely be screened by intervening topography. However, earthworks operations and movement of plant and equipment are likely to be prominent and in close proximity during construction, resulting in high magnitude of change. At operation and in the long term, the proposed Scheme would occupy a slightly larger part of the view than the existing A9 and therefore magnitude of change would be moderate.

It is therefore anticipated that the proposed Scheme would result in major negative effects during construction and moderate negative effects at operation and in the long term.

Viewpoint 7 – Beacon Tower

Views from this location are considered to be of high value. The presence of the existing A9 and associated traffic and large retaining walls reduce the susceptibility to change. It is therefore considered that the visual sensitivity of receptors at this location is medium.

The proposed Scheme would be located in close proximity to the northeast. Although occupying a relatively small part of the overall view, earthworks operations and movement of plant and equipment are likely to be prominent in the main view during construction. This would result in a high magnitude of change. The visual prominence of the proposed Scheme would be reduced at operation and in the long term, resulting in a medium magnitude of change.

It is therefore anticipated that the proposed Scheme would result in major negative effects, during construction, and moderate negative effects during operation and in the long term.

5.6 Mitigation

Mitigation measures are undertaken as a response to anticipated adverse effects and can be described as primary or secondary. Primary mitigation measures are steps taken during the design phase of the proposed Scheme to help minimise potential effects, based on key sensitivities, constraints and opportunities identified through baseline study. Secondary mitigation measures are those that seek to further reduce potential effects that could not be entirely designed out and have been identified and informed by the detailed assessment stage. Secondary mitigation measures include planting and landform re-profiling and seek to help reduce the extent or significance of negative effects in the long term. Figure 5.5 – Indicative Landscape Plan illustrates the landscape mitigation proposals.

The landscape and visual mitigation measures associated with the proposed Scheme have been developed with reference to the principles contained within the following publications:

- Cost Effective Landscape: Learning from Nature (Scottish Executive, 1998);
- Fitting Landscapes: Securing More Sustainable Landscapes (Transport Scotland, 2014);
- Scotland's Native Trees & Shrubs, (Scottish Executive, 2001); and
- The Caithness and Sutherland Landscape Character Assessment, (SNH, 1998).

In addition, a meeting to discuss landscape proposals for the proposed Scheme was held with Transport Scotland's Landscape Advisor and the key principles for the design agreed.

Primary mitigation measures associated with the scheme include input into the selection and appraisal of route options and the gradients and finishes of the cut slopes. The proposed Scheme was identified at the options appraisal stage as having the lowest level of potential landscape and visual effects. As the design has development landscape and visual aspects have been considered and have influenced the design to help further reduce potential effects. This has included grading out cutting slopes to allow soil and grass seeding rather than

exposed rock faces for the majority of the Scheme. Other aspects that would be incorporated into the detailed design would be variable gradients of slopes, use of local stone and materials and incorporation of planting to help ensure the best landscape fit for the Scheme.

Secondary mitigation measures would include grubbing up and re-profiling of the redundant section of carriageway to integrate it with the existing slopes above and below the road corridor, removing the unnatural landform. Woodland and scrub planting would also be incorporated onto the re-profiled landform, around the drainage basin, and along the footpath to the cemetery in order to further aid landscape integration. Planting would also be used to help reduce potential visual effects, by providing localised screening of traffic and constructed elements. The planting would also compensate for the loss of any existing planting as part of the scheme and would include native species found in existing local planting. Woodland planting would include Scot's Pine, Birch and Rowan and scrub planting would include Juniper, Hawthorn and Blackthorn.

A new pedestrian access to the Cemetery, including a scenic viewpoint has been included as part of the landscape proposals for the Scheme, see Figure 5.5 – Indicative Landscape Plan. The following provides a brief description of this element of the Scheme. However, proposals would be further developed at the detailed design stage. The footpath would be finished in a whin dust or bound gravel surface, the colour of which would be chosen to reflect those of the local stone. Masonry walls constructed using local stone and designed to reflect those at the cemetery and The White House would be included at the layby and viewpoint to provide a sense of place in addition to providing separation of the footpath from the road corridor. Seating and interpretation boards could be incorporated into the walls at the viewpoint area. The emphasis would be on a simple, appropriate design, finished to a high standard.

5.7 Residual Effects

The proposed landscape design and mitigation measures, detailed above, have been considered when determining the level of potential landscape and visual effects. Therefore residual effects would be the same as those identified at operation and in the long term, as detailed in Section 5.5, above.

5.8 Summary

5.8.1 *Landscape Character*

The landscape character assessment has indicated that the overall character of the majority of the identified landscape designation and character types found within the study area would not be significantly affected by the proposed Scheme. However, localised significant effects are anticipated on the Flow Country and Berriedale Coast SLA and Small Farms and Crofts LCT during construction and at operation and on Strath LCT during construction. However it is anticipated that in the long term these effects would be reduced to minor negative, and therefore not significant.

5.8.2 *Visual Amenity*

The majority of potential visual receptors within the study area would not be affected by the proposed Scheme. However, the visual assessment has identified that there may be significant negative effects on receptors at VP1 (Portland Hall), VP3 (The White House), VP5 (Portland Terrace), VP6 (Berriedale Castle) and VP7 (Beacon Tower) during construction. At operation, visual effects at all locations would be reduced. However, it is anticipated that effects at VP3 (The White House), VP5 (Portland Terrace), VP6 (Berriedale Castle) and VP7 (Beacon Tower) would remain significant. In the long term, as mitigation planting matures, visual effects would be further reduced, with significant effects being limited to two locations (Berriedale Castle and Beacon Tower).

5.9 References

- The Landscape Institute/ Institute of Environmental Management and Assessment (2013); *Guidelines for Landscape and Visual Impact Assessment. Third Edition.* The Landscape Institute/ Institute of Environmental Management and Assessment.
- Highways Agency (1993); *Design Manual for Roads and Bridges (DMRB) Volume 11 Section 3 Part 5: Landscape Effects*. Department for Transport
- Historic Scotland Inventory of Gardens and Designed Landscapes. Available at: http://www.historic-scotland.gov.uk/index/heritage/gardens.htm
- Highland Council (2012); *The Highland wide Local Development Plan.* The Highland Council
- Horner + Maclennan (2011); *Assessment of Highland Special Landscape Areas*. The Highland Council
- Scottish Executive (1998); *Cost Effective Landscape: Learning from Nature.* Scottish Executive
- Scottish Executive (2001); *Scotland's Native Trees & Shrubs.* Scottish Executive
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- Transport Scotland (2014); *Fitting Landscapes: Securing More Sustainable Landscapes.* Transport Scotland

6 NATURE CONSERVATION

6.1 Introduction

This chapter of the Environmental Report addresses the potential impacts of the A9 Berriedale Braes Improvements on ecological receptors, including direct impacts resulting from activities integral to the project, indirect impacts and cumulative impacts.

It is particularly important to read this chapter in conjunction with the HRA screening report given in Appendix 2 – Screening Report to inform Habitats Regulations Assessment, since it is referenced with regard to breeding seabirds. It should also be read in conjunction with Chapter 5: The Proposed Scheme, and Chapter 8 - Road Drainage & the Water Environment.

There are a number of drawings that support this assessment as listed below:

- Fig7.1 Designated sites
- Fig7.2 Phase 1
- Fig7.3 Protected species
- Fig7.4 Breeding bird territories
- Fig7.5 Breeding birds visit 1
- Fig7.6 Breeding birds visit 2
- Fig7.7 Breeding birds visit 3
- Fig7.8 Breeding birds visit 4

6.2 Legislative & Planning Context

6.2.1 *Summary of key legislation*

Conservation (Natural Habitats, &c.) Regulations 1994 (as amended in Scotland)

The 'Habitats Regulations' implement the Habitats Directive in Scotland, affording statutory protection to European Protected Species (EPS) and European designated sites (Special Areas of Conservation and Special Protection Areas). For EPS (of which bats, otter *Lutra lutra*, and great crested newt *Triturus cristatus* are most often encountered) it is an offence to:

- Deliberately or recklessly kill, injure or take an EPS (or its eggs where applicable);
- Deliberately or recklessly disturb an EPS at a place of shelter, or elsewhere if this could impair its ability to breed or affect its local distribution; and
- Damage, destroy or obstruct access to an EPS place of shelter (whether occupied or not, and strictly constituting an offence whether deliberate or not).

Protected places of shelter for bats include all types roost, however temporary, and for otters include holts and laying-up areas. For great crested newt, they include foraging and hibernation habitat up to 500m from breeding ponds where connective habitat exists.

Actions which would be offences can be licensed, but only under strict conditions: the reason for doing so must be one of the specified purposes in Regulation 44(2); there must be no satisfactory alternative; and the action must not be detrimental to the 'favourable conservation status' of the species. Developments affecting European sites must be subject to a Habitats Regulations Appraisal (HRA), which is further explained under Scottish Planning Policy below.

Wildlife & Countryside Act 1981 (as amended in Scotland) and Nature Conservation (Scotland) Act 2004

This legislation affords protection to birds and certain animals and plants which are not EPS, regulates non-native invasive species, and designates and protects Sites of Special Scientific Interest (SSSIs). It also places a duty on public bodies to further the conservation of biodiversity. For fully protected (Schedule 5) animals (including red squirrel *Sciurus vulgaris*, pine marten *Martes martes* and wildcat *Felis sylvestris*) it is an offence to intentionally or recklessly (or knowingly cause/permit another person to):

- Kill, injure or take the animal;
- Damage, destroy or obstruct access to the animal's places of shelter; and
- Disturb the animal whilst at a place of shelter.

The second and third of the above three points also apply to water vole. Limited protection is afforded to common reptiles from killing/injuring and common amphibians from sale/trade. For birds it is an offence to intentionally or recklessly:

- Kill, injure or take any wild bird or its eggs;
- Take, damage, destroy or interfere with the nest of any wild bird whilst in use or being built (or at any time for eagles), or obstruct/prevent any wild bird from using its nest;
- Disturb Schedule 1 birds at or near an active nest or lek, or their dependent young.
- Harass eagles, hen harrier or red kite at any time.

Licensing is not possible for wild birds for development purposes. Some actions affecting non-bird protected species which would be offences can be licensed, including for development purposes where there is significant social, economic or environmental benefit and no satisfactory alternative. Developments affecting SSSIs are generally only permitted where there are overriding reasons of national importance and site integrity will be maintained.

Protection of Badgers Act 1992 (as amended in Scotland)

It is an offence to wilfully kill, injure or take a badger, or to intentionally or recklessly damage, destroy or obstruct a badger sett, or disturb a badger in a sett (or to allow another person to do any of these things). The Act defines a sett as any structure or place with signs of current use by badger; however, 'current' is interpreted in a wide sense and SNH consider it to include any sett in an occupied territory. Some actions which would be offences can be licensed, but for development purposes it is not possible to licence direct removal or killing of badgers.

Water Framework Directive ('WFD')

Through the WFD, SEPA require that developers identify groundwater-dependent terrestrial ecosystems (GWDTEs; see SEPA 2014 and SNIFFER 2009) within 100m of roads/trenches or 250m of substantial constructions, and pressures on them. If avoidance is not possible, mitigation should be developed to minimise impacts, particularly from drainage, pollution and waste management. SEPA may request planning conditions to guarantee mitigation.

Marine (Scotland) Act 2010

Amongst the provisions of this Act is the designation of seal haul-out sites, within which it is an offence to intentionally or recklessly harass seals.

6.2.2 *Key planning policy context*

Scottish Planning Policy (2014) (SPP)

SPP recognises the environment as a national asset offering opportunities for enjoyment, recreation and sustainable economic activity. The relevant summarised key principles are:

- facilitate positive change while maintaining/enhancing distinctive landscape character;
- conserve and enhance protected sites and species, while maintaining the healthy ecosystems and natural processes which provide important services to communities;
- protect and improve all parts of the water and soil environment in a sustainable way;
- protect and enhance ancient woodland, hedgerows and individual trees with high ecology or landscape value;
- seek biodiversity benefits from new development where possible, including habitat restoration and avoiding fragmentation.

SPP emphasises the biodiversity duty of public bodies as well as the legislative requirements for protected sites and species. This includes Habitats Regulation Appraisal (HRA) of European sites whereby plans or projects potentially affecting them can only be approved if there will be no adverse effect on site integrity; derogation is possible only if there are no alternatives and there are imperative reasons of overriding public interest, in which case sufficient compensation is required to maintain coherence of the European site network.

SPP also promotes green infrastructure; avoidance of culverting, flooding and development on floodplains; and use of Sustainable Drainage Systems (SuDS).

National Planning Framework 3 (2014) (NPF3)

NPF 3 sets out a vision for development and investment across Scotland as a "*Successful, sustainable place, a low carbon place, a natural resilient place and a connected place".* Regarding biodiversity it states that:

"Biodiversity in Scotland is rich and varied. We have numerous internationally and nationally important habitats and species with a diverse network of protected sites [….] However, biodiversity is not just confined to our rural areas – our built environment, key infrastructure corridors and the greenspaces within our cities and towns also provide important habitats, and can together contribute to a wider national ecological network. Our marine wildlife is rich and varied. Geodiversity underpins our landscapes and provides important ecosystem services."

UK Biodiversity Action Plan

The UK Biodiversity Action Plan (UK BAP) includes lists of national priority habitats and species, with action plans defining measures to aid their conservation. The following UK BAP priorities are either present or may occur in the study area: rivers, native pine wood, upland birch wood, inland rock outcrop, maritime cliff & slope, salmon, brown trout, common lizard, slow-worm, adder, common toad, bats, otter, wildcat, pine marten, red squirrel.

Caithness Local Biodiversity Action Plan

The Caithness Local Biodiversity Action Plan does not list local priorities as such, but gives UK BAP (see above) and other nationally or locally notable habitats and species known to occur in Caithness, and explains issues of concern for habitats and species in Caithness.

6.3 Consultation

Consultation letters regarding this proposal were issued in October 2013 and March 2014. The consultees relevant to nature conservation were SNH, SEPA and the Caithness District Salmon Fisheries Board (CDSFB). SNH also gave pre-application advice in July 2013, and an opinion in August 2014 on the HRA screening report produced by URS.

The following points summarise the earlier SNH responses:

- East Caithness Cliffs SPA lies within 100m. Noise from construction/operation could disturb/displace cliff nesting breeding birds which are qualifying features. Therefore HRA is required. An assessment should be carried out to determine likely impacts on the SPA species.
- East Caithness Cliffs SAC lies within 100m. Impacts on designated vegetation could occur through vegetation clearing, or indirectly e.g. changes to water drainage. An assessment should be carried out to determine if there is connectivity between this proposal and the SAC.
- Berriedale and Langwell Water SAC lies within 100m. Impact on the qualifying species (salmon) could occur by affecting water quality via runoff. An assessment should be carried out to determine likely impacts on salmon. Pollution prevention measures should be implemented (following SEPA best practice guidance) and construction works should be carried out in accordance with a Construction Environmental Management Document (CEMD).
- Berriedale Cliffs SSSI lies within 100m. It overlaps East Caithness SPA/SAC and is designated for the same species and habitats. The Site Management Statement and Citation explain the broad characteristics.
- Risk to protected species should be assessed which could include otter, bats and Killarney fern, all European Protected Species.
- The potential for landslide onto the above SPA/SACs should be fully investigated. This could affect the designated species/habitats in both protected areas. Any mitigation to avoid this should be clearly stated in the environmental report.
- It is likely that most impacts can be reduced through mitigation and careful design.

The following points summarise the relevant parts of the SEPA response:

- Surface water was expected to be treated with two levels of SuDS.
- A Construction Environmental Management Plan should be developed with specific consideration of the Berriedale Water.
- The Berriedale Water and Langwell Water should not be impacted in any way.

The following points summarise responses from CDSFB:

- The initial response noted that risks to fish are likely during construction, but did not comment further because the full details were not known to them at that point.
- In October 2014 the CDSFB commented that the proposed SuDS may not deal sufficiently well with all pollutants; this was prior to the addition of a hydrodynamic vortex separator to the SuDS to enable better treatment of hydrocarbons and other pollutants (see Chapter 3 – Scoping and Consultaiton, section 3.3).

In response to the HRA screening report sent to SNH in August 2014, although noting that a full appraisal had not been made, SNH responded that:

- SNH expressed general agreement with the conclusions of the HRA screening report;

- The mitigation appeared appropriate, and it was important that it be implemented.

6.4 Approach & Methodology

Assessment of ecological impacts is known as Ecological Impact Assessment (EcIA), for which there is no universally agreed method, although certain general principles and approaches are widely accepted. The method used here provides a systematic and transparent assessment of the significance of impacts upon ecological receptors. It is based on current best practice outlined in legislation and planning policy with cognisance of environmental legislation relevant to Scotland and guidance from the Chartered Institute of Ecology and Environmental Management (CIEEM 2006). Other more specific guidelines and information sources have also been used as appropriate for specific ecological receptors, and these are stated where employed. Due consideration has also been given to the Design Manual for Roads and Bridges (DRMB) Volume 11, Section 3, Part 4 Ecology and Nature Conservation (Highways Agency 1994).

6.4.1 *Desk study*

Existing baseline information was collated through desk-top research utilising a number of sources:

- SNH SiteLink website (designated sites);
- JNCC website (SPA/SAC descriptions);
- NBN Gateway (species data);
- UK Biodiversity Action Plan;
- Caithness Local Biodiversity Action Plan.
- Other sources for specific purposes which are stated below where applicable.

6.4.2 *Field survey methodology*

Habitats

An extended Phase 1 habitat survey was undertaken on 4th and 5th June 2013 by a URS ecologist competent in botanical and habitat survey, including National Vegetation Classification (NVC) survey. The standard Phase 1 habitat survey methodology (JNCC 2010) was used, the extended aspect comprising close attention to species composition of all habitats, assessment of habitat potential for protected species, note of protected species evidence, mapping of non-native invasive plant species, and any other relevant ecological information. Phase 1 field mapping was undertaken using high resolution aerial photography combined with Ordnance Survey mapping to maximise mapping accuracy, and subsequently digitised using ArcGIS. A Phase 1 habitat map is provided in Figure 6.2 – Phase 1 Habitats.

During the above habitat surveys, note was made of Groundwater Dependent Terrestrial Ecosystems (GWDTEs) according to the Wetland Typology (SNIFFER 2009), the purpose of which is to help ensure the WFD is fully implemented regarding the water needs of terrestrial ecosystems. Habitat classification by this method is less complex than NVC but generally more detailed than Phase 1 (although SEPA normally require NVC to be determined), and additionally records of landscape setting, hydrological features and existing pressures are also required.

Breeding seabirds

For breeding seabirds, two URS ecologists with ornithological competence surveyed the qualifying breeding bird species of East Caithness Cliffs SPA in the proposal vicinity. Methods followed recommendations in Walsh *et al* 1995 as far as possible. Observations were made

from exposed rock adjacent to the islet Creag na Sgadain. Small areas not visible from this viewing location were observed from supplementary viewpoints, so that there were no gaps in the surveyed cliff. Survey visits were made in 2014 on 15th April, 13th May, 4th June and 12th June, between the hours of 09:00 and 16:00 (except for puffin which required evening observation in April), in order to follow the differing recommended guidelines for counting each species, and to avoid high tide. Observations were made with a Nikon fieldscope and binoculars. The conditions during all the surveys were good (wind Beaufort 1 to 3; rain zero to light; good visibility). Note that SPA qualifying species were the primary concern of the surveys and for this reason counts of black guillemot (not an SPA species) were undertaken at suboptimal times of day (the recommended time of day is within two hours of dawn).

A separate HRA screening report was produced by URS which contains details of SPA qualifying breeding bird species and is given in Appendix 2 – Screening Report to inform Habitats Regulations Assessment. Figures 3 and 4 in the HRA screening report are particularly important: Figure 3 shows the locations of qualifying breeding bird species in relation to the scheme outline, and Figure 4 shows the locations of qualifying breeding bird species on a panoramic photograph of cliff sections 1 and 2. The surveyed cliffs were divided into three sections. Section 1 starts south-east of the cemetery, extends a short distance north-east, and then turns by Creag na Sgadain and continues north. Section 2 continues from Section 1 but in a north-east direction ending at a very steep rocky promontory 145m from the closest part of the proposed scheme. Section 3 is a separate cliff on the opposite side of the Berriedale Water near the sea confluence. Other cliffs along the Berriedale Water did not support qualifying species.

Breeding birds (other than seabirds)

For breeding bird species other than seabirds an adaptation of the Common Birds Census methodology (Gilbert 1998) was employed, comprising four surveys undertaken in 2014 on 15th April, 14th May, 4th June and 12th June by two URS ecologists with ornithological competence. A transect was devised such that all parts of the study area were approached within 50m (the study area is shown in Figures 6.4 – Breeding Bird Summary (Excluding Seabirds) and Figure 6.5 – Breeding Bird Summary (Sheets 1.4)). The surveys were undertaken between 04:50 and 08:20 and finished within three hours of sunrise. The conditions during all the surveys were ideal (wind Beaufort 0 to 1; no precipitation; good visibility). Field mapping of BTO species and activity codes was undertaken using high resolution aerial photography combined with Ordnance Survey mapping to maximise mapping accuracy, and subsequently digitised using ArcGIS.

Occupied nests, adults carrying food or nest material, and newly fledged young were taken as definite breeding signs; displaying, singing, territorial dispute and alarm calling were considered to indicate likely breeding activity. The combined data from the four visits was used in conjunction with knowledge of the breeding habits of each species (particularly possible territory size and density, drawn from Forrester & Andrew 2007) to derive a map showing the estimated territory centres of likely breeding birds (Figures 6.4 – Breeding Bird Summary (Excluding Seabirds) and Figure 6.5 – Breeding Bird Summary (Sheets 1.4) show the separate full data for each of the four surveys).

Bats

Bat surveys were undertaken on 4th and 11th June 2014 by two URS ecologists with bat survey competence. Surveys and assessment were guided by recommendations in Hundt 2012. On 4th June a dawn re-entry survey was carried out for trees previously identified as having moderate roost potential located adjacent to the existing A9 opposite the 'White House'. On 11th June a dusk emergence survey was carried out for the same trees, and also a looped activity transect running up the A9 from the cemetery to the 'White House', behind the 'White House' and past two stone barns in the cattle field to the rear, and back to the cemetery. The transect was short and was therefore carried out twice on the evening of the 11th, to monitor

bat activity at different times along the route. The transect incorporated five minute stops to survey for bats every 50m. Two bat detectors were used for these surveys: a BatBox Duet and an automatic Anabat SD1. Conditions were favourable during these bat surveys (wind Beaufort 0 to 3 with force 3 confined to exposed higher ground; no precipitation; temperature 7°C to 9°C).

On 12th June a ladder, endoscope, torch and extendable mirror were used to make visual internal inspections of potential roost sites in the trees, searching for evidence including droppings, urine/grease stains, feeding remains, scratch marks, audible squeaking or actual dead/live bats.

Other mammals

Survey for other protected mammals including badger, otter, pine marten, red squirrel and wildcat was undertaken on 4th and 5th June 2013, supplemented by observations made on visits in April, May and June 2014. Surveys and assessment were based, where appropriate to a site survey, on guidance in published literature (Harris *et al* 1989; Cresswell *et al* 2012; Chanin 2003; Liles 2003; Strachan 2007). Evidence searched for included: places of refuge (setts, holts, lie-ups, dens and dreys); spoil heaps and bedding; latrines, spraints and scats; guard hairs; footprints, trails and scratch marks; and foraging evidence.

6.4.3 *Impact assessment methodology*

The method used to assess impact on ecological receptors is based on CIEEM guidelines for ecological impact assessment (CIEEM 2006) and also incorporates good practice from other published documents. The assessment process is summarised below:

- Baseline: Ecological receptors that might be affected by the scheme directly or indirectly are considered, and the existing conditions ('baseline') defined;
- Value: Baseline ecological receptors are assigned values, through consideration of available information and professional judgement, using a geographic frame of reference;
- Impacts: The type and significance of likely impacts (positive, negative or cumulative) on ecological receptors are predicted, and quantified as far as possible.
- Avoidance, Mitigation, Compensation: Proportionate measures are developed to avoid, reduce or if necessary compensate for significant negative impacts;
- Residual Impacts: Any remaining (residual) impacts are determined;
- Enhancement: Opportunities to benefit nature conservation may be determined;
- Monitoring: If appropriate, proposals are made for post-construction monitoring.

Assessing the value of ecological receptors

An ecological receptor is a site, habitat or species of nature conservation value. Receptor values are described within a geographic frame of reference so that legal and policy implications can be widely understood. Examples of types of receptor which might fall into various geographic classes are given below (adapted from CIEEM 2006).

Table 6.1 Geographic values for ecological receptors

Value	Examples of types of receptor (subject to professional judgement)
International	Internationally designated site or candidate/proposed international site. Sustainable area of habitat listed in Annex I of the Habitats Directive or smaller area of such habitat essential to maintain the viability of a larger whole. Sustainable internationally-significant population (of e.g. rare UK Red Data Book species of unfavourable conservation status in Europe or of global conservation concern), or site supporting such a population.
National (UK or Scotland)	Nationally designated site or site considered worthy of such designation. Sustainable area of a UK BAP priority habitat which constitutes a significant proportion of the UK resource. Sustainable nationally-significant population (of e.g. rare UK Red Data Book or other nationally rare/threatened species), or site supporting such a population.
County (Inverness-shire)	Sites designated at county level (e.g. Local Nature Reserve, Local Nature Conservation Site/Site of Interest for Nature Conservation). Sustainable area of a County BAP priority habitat which constitutes a significant proportion of the county resource. Large sustainable population of e.g. species listed as rare/local in a county context, or sites supporting 1% or more of a county population.
District (Caithness)	Habitat areas or species populations not considered notable at County level but exceeding Local value.
Local / Parish	Viable area of UK BAP or County BAP habitat not considered large enough for district/county value, or one that is degraded with low restoration potential. Site/feature which appreciably enriches the local habitat resource. Small but sustainable population of a notable or legally protected species not qualifying for higher valuation.
Site/Zone of influence	Area of heavily managed/modified habitat of low intrinsic interest and low value to species of conservation interest that does not appreciably enrich the local area. Common and widespread species.
Negligible	Makes no material contribution.

Valuation is subject to professional judgement, based on factors such as:

- Rarity, endemicity, mobility and geographic range;
- Trends, size/extent and vulnerability of populations or habitats;
- Diversity and connectivity/fragmentation;
- Typicalness;
- Value to other receptors (e.g. buffer habitat or food source);
- Potential for substitution/re-creation;
- Sustainability and intrinsic value to stakeholders.

Ecological valuation is not necessarily affected by legislative protection or priority listing. For example, badgers and kingfishers are strictly protected but may only be of local value if widespread and common (though legal requirements must still be met). Similarly, species or habitat action plans are aids to conservation and do not imply specific value, since occurrences may be fragmented, atypical or otherwise in unfavourable condition. Thus a habitat may be a UK or local BAP priority, but the valuation is based on the amount and quality of that habitat rather than its presence per se, so that small areas of poor-quality habitat are not over-valued.

Assessing impacts

Likely impacts are characterised using the parameters below (CIEEM 2006).

Table 6.2 Impact parameters

Parameter	Description
Direction	Whether the impact will have a positive or negative effect.
Magnitude	The 'size' or 'amount' of an impact, determined on a quantitative basis where possible (e.g. estimated numbers or proportion of a species or habitat).
Extent	The area an impact occurs over. Could be the same as magnitude for habitats.
Duration	The time for which an impact is expected to last prior to recovery or replacement (if possible) of the resource or feature. It is considered in terms of ecological timescales rather than human timeframes. Activity duration may differ from impact duration (e.g. breeding disturbance may cause breeding failure in the area over a longer period). For these purposes, <5 years is short-term, 5-15 years is medium-term, 15-25 years is long-term, and >25 years is very long-term or permanent.
Timing and Frequency	The precise timing of an activity, an important consideration since it may only cause an impact if it coincides with critical life stages or seasons (e.g. breeding season). If repeated, the frequency of an activity is also considered, since repeated occurrences of an activity may have greater impact than a single event.
Reversibility	A reversible (temporary) impact permits spontaneous recovery in a reasonable timescale or effective mitigation, but an irreversible (permanent) impact does not.

Guidelines for the magnitude parameter are given below.

Table 6.3 Guidelines for magnitude parameter

Magnitude	Guideline description
Major	Adverse: Total or major loss/alteration to key elements/features of the baseline conditions such that post-development character/composition/attributes would be fundamentally changed and may be lost from the site altogether. Guide: 20-80% of population/habitat lost. Beneficial: Large scale or major improvement of resource quality; extensive restoration or enhancement; major improvement of attribute quality.
Moderate	Adverse: Loss/alteration to one or more key elements/features of the baseline conditions such that post-development character/composition/attributes would be partially changed. Guide: 5-20 % of population/habitat lost. Beneficial: Benefit to, or addition of, key characteristics, features or elements; improvement of attribute quality.
Minor	Adverse: Minor shift away from baseline conditions. Change arising from loss/alteration would be discernible but the underlying character/composition/attributes would be similar to pre-development circumstances/patterns. Guide: 1-5 % of population/habitat lost. Beneficial: Minor benefit to, or addition of, one (maybe more) key characteristics, features or elements; some beneficial impact on attribute or a reduced risk of negative impact occurring.
Negligible	Adverse: Very slight change from baseline condition. Change barely distinguishable, approximating to the "no change" situation. Guide: < 1% population/habitat lost. Beneficial: Very minor benefit to or positive addition of one or more characteristics, features or elements.

Impacts may occur during the construction, operation and decommissioning phases of a development. They may be direct or indirect (also termed secondary). Direct impacts are

attributable to an action associated with a development. Indirect impacts are often produced away from a development or as a result of other initial impacts.

Consideration is also given to cumulative impacts, since impacts acting in combination may have a cumulative impact exceeding that of the separate impacts. Cumulative impacts on a receptor may arise from the combination of a number of impacts from the development itself (e.g. impacts at the construction and operation stages), or the combined impacts from a number of developments in the nearby area.

Assessing significance

An ecologically significant impact (positive or negative) is an impact on the integrity of a site or ecosystem or on the conservation status of a species or habitat within a geographical area. An impact that is not significant at the level it was valued may be significant more locally.

- Significant – An impact is significant at a stated geographic level if it is e.g. large in scale, irreversible in a reasonable timescale, long-term, or coincides with critical life stages;
- Not significant – An impact is not significant at a stated geographic level if it is e.g. small in scale, reversible, short-term or does not coincide with critical life stages.

Integrity is defined as, “the coherence of its ecological structure and function, across its whole area, that enables it to sustain the habitat, complex of habitats and/or the levels of populations of the species for which it was classified” (CIEEM 2006). Sites or ecosystems achieving this are in favourable condition. In assessing impacts on integrity, consideration is given to whether site processes will be removed or changed, effects on component habitats or average population size/viability of component species, and whether these effects will move condition away from favourability.

Initially, impact significance does not consider mitigation/enhancement measures that might be developed and agreed. Determination of residual impacts takes this into account. The aim is that wherever possible residual impacts are significant at a lower geographic level than the unmitigated impacts, or not significant at any level.

The above method of determining impact significance at specified geographic levels, using guidance and professional judgement, is preferred by CIEEM (CIEEM 2006). However, in order to provide consistency with other disciplines in this Environmental Report, CIEEM impact significance is finally translated into the DMRB significance levels of ‘very large’, ‘large’, ‘moderate’, ‘slight’ or ‘neutral’ significance, and adverse or beneficial, as shown in the following table. Impacts of ‘very large’ or ‘large’ significance are likely to be critical to decision-making.

Table 6.4 Equivalent significance

CIEEM assessment	Equivalent DMRB significance	Relevance toEIA decision-making
Significant Negative Impact on ecological integrity or conservation status at International scale	Very Large Adverse	Key factor
Significant Negative Impact on ecological integrity or conservation status at Regional or National scale	Large or Very Large Adverse	Key factor
Significant Negative Impact on ecological integrity or conservation status at District or County scale	Moderate or Large Adverse	Possible key factor
Significant Negative Impact on ecological integrity or conservation status at Site or Local scale	Slight Adverse	Not a key factor
No Significant Impact on ecological integrity or conservation status at any scale	Neutral	Not a key factor

CIEEM assessment	Equivalent DMRB significance	Relevance toEIA decision-making
Significant Positive Impact on ecological integrity or conservation status at Site or Local scale	Slight Beneficial	Not a key factor
Significant Positive Impact on ecological integrity or conservation status at District or County scale	Moderate or Large Beneficial	Possible key factor
Significant Positive Impact on ecological integrity or conservation status at Regional or National scale	Large or Very Large Beneficial	Key factor
Significant Positive Impact on ecological integrity or conservation status at International scale	Very large Beneficial	Key factor

Confidence in assessment

It is valuable to attribute a level of confidence to the accuracy of a predicted impact. Four levels are used in accordance with guidelines (CIEEM 2006):

- Certain / near-certain: probability estimated at 95% chance or higher;
- Probable: probability estimated above 50% but below 95%;
- Unlikely: probability estimated at less than 50%; and
- Extremely unlikely: probability estimated at less than 5%.

The reason for including a confidence category of 'extremely unlikely' is that although some effects may be very improbable, they would have very serious implications should they occur.

6.5 Baseline Conditions

6.5.1 *Designated sites*

Designated sites for nature conservation are listed in the table below and shown in Figure 6.1 – Designated Nature Conservation Sites. International designations (in this case SPA and SAC) are listed first. The desk study did not find any non-statutory designated sites.

Table 6.5 Designated sites

Qualifying / notified feature	Condition	Closest distance to scheme[1]
East Caithness Cliffs SPA		
Peregrine *Falco peregrinus* (breeding)	Favourable Maintained	Unknown – nests not in survey area
Guillemot *Uria aalge* (breeding)	Favourable Maintained	130m
Kittiwake *Rissa tridactyla* (breeding)	Favourable Maintained	75m
Razorbill *Alca torda* (breeding)	Favourable Maintained	75m
Herring Gull *Larus argentatus* (breeding)	Unfavourable Declining, due to fish discard decrease	115m
Shag *Phalacrocorax aristotelis* (breeding)	Unfavourable Declining, due to fish stock decrease	Unknown – nests not in survey area

[1] Distances to qualifying/notified features are approximate and as informed by field survey (see below).

Qualifying / notified feature	Condition	Closest distance to scheme[1]
Seabird assemblage of above seabirds plus: Puffin *Fratercula arctica*, Great Black-backed Gull *Larus marinus*, Cormorant *Phalacrocorax carbo*, Fulmar *Fulmarus glacialis* (all breeding)	Favourable Maintained for puffin & fulmar Unfavourable Declining for cormorant & great black-backed gull, due to fish stock and fish discard descreases	Puffin & fulmar: 85m Cormorant & great black-backed gull: unknown – nests not in survey area
East Caithness Cliffs SAC		
Vegetated sea cliffs of the Atlantic and Baltic coast	Favourable Maintained. No significant changes since surveys began in 1982.	25m
Berriedale & Langwell Water SAC		
Atlantic Salmon *Salmo salar*	Unfavourable Recovering	42m from road scheme, but adjacent to SUDS which drains into it
Berriedale Cliffs SSSI		
Guillemot *Uria aalge* (breeding)	Favourable Maintained	130m
Kittiwake *Rissa tridactyla* (breeding)	Favourable Maintained	75m
Razorbill *Alca torda* (breeding)	Favourable Maintained	75m
Fulmar *Fulmarus glacialis* (breeding)	Favourable Maintained	70m
Seabird colony (breeding)	Favourable Maintained	70m
Shag *Phalacrocorax aristotelis* (breeding)	Unfavourable Declining, due to fish stock decrease	Unknown – nests not in survey area
Maritime cliff	Favourable Maintained	20m[2]
Berriedale Water SSSI		
Upland birch woodland	Unfavourable No change, due to overgrazing and some bracken encroachment	450m upstream, 150m directly
Langwell Water SSSI		
Upland birch woodland	Unfavourable No change, due to overgrazing and some bracken encroachment	610m upstream, 530m directly

The conservation objectives for the above SPA and SACs are jointly summarised below:

- Avoid deterioration of the qualifying species, qualifying habitats, or habitats of the qualifying species, thus ensuring that site integrity is maintained and the site makes an appropriate contribution to achieving favourable conservation status for each of the qualifying features.
- Ensure for the qualifying habitats/species that the following are maintained in the long term:

[2] The SSSI boundary is slightly closer to the scheme than the SPA/SAC boundaries, hence the shorter distance.

- Distribution and extent of qualifying species, qualifying habitats, or habitats supporting qualifying species;
- Populations of qualifying species as viable components of the sites, including range of genetic types for salmon;
- Structure, function and supporting processes of qualifying habitats and habitats supporting qualifying species;
- Viability of typical species as components of qualifying habitats;
- No significant disturbance of qualifying species or typical species of qualifying habitats.

The management objectives for Berriedale Cliffs SSSI are to maintain condition and extent of maritime cliff vegetation (currently through minimal intervention), and to maintain the size and distribution and avoid significant disturbance of breeding seabirds and peregrine (currently requiring no intervention). The management objectives of Berriedale Water SSSI and Langwell Water SSSI are to enhance the condition and maintain the extent and distribution of woodland (grazing and bracken control), and maintain water quality (currently through minimum intervention).

Some pertinent observations of vegetation within East Caithness Cliffs SAC/SPA in the survey area were made during field survey. It was found that the coastal neutral grassland, although having an abundance of a small number of large herbs (see Phase 1 habitats description below), does not appear to be species-rich in this area, and is dominated by dense grass. This is supported by the JNCC description[3] of the SAC which specifically notes that around Berriedale (and southwards) there is a decrease in maritime species. The JNCC description also notes that there is no maritime heath in this area within the SAC, also confirmed by field survey, although a small patch of heath was noted outside the SAC with heather *Calluna vulgaris*, bell-heather *Erica cinerea* and occasional crowberry *Empetrum nigrum* (see Figure 6.2 – Phase 1 Habitats). Also noted in the JNCC description is the occurrence of scrub and trees in gullies; however, there are no gullies within the SAC in the survey area, and the notable woody species (juniper *Juniperus communis* and aspen *Populus tremula*) are not present in this area except for one juniper bush in woodland outside the SAC.

In addition to the above designations, the study area includes a very small part of the designated seal haul-out site 'BC-040', which encompasses many kilometres of the Caithness east coast but is not one of the 'key' designated haul-outs[4]. For reasons expounded in the protected species section 6.5.9 below, seals are not thought to regularly use the coast in the study area.

6.5.2 *Ancient woodland*

Scottish ancient woodland is defined as land that is currently wooded and has been continually wooded since 1750 or the mid-1800s, depending on the earliest mapping available. The Ancient Woodland Inventory (AWI) is a provisional guide to the location of ancient woodland in Scotland, which has important biodiversity and cultural value by virtue of its antiquity. Although there is no legislation specifically protecting ancient woodland, Scottish Planning Policy identifies it as an important and irreplaceable national resource that should be protected and enhanced, as should other native and long-established woodlands with high nature conservation value.

The AWI is not definitive and should be used with care. In particular any woodland shown on OS 1st Edition maps or Roy maps (available at www.nls.uk) which is not in the AWI is still likely to be ancient or long-established woodland, and should be treated as such unless

[3] http://jncc.defra.gov.uk/protectedsites/sacselection/sac.asp?EUCode=UK0030143
[4] www.scotland.gov.uk/Topics/marine/marine-environment/species/19887/20814/haulouts

evidence is available to the contrary. Note also that during capture of the AWI data there was a minimum capture size of two hectares.

All woodland in the AWI in the scheme vicinity is of the semi-natural type, which is the most valued (see Figure 6.1- Designated Nature Conservation Sites) This includes woodland west of the 'White House' on steep ground between the A9 and Berriedale Water, immediately adjacent to the A9. Note that the boundaries of AWI woodland in the survey area are approximate – in places AWI woodland extends over ground which is no longer wooded and has not been for a long time (for example it encroaches on to the actual A9).

6.5.3 *Phase 1 habitat survey*

Phase 1 habitats are shown in Figure 6.2 – Phase 1 Habitats. The dominant habitats in the survey area are semi-improved acid grassland (pasture), mixed/broadleaved semi-natural woodland, bracken and gorse scrub. The main habitats in East Caithness Cliffs SAC and the terrestrial part of East Caithness Cliffs SPA are unimproved (but not species-rich) neutral grassland, bracken and gorse scrub. Note that no marshes, flushes, swamps, wet heaths, bogs or wet woodland were recorded, and therefore there are no Groundwater Dependent Terrestrial Ecosystems in the survey area.

Woodland and scrub

The largest woodland is mature mixed semi-natural woodland within the sharp hairpin in the A9 and widening north-westwards, on steep slopes dropping towards the Berriedale Water. It is dominated by Scots pine *Pinus sylvestris* and downy birch *Betula pubescens*, but with locally frequent young beech *Fagus sylvatica* and larch *Larix* sp. The ground flora comprises either dense great woodrush *Luzula sylvatica*, ericoid shrubs (mainly heather *Calluna vulgaris* and blaeberry *Vaccinium myrtillus*, and occasionally bell-heather *Erica cinerea*), or bracken (often open woodland with bluebell *Hyacinthoides non-scripta*). The northern part and strip adjacent to the A9 are differentiated by more rowan *Sorbus aucuparia*, sycamore *Acer pseudoplatanus* and wych elm *Ulmus glabra*, with scattered male-fern *Dryopteris filix-mas* and angelica *Angelica sylvestris*.

Surveyed woodland elsewhere, apart from a very small amount of plantation by the A9, is broadleaved semi-natural and mostly mature. To the north-west (not adjacent to the scheme) there is dense, mature but somewhat stunted birch on a steep slope dropping to gentler ground by the Berriedale Water. Willow *Salix* sp is locally dominant and the ground flora is variable, with bracken-, bluebell- and grass-dominated areas. At the base of this sloping woodland bluebell is dominant in the open without tree cover.

The section of woodland between the south end of the scheme and dropping very steeply to the Berriedale Water comprises mature sycamore, wych elm and (to the south) downy birch, with occasional rowan. Bluebell is abundant in the ground flora, with frequent male-fern, hogweed *Heracleum sphondylium*, greater stitchwort *Stellaria holostea*, angelica and the moss *Thuidium tamaricinum*. Great woodrush dominates on the steepest slopes, and one juniper *Juniperus communis* bush was also recorded here. On the cliff by the Berriedale Water there is scattered ash *Fraxinus excelsior*. Westwards to the A9 bridge there is mature sycamore, willow and alder *Alnus glutinosa* by the river, often with greater woodrush. Further upstream the woodland includes mature sycamore, downy birch and larch.

Scrub is nearly always dense gorse, and occurs extensively east of the cemetery and north of it along the A9. A very small amount of elder *Sambucus nigra* occurs by the A9 north of the scheme.

Grassland

By far the largest area of grassland represents grazed pasture east of the A9 and most of this is semi-improved acid grassland, which is species-poor with much common bent *Agrostis capillaris*. Locally (see Figure 6.2 – Phase 1 Habitats) there are two small areas of steeper ground with unimproved acid grassland, one south of the 'White House' and in the scheme footprint; these are dominated by common bent and sweet vernal-grass *Anthoxanthum odoratum* with field woodrush *Luzula campestris*, heath bedstraw *Galium saxatile*, tormentil *Potentilla erecta*, bird's-foot trefoil *Lotus corniculatus*, common milkwork *Polygala vulgaris*, cat's-ear *Hypochaeris radicata* and bitter-vetch *Lathyrus linifolius*. There are scattered *Dactylorhiza* sp. orchids south of the 'White House'. There is also an area coded as improved grassland within the pasture, which is very heavily grazed and poached.

Apart from amenity grassland in gardens and amenity ground by the estate office, other grassland in the survey area is neutral and mostly unimproved. The largest extents are on steep coastal slopes dropping to cliffs and on flat ground north-west of the scheme by the Berriedale Water. The latter is unusual in that bluebell is a dominant species. The unimproved neutral grassland on the coastal slopes is dominated by dense red-fescue *Festuca rubra*, common bent and cocksfoot *Dactylis glomerata*, and does not appear to be species-rich, but has an abundance of a small number of large herbs including bluebell, greater stitchwort, common sorrel *Rumex acetosa*, hogweed and red campion *Silene dioica*[5]. Other small patches of neutral grassland elsewhere, some of which close to the A9 are semi-improved, tend to be dominated by red fescue and/or cocksfoot, and none are notable. Some appear to be developing into neutral grassland from acid grassland through undergrazing, and include a mix of neutral and acid species including red fescue, cocksfoot, sweet vernal-grass, pignut *Conopodium majus*, hogweed, greater stitchwort and rarely heather.

Heath

There is one small patch of coastal heath south of the scheme by the fishing cottages, comprising heather, bell-heather and occasional crowberry. Ericoids occur extensively elsewhere but in woodland (see above).

Other habitats

Bracken is extensive on slopes running down to the coast from the southern part of the scheme, and in the southern basin between the A9 and Berriedale Water where the SUDS ponds are proposed. In places it supports bluebell but is otherwise grassy. There are also patches within the mixed semi-natural woodland and north of it. Areas of tall non-ruderal vegetation correspond to open areas within woodland with mixes of great woodrush, bracken and bluebell. Tall ruderal vegetation comprises two small patches of disturbed vegetation beside the 'White House' and beside the estate office. These habitats are not scarce locally and/or are not notable, and are considered to have site/zone of influence value.

East of the scheme there is an extensive stretch of vertical rocky cliff, mostly within East Caithness Cliffs SAC/SPA. Rocky cliff also occurs south of the scheme beside the Berriedale Water below bracken/woodland.

Running water comprises the Berriedale Water. The confluence with the Langdale Water is at the south edge of the survey area, and the Berriedale Water flows into the North Sea approximately 200 metres downstream. This habitat appeared clean and in good health, and otter spraints were recorded under the A9 bridge.

Habitat within scheme footprint

Habitats which will be impacted by the scheme are shown in Table 6.6 below, with areas. In practice, the impacted areas will be slightly larger because the working construction area is

[5] This grassland is on dangerous steep slopes dropping to cliffs and so was surveyed from the edge.

likely to be larger, but it can be seen that the areas involved are very small with the exception of semi-improved acid grassland (grazed pasture), dense scrub (gorse) and bracken, which have low ecological value.

Table 6.6 Areas of habitats within scheme footprint (including SUDS)

Phase 1 code	Habitat	Area (ha)
A1.1.1	Semi-natural broadleaved woodland	0.0616
A1.1.2	Broadleaved plantation	0.0801
A1.3.1	Semi-natural mixed woodland	0.0969
A1.3.2	Mixed plantation	0.0020
A2.1	Dense scrub	0.4466
B1.1	Unimproved acid grassland	0.1137
B1.2	Semi-improved acid grassland	0.8787
B2.1	Unimproved neutral grassland	0.0784
B2.2	Semi-improved neutral grassland	0.1146
C1.1	Bracken	0.3731
C3.2	Tall non-ruderal	0.0002
I1.1.1	Inland acid cliff	0.0023
	Total	2.1683

6.5.4 *Ground-water Dependent Terrestrial Ecosystems*

None of the habitats within the surveyed area constitute GWDTEs.

6.5.5 *Protected species – birds*

Breeding seabirds

The cliffs along the stretch of coastline running northwards for c.450m from the end of the Berriedale Water were found to support the following breeding seabird species: kittiwake, fulmar, herring gull, puffin, guillemot, razorbill, and black guillemot *Cepphus grylle*. A brief summary of the seabird survey results is given below. Detailed results for SPA qualifying species within the survey area (all the above except black guillemot) are set out in detail in a separate HRA screening report produced by URS, which is given in Appendix 2 – Screening Report to inform Habitats Regulations Assessment. Figures 3 and 4 in the HRA screening report are particularly important. Black guillemot is not covered by the HRA screening report because it is not an SPA species, but is less critical both for that reason and because only a very small number were found in the survey area (maximum of two pairs).

The numbers of qualifying breeding birds recorded during the survey are shown in Table 6.7 below, with explanatory notes. Note that all counts are best estimates[6]. Great black-backed gull, cormorant and shag (all SPA qualifying species) were not observed in the survey area apart from one occurrence of a non-breeding shag. Peregrine (which is not a seabird but is a qualifying species for this SPA) was also not observed. There are three cliff sections in the table. Section 1 starts south-east of the cemetery, extends a short distance north-east, and then turns by Creag na Sgadain and continues north. Section 2 continues from Section 1 but in a north-east direction ending at a very steep rocky promontory 150m from the closest part of the proposed scheme. Section 3 is a separate cliff on the opposite side of the Berriedale

[6] Estimations may be overestimations, particularly for fulmar which typically breeds at 10 years but can temporarily occupy breeding sites as individuals or pairs when not breeding.

Water near the sea confluence. Other cliffs along the Berriedale Water did not support qualifying species. The closest point of the surveyed cliffs from the scheme footprint (the new cutting) is the junction of Section 1 and Section 2, 70m away.

Table 6.7 Numbers of breeding seabirds in the survey area.

Cliff section	Species	No.	Pairs/Individuals
1	Kittiwake	9	Pairs
	Fulmar	21	Pairs
	Puffin	8	Individuals
2	Kittiwake	34	Pairs
	Herring Gull	6	Pairs
	Fulmar	10	Pairs
	Guillemot	250	Individuals
	Razorbill	51	Individuals
	Puffin	16	Individuals
	Black guillemot	4	Individuals
3	Kittiwake	48	Pairs
	Fulmar	11	Pairs

The table below shows ecological value of breeding seabirds in the survey area, and percentages of the total SPA populations where applicable. SPA total populations were obtained from the SNH SiteLink website, except for puffin and fulmar whose percentages were derived as explained in the HRA screening report (Appendix 2 – Screening Report to inform Habitats Regulations Assessment). In most cases value has been assigned at the local level because of the small populations involved in comparison to numbers present at a county scale. In the case of puffin, county-level has been assigned to provide a conservative approach, because it is remotely possible that 1% of Caithness population could be present in the survey area.

Table 6.8 Value of breeding seabird populations in the survey area and percentages of SPA population (where applicable)

Species	Total no. in study area	Pairs/ Individuals	SPA species	% of SPA population	Value for EIA purposes
Kittiwake	91	Pairs	Yes	0.3	Local
Herring Gull	6	Pairs	Yes	0.1	Local
Fulmar	42	Pairs	Yes	0.3	Local
Guillemot	250	Individuals	Yes	0.2	Local
Razorbill	51	Individuals	Yes	0.3	Local
Puffin	24	Individuals	Yes	2.0	District
Black guillemot	4	Individuals	No	n/a	Local

Figures 3 and 4 of the HRA screening report (Appendix 2 – Screening Report to inform Habitats Regulations Assessment) show: i) the locations of qualifying breeding birds species in relation to the scheme; and ii) the locations of qualifying breeding bird species on a panoramic photograph of cliff section 1 and 2. It is apparent that most of the qualifying breeding birds are located at or near the sea edge. Only a minority of the observed puffins

and fulmar nest inland from the sea edge, but are much closer to the cliffs than the inland SPA boundary.

The above breeding bird data suggest that 0.1% to 0.3% of the SPA qualifying breeding birds are present in the survey area (i.e. within conceivable disturbance distance), except for puffin at 2% (this is an estimated maximum of 2% and is probably considerably lower for reasons explained in the HRA screening report in Appendix 2 – Screening Report to inform Habitats Regulations Assessment). The numbers of black guillemot appear to be very low at a maximum of two pairs.

Breeding birds other than seabirds

The estimated numbers of breeding bird territories (excluding seabirds – see above) in the survey area are given in Table 6.9 below. Figure 6.4 – Breeding Bird Summary (Excluding Seabirds) shows the estimated centres of these territories, and Figure 6.5 – Breeding Bird Survey (Sheets 1-4) gives the individual data from the four separate breeding bird surveys from which the estimated territories were derived.

Table 6.9 Number of estimated breeding bird territories in survey area (excluding seabirds)

Species	Territories	Conservation status	Assessed value
Bullfinch *Pyrrhula pyrrhula*	1	Red List, UK & Scottish BAP	District
House sparrow *Passer domesticus*	2	Red List, UK BAP	Local
Linnet *Carduelis cannabina*	1	Red List, UK & Scottish BAP	Local
Starling *Sturnus vulgaris*	2	Red List, UK BAP	Local
Dunnock *Prunella modularis*	3	Amber List, UK BAP	Local
Mistle thrush *Turdus viscivorus*	1	Amber List	Local
Willow warbler *Phylloscopus trochilus*	7	Amber List	Local
Blackbird *Turdus merula*	4	Green List	Site/Zone of influence
Blackcap *Sylvia atricapilla*	1	Green List	Site/Zone of influence
Blue tit *Cyanistes caeruleus*	3	Green List	Site/Zone of influence
Chaffinch *Fringilla coelebs*	4	Green List	Site/Zone of influence
Coal tit *Periparus ater*	2	Green List	Site/Zone of influence
Goldcrest *Regulus regulus*	1	Green List	Site/Zone of influence
Goldfinch *Carduelis carduelis*	2	Green List	Site/Zone of influence
Great tit *Parus major*	2	Green List	Site/Zone of influence
Greenfinch *Carduelis chloris*	1	Green List	Site/Zone of influence
Pied wagtail *Motacilla alba*	1	Green List	Site/Zone of influence
Robin *Erithacus rubecula*	3	Green List	Site/Zone of influence
Siskin *Carduelis spinus*	1	Green List	Site/Zone of influence
Tree creeper *Certhia familiaris*	1	Green List	Site/Zone of influence
Wren *Troglodytes troglodytes*	10	Green List	Site/Zone of influence

The following additional bird species were noted during the bird surveys but displayed no breeding behaviour (often just flying past): rock dove, house martin, jackdaw, meadow pipit, pink footed goose, spotted flycatcher, swallow and song thrush.

There are 21 breeding bird species (excluding seabirds) in the survey area, occupying a total of 53 estimated territories. No specially protected Schedule 1 bird species were found. Three species are on the BOCC[7] Red List, and four are on the BOCC Amber List; however, the numbers of territories involved for all species are very low. The most notable species is bullfinch, whose preferred habitats are scarce in Caithness, and is therefore assigned district value. Other species are considered to be of local value except for Green List species (which are common and widespread) which are zone of influence value only.

6.5.6 *Protected species – bats*

During the 4th June dawn re-entry survey on trees with moderate bat potential opposite the 'White House', seven bat passes were recorded, all of common pipistrelle. The bats were recorded in a brief period, the first at 03:36 and the last at 03:43. The last recorded bat occurred 32 minutes before sunrise. The calls were closely spaced and there was no evidence of more than one bat calling during a single recording, suggesting that only one or two bats were present. No bats were seen entering tree roosts, and the combination of species and timing of recordings further suggests that the bat(s) were not roosting in the trees.

During the 11th June dusk emergence survey on the same trees, 30 bat passes were recorded, all of common pipistrelle. The first bat was recorded at 23:17 and the last one at 23:47, and the majority occurred in a brief period between 23:23 and 23:27. The first recorded bat occurred exactly 1 hour after sunset. The calls were closely spaced and there was no evidence of more than one bat calling during a single recording, suggesting that only one or two bats were present. No bats were seen entering tree roosts, and the combination of species and timing of recordings further suggests that the bat(s) were not roosting in the trees.

No bats were found during the transect.

The internal inspections via ladder of possible roost sites in the trees found that some apparent holes previously recorded from ground level viewing were not holes, and where possible roosting features existed no evidence of bats was found.

The conclusions of these bat surveys are that:

- There is very limited bat activity in the scheme vicinity;
- No bats were found in trees with previous moderate potential opposite the 'White House', which have consequently been reduced to low potential where roosting potential still remains, in accordance with guidelines (Hundt 2012);
- Although not subject to impact, the 'White House' and adjacent tree with previous high potential have been reduced to moderate roost potential, owing to the very limited recorded bat activity in this area.
- The scheme is very unlikely to have any significant impact on bats, and the conservation status of bats in the area, such that it is, is anticipated to remain the same.

6.5.7 *Protected species – otter*

An otter holt was found close to the proposed outfall of the SUDS pond, under a tree in the bank of the Berriedale Water. This contained part of an eaten fish and spraint, indicating very recent use. This holt was well-enclosed but not very deep, and liable to flooding. Given also

[7] Birds of Conservation Concern (see Eaton *et al* 2009)

the proximity to the A9 and houses of Berriedale, it is most likely used as a temporary refuge during nocturnal foraging. Otter spraints were also found under both the old and new A9 bridges across the Berriedale Water. There is potential for otters to use other riverside cavities as holts, though no other evidence was found. Upstream on the Langwell Water in particular but also on the west side of the Berriedale Water there are inaccessible steep rocky slopes with dense tree cover that are likely to provide numerous refuge opportunities.

6.5.8 *Protected species – Killarney fern*

Killarney fern *Trichomanes speciosum* was removed from the UK Biodiversity Action Plan owing to successful conservation efforts, but remains a European Protected Species. The hectad in which Berriedale sits is one of 25 in Inverness-shire with Killarney fern, in this case only the inconspicuous gametophyte. The 1993 BSBI hectad record (ND12) on the NBN Gateway appears to correspond to a 1km square record (ND1122) which was from the steep banks of the Langwell Water (Rumsey & Jermy 1998). For reasons explained under Assessment of Impacts below, Killarney fern is not expected to occur close to the proposed scheme.

6.5.9 *Protected species – other*

No indication of other terrestrial protected mammals was found within the study area, including an absence of both refuges and field evidence of badger, red squirrel and pine marten/wildcat. The Berriedale Water and Langwell Water are highly unsuitable for water vole, and there is no suitable habitat (or likelihood) for great crested newt.

No hauled-out seals, or seals in near-shore waters, were seen during site visits. Seals may be discouraged from the coastline in the study area because the non-rocky part is well-frequented by tourists (the shore fishing cottages are holiday lets), and the rocky areas can also be easily reached by more agile people. The amount of rocky shore that is not regularly covered at high tide is small, and although there are caves in the rocky part of the study area, these are small and flood at high tide, so could not be used for breeding purposes.

Common reptiles (which have limited protection from killing and injury) are likely to occur in the rough grassland and bracken, which provide good opportunities for foraging, basking and shelter. These are most likely to comprise common lizard *Zootoca vivipara* and slow-worm *Anguis fragilis*, but may also include adder *Vipera berus* (records of which are present on the NBN Gateway at Berriedale). Given the small numbers of reptiles that could be affected and lack of specially protected species, and presence of much other suitable reptile habitat in the local area, specific reptile surveys have not been undertaken.

6.5.10 *Future baseline*

There is no reason to believe that the baseline conditions described here will not be very similar at the time of construction, particularly as there is not anticipated to be a prolonged delay before construction begins (2016).

6.6 Assessment of Impacts

6.6.1 *Value of ecological receptors*

The assessed values of ecological receptors identified in the baseline are given in Table 10.6 together with the rationale.

Table 6.10 Value of ecological receptors

Receptor	Value	Rationale
SPA and SACs	International	International value by virtue of SPA/SAC designation. Includes the maritime cliffs and Berriedale and Langwell Waters.
SSSIs	National	National value by virtue of SSSI designation. Includes the Berriedale Water and Langwell Water.
Ancient Semi-natural Woodland	County	Ancient Semi-natural Woodland is very scarce in the Highlands, irreplaceable except in the very long term, and highly valued ecologically.
Other mature semi-natural woodland	District	All semi-natural woodland is scarce in Caithness.
Unimproved coastal neutral grassland	District	Although not species-rich here (see Baseline Conditions above), it is nevertheless unimproved and of a type which is localised within Caithness.
Species-rich unimproved acid grassland	Local/Parish	Locally scarce but not rare in Caithness nor of sufficient interest to justify higher value.
Other terrestrial habitats	Site/zone of influence	Other grassland is of no ecological note; heath is of very small extent and not ecologically notable; bracken is common and widespread; ruderal vegetation is not ecologically notable.
Breeding puffin	District	Apparent higher proportion of the population present compared to the other seabirds. Figures for puffin are more dubious than for the other seabirds but a conservative approach has been taken.
Breeding seabirds other than puffin	Local	The populations in the survey area are small but significant locally.
Breeding birds (other than seabirds)	District for bullfinch; Local or less for other species	Bullfinch is a red list species dependent on certain types of lowland woodland/scrub that are scarce in Caithness. Other species are not rare in Caithness or, for green list species, are sufficiently widespread to be only of local or zone of influence value.
Bats	Local	There appears to be very limited bat activity in the scheme vicinity.
Otter	Local	Otters are not scarce at district level but are significant locally.
Reptiles	Local	No specially-protected species are present, but the species may include adder, which is declining and enriches the local fauna.
Killarney fern	County	The species is scarce in Inverness-shire (25 hectads), but under-recorded. It is not under clear threat and has been subject to successful conservation efforts (hence removal from UK BAP).

6.6.2 *Impacts screened out of further assessment*

Impacts listed in Table 6.12 in the next section include those expected to be slight and not significant at any scale. However, some other potential impacts noted by consultation responses or earlier during the assessment are now not expected to occur at all. These are listed and explained in Table 6.11.

Table 6.11 Impacts screened out of further assessment

Impact	Reason for screening out impact
Hydrological effects on terrestrial habitat within SPA, SACs or SSSIs	On-going effects on hydrology and groundwater will be restricted to areas of new cut/embankment, which are at closest 20m from Berriedale Cliffs SSSI, 25m from East Caithness Cliffs SPA/SAC and 40m from Berriedale & Langwell Water SAC (other designated sites are far too distant to be hydrologically connected to the scheme vicinity). Additionally, no Ground-water Dependent Terrestrial Ecosystems (GWDTEs) were identified. Consequently, there are not considered to be any hydrological impacts on terrestrial habitat within designated sites.
Impacts on Killarney fern	As noted above there is a record of Killarney fern in the 1km square ND1122 from the steep banks of the Langwell Water (Rumsey & Jermy 1998). It occurs in this area as the inconspicuous non-leafy gametophyte , which requires small clefts, crevices and rock hollows with high humidity and less than 1% ambient light (Preston *et al* 2002). The downstream end of the Langwell Water at the confluence with the Berriedale Water is 15m south of the nearest proposed works (the SUDS outflow). However, based on observations during site visits, likely habitat matching the gametophyte requirements and record description does not exist close to the scheme, but begins further up the Langwell Water at closest 40m from the nearest works, where the river becomes much less open and runs through a steep dark narrow gorge with dense tree cover. Light or humidity effects on this habitat from potential tree felling associated with the works cannot occur because of the distance and bearing to the works (no shading effect on possible Killarney fern habitat). Therefore no direct or indirect impacts on Killarney fern are expected.
Disturbance of hauled-out seals in designated haul-out BC-040	No hauled-out seals, or seals in near-shore waters, were seen during site visits. As mentioned above, seals may be discouraged from the coastline in the study area by the occurrence of people including tourists on the Berriedale shore, and there is negligible breeding opportunity. The relevant designated haul-out (BC-040) is not one of the 'key' haul-outs, and is very long, providing many kilometres of potential seal haul-out habitat which is far more secluded. For these reasons, seals are not thought to regularly use the shore in the study area and are not considered further.
Loss of ancient semi-natural woodland	According to the Ancient Woodland Inventory (AWI), a thin strip of ancient semi-natural woodland (ASNW) will be impacted by the northern end of the scheme, amounting to approximately 4% of the relevant ASNW block. However, the Ancient Woodland Inventory boundaries are not exact (demonstrated by the inclusion of the A9 within the ASNW block), and woodland beside the A9 at this point is not semi-natural: the ground flora indicates disturbance and sycamore is frequent (and has therefore been coded as plantation), in contrast to the bulk of the block which is mainly Scots pine, birch and rowan with a natural ground flora. Consequently, there is not considered to be any loss of semi-natural ancient woodland.

6.6.3 *Predicted and residual impacts*

Tables 6.12 and 6.13 below provide assessments of likely construction and operational ecological impacts respectively. Recommended mitigation is also briefly stated, and the resulting residual impacts. Significance is given in both the CIEEM format and DMRB format.

Table 6.12 Likely construction impacts on ecological receptors

Magnitude and extent	Timing, frequency, duration and reversibility	Impact significance (unmitigated)	Proposed mitigation	Residual impact significance
Construction disturbance of SPA breeding birds				
It is estimated that 0.1% to 0.3% of the total SPA breeding populations of kittiwake, fulmar, herring gull and guillemot, and up to 2% for puffin (but probably less – see HRA report in Appendix 2), could be disturbed by rock blasting and impact-driven piling if these were carried out during the breeding season. No such disturbance of peregrine, shag, cormorant or great black-backed gull is expected because no nests or other breeding signs of these species were observed in the study area.	Construction activity would be undertaken during the day. Rock-blasting/piling would occur over a period of days or weeks, intermittently for rock blasting but persistently (during the day) for piling until complete.	CIEEM: Probable significant negative impact at the District level DMRB: **Large Adverse**	Rock-blasting and piling will be restricted to the period September to February inclusive (August if contractor's Ecological Clerk of Works (ECoW) confirms SPA breeding birds have finished breeding in the area). Additionally a bored piling method will be used and not an impact-driven one.	CIEEM: No significant impact DMRB: **Neutral**
Construction pollution of or landslide into SPA, SACs or SSSIs				
If material fell into these designations or pollution entered them this could compromise component habitats or the conservation status of qualifying/notified features, which might have significant effects on site integrity. This would constitute a severe impact since the designations are international or national. However, with regard to East Caithness Cliffs SAC the coastal vegetation in this locality is less notable than elsewhere in the SAC (see Baseline Conditions above).	Could occur at any time if not mitigated, and may have effects which are permanent or not easily or quickly rectified.	CIEEM: Unlikely significant negative impact at the International level DMRB: **Very Large Adverse**	Contractor's Construction Environmental Management Document (CEMD) and Construction Method Statements, adhering to PPGs and incorporating silt management and management of materials, and monitored by ECoW. Retaining wall in-built into design to prevent collapse/slippage. Safety margins necessarily in-built into design to avoid slope failure.	CIEEM: No significant impact DMRB: **Neutral**
Hydrological effects on terrestrial habitats				
It has been concluded that on-going effects on hydrology and groundwater will be restricted to areas of new cut/embankment. Since, in addition, no Ground-water Dependent Terrestrial Ecosystems (GWDTEs) were identified, such hydrological effects would only have slight impact at most on habitat immediately	On-going but only applicable to habitats immediately beside the new cut/embankment and of slight effect at most (see	CIEEM: No significant impact DMRB: **Neutral**	None required because no significant impacts expected.	CIEEM: No significant impact DMRB: **Neutral**

Magnitude and extent	Timing, frequency, duration and reversibility	Impact significance (unmitigated)	Proposed mitigation	Residual impact significance
beside the new cut/embankment.	left).			
Loss of semi-natural woodland and unimproved coastal neutral grassland				
Although these habitats were valued as a whole at District level, the minor nature of the actual losses does not warrant significance at that scale. Loss of semi-natural woodland will be limited to the mixed woodland edge in the hairpin and a small area of sycamore/elm woodland above the Berriedale Water. The scheme footprint losses are 0.09ha and 0.06ha respectively but the construction losses would be slightly larger. Loss of unimproved coastal grassland will be limited to very small patches of species-poor red fescue in dense gorse east of the cemetery (0.02ha).	Permanent.	CIEEM: Certain significant negative impact at the Local level DMRB **Slight Adverse**	It is best practice to compensate loss of semi-natural woodland by tree planting with native species suitable to the locality (e.g. ash, elm, oak and birch around SUDS; birch, rowan and Scots pine elsewhere). It would be beneficial and appropriate for planted scrub to include juniper. There is a residual impact because plantations will not become semi-natural for many decades. Loss of small species-poor red-fescue patches does not warrant mitigation, particularly as new road verge grassland is likely to be more diverse.	CIEEM: Certain significant negative impact at the Local level DMRB **Slight Adverse**
Loss of species-rich unimproved acid grassland				
The small patch affected by the scheme will be mostly lost (0.11ha). Unimproved acid grassland is not rare in general or in Caithness, and similar grassland with similar species exists to the north-east, hence Local value and local significance.	Permanent.	CIEEM: Certain significant negative impact at the Local level DMRB **Slight Adverse**	None required (or feasible) given the presence nearby and further afield of similar grassland with similar species, and lack of rarity.	CIEEM: Certain significant negative impact at the Local level DMRB **Slight Adverse**
Loss of other terrestrial habitats				
The largest other habitat loss will be of semi-improved acid grassland (0.88ha), which is very species-poor and very common. The next largest losses are gorse scrub (0.45ha), bracken (0.37ha), species-poor neutral grassland (0.18ha) and partly immature broadleaved plantation (0.08ha). These habitats are common in	Neutral grassland and scrub will develop quickly on the new road verges and will therefore reverse losses to a large extent. Tree regeneration is likely	CIEEM: Certain significant negative impact at the Site level DMRB **Slight Adverse**	Leave significant areas of the new wide road verges unplanted with trees, so that natural regeneration on the verges can provide compensatory neutral grassland, scrub and (over time) tree regeneration.	CIEEM: No significant impact DMRB: **Neutral**

Magnitude and extent	Timing, frequency, duration and reversibility	Impact significance (unmitigated)	Proposed mitigation	Residual impact significance
general and locally and/or not ecologically notable locally, and therefore only of Site significance. SUDS ponds may add a small amount of marshy habitat.	in the medium term, additionally to any planting.			
Construction disturbance of otter				
Construction of the SUDS ponds and associated works will cause disturbance of the otter holt located just downstream of the A9 bridge over the Berriedale Water. Destruction of the holt might occur depending on final micro-siting of the SUDS outfall. Although well-enclosed this holt is relatively shallow, and given also the liability to flooding (being under a riverbank tree), relatively large size and rapid flow of the river, and proximity to the A9 and Berriedale houses, it is very unlikely to be used for breeding purposes. It is most likely to be used at night as a feeding station and temporary resting area. There is also much opportunity for otter refuges upstream amongst extensive densely wooded, steep and inaccessible slopes, which also represent good breeding habitat. Therefore disturbance or destruction of this holt is only considered to have local significance.	The time of year of the SUDS works is not set and may occur at any time of year, but not likely in winter. Works would be undertaken during the day and not at night when otters are most active.	CIEEM: Probable significant negative impact at the Local level DMRB **Slight Adverse**	To meet **legal requirements** it will be necessary to carry out a pre-construction survey, and to obtain an appropriate license from SNH incorporating proportionate mitigation/compensation.	CIEEM: No significant impact DMRB: **Neutral**
Construction disturbance of bats/bat roosts				
As discussed above, there is limited bat activity in the area. No roosts were found in trees adjacent to the A9 and existing tree features which may be felled are considered to have low roost potential for small numbers of bats in spring, summer or autumn, most likely common pipistrelle since small numbers of that species were all that was recorded during surveys.	The timing of any clearance works is not set and could occur at any time of year, but not likely in winter. Works would be undertaken during the day	CIEEM: Probable significant negative impact at the Local level DMRB **Slight Adverse**	To meet **legal requirements** it will be necessary to carry out a pre-construction check of trees likely to be felled, and, in the unlikely event that roosts are found, to obtain an appropriate license from SNH incorporating proportionate mitigation/compensation.	CIEEM: No significant impact DMRB: **Neutral**
Loss of foraging habitat for bats				
The most suitable habitat for foraging bats affected by	Not relevant since no	CIEEM:	None required since no significant	CIEEM:

Magnitude and extent	Timing, frequency, duration and reversibility	Impact significance (unmitigated)	Proposed mitigation	Residual impact significance
the scheme footprint is woodland of all types, but given the very minimal loss of trees compared to the amount of woodland in the area, presence further afield of other good foraging habitat such as lowland rivers, and compensatory tree planting for other reasons, no significant impact on bat foraging habitat is expected.	significant impact expected.	No significant impact DMRB: **Neutral**	impact expected.	No significant impact DMRB: **Neutral**
Construction disturbance of and loss of habitat for non-SPA breeding birds				
The most notable non-SPA breeding bird recorded was bullfinch, but bullfinches tend to have relatively large territories and their key habitats will be largely unaffected. The majority of the scheme occupies grazed grassland and scrub with little or no breeding bird activity. Habitat loss suggests that one chaffinch, one great tit, two willow warbler and two wren territories could be lost during the time that habitat has been cleared and not yet regrown/replanted. However, given that these species are common in the area, and that serious disturbance from rock blasting/piling will not occur through restriction to non-breeding period, impacts on non-SPA breeding birds are considered to be of Zone of influence level only. Replacement of poor pasture with grassland/scrub new road verges will significantly compensate for breeding bird habitat loss, and SUDS ponds may provide new marshy habitat which may increase breeding bird diversity.	The small breeding bird habitat loss will be largely temporary since vegetation will re-establish or be planted on verges and around SUDS ponds. Disturbance from normal construction work (not rock blasting/piling which will occur outside the breeding season) could occur for a maximum of a whole breeding season but is unlikely to prevent nearby birds breeding.	CIEEM: Probable significant negative impact at the Zone of influence level DMRB **Slight Adverse**	To meet **legal requirements**, it will be necessary to either clear vegetation during the period September to February to avoid the breeding bird season, or to use an ECoW outside that period to check vegetation for breeding birds prior to clearance. SUDS and large road verges on current poor pasture are in-built into the design and will automatically increase/diversify breeding bird habitat.	CIEEM: Probable no significant impact or significant positive impact at the Zone of influence level. DMRB: **Neutral** or **Slight beneficial**
Construction harm to and loss of habitat for common reptiles				
There will be removal of reptile habitat and possibility of harm to reptiles. However, only a very small fraction of good reptile habitat in the local area will be affected and by extension a very small proportion of existing reptiles. New road verges will provide a greater area of suitable and permanent replacement habitat.	Could occur at any time of year but not likely in winter.	CIEEM: Probable significant negative impact at the Local level DMRB **Slight Adverse**	Contractor to strim bracken/tall grass down to a low level prior to clearance. New large road verges will provide suitable and permanent replacement reptile habitat of greater extent than that lost (since it partly replaces low value heavily grazed pasture).	CIEEM: Probable significant positive impact at the Local level. DMRB: **Slight beneficial**

Table 6.13 Likely operational impacts on ecological receptors

Magnitude and extent	Timing, frequency, duration and reversibility	Impact significance (unmitigated)	Proposed mitigation	Residual impact significance
Operational disturbance of SPA breeding birds				
Operational (traffic) disturbance is not expected to be significant because: a) the closest breeding birds are approximately 70m away horizontally; and b) disturbance will be strongly attenuated by the substantial vegetated slopes rising high above and receding from the cliffs, and by the location of the new road to a large extent within a deep cutting.	Not relevant since no significant impact expected.	CIEEM: No significant impact DMRB: **Neutral**	None required because no significant impact expected.	CIEEM: No significant impact DMRB: **Neutral**
Operational pollution of SPA, SACs or SSSIs				
The topography means that Berriedale & Langwell Water SAC is the most likely designation to be affected by untreated run-off. Currently run-off is not purposefully treated which is probably causing some pollutants to enter this SAC in particular (since it is downslope of the whole section of road). Without mitigation this would continue but, since there is a healthy salmon population without purposeful run-off treatment, the effect would be slight. With appropriate SUDS there may be a slight positive impact by reducing pollutant flow to the SAC. No significant change to air pollution is likely given that traffic is not expected to change from the current low volume.	Operational pollution by run-off would be on-going if not mitigated, although probably similar to the existing state since the road position will be similar and traffic volume will not change.	CIEEM: Unlikely significant negative impact at the Local level DMRB **Slight Adverse**	SUDS is in-built into design, including a pond, to treat run-off and attenuate flows. A hydrodynamic vortex separator will also be installed to capture liquid and sediment-bound hydrocarbons, fine particles and other pollutants. The SUDS will be subject to SEPA approval.	CIEEM: Unlikely significant positive impact at the Local level DMRB: **Slight Beneficial**
Operational disturbance of otter				
No change to disturbance levels for otter is expected during operation of the road. This is because there will be no change in traffic volume, and traffic speed in the vicinity of the Berriedale Water will also not change because the existing road bends either side of the A9	Not relevant since no significant impact expected.	CIEEM: No significant impact DMRB: **Neutral**	None required since no significant impact expected.	CIEEM: No significant impact DMRB: **Neutral**

Magnitude and extent	Timing, frequency, duration and reversibility	Impact significance (unmitigated)	Proposed mitigation	Residual impact significance
road bridge will remain unaltered.				
Operational disturbance of bats				
As discussed above, there is limited bat activity in the area. No significant effects on foraging or commuting bats are likely during operation given the low levels of recorded activity, and also because the scheme will not affect traffic volume and will cause only minor increases in traffic speed.	Not relevant since no significant impact expected.	CIEEM: No significant impact DMRB: **Neutral**	None required since no significant impact expected.	CIEEM: No significant impact DMRB: **Neutral**

6.6.4 *Cumulative impacts*

Cumulative impacts with other developments have been scoped out of the assessment as detailed in Chapter 3 – Scoping and Consultation, as there are no developments proposed or with permission in the vicinity of the Scheme.

Concerning possible in-combination effects with plans, a review of the Highland-wide Local Development Plan (Highland Council 2012), Caithness Local Plan (Highland Council 2002) and Highland Coastal Development Strategy (Highland Council 2010) found that none of these plans promote specific development or other activity in the Berriedale area or near the relevant designated sites. More general policies which might affect, for example, general traffic volume and tourism, cannot conceivably have in-combination effects with the proposal. This is because the proposal is relatively small and not intended to alter traffic volume or accessibility. Thus the proposal will have no effects resulting from these factors, and there cannot be in-combination effects related to them.

In theory the proposal could with regard to noise disturbance produce in-combination effects with itself. Construction activity and associated noise would occur at the same time as normal traffic since it is a requirement of the project that at least one lane of the A9 is kept open. However, traffic on the existing A9 section would be forced to continue travelling at very low speed by the steep gradient and very tight hair-pin bends, and the limited noise produced by such traffic is considered to be negligible compared to noise from construction activity.

In summary, then, no significant in-combination effects are anticipated.

6.7 Mitigation

6.7.1 *General mitigation measures*

A Construction Environmental Management Document and Construction Method Statements will be produced by the contractor and agreed with the relevant authority in advance of construction. This will detail environmental effects, mitigation measures, timescales and responsibilities.

Works will be supervised as and when necessary by an Ecological Clerk of Works (EcoW). In particular the ECoW will: a) ensure that any nature conservation license requirements are met, and implement corrective action (if required) including liaison with SNH; b) supervise clearance of breeding bird habitat during the breeding season (if required); and c) ensure that mitigation measures to avoid pollution of designated sites are effective.

Good practice management measures for working near watercourses will be adhered to including SEPA Pollution Prevention Guidelines. Controls and contingency measures will be provided for management of run-off from construction areas, silt management, and management of fuel, oil, chemicals and materials (see Chapter 8 - Road Drainage and the Water Environment).

No construction activities will be undertaken during the hours of darkness.

6.7.2 *In-built design mitigation*

Implementation of SUDS is incorporated into the design, including a SUDS pond. A hydrodynamic vortex separator will also be installed to capture liquid and sediment-bound hydrocarbons, fine particles and other pollutants, and the whole SUDS scheme will be subject to SEPA approval. The SUDS will attenuate flows and provide treatment of run-off. Since the existing road section does not have such a system, run-off will be entering surrounding habitats untreated, potentially including designated sites. The SUDS should therefore improve pollution levels in habitats and sites near the scheme. The provision of a SUDS pond is also likely to provide a degree of habitat enhancement which may additionally benefit breeding birds, invertebrates and amphibians.

The relatively wide sloping verges of the new road section will provide areas of rough grassland and scrub which will partly replace existing heavily-grazed grassland with negligible ecological value. This will significantly compensate for the small losses of grassland and scrub inherent to construction, and will provide suitable habitat for breeding birds and reptiles.

The proposed Scheme design includes a retaining wall which will be constructed on the south side of the new road between the southern tie-in and the new cutting. This will avoid collapse/slippage of material towards designated sites. Additionally, the road design necessarily incorporates safety margins to avoid slope failure.

6.7.3 *Specific mitigation measures*

To avoid potential disturbance of qualifying SPA breeding seabirds on the coastal cliffs, rock-blasting and piling avoid the breeding season by restriction to the period September-February inclusive (August if the ECoW determines that SPA breeding birds have finished breeding on the nearby cliffs). Additionally, a bored piling method will be used instead of an impact-driven one.

Pre-construction inspections/surveys will be undertaken for otter and bats. To meet legal requirements, at least a disturbance license will be required for otter because there is a holt close to the SUDS outflow. Depending on the required work at the outfall and exact positioning of the outfall, it may be necessary to obtain a destruction license. In the unlikely event that pre-construction bat surveys locate a bat roost in trees liable to be felled, a bat disturbance license will also be required.

If any vegetation clearance will be undertaken in the breeding bird season, this will be supervised by an ECoW. Any areas found to be occupied by breeding birds will not be cleared until the ECoW determines that breeding attempts have finished.

Bracken and tall grass that need to be cleared will be strimmed down to a low level prior to clearance, to encourage reptiles to move out of the area and minimise risk of harm.

6.7.4 *Monitoring*

No monitoring is considered necessary with the exception of any monitoring necessary for the required otter disturbance license, and any other monitoring that might be necessary for other species licenses (in the event that these are found necessary following pre-construction surveys).

6.8 Summary

A summary of ecological impacts before and after proposed mitigation measures is provided in Table 6.14 below. Accounting for in-built design mitigation and following implementation of other mitigation measures, there are expected to be two impacts of Slight Adverse significance, three of Slight Beneficial significance, and the remainder Neutral. No adverse impacts are expected on designated sites or their qualifying/notified features with mitigation in place, in particular restriction of rock-blasting and piling to periods outside the breeding bird season, implementation of SUDS, and development of an Construction Environmental Management Document construction method statements.

Table 6.14 Summary of ecological impacts

Predicted impact	Significance (unmitigated)	Proposed mitigation	Residual significance
Construction impacts			
Construction disturbance of SPA breeding birds	Large Adverse	Rock-blasting/piling outside breeding bird season. Bored (not impact) piling.	Neutral

Predicted impact	Significance (unmitigated)	Proposed mitigation	Residual significance
Construction pollution of or landslide into SPA, SACs or SSSIs	Very Large Adverse	Construction Environmental Management Document, Construction Method Statements incorporating good practice pollution controls and contingencies, monitored by ECoW. Retaining wall. Necessary engineering safety margins.	Neutral
Hydrological effects on terrestrial habitats	Neutral	Not required.	Neutral
Loss of semi-natural woodland and unimproved coastal neutral grassland	Slight Adverse	Compensatory planting of suitable native species.	Slight Adverse
Loss of species-rich unimproved acid grassland	Slight Adverse	Not required (see Table 6.12)	Slight Adverse
Loss of other terrestrial habitats	Slight Adverse	Leave significant areas of road verges unplanted with trees.	Neutral
Construction disturbance of otter	Slight Adverse	Pre-construction survey and licensing.	Neutral
Construction disturbance of bats/bat roosts	Slight Adverse	Pre-construction survey and (if required) licensing.	Neutral
Loss of foraging habitat for bats	Neutral	Not required.	Neutral
Construction disturbance of and loss of habitat for non-SPA breeding birds	Slight Adverse	Clear vegetation outside breeding bird season or ECoW to supervise. Automatic suitable habitat (possible increase) on verges/around SUDS.	Neutral or Slight Beneficial
Construction harm to and loss of habitat for common reptiles	Slight Adverse	Strim bracken/grass down before clearance. Automatic suitable habitat on wide verges, partly replacing poor pasture.	Slight Beneficial
Operational impacts			
Operational disturbance of SPA breeding birds	Neutral	Not required.	Neutral
Operational pollution of SPA, SACs or SSSIs	Slight Adverse	Implement SUDS approved by SEPA.	Slight Beneficial
Operational disturbance of otter	Neutral	Not required.	Neutral
Operational disturbance of bats	Neutral	Not required.	Neutral

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7 CULTURAL HERITAGE

7.1 Introduction

This chapter identifies and assess the potential impacts upon the cultural heritage resource from the A9 Berriedale Braes Improvement Scheme. The heritage resource consists of archaeology, historic buildings and the historic landscape and covers both designated and non-designated assets.

The previous stages of work have identified a number of heritage assets within the vicinity of the proposed Scheme. These include the scheduled monuments of Berriedale Castle and Langwell Castle, the garden and designed landscape of Langwell Lodge and the category C listed White House. There is the potential for the construction and/or operation of the proposed Scheme to impact upon the setting of these assets. There is also the potential for the Scheme to physically impact upon non-designated assets identified in close proximity to the proposed route.

7.2 Planning Policy & Legislation

There are a number of statutory instruments and policies governing the approach to cultural heritage. The main pieces of legislation and policy and guidance are:

- The Historic Environment (Amendment) Scotland) Act 2011;
- Planning (Listed Buildings and Conservation Areas) (Scotland) Act 1997;
- Ancient Monuments and Archaeological Areas Act 1979;
- Scottish Planning Policy (SPP) (2014);
- The Historic Environment Strategy for Scotland (2014);
- Scottish Historic Environment Policy (SHEP) (2011);
- Planning Advice Note 2/2011 – Planning and Archaeology (2011);
- Planning Advice Note 71 – Conservation Area Management (2004); and
- Managing change in the historic environment' series of guidance notes issued by Historic Scotland.

The Highland Council have also produced an Historic Environment Strategy as supplementary planning guidance to the Highland-wide Local Development Plan. This was formally adopted as supplementary guidance in 2013.

Local planning policy is provided by the Highland Council in the Highland-wide Local Development Plan adopted in April 2012. The HwLDP states that consideration of the cultural heritage of the Highlands must be considered when development proposals are put forward. The HwLDP separates heritage assets into three categories – local and regionally important, national important and internationally important based on their type and importance.

Local and regionally important assets are identified at Council level and contribute to the identity of the Plan area. Heritage assets within this category are defined as:

- Sites and monuments record archaeological sites;
- Category B and C listed buildings;
- War memorials;
- Archaeological Heritage Areas;
- Conservation Areas.

Nationally important heritage features are defined as those identified by national organisations or by the Council under national legislation. These include:

- Category A listed buildings;
- Scheduled monuments;
- Historic battlefields; and
- Inventoried gardens and designed landscapes.

Internationally important heritage features are identified under government directives and European conventions. For heritage, this applies to World Heritage Sites.

Policy 57 of the HwLDP sets out the test against which development proposals within the plan area must be judged against when those proposals may affect cultural heritage assets. The policy states:

"*All development proposals will be assessed taking into account the level of importance and type of heritage features, the form and scale of the development, and may impact on the feature and its setting, in the context of the policy framework of Appendix 2. The following criteria will apply:*

1. For features of ***local/regional importance*** we will allow developments if it can be satisfactorily demonstrated that they will not have an unacceptable impact on the...heritage resource.

2. For features of ***national importance*** *we will allow developments that can be shown not to compromise the heritage resource. Where there may be any significance adverse effects these must be clearly outweighed by social or economic benefits of national importance.*

3. For features of ***international importance*** *developments likely to have a significance effect on a site, either alone or in combination with other plans or projects, and which are not directly commented with or necessary to the management of the site will be subject to an appropriate assessment. Where we are unable to ascertain that a proposal will not adversely affect the integrity of a site, we will only allow development if there is no alternative solution and there are imperative reasons of overriding public interest, including those of a social or economic nature."*

The policy also states that the Historic Environment Strategy (HES) described above will be adopted as supplementary planning guidance and therefore form part of local and regional policy. The purpose of the HES is to ensure that future developments take account of the historic environment and that a proactive approach is taken to the protection of the historic environment. The strategy is underpinned by a series of aims relating to the different aspects of the historic environment which should be complied with to ensure the appropriate management of change to the historic environment resulting from development proposals. Only those strategic aims which are directly relevant to this project have been reproduced here:

Understanding heritage value - strategic aim 1: to ensure that future management strategies, proposals and decisions affecting the historic environment are based on a thorough understanding of the special features of heritage assets and associated archaeology, history and architecture of the Scottish Highlands.

Listed buildings – strategic aim 6: that listed buildings within Highlands are protected from harmful developments, including extension and alteration, which may affect their special architectural and historic interest or their setting and that there is a presumption against the demolition of listed buildings.

Scheduled monuments – strategic aim 13: that scheduled monuments – and their setting – within Highland are protected from harmful developments which may affect their national importance.

Designed landscapes – strategic aim 14: that all designed landscapes within Highland are protected from harmful developments which may affect their integrity.

Archaeological sites and landscapes – strategic aim 16: to ensure that the importance of non-designated archaeological sites and landscapes and their settings are understood and wherever possible protected from harmful developments.

Archaeological sites and landscapes – strategic aim 17: to ensure no asset or its setting is lost or altered without adequate consideration of its significance and of the means available to preserve, record and interpret it in line with national and local policy and Highland Council's Standards for Archaeological Work.

Specific policy to Caithness can be found in the Caithness Local Plan adopted in 2002 but still in force until replaced with the updated Caithness Local Plan however the majority of polices have been redacted, with no generic policies relating to heritage remaining in force.

Other relevant guidance documents utilised in this report include:

- Scottish Archaeological Research Framework (2014 website).

7.3 Approach & Methods

All work has been undertaken in accordance with the Institute for Archaeologists Code of Conduct (2013/14).

The assessment methodology follows guidance set out in DMRB, Volume 11, Section 3, Part 2, Cultural Heritage (HA 208/07Highways Agency 2007). Application of appropriate mitigation measures follows guidance set out in DMRB Volume 10, Section 6, (HA75/01 - Highways Agency 2001). Assessment of residual effects is undertaken in two stages. The magnitude of impact is first assessed without reference to the value of the feature. The findings of this assessment are then cross-referenced with the value rating of the feature (see Section 7.3.1 below) to establish the significance of residual effect that is likely to result from the Scheme firstly prior to mitigation measures being imposed, then again taking into account the mitigation proposals. Both stages are calculated by the use of a matrix (Table 7.1) that balances the importance of a feature against the magnitude of impact.

Table 7.1: Significance of Effect

Magnitude of Impact	Sensitivity of Receptor				
	Very High	**High**	**Medium**	**Low**	**Negligible**
Major	**Very Large**	**Large or Very Large**	**Moderate or Large**	Slight or Moderate	Slight
Moderate	**Large or Very Large**	**Moderate or Large**	Moderate	Slight	Neutral or Slight
Minor	**Moderate or Large**	Slight or Moderate	Slight	Neutral or Slight	Neutral or Slight
Negligible	Slight	Slight	Neutral or Slight	Neutral or Slight	Neutral
No Change	Neutral	Neutral	Neutral	Neutral	Neutral

7.3.1 *Assessing the value of an asset*

The value of a structure, area, site or landscape reflects its significance as a historic asset and, therefore, its sensitivity to change. The value of an asset is not simply a reflection of its designated or non-designated status. For the purposes of this report, value has been assessed in accordance with DMRB Volume 11, Section 3, Part 2, Cultural Heritage (HA 208/0 Highways Agency 2007). This sets out a number of different criteria which can be applied to all elements of the historic environment (archaeology, historic buildings and historic landscapes) irrespective of any designated status. This allows an objective assessment of the value of the heritage asset.

Designations and other criteria currently vary depending on the nature of the asset and therefore the evaluation of archaeological remains, historic buildings and the historic landscape is undertaken by reference to different sets of criteria as outlined in Table 7.2. The purpose of the evaluation is to allow an objective assessment of the significance of an effect on that heritage asset in accordance with Table 7.1.

Historic Scotland has outlined a number of special characteristics which contribute to an asset's value, including evidential, historical, aesthetic and communal. Non-designated assets may exhibit equivalent values to those which have been granted statutory or designated protection and have been assessed accordingly.

Table 7.2: Guide for Assessing the Value of Heritage Assets

Importance	Description
Very High	World Heritage Sites Assets of acknowledged international importance Assets that can contribute significantly to acknowledged international research objectives Buildings of recognised international importance Historic landscapes of international value, whether designated or not Extremely well preserved historic landscapes with exceptional coherence, time-depth or other critical factor(s)
High	Scheduled Monuments Non designated assets of schedulable quality and importance Assets that can contribute significantly to acknowledged national research objectives Category A Listed Buildings Other listed buildings that can be shown to have exceptional qualities in thei fabric or historical association not adequately reflected in their listing grade Conservation Areas containing very important buildings Non designated structures of clear national importance Designated historic landscapes if outstanding interest Well preserved historic landscapes, exhibiting considerable coherence, time depth or other critical factor(s)
Medium	Designated or non-designated assets that contribute to regional research objectives Category B Listed Buildings Historic (non-listed) buildings that can be shown to have exceptional qualities in their fabric or historic association Conservation Areas containing important buildings Historic Townscape or built-up areas with historic integrity in their buildings, or built settings (e.g. including street furniture and other structures) Designated special historic landscapes Non-designated that would justify special historic landscape designation, landscapes of regional value Averagely well-preserved historic landscapes with reasonable coherence, time-depth or other critical factor(s).

Importance	Description
Low	Non designated assets of local importance Assets compromised by poor preservation and/or poor survival of contextua associations Assets of limited value, but with potential to contribute to local research objectives Category C Listed buildings Historic (non-listed) buildings of modest quality in their fabric or historical association Historic Townscape or built-up areas of limited historic integrity in their buildings, or built settings (e.g. including street furniture and other structures Robust non-designated historic landscapes Historic landscapes with importance to local interest groups Historic landscapes whose value is limited by poor preservation and/or poor survival of contextual associations
Negligible	Assets with very little or no surviving archaeological interest Buildings of no architectural or historical note; buildings of an intrusive character Landscapes with little or no significant historical interest
Unknown	The importance of this resource cannot be ascertained Buildings with some hidden (i.e. inaccessible) potential for historic significance

7.3.2 *Levels of impact*

Impacts from the Scheme upon heritage assets can be direct or indirect, be upon the physical fabric of the asset or upon its setting; permanent or temporary and/ or cumulative. They may arise from the construction and/or the operation of the works.

Direct impacts are those that arise as straightforward consequences of the Scheme. For archaeological remains and historic structures, this can mean physical damage to, or physical improvement of, the fabric of the asset, but it can also mean impacts on the setting of cultural heritage assets. For instance an increase in noise and pollution as a result of the Scheme would constitute a direct impact.

An indirect impact is an impact arising from the Scheme via a complex route, where the connection between the Scheme and the impact is complicated, unpredictable or remote.

Long-term or permanent impacts can be related to either the construction or the operation of the Scheme. Long-term construction impacts include topsoil stripping, geotechnical investigations, hedgerow removal, excavations for borrow pits, drainage and communications, the movement and installation of heavy machinery and plant, and mitigation works in connection with other environmental topics. Long-term operational impacts are those that would arise from the use of the road once built, for example new lighting, noise, dust, vibration, and visual intrusion by traffic or planting.

Temporary impacts are mainly related to the construction of the Scheme. These include noise, dust, visual intrusion and disruption of access during construction, all of which may cease with the completion of the road. Temporary impacts arising from the operation of the Scheme may be the result of noise caused by traffic diverted during predictable maintenance or other traffic management operations.

Setting is a material consideration in Scottish planning and guidance relating to archaeological remains, historic buildings and designed landscapes and should be assessed as part of the environmental assessment process. Historic Scotland have published specific guidance entitled 'Setting' relating to the setting of heritage assets (Historic Scotland 2010). The guidance note gives a broad description of how Historic Scotland considers setting. It states *'setting should be thought of as the way in which the surroundings of a historic assets or place contribute to how it is experienced, understood and appreciated*.' In managing change within

the historic environment, the SHEP (Historic Scotland 2011) emphasises the need to maintain an appropriate setting for a heritage asset and SPP states that "*change should be sensitively managed to avoid or minimise adverse impacts on the fabric and setting of (an) asset, and ensure that its special characteristics are protected, conserved or enhanced*" (*SPP 2014, paragraph 137).*

Cumulative impacts can arise from the multiple effects of the same scheme on a single asset, different multiple effects of the scheme and other schemes on the same asset, or incremental effects arising from a number of small actions over time. Interactions may arise from activities related to other topics, such as drainage schemes, endangered species relocation, sound attenuation measures or access arrangements, taken together with any cultural heritage impacts.

Table 7.3: Guidance factors in assessing the magnitude of impacts on heritage assets

Impact description	Magnitude of Impact
Change to most or all key heritage (archaeology, buildings) elements, such that the resource is totally altered Comprehensive changes to setting Change to most or all key historic landscape elements, parcels or components; extreme visual effects; gross change of noise or change to sound quality; fundamental changes to use or access; resulting in total change to historic landscape character unit.	Major
Changes to many key heritage elements, such that the resource is clearly modified Considerable changes to setting that affect the character of the asset Changes to many key historic landscape elements, parcels or components, visual change to many key aspects of the historic landscape, noticeable differences in noise or sound quality, considerable changes to use or access; resulting in moderate changes to historic landscape character.	Moderate
Changes to key heritage elements, such that the asset is slightly altered Slight changes to setting Changes to few key historic landscape elements, parcels or components, slight visual changes to few aspects of historic landscape, limited changes to noise levels or sound quality; slight changes to use or access: resulting in limited changes to historic landscape character.	Minor
Very minor changes to elements or setting. Very minor changes to key historic landscape elements, parcels or components, virtually unchanged visual effects, very slight changes in noise levels or sound quality; very slight changes to use or access; resulting in a very small change to historic landscape character.	Negligible
No change No change to elements, parcels or components, no visual or audible changes; no changes arising from in amenity or community factors	No change

7.3.3 *Study Area*

For designated assets (scheduled monuments, listed buildings, gardens and landscape listed on the Historic Scotland Inventory, battlefields listed on the Historic Scotland Inventory, Conservation Areas and World Heritage Sites), a search area of a 1km buffer either side of the proposed Scheme was used. This enabled the identification of assets which may not only

have their physical fabric impacted but also their setting. The data was obtained from the Highland Historic Environment Record (HHER) and the Historic Scotland GIS database. The assets are identified in the text with their Historic Scotland number in bold. The assets are shown on Figure 7.1 – Designated Heritage Assets with the gazetteer provided in Appendix 3 – Heritage Asset Tables.

A search area of 1km was also used for the non-designated assets (archaeological sites, findspots, unlisted buildings, historic landscape units). This large search area was undertaken in order to identify the archaeological context of the study area and to enable trends or clusters of archaeology from similar periods to be identified. This helps to identify the archaeological potential of the Scheme footprint. The data was obtained from the HHER and is referenced in the text with its HHER reference number in bold. The gazetteer of assets is located in Appendix 3 – Heritage Asset Tables.

7.4 Site Visit

A site visit was undertaken in July 2014 by an archaeological consultant from URS. The purpose of the visit was to walk along the proposed route to identify any previously unidentified archaeological assets and to establish the condition and setting of the already identified assets.

7.5 Assumptions and Limitations

It is assumed that all third party data supplied for this project is accurate and up to date.

No limitations have been identified during the preparation of this report.

7.6 Geology and Topography

The accompanying DMRB Stage 3 Scheme Assessment Report contains a detailed description of the geological baseline for the Proposed Scheme.

7.7 Baseline Conditions

7.7.1 *Designated Assets*

Within the 1km search area from the centre line of the proposed scheme there are four scheduled monuments, 18 listed buildings (a number of these have the same reference number) and one garden on the Inventory of Gardens and Designed Landscapes.

The scheduled monument of Berriedale Castle (**3438**) is located 0.1km to the south of the proposed Scheme, at sea level. It is located on a promontory of rock projecting across the mouth of the Berriedale River. The castle is defended on most sides by the natural, rocky slopes enhanced with an enceinte wall 2.5m thick which runs all the way around the promontory. Where the land joins with the mainland, a deep ditch was cut to cut-off access. This ditch was 6m wide and crossed by a bridge, of which only the abutment remains today. Foundations of a range of building survive including a gatehouse, and further buildings consisting of three compartments along the west side survive to a height of 0.8m.

There are records of the castle dating back to the 14th century where it was in the hands of the Cheyne family. The castle then passed through marriage to the Sutherland family before passing to the Oliphants. In 1606, the castle was purchased by the Earl of Caithness. The castle has extensive views out to sea and across Berriedale Harbour. Its location means that it could operate as an early warning system for potential sea-invaders trying to make for the harbour or the river. It has a much reduced view inland, being surrounded on all sides by the coastal hills. There are better views to the south which would warn of possible land attack, but it may be that the castle at Langwell operated as a look-out post, providing early warning and allowing Berriedale to operate their defences. As a defensive asset, the views available from the asset contribute a great deal to the understanding of the key characteristics. The key

views from the asset are out to sea and across the harbour. In addition, the other key characteristics of the asset include the ability to compare the architecture and defence technology with Langwell Castle. Possible evidence from within the castle complex can provide information on the material culture of the elite society who resided here and the historical links with the Earl of Caithness lends the asset historical value. The setting of the asset is the promontory on which it was very purposefully constructed. The setting also comprises the views mentioned above.

Plate 1 View of Berriedale Castle remains looking northeast

Plate 2 View of natural ditch cutting Berriedale Castle off from mainland

Plate 3 View from Berriedale Castle towards the proposed scheme location

Langwell Castle, also known as Achcastle Achastle (**3437**) is located 0.3km to the west of the proposed Scheme. This asset is the ruins of a large rectangular keep, with the walls only standing to a height of 1.5m and is located within the boundary of Langwell Lodge garden and designed landscape. The castle does not contribute to the significance of the garden and the later Langwell House was constructed in such close proximity to the castle because of the extensive views available, rather than any historical connection. The gardens are structured around the estate of the castle, but the historic link has been severed by the construction of Langwell House. The castle was constructed in the 14th century and given its close proximity to Berriedale and the position it holds overlooking Berriedale castle, it is reasonable to assume that either the castles were held by the same family or cadet branches of the same family. It is said to have been built by the Sutherland Family. The castle is located on the edge of the ridge overlooking Berriedale Water and has good views to the north and south. It is protected by steep banks and by a broad, deep ditch measuring 11.5m wide and 4m deep. In addition to the keep are two turrets located at the northeast and northwest angles and a causeway crosses the ditch entering the castle complex at a northwest angle. The castle is said to have been built by John Beg, the third son of the Earl of Sutherland but the date of the destruction of the castle is unknown. The key characteristics of this monument are the views out to sea and to the north and south. As a defensive monument, these views add to the significance of the asset and contribute to the understanding. In addition, the castle can contribute to the archaeological record by enhancing knowledge of medieval castle construction design and layout and defensive technology at the time. The link with Berriedale Castle adds to the significance of the asset.

A broch and a later post-medieval farmstead Scheduled Monument (**577**) are located approximately 0.4km to the west of the scheme, at Rinsary. The broch dates to the Iron Age. The function of brochs is still not clearly understood, with their thick outer walls, imposing presence, lack of external windows and tightly controlled entrance. It is thought that they were defended settlement sites, possibly located within a wider settlement and a place of safety to retreat to if attacked. It is also thought that these large and stout buildings were status symbols, and the homes of the wealthy elite. Whichever the true function, these were buildings which were designed to be seen as a symbol of power, be that defensive power or wealth or both. The broch at Rinsary survives as a mound 16m high with some stonework evident on the eastern side where the outer face of the broch forms the western gable end of a stone rectangular foundation structure representing a post-medieval farmstead of possibly 18th century date. There is also a kiln barn with attached rectangular enclosure located to the southwest of the broch which has been dated to the 19th century.

Although brochs are more regularly located in the Highlands than in the more southerly areas of Scotland, this does not diminish their significance. The setting of this asset is the surroundings in which it is located, and the easily defendable position on the steep valley side of the Berriedale Valley overlooking Berriedale Water located to the west. The asset was clearly meant to be a visible feature in the landscape and therefore views towards the asset are of significance. As a defensive asset, views from the asset are usually of significance however brochs did not have any external windows. There may have been a rooftop walkway but this has never been conclusively proven for any broch. Therefore it is more likely that the sheer size and mass of a broch was intended to act as a deterrent, rather than being a place from which to identify attackers. This therefore places the emphasis on views towards the asset, and the asset within the landscape rather than views from the asset. The setting of the asset does add to the understanding of some of the key characteristics and there are panoramic views afforded from the broch location. The key characteristics of this asset lies in the potential it has to provide information on Iron Age society and defensive architecture and to provide evidence of social hierarchy as well as the material culture.

The final scheduled monument located within the study area is a cairn situated to the southwest of Langwell House (**460**). The Neolithic cairn is described as chambered but visits in the 1980s record the cairn as slightly degraded. The visible remains of the cairn measure 21m in diameter and surviving to a height of 1.5m in places. The cairn is located on the edge of a terrace at 78mOD with a severe drop on the southwestern edge to Langwell Water. The centre of the cairn is clear of trees but obscured with grass and heather. The southwestern portion of the cairn has been robbed out but the remains of a possible chamber have been located in this section. The remains of a passage lintel have been recovered and the chamber is defined by a prominent back-slab and five orthostats visible in the rubble. The structure of the inner chamber is still fairly well-defined within the ruined cairn. The key characteristics of this asset lie in the archaeological and historic evidence it can provide for Neolithic and wider prehistoric burial practices and ritual activity. It can provide useful information on the utilisation of the landscape and how the landscape may have been divided into ritual and secular areas. The location can also provide evidence for the identification of other cairns in similar topographical areas. The situation of the cairn on the edge of a terrace overlooking Langwell Water and with views towards the sea indicates that these views are of significance to the asset and also indicate that it would once have been a visible feature within the landscape. The setting also encompasses the wider landscape within which the asset is situated, although it immediate setting has been altered by the creation of the designed landscape around Langwell House. This has diminished the setting of the asset by introducing a man-made and sculptured landscape which does not contribute towards the understanding of the asset. The asset is now located in heavy woodland within the Langwell Estate and although the relationship with Langwell Water can still be appreciated and understood, the relationship with the sea has been severed and the asset is no longer a visible marker.

The majority of buildings lie within the settlement of Berriedale. Berriedale is a linear settlement which follows the valley of Berriedale Water to the sea. At the western end is the Welbeck Estate, including the Category B listed Estate Office, Berriedale Post Office and Stable/ Byre Range (**7932**) and Ivy Cottage and Laundry (**50836**). All date to the 19th century and form an interesting group set back from the main road with the woodland belt of Langwell Lodge designed landscape to the rear.

Plate 4 View of listed Post Office and Estate Office in Berriedale from the A9

Situated to the south of the Welbeck Estate, and encompassed within the designed landscape, are the Category C listed Bridges over Berriedale and Langwell Waters (**7968**). Both were designed by Thomas Telford and date to 1815. The road they serve is no longer in use, having been bypassed by the present A9. Situated between the two bridges is the Category B listed War Memorial **(7969)** which lies alongside the A9. The monument was erected in 1919, with the names of those killed in World War Two added at a later date. These buildings form a nucleated cluster orientated around the bridges and the Berriedale Water. The settings of these assets are reliant on each other to provide context and appreciation to one another. The rising topography encloses the cluster and the intervening trees and vegetation produce an intimate and pleasing village scene.

Plate 5 War Memorial in Berriedale

Taking advantage of the waterway is the Category B listed Sawmill (**7922**) and associated Mill Cottages (Category C listed; **7921 & 7933**). The Mill and No 1 Mill House, the former Miller's house, both date to the early 19th century, with No 2 Mill House added in the late 19th century. The cottages are typical single-storey domestic structures. The mill rises to two storeys with integrated overshot waterwheel. The group lies on the wooded banks of Berriedale Water, within a secluded position away from the road. The Category C listed No's 1, 2 & 3 Portland Terrace (**7923**) also lie beside Berriedale Water. The terrace represents a row of three, one and a half storey cottages dating to the late 19th century. They are orientated towards the water with the wooded valley side rising to the rear (west). A similar terrace is located at the southern end of Berriedale. The Category C listed Shore Cottages (**7924**) represent a row of four early 19th century cottages located on the shoreline. Associated with the cottages are the Category C listed Fishing Store and Ice House (**7925**). Both were built to serve the salmon industry which played an important part in the development of the settlement. The pair forms a group with the ice house built into the side of the hill to the rear. After fishing fell into decline in the 20th century, the cottages were left to decay and in the 1950s were empty. The cottages have been sympathetically restored by the Landmark Trust and now offer holiday accommodation. The significance of these cottages lies with the historical connection to the

Salmon fishing industry, initially built to take advantage of the proximity to the sea and the safe natural harbour making the sea an essential part of their setting and understanding.

Plate 6 View of the listed Shore Cottages, the non-designated The Haven and the listed Fishing Store

Plate 7 Close up view of the category C listed Shore Cottages

Berriedale Parish Church is located outside the village, to the north. The Category B listed building (**7926**) dates to 1826 and was built to the designs of Thomas Telford as part of his work on Parliamentary churches, those built under the Act of 1823. The design is typical of Telford's churches being 'T'-shaped in plan with simple bellcote at the west end. The church is located in an isolated position on an elevated part of the road. It is set within a burial ground, itself a non-designated asset (**MHG31341**), defined by drystone walls. Associated with the church, although located at some distance, is the former manse now referred to as The White House (**7927**). The house is Category C listed and was similarly designed by Thomas Telford in 1826. The house is situated alongside the road with open views to the east, enhanced by the fall in topography.

Plate 8 Berriedale Parish Church looking southwest

Plate 9 View of south-facing gable end of the White House

Plate 10 View south towards proposed scheme from the southern boundary of the White House

Although located beyond 200m of the scheme, a pair of Category B listed Navigation Beacon Towers **(7931)** have been considered within this assessment due to their landmark quality. The northern of the two towers overlooks Berriedale Braes, with the southern tower clearly visible in the background. The pair date to the early 19th century and were constructed as a navigational tool to guide vessels into Berriedale. They are positioned in prominent positions along the cliff top.

Plate 11 View of navigational beacon from Berriedale Castle, looking south

The garden at Langwell Lodge also contains the scheduled remains of Langwell Castle, also known as Achastle (**3437**) which is discussed in detail above. The garden is included on the Historic Scotland inventory of gardens and designed landscapes and is therefore considered to be of national importance. The summary of the reason for inclusion states that the garden is the UKs most northerly nursery walled garden established in the 19th century and that the garden and surrounding parkland and woodland make an important contribution to the landscape setting of Langwell House and the surrounding landscape. The earliest records of the estate show that the first house on the site of Langwell House was a farmhouse built for a James Horn(e) who purchased the estate from Sir John Sinclair. The 5th Duke of Portland purchased the estate in 1858 and it was he who made improvements to the house, developing it as a shooting lodge. Langwell House (**MHG24066**) is a non-designated asset.

It is probably from the time the estate passed into the ownership of the Duke of Portland that the designed landscape began to evolve around the house. Drives were laid out including one moving from the east lodge, along the valley of Langwell Water, taking advantage of this picturesque area, before turning sharply north towards the house. A Gamekeepers Cottage, Victorian Factory House, Gardeners Cottage, lodges and formal gardens were created along with a walled garden located at the very western end of the parkland. A tea house was built for the Duchess at the shore of the bay, but this was swept away by the sea in the early 20th century. The 6th Duke of Portland added a 9-hole golf course to the west of the house in 1932, but this has fallen out of use. The walled garden has recently been restored and now is a commercial nursery. The house and parkland are located at 110m AOD and as such have commanding views out to sea and along the coast to the south. The estate woodlands were mostly planted in 1850 and then felled during WWII. They were then replanted after the war as commercial plantations and deer forest. The parkland also has quite an open aspect and that, coupled with the sloping site means that the house and the formal gardens are visible from the A9 to the south when moving towards Berriedale. Langwell House has views southeast, not directly towards the scheme, but the house is visible from the location of the proposed scheme.

The key characteristics of this asset lie in its aesthetic value, particularly with the surviving walled garden which enhances the asset. The asset has some historic value in the connection with the Duke of Portland and its continued use as a shooting lodge, and could possibly provide evidence of the design and layout of hunting landscapes in the north-eastern Highlands. The formal and designed elements of the asset also provide a pleasing contrast between the wild moorland to the north, particularly when viewed from the south and when travelling along the A9 from the south and from the north. The setting of this asset encompasses the Morayshire Coast over which there are extensive views, though the contrast between the formal and the natural landscape does represent a clear boundary.

7.7.2 *Non-designated Assets*

There are 44 non-designated assets located within the 1km search area, though a small number of these are duplicates; the same asset recorded with two different HER numbers. The assets are catalogued in Appendix 3 – Heritage Asset Tables and illustrated on Figure 7.2 – Non-Designated Heritage Assets. They are referenced in the text with their Highland HER reference numbers in bold type.

Prehistoric and Iron Age (10,000BC – AD500)

One non-designated asset was identified within the study area dating from the prehistoric period. A sickle-shaped black flint knife (**MHG628**) was discovered near Langwell House in the early 20th century. The current location of the knife is unknown. As a findspot, this is of no intrinsic heritage value or significance; it is merely the record of an asset. Therefore there will be no impact upon this asset from the scheme.

The scheduled monument of a Neolithic chambered cairn is also located within the study area, near Langwell House. Although the evidence of a single flint knife and a chambered cairn alone are not likely to be indicative of prehistoric activity within the study area, it is likely that

some activity was taking place here. The evidence of the scheduled broch at Rinsary indicates settlement activity of the later prehistoric to Roman period and there is no evidence thus far of any earlier settlement activity.

Given the topography of the study area, it is likely that if prehistoric activity were present, it would be located either along the shore of Berriedale Water which would provide safe harbour or along the sloping land around Langwell House and west of the line of the A9. The forestry survey carried out by Headland Archaeology in 1999 (Headland Archaeology 1999) in the area to the northwest of the proposed scheme identified that within the confines of that study, the prehistoric assets were confined to the unimproved heather moorland which is situated to the west of the study area. There is potential for the recovery of further prehistoric assets from the study area, though given the steep topography, this potential is low.

Early Medieval (AD500 – 1100)

No non-designated assets have been identified dating from this period, however there may have been limited activity taking place within the study area as it has been suggested that the scheduled monument of the castle at Berriedale was constructed during this period or at least an earlier version of the castle was constructed here. It is more likely however that the castle whose ruins are visible today was constructed in the 14th century.

There is no further evidence for early medieval activity within the study area, though the safe inlet at the mouth of Berriedale Water would have provided a convenient harbour for approaching ships. There is very low potential for the recovery of early medieval assets from the study area.

Medieval (1100 – 1540)

There are no non-designated assets dating to this period located within the study area, however the medieval period sees the first definite signs of human occupation within the study area since the prehistoric period.

Berriedale Castle was one of a small number of approximately eight castles located on the Caithness coast which were situated on headlands with commanding positions overlooking river mouths, harbours and inlets (Macgibbon & Ross 1971, 298). All of the castles in this chain share similar characteristics in their location and architecture. They were all built in naturally defensible positions – for example at Berriedale where the castle is built on a promontory of rock cut off from the mainland by a deep ditch at the neck of the peninsula.

The first documentary record of Berriedale is in 1330-1 when Reginald More, the Chancellor of Scotland was appointed as steward by Malise, the 8th Earl of Strathearn. Reginald Cheyne came into the ownership of the castle briefly in 1345 before being passed into the Clan Sutherland through the marriage of Reginald's daughter Marjorie to Nicholas Sutherland (www.caithness.org). The castle was passed to the Oliphant clan with the marriage of William Oliphant to Christina Sutherland in 1497. The castle and estate was then sold in 1606 to the Sinclair family, the Earls of Caithness (RCAHME 1911, 85).

The castle at Langwell was not constructed until the 14th century. The castle, also known as Achastle was said to have been built by John Beg, the son of Nicholas, Earl of Sutherland and was part of the same estate as Berriedale Castle. It is uncertain why this castle was constructed in such close proximity to Berriedale. It may be that the castles were constructed by two different branches of the same family, or that the site at Berriedale was naturally constrained by its position and therefore any expansion or updating of the castle was not possible, leading to a more modern castle being constructed at Langwell.

Post-medieval (1540 – 18th century)

There are a number of assets located within the study area dating to the post-medieval period, The majority of these assets are the records of townships which were removed during the

clearances of the late 18th century by Sir John Sinclair. By the end of the post-medieval period, the castles at Langwell and Berriedale had fallen into a state of disrepair. Records from the early 18th century describe Langwell as "*an antient fabric, a part whereof stands yet"* (RCAHMS 1911, 51) and the 1832 Thomson map of Scotland describes Berrydale (sic) Castle as "in ruins".

A settlement of five buildings is recorded on the Taylor and Skinner Road Map of 1776 situated lining the coaching road (**MHG32731**) road and labelled as *Berrydale* (**MHG1113**). It is likely that this is the original crofting township of Berriedale which was later cleared by Sir John Sinclair. It is also shown on the Roy Military map of that area surveyed from 1742-55 where it is labelled as *Craft.* This indicates that it is possible that this grouping of five buildings may have changed its name, or simply the area was labelled as Berrydale with the grouping of five buildings actually being Craft township. In either case, the buildings are no longer extant.

The Taylor and Skinner map shows the road broadly passing over the confluence of the Langwell and Berriedale waters in a similar position to today, though we know that the bypass road built in the 1960s was situated slightly further east. As the road continues north, rather than curving around the steep topography, the road cut further to the east. As the coaching road crosses the confluence of the two waters, it crosses a bridge. The bridge at Berriedale (**MHG1102**) is noted as existing prior to 1726 in association with an inn. The location of the bridge is given as at the junction of the Langwell and the Berriedale Waters with the inn located at the eastern end (HHER record card for MHG1102). Archaeological investigations were carried out in the 1960s, possibly associated with the re-routing of the A9. No traces of the bridge or the inn were identified.

Plate 12 1747 Roy Military Map (National Library of Scotland)

The Roy Military Map also shows a number of other small settlements which do not appear on the later mapping. The townships of Achstone (**MHG1111**)**,** Inver (**MHG1115/MHG26143**), Langwell (**MHG1112**) and Borgy are all shown with at least four or five buildings. A building is still shown at Borgy/Borgie on the 1st edition Ordnance Survey map (**MHG20168**) which may be a remnant of this settlement but this is the only exception. The other settlements were entirely removed in the 19th century. The key characteristics of these assets are the ability to provide archaeological information on the original crofting settlements of the Highlands, both through the material culture and architectural tradition. The strong historical and emotive

nature of these cleared settlements means that any evidence that can be recovered will help add to the narrative of the lost populations of the Highlands.

A kiln is recorded as dating to the post-medieval period at Rinsary (**MHG39015**), built into the southwestern portion of the scheduled broch. The record within the HER also states that the reference may refer to a farmstead rather than a kiln, but it is certainly associated with buildings nearby. The re-use of the broch as a kiln certainly makes sense from an architectural and functional point of view with the thick walls of the broch acting as a ready-made kiln wall. This also illustrates continuity of settlement from the prehistoric period possibly through to the post-medieval period in an advantageous position.

Further evidence of the cultivation and occupation of this landscape were recovered during a forestry survey in 1999 between Langwell and Rinsary Braes (Headland Archaeology Ltd 1999). The survey identified the ruins of a farmstead (**MHG35913**) consisting of a rectangular building with a low rubble wall footing located on the front of a river terrace overlooking Berriedale Water. Areas of cultivation were also located within the areas of dry, flatter land or within well-drained fluvial terraces. One of these cultivation areas was located within the study area (**MHG35912**). The asset consisted of two areas of fluvial terrace by Berriedale Water separated by the Alt Mor. There is evidence of clearance cairns around the edge of the area but there is no evidence of ridging.

The final asset dating from the post-medieval period is a monument consisting of two standing stones. The HER record states that it is located within the burial ground at the east side of Berriedale Water, in the hairpin bend of the current A9 (**MHG1104**) and the GIS location places the asset within the hairpin. It is likely that the standing stones were once situated in close proximity to the burial ground but with the movement of the A9 firstly in the 1960s to bypass Berriedale, then again in the late 20th century has severed the connection between the standing stones and the burial ground. Tradition dictates that the stones were placed there by William More Sutherland of Berriedale Castle in 1530, though this is unsubstantiated. There was no trace of these stones found during an Ordnance Survey field visit in the 1960s.

Early Modern and Modern (18th century – present)

The majority of the non-designated assets from the study area date to the early modern and modern period.

Prior to the purchase by Sir John Sinclair in 1788, there are records that the Langwell estate was purchased by a William Gray, the Provost-Marshal of Jamaica. It has been suggested that due to mismanagement of the estate by its last Sutherland owner, Robert, a deal was made with William Gray to pay off the debt (www.badbeafamilies.com). The estate was finally sold to Sir John Sinclair for £7,000. Sinclair was an agriculturalist and a keen supporter of the clearance policy. He invested heavily in sheep farming, purchasing large flocks of Cheviot sheep and putting them to pasture on the Berriedale straths. The inhabitants of Langwell were all turned out of their homes, with 80 families recorded as being removed from Langwell and moved to the newly created crofting settlement at Badbea two miles to the south (Ormand 1989) further south along the coast. This settlement was reputed to be cramped and crowded and by 1912, the settlement had disappeared. The site is now marked with a plaque (Ormand 1989). A further settlement was established at Badrinsary (**MHG20276**) at the furthest extent of the study area which is shown on the 1st edition Ordnance Survey map of 1877 as consisting of three buildings and an enclosure. As an alternative means of employment for the former crofters, Sir John utilised the booming fishing industry that was arising along the Caithness coast. The settlement of Berriedale (**MHG1119**) was established at this time, along with the harbour (**MHG1120**) to take advantage of the safe landing place Berriedale provided and increase the fishing trade in the area. The listed fishing cottages, ice house and salmon bothy situated on the shore were constructed by Donald Horne, one time owner of the Langwell Estate. There was a road access to the fishing cottages from the north, but pedestrian access was via a suspension bridge (**MHG19885**) across Berriedale Water which is still extant. The cottages demonstrate the investment in the fishing industry at Berriedale but also show the shift from herring to salmon, a more profitable and upper class product. This

would have been especially prudent move after the Langwell estate was sold to the Duke of Portland in 1868 providing a nearby market for the salmon caught and stored at Berriedale. The introduction of the fishing cottages is not the only improvement made by the Horne family. It is reported in the New Statistical Account of Scotland published in 1840 that within the Langwell Estate, James Horne reclaimed much of the waste land in the area by burning off the moss, then laying lime over the ground. This encouraged rich pasture to grow and would have improved the conditions for the sheep farming introduced by Sir John Sinclair in the area.

The creation of the early modern settlement of Berriedale saw the establishment of religious, industrial and domestic buildings, built to cater to the families of the fishermen living and working along the coastline. The early modern period saw the establishment of a Mission Chapel (**MHG25110/MHG42982**) at Berriedale, located outside of the proposed Scheme footprint. The exact date of the construction of the church is not known, however it is mentioned in the New Statistical Account of Scotland published in 1840 (Davidson 1840, 108) and is shown on a map of the area from 1832. The Mission Chapel was built by the Society in Scotland for Propagating Christian Knowledge (SSPCK). This was a society founded in Edinburgh in 1709 for the purposes of educating and 'civilising' the people of the Highlands. The Society established a number of schools throughout the Highlands and taught only in English, and Presbyterian focussed writings. The activity of the society declined in the mid-19th century when Gaelic Societies were established and a more enlightened outlook was adopted. This is reflected in Berriedale when in 1826, the Government funded Berriedale Church (**7926**) was constructed. The Mission Chapel is no longer extant. The exact location of the Mission Chapel is not certain. Its location on the 1832 Thomson map is indicative and the chapel is not depicted on the 1st edition Ordnance Survey map of 1871. It has been suggested that the extant cemetery (**MHG1110**) located to the east of the current A9 was the cemetery for the Mission Chapel however there is no evidence for this.

Plate 13 View of current A9 from within Berriedale Cemetery boundary

The cemetery may simply have been a municipal burial ground for the parish, acting as an overspill for Berriedale Church. Possibly associated with Berriedale Church is the site of an enclosure (**MHG29214/35914**) identified during a forestry survey. The enclosure is trapezoidal in shape and measure 15m by 9m. It is located to the southwest of the church and is defined by low stone rubble walls. Its purpose is unknown. The cemetery is a place with natural as well as man-made importance and as such greater reverence and appreciation is attached to it. The cemetery is appreciated for its picturesque and isolated presence on the top of an

escarpment overlooking both Berriedale and with the backdrop of the rugged coastline with the North Sea beyond. The cemetery is humble in its appearance perhaps representing its rural location. It is bounded by a low stone wall with monuments of differing ambition. The cemetery provided a place to bury and commemorate the past members of the community, providing a focal point for mourning and religious observance within Berriedale. The setting provides an opportunity for an immediate connection with the landscape and seascape and it is likely those fishermen associated with the salmon industry are buried here with views out to sea. Albeit the cemetery is a functional part of the landscape it provides an important record of the social history of the Berriedale area. The simple design, layout and commemorative designs reflect the fashions of the time. The combination of the monuments and the enclosure of the cemetery from the open countryside contrast with this little piece of designed landscape and has produced a special element in the landscape of Berriedale. The cemetery contains mostly modest and humble headstones although there are some more opulent ones such as obelisks and urns. All the memorials possess value as tributes to past lives and as visual components in the special cemetery landscape. The taller ones providing punctuation and a focal point as observers move through the landscape. Also associated with Berriedale Church is the former manse, now known as The White House (**7927**) a category C listed building. These add to the group value of the assets.

Other buildings established in Berriedale include a smithy (**MHG1106**), the listed estate office buildings and the listed residential buildings of Portland Terrace. Other buildings were also established within Berriedale which are no longer extant (**MHG18451, MHG20179**). A school was also constructed to the east of the A9 which is now used as a hall. Located to the east of the former school building is a monument commemorating John Nicoll who died in 1865 (**MHG1109**). The memorial was erected in 1928. The identity of John Nicoll remains a mystery but the memorial states "*Erected by His Grace the Duke of Portland K. G. 1928 in memory of John Nicoll a native of Berriedale who dies in 1865 and whose remains are interred in Berriedale Churchyard. He lived in Berriedale from 1812 to 1865*". The monument is located on the edge of the cliffs, facing south. It has panoramic views out to sea and will have no or very limited visibility of the scheme.

Plate 14 The Nicoll Monument

The early modern period saw the use of the Langwell estate for private shooting parties by the Duke of Portland. Although not identified by the historic environment record, there was a teahouse built at the end of the road in Berriedale, overlooking the bay for the use of the Duchess of Portland. The hut is shown in early postcards of the site, but was washed away in the early 20th century when the retaining wall was destroyed in an earlier storm.

The study area also contains the remains of agricultural activity from the early modern period including assets discovered during the forestry walkover survey undertaken by Headland Archaeology in 1999. A single building at Rinsary (**MHG18449**) and another (**MHG20171**) along with a farmstead at Lower Newport (**MHG20173**) are all shown on the 1st edition Ordnance Survey mapping of 1877 but are all no longer extant. To the south of the existing A9 are a group of agricultural assets dating from the early modern period consisting of two clearance cairns (**MHG26142, MHG382**), the remains of a crofters cottage (**MHG388**) and a stack stand (**MHG387**) consisting of 18 flat, circular stone settings 2.5 – 4m in diameter set in a rough semi-circle 1m apart. These assets are all evidence of the continuing, but much diminished agricultural tradition which survived after the clearances. The key characteristics of these assets lie in the evidence they provide for the lifestyle of the residents of Berriedale during the early modern period.

Given the coastal location and rocky waters of the area, it is perhaps no surprise that a number of wrecks have been recorded. Within the study area, two wrecks are noted. The first is the wreck of the Marie Louise (**MHG46446**), an iron steam trawler lost on the 8th January 1899. The second wreck is that of the Fair Wind (**MHG47222**), a wooden smack which was run aground on the 2nd April 1880. These assets provide evidence of the extensive fishing industry which operated from Berriedale and was also a reminder of the need for the two category B listed Berriedale navigational beacons (**7931**), or the Duke's Candlesticks as they were also known used to guide fishing vessels into the harbour. The assets will clearly not experience any impacts from the proposed scheme, either physical or to their setting.

The modern period saw little substantial change to Berriedale with the exception of the diversion of the A9 in the 1960s. The road ran on the route depicted on the early maps and 1st edition Ordnance survey maps until the 1960s. The original road came into Berriedale crossing the Langwell Water and with the road accessing the Langwell Estate running parallel to and adjoining the road near to the bridge over the Berriedale Water. These two original bridges are listed at category C (**7968**). The road then continues north into Berriedale passing the post office and estate laundry buildings. The road then forms a sharp 45° angle southeast to travel up Berriedale Braes. A haul road towards the ice house and fishing cottages is also extant on the 1st edition Ordnance Survey map, now lost. The road then performs another, even tighter bend to the northwest to continue north. The apex of this turn is located further west than the current apex and the road itself is slightly further south, away from the cemetery than the current road alignment. The road then continues on in much the same alignment as today. In the 1963, the new road alignment and the two new bridges were opened, caused by the increase in traffic and a need to widen and upgrade the road surface. The main differences in the road alignment are as it crosses the Berriedale and Langwell Waters, where the whole road has shifted to the east, necessitating the creation of a new access to the Langwell Estate off the A9. The road also bypasses Berriedale. The alignment of the old road is still extant, acting as a slip road into Berriedale off the A9 and a local road for the former post office and Welbeck Estate Offices. The road is now a dead end with the former sharp bend now blocked with no access to re-join the A9. The new alignment then continues with much less sharp angles on the apexes of the turns, allowing easier access for HGVs, but this still remains a challenging route.

The assets that date to the modern period are mostly associated with defence and were created during the First or Second World War. The harbour at Berriedale would have provided an ideal and secluded landing spot for troops trying to gain access to Britain. To try and limit this, a road block (**MHG30393**) was constructed across the main A9 and an anti-tank device (**MHG30470**) was located to the east of the A9. This was a system known as a flame trap or

fougasse and was a mechanism that acted as a mine that when triggered by a passing vehicle would project burning liquid onto it to stop

A further asset identified as dating to the modern period is a house known as The Haven (**MHG52675**). This is located adjacent to the fishing cottages, accessed now only on foot via the suspension bridge. A building in the same location as The Haven is noted on the 1st edition Ordnance Survey map. However the house and garden are shown on a slightly different alignment than the modern property and it is possible that the extant house is a more modern addition. The house is presently boarded up and as such slightly detracts from the group aesthetic of the restored ice house, salmon bothy and fishing cottages, however the building does add to the overall group value of these shoreline structures.

Undated

There are three assets of an unknown date located within the study area. For two of these assets (**MHG13523, MHG29212**) no description is given other than site. These assets can therefore be considered as having no heritage value and are discounted from any further assessment. The third asset (**MHG29213**) is labelled as a building identified during the Langwell to Rinsary Braes forestry walkover survey of 1999. The building is unidentified but still extant. It will not experience any impact from the proposed scheme.

Historic Landscape

A Historic Landuse Assessment (HLA) has been carried out by Historic Scotland within the study area and a total of seventeen HLA units are located within the 1km study area. Two of the identified HLA units are the designed landscape of Langwell Lodge and are therefore not included in this section. The HLA units have been labelled with URS numbers and are catalogued in Appendix 3 – Heritage Asset Tables. They are illustrated on Figure 7.3 – Historic Landscape.

The HLA units are grouped into broad historic landscape types and the fifteen HLA units considered within the report fall into four categories as shown in Table 7.4 below:

Table 7.4 – Historic Landscape Type

Historic Landscape Type	No. of HLA units
Agriculture and settlement	5
Woodland and forestry	5
Rural settlement	1
Moorland and rough grazing	4

The four categories are further subdivided into their narrow type and into the different time-depth they still exhibit. Agriculture and settlement is separated into two smaller types:

- Rectilinear fields and farms - 18th century to present (4 areas)
- Smallholdings – 19th-20th century (1 area)

Woodland and forestry is split into two types:

- Plantation – 20th century – present;
- Managed woodland – 18th – 20th century.

The rural settlement is described as industrial planned village dating to the 18th – 20th century and the moorland and rough grazing is all within the rough grazing type dating from the late 20th century to the present.

The proposed road runs through landscape unit **URS11** an area of agriculture and settlement with the type labelled as smallholdings. This landscape has some time-depth. It retains some

field boundaries, though many of the walls are in ruins. The landscape is grazed by livestock and marks an arable area between the A9 and the cliff edge giving way to the rough grazing and moorland. The historic characteristics of this HLA unit are the very fragmentary retained field boundaries and the well-defined boundary walls of the former manse. The historic landscape still holds evidence of the agricultural economy that survived on a small scale after the clearances and as such dates to the 19th and 20th centuries. The landscape retains some heritage value, however the removal of field boundaries has removed some of the heritage value.

The other agricultural and settlement landscape units (**URS1, 2, 3, 4**) are remnants of rectilinear fields and farms. These units are scattered across the landscape within the study area, to the south of the Langwell Estate, then in the north and west regions of the study area. These areas retain elements of the historic character with some intact field boundaries and remnants of clearance cairns. They provide historic evidence in the form of the narrative history of the area and the transformation from the isolated farmsteads and individual crofts to the clearances and sheep farming economy.

The HLA units of woodland and forestry are situated in the western portion of the study area, on the higher ground and adjacent to the existing route of the A9 on the western side. The woodland covers large areas and is punctuated by pockets of moorland and rough grazing and agricultural land. The topography of the landscape has also dictated its use. The steeply sloping valleys, the estate at Langwell, the sheer cliff edges and sea to the east and the sharply rolling hills to the west all serve to limit the areas available for agriculture, settlement and development. The valley bottom is the location of the settlement of Berriedale (**URS10**) adjacent to Berriedale Water. This part of Berriedale represents the fishing cottages on the shore and the buildings lining the south side of Berriedale Water, rather than the post office and estate buildings which fall within the designed landscape area of Langwell. This landscape unit has heritage value as the village created out of the clearances by Sir John Sinclair. Its setting is the surrounding landscape which was emptied of families, but is also closely associated with the sea, which allowed some of the settlers to continue making a livelihood through fishing.

The forestry survey carried out by Headland Archaeology in 1999 within the study area found that the majority of the prehistoric activity in their study area was located on the areas of unimproved heather moorland to the west of the A9. There are a number of units of moorland and rough grazing (**URS12, 13, 14, 15**) located throughout the study area including the steeply sloping piece of land lining the cliff edge on the east of the study area. These areas have considerable time depth and represent the unaltered landscape before improvements such as the burning off of the heather to create grassland and pasture for sheep farming. The areas of this HLA unit have historic and archaeological characteristics and can provide evidence for possible prehistoric land-use and land division.

7.8 Archaeological potential

In addition to the known historic resource, this section assesses the potential for previously unrecorded archaeology to be present within the footprint of the proposed scheme.

There is very limited evidence for prehistoric activity, mainly concentrated to the western portion of the study area, located on the unimproved moorland of the Rinsary Braes. It is likely that any further prehistoric evidence would be located to the west of the study area due to the challenging topography of the coastal area making it an unattractive place for settlement. The potential for the recovery of prehistoric archaeology is therefore very low.

There is obvious evidence of medieval activity in the area in the form of the two castles at Langwell and Berriedale. It is likely that there would have been settlements nearby where the agricultural workers providing food for the inhabitants at the castle would have resided. No evidence for settlement activity has been recorded but it is likely that the crofting settlements shown on the Roy military mapping of the 18th century were extant in the medieval period. There is the potential for the recovery of medieval material in particular near the former

settlement labelled Craft on the Roy military maps. This potential can be quantified as low to medium.

There is post-medieval activity potentially within the footprint of the proposed scheme with the posited location the settlement named as Craft. It is likely that other post-medieval activity would be in the form of agricultural remains given the marginal location of the proposed scheme on the cliff edge. The potential for the recovery of post-medieval material is medium to high.

There is low to medium potential for the recovery of early modern archaeology relating to agricultural activity. After the clearance of the Craft township, the area within and around the proposed site would have been turned over to sheep farming, with the only buildings being temporary shelters, or shieling huts for shepherds.

There is very low potential for the recovery of modern archaeology from within the study area as there has been little change in the area during the 20th century with the exception of the addition of defensive assets during World War II. There may be a low potential of the recovery of more military assets, but this cannot be ascertained with certainty at this stage.

7.9 Predicted Impacts

Construction

The excavation and construction activity associated with the creation of the cutting, reinforced soil embankments and 4m high berm will have a temporary setting impact upon the scheduled monument of Berriedale Castle (**3438**), an asset of high value. The Proposed Scheme will require the excavation of soil and rock to create the necessary topography to allow the new alignment of the A9. The movement and noise created during the construction works will also impact upon the setting of the asset by removing the current tranquil nature of the castle. The setting of the castle is the natural promontory of rock it was built upon, the sea and the mouth of Berriedale Water as it enters the sea. The site of the castle has panoramic views, but the most dramatic are those looking out to sea and along the coast. These views would have been of historic significance and would give early warning of an approaching raiding party. The construction works will be clearly visible from the castle. The views currently are of the coastal slope and the A9 as it navigates the steep climb and continues northwest-wards. It is possible that views towards this direction would have provided an early warning of a land-based attack, however given the extremely strong, naturally defendable position of the castle, it is more likely that it was intended to be a visible and potent symbol of power and was designed to be seen when approaching Berriedale via the water or on land. The view towards the current A9 contributes little to the understanding of the asset, other than a scenic quality. It is this scenic and tranquil quality which will be temporarily removed during the construction phase. There will be no loss of the ability to understand the historic and archaeological value of the castle, or the evidence they can provide for medieval defensive architecture, society and land-use. The construction works will be a visually and aurally distracting element for their duration which would reduce the ability to appreciate the isolated location of the castle and therefore the impact is judged to be **moderate**. Before mitigation, this would result in a **moderate adverse effect**.

The excavation and construction activity associated with the creation of the cutting, reinforced soil embankments and 4m high berm will have a temporary setting impact upon the scheduled monument of Achastle or Langwell Castle (**3437**) an asset of high value. The ruins of this castle are located on the edge of the scarp overlooking the confluence of the Langwell and Berriedale Waters and the view across to the Proposed Scheme are blocked by woodland planting on the edge of the Langwell Lodge designed landscape. The setting of the castle includes the views it would once have had across the valley of the Berriedale Water below and the views out to sea to the east. The setting also encompasses Berriedale Castle located to the southeast. It is likely that the noise during construction activities from the Proposed Scheme will be audible from Langwell Castle which will remove the tranquil setting that it currently holds. Views towards this asset would also be of significance as a defensive and

dominant symbol of power and wealth within the landscape, however the understanding of the asset and its historic and archaeological characteristics will not be significantly altered by the construction activity. The potential evidence the castle ruins could provide of medieval defensive architecture and technology, as well as medieval society and material culture will not be impacted. Given the current screening by woodland, it is unlikely there will be significant visibility of the construction works from the asset, however the construction works will result in a change to the setting of this asset and reduce the tranquillity and isolated, rugged coastal and rural setting of the asset for the duration of the works. This impact is judged to be **minor**. Before mitigation, the effect of this is judged to be **slight adverse.**

There will be no impact upon the setting of the scheduled broch at Rinsary (**577**) an asset of high value during the construction of the scheme. It has been shown that the setting of the asset includes the surrounding landscape and views across the landscape towards the broch. There is the potential that the construction phase of the proposed Scheme may be visible from the broch, however it is unlikely this will cause an impact. The views from the broch do contribute to the setting of the asset however the views afforded are panoramic in scope and it is likely given the location of the construction phase, any views will be glimpsed and non-intrusive. They will not block or impede views from the broch nor will any views towards the broch be disrupted or blocked. The key characteristics of the asset will remain unaffected. The historic and archaeological intrinsic value of the asset will not be reduced in any way, nor will the understanding of the asset be reduced. The impact is therefore **no change**. Before mitigation this would result in a **neutral effect.**

There will be no impact upon the Langwell House cairn, 400m southwest of Berriedale (**460**) an asset of high value during the construction of the scheme. It has been established that the setting of the asset is the landscape in which it sits which includes the designed landscape of Langwell House and the woodland within which it is surrounded. This setting does not contribute towards the understanding of the asset. The location overlooking Langwell Water does contribute to the understanding of why this location was chosen for the cairn and this view will not be impacted by the proposed scheme. The impact will therefore be **no change**. Before mitigation this will result in a **neutral effect.**

There is the potential that the construction activity associated with the excavation of the cutting and the movement of construction vehicles will create a temporary setting impact upon the garden and designed landscape of Langwell Lodge, an asset of high value. The elevated location of the estate allows extensive views particularly out to sea and along the Morayshire coast. There are views towards the Proposed Scheme from the eastern portion of the estate, and around Langwell House. The views of the coastal slopes from the house contribute to the aesthetic character of the asset and the house was deliberately positioned within the estate to take advantage of these. The setting of the wooded valley of Langwell Water also provide a sense of enclosure whilst driving from the East Lodge, until the woodland opens up to reveal the house within the hills to the north forming a scenic backdrop. The designed landscape is included in the Inventory in the main due to its scenic value in in its value as an area of nature conservation. It has some historic and archaeological value with associations with various historic figures who have helped to shape the development of Berriedale: the Horne's, Sir John Sinclair and the Duke of Portland. The views towards the designed landscape are also of significance because of the aesthetic contrast they provide with the wild and rugged landscape surrounding the formal designed estate. The construction activity will bring a modern, moving and noisy element into the views from within the estate and in the backdrop of the reveal of the house when moving along the drive from the East Lodge. This activity will provide a distracting element within the view, though substantial sections of unimpeded views out to sea will still be available. This will reduce the ability to appreciate the tranquil and rural nature of the surrounding landscape and bring modern, moving elements into the view, though the location of the majority of the substantial cutting works will be located further down the coastal slope, meaning the full impact of these works will be screened by the natural topography. This impact is therefore judged to be **minor**. Before mitigation, the effect will be **slight adverse.**

The excavation for the cutting as well as the works for the 4m high berm have the potential to permanently and physically impact upon the non-designated asset of the Craft township (**MHG1113**) an asset of low value. The exact location of this asset is unknown however it is shown on the Roy military mapping of 1747 in the general vicinity of the proposed cutting. The construction works have the potential to remove this asset entirely or at least remove a substantial portion, removing its archaeological and historic value. Any knowledge of crofting settlements would add to the historical narrative of Berriedale. The impact is judged to be **major**. Before mitigation, this effect is judged as **moderate adverse.**

The construction activity and noise associated with the excavation for the cutting, construction of drainage, the laying of the new footway for access and associated groundworks will have a temporary impact upon the setting of the cemetery (**MHG1110**), an asset of low value. The asset will not experience any physical impacts from the scheme. The construction works are occurring in extremely close proximity to the cemetery and will block the views the cemetery has out to sea. The tranquil and isolated feeling that is experienced when visiting this cemetery and which add to the aesthetic value of the asset will also be removed during the construction phase of works. The historic characteristics of the asset and its ability to provide information on the former inhabitants of the Berriedale area will not be impacted by the construction phase. The impact of this is judged to be **major**. Before mitigation, the effect is judged to be **moderate adverse.**

There is the potential that excavation activity for the cutting will permanently and physically impact upon the non-designated asset of a structure shown on the 1st edition Ordnance Survey (**MHG20179**), an asset of low value. The cutting will entirely remove this asset, removing its archaeological value. However, it is likely that this structure is a simple agricultural building, possibly a shieling and therefore the knowledge it could contribute to the historic and archaeological narrative of the area is limited. The impact on the asset is judged to be **major** however the effect before mitigation is deemed to be **slight adverse**.

The asset of the military trap (**MHG30470**), of low value, has the potential to be permanently and physically impacted by the construction of the new road and the excavation for the cutting. The exact location of this asset is uncertain, however it is possible that all, or a substantial portion of the asset will be removed. This will remove its archaeological value and its significance. The impact is judged to be **major**. The effect before mitigation is judged to be **moderate adverse.**

There is potential that the construction of the drainage basin to physically impact upon the possible location of the former road which ran through Berriedale (**MHG32731**) an asset of low value. The cutting and excavation required for the drainage basin has the potential to remove deposits associated with the road and remove the part of the archaeological value of the asset. It is unlikely that the entirety of the asset would be removed by the construction activity, and the historic value would be retained. As the proposed construction works are to upgrade the A9, it can be seen in the context of the evolving transport network, of which the asset once formed a part. The impact is judged to be **moderate.** The effect is judged to be **slight adverse**.

There will be a physical, permanent impact to the historic landscape unit **URS 13,** an asset of low value from the construction of the scheme. The excavation for the cutting will remove a fairly large section of this agricultural landscape, however the landscape unit will remain unaffected over the majority of its area. The historic value of this asset lies in the evidence to provide for the use of the area for arable pasture after the clearances and for small-scale local agriculture. It is marginal land located on the coastal slope. No field boundaries will be removed by the scheme therefore the historic legibility that remains within this landscape will be retained. The A9 has travelled through this landscape unit for a number of centuries, previously as a coaching road. Therefore the construction of a new alignment is a continuation of the evolution of the transport network along the east coast. The impact is judged to be **moderate**. The effect is judged to be **slight adverse**.

There is the potential that the construction phase of the project will result in a temporary setting impact on the historic landscape unit of the rural settlement of Berriedale **URS 10**, an asset of low value. The HLA is the settlement of Berriedale established in the 19th century following the clearances which lines Berriedale Water and also contains the fishing cottages and ice house located on the shore line. The HLA has historic and archaeological value, with the location of the inn and bridge lining the old coaching road prior to the establishment of the settlement. The construction activity for the Proposed Scheme will be visible from within the village and will impact upon the tranquil and rural river valley setting of the village. The impact is judged to be **minor**. The effect before mitigation will be **slight adverse**.

The excavation and construction activity associated with the creation of the cutting, reinforced soil embankments and 4m high berm will have a temporary setting impact upon the Category C listed White House (**7927),** an asset of low value. The Proposed Scheme will require the excavation of soil and rock to create the necessary topography to allow the new alignment of the A9. The movement and noise created during the construction works will impact upon the setting of White House by removing the current tranquil nature of the field to the south. These will result from the movement of construction vehicles and associated noise during the upgrading of the existing carriageway and the construction of the new offline embankment. The White House is currently very close to the existing A9 situated behind a stone retaining wall. The White House enjoys an elevated position that surveys Berriedale and has views towards the sea. The location of the White House as the former manse associated with the Berriedale Parish Church is likely to be purposeful, built to oversee the activities of the parish. Now, as a residential property, the elevated position and the dramatic fall in topography allows extended views to the south and southwest and adds to the artistic interest and enjoyment from the building. The manse was constructed alongside the A9 and therefore was situated in a position to utilise this transport route to access the church and to access the village. The current fairly heavy use of the road removes some of the scenic and tranquil qualities of the setting. However this is only intermittently disrupted by the passing of vehicles, the construction activities of the road would introduce prolonged disturbance above those currently experienced, albeit these will be temporary. The construction of the proposed scheme would however physically sever the link between the former manse and the cemetery (**MHG1110**). Whilst the connection between the former manse and the cemetery is not known, it is believed that the cemetery located to the east of the current A9 was the cemetery for the Mission Chapel (now demolished) however there is no evidence for this. The cemetery may simply have been a municipal burial ground for the parish, acting as an overspill for Berriedale Church. The cemetery is considered to form part of the ecclesiastic link that is associated within this northern section of Berriedale. The intervisibility with the former manse will be affected during the construction phase and the physical accessibility across open countryside would be permanently lost however the associated setting and link between the former manse and the church to the north will not be affected. Regardless of the history of the cemetery, there is a religious association that adds to the historic interest of the manse. The construction works will be a visually and aurally distracting element for their duration which would reduce the ability to appreciate the connection between the cemetery and the former manse, therefore the impact is judged to be **moderate**. Before mitigation, this would result in a **slight adverse** effect.

The construction of the offline embankment will also introduce new visual and noise impact into the setting of the Category C listed Shore Cottages **(7924),** Fishing Store and Ice House **(7925)** and the non-designated The Haven (**MHG52675),** assets of low value. The setting of these buildings is considered to be the shoreline to which they are orientated and which forms an important part of their function as part of the fishing industry. It is likely that the noise and construction activity from the Proposed Scheme will be audible from Shore Cottages and Ice House which will remove the tranquil setting that it currently holds. The scheme will be visible in the backdrop to these structures, bringing the existing hard landscaping closer to the assets, the cottages are sensitive to vehicular movements within their setting as the cottages are currently only accessible on foot via the suspension bridge this adds to the detachment from vehicles and other intrusions; the impact on their significance and setting is considered to be **moderate**. Before mitigation, this would result in a **slight adverse** effect.

The excavation and construction activity associated with the creation of the cutting, reinforced soil embankments and 4m high berm will have a temporary setting impact upon the Category C listed 1-3 Portland Terrace **(7923),** assets of low value. The setting of these buildings is considered to be the shoreline to which they are orientated and which forms an important part of their setting. The linear arrangement of the three cottages with four large chimney stacks and equally spaced dormers with grey slate roof and cream painted masonry contrasts dramatically with the dense wood backdrop and rugged and untamed nature of the coastline. This creates a visual aesthetic and is an essential part of how the buildings are experienced. The current route of the A9 contributes to this as it allows elevated views of this scene. This would not be impacted by the proposed scheme. Whilst the construction phase will have temporary impacts by being visually and aurally distracting element, the impact on their significance and setting is considered to be **moderate**. Before mitigation, this would result in a **slight adverse** effect.

There will be no impact upon the setting of the Category B listed Sawmill (**7922**), an asset of medium value and associated Mill Cottages (Category C listed; **7921 & 7933**), assets of low value. The group lies on the wooded banks of Berriedale Water, within a secluded position away from the road and are essentially characterised by their proximity to and historic and functional association with Berriedale Water. Views of shoreline east from the assets provide context to the assets. There is a possibility that the construction phase of the proposed scheme may be visible from the assets, however this unlikely to cause an impact to the setting or significance of the assets as the key characteristics and the way in which the assets are understood, appreciated or experienced. The impact is therefore **no change**. Before mitigation this would result in a **neutral effect**.

There will be no impact from the construction of the scheme on any of the other non-designated assets identified in the baseline section above. The remainder of the assets lie outside of the footprint of the proposed scheme and will therefore not be physically impacts by the scheme. Moreover, the setting of the assets will not be impacted by the proposed scheme.

Operation

The operational scheme would have no impact upon the scheduled monuments of Berriedale Castle (**3438**) or Langwell Castle (**3437**) assets of high value. The landscape mitigation will allow the Proposed Scheme to become an embedded part of the landscape and will be a continuation of the traffic activity that currently uses the road. The deep cutting of the Proposed Scheme means that the taller HGV's and double decker buses will be reduced in the view from the current baseline where a good proportion of the taller vehicles are visible. This will allow the asset to retain its rural, isolated and coastal aspect. The photomontages produced by the Landscape and Visual Team (Figure 5.4- Viewpoint Photography and Photomontages) demonstrates that once the landscape proposals have become embedded, the road surface will not be visible and it will be extremely difficult to differentiate between the previous road route and the new route. There will be no change to the archaeological or historic characteristics of these assets or a reduction in the evidence they can provide for medieval society. The impact is therefore judged to be **no change**. Before mitigation, the effect of this will be **neutral.**

There will be no impact upon the setting of the scheduled broch at Rinsary (**577**) or the cairn at Langwell House (**460**) assets of high value during the operation of the scheme. The effect before mitigation will be **neutral.**

There will be no impact from the operational scheme on the designed landscape of Langwell Lodge. The operation scheme will represent a continuation of the road activity as it exists today. The operational scheme will be further from the boundary of the estate and will be further down the coastal slope and within a cutting which would potentially reduce visual impact from Langwell House in particular. The impact is judged to be **no change**. The effect before mitigation is judged to be **neutral.**

There will be no impact on the HLA unit **URS13** from the operation of the scheme as it represents a continuation of the use of a road within this landscape.

The operation scheme will have an impact on the Category C listed White House (**7927),** an asset of low value. The deep cutting of the Proposed Scheme would create a physical barrier and a severing of the link between the former manse and the cemetery. The deep cut means that the physical intrusion of vehicles in both to and from the former manse from the cemetery will be reduced. This will not alleviate the physical truncation of the historic access that may that may have once existed between the two assets. However the White House is no longer in ecclesiastical use and the connection between the former manse and the cemetery is undetermined. This reduces the sensitivity of the asset and its association with the cemetery to a degree although both remain as legible part of the legacy of religious activity within Berriedale in the late 18th and 19th centuries. Therefore the impact is judged to be **minor**. Before mitigation, the effect of this will be **slight adverse effec**t.

There will be no impact from the operational scheme on the setting of Category C listed Shore Cottages **(7924),** Category C listed Fishing Store and Ice House **(7925)**, Category C listed 1-3 Portland Terrace **(7923)** and the non-designated The Haven **(MHG52675).** It is not anticipated that increased noise from running traffic will be at such a level to impact on the significance of the assets. No new signage or lighting is proposed that will impact on the built heritage resource as there will be a continuation of the traffic activity that currently uses the road. Before mitigation, the effect is judge to be **neutral.**

The operational scheme will have an impact on the non-designated cemetery (**MHG1110**). As identified within the baseline the cemetery is a place with natural as well as man-made importance where greater reverence and appreciation are attached. The cemetery has a fundamental link to it setting as a picturesque and isolated presence on the top of an escarpment overlooking both Berriedale and with the backdrop of the rugged coastline with the North Sea beyond. It has communal characteristics, providing an important record of the social history of the Berriedale area. The location of the cemetery has aesthetic importance as the elevated location provides an opportunity for an immediate connection with the landscape, seascape and Berriedale. The combination of the monuments and the enclosure of the cemetery from the open countryside provides a contrast and has produced a special element in the landscape of Berriedale. The historic connection and religious association with the former manse, the Berriedale Parish Church and the Missionary Chapel has increased the group value and relevance of the cemetery to the landscape. The landscape proposals show that the existing A9 will be grubbed up, reprofiled and planted to restore the rural landscape and the view from the northern portion of the cemetery. The operational scheme will be in close proximity to the cemetery however it will be in a deep cutting, with planting to soften the views of the road as it passes to the southwest. The impact of this is judged to be **moderate**. Before mitigation, the effect is judged to be **slight adverse.**

There will be no impacts upon any of the non-designated archaeological assets mentioned in the construction phase above from the operation of the scheme. The non-designated assets which would experience impacts from the construction of the proposed scheme would have been removed during this phase of the project and the proposed mitigation measures would have been put into place. Therefore the non-designated asset would no longer remain and would not be able to experience impacts from the operation of the scheme.

There will be no impact on the remaining non-designated assets from the operation of the completed scheme. The setting of the asset will not be impacted or changed.

7.10 Mitigation

It is proposed that a programme of trial trenching is undertaken in advance of development of the road scheme in the area of the asset of the Craft settlement (**MHG1113**). This mitigation, though it will not reduce the impact of the scheme, will assist in reducing the residual effect by ensuring that the archaeological knowledge of the settlement is preserved through recording.

It is also recommended that trial trenching is undertaken in the areas of the location of the assets of the military installation (**MHG30470**) and the single building on the 1st edition Ordnance Survey map (**MHG20179**) to try and locate these assets prior to construction. This will allow the assets to be recorded and have their archaeological knowledge preserved.

No mitigation is proposed for the majority of the cutting area as the gradient of the slope precludes there being any archaeological potential. As the proposed Scheme moves northwards to tie into the extant A9, it is recommended that archaeological trial trenching or geophysical survey is undertaken along the route and the cutting in order to identify any unknown archaeological deposits which may be extant along the route.

No mitigation is proposed for the area of the former road (**MHG32731**) due to the steep topography of the area and the lack of any likely useful evidence. The road route can be traced from historic mapping and the physical evidence of the road will not add to the knowledge of this asset.

Mitigation for the setting impacts has been proposed incorporated into the scheme design in the form of planting and screening through vegetation. In some instances, the screening options themselves can cause setting impacts. No additional specific mitigation is proposed above and beyond this. Details regarding landscaping and planting is provided in Chapter 5 – Landscape and Visual.

Where setting impacts have been identified, the mitigation outlined above will help to reduce these impacts, particularly once the vegetation has become established within the landscape.

7.11 Disruption due to Construction

There is the potential for the non-designated asset of the cemetery (**MHG1110**) at Berriedale to experience disruption during construction of the asset. The impact of this has been addressed above but the amenity value of the cemetery and possible visitors to the graves will experience disruption due to the noise and movement of machinery and excavation during the construction phase of the project.

There is the potential for the Category C listed Shore Cottages **(7924)**, Category C listed Fishing Store and Ice House **(7925)** and Category C listed 1-3 Portland Terrace **(7923)** to experience disruption during the construction of the proposed Scheme. The impact of this has been addressed above but the amenity value of the assets as holiday cottages and residential properties could be affected due to the noise, lighting, disruption to access and movement of machinery and excavation during the construction phase of the project.

There is the potential for the non-designated heritage asset of The Haven **(MHG52675)** to experience disruption during the construction of the proposed Scheme. However the asset is currently boarded up and does not appear to be used this has been addressed above however if this situation changes the amenity value as a residential property or holiday cottages could be affected due to the noise, lighting, disruption to access and movement of machinery and excavation during the construction phase of the project.

7.12 Residual Impacts

The residual effects of the Scheme which remain after mitigation proposals are stated below:

The residual effect on assets of **high** value is:

- Berriedale Castle Scheduled Monument – Moderate Adverse;
- Achastle or Langwell Castle Scheduled Monument - Slight Adverse
- Broch at Rinsary Scheduled Monument – Neutral
- Langwell House cairn Scheduled Monument - Neutral

- Langwell Lodge GDL - Slight Adverse

The residual effect on assets of **low** value is:

- Craft settlement – Slight Adverse
- Single structure shown on 1st edition Ordnance Survey map – Slight Adverse
- Military installation/site – Slight Adverse
- Former road – Slight Adverse
- Cemetery – Moderate Adverse
- HLA unit **URS 13** – Slight Adverse
- HLA unit **URS 10 –** Slight Adverse
- White House category C listed building – Slight Adverse
- Shore Cottages category C listed building – Slight Adverse
- Fishing Store and Ice House category C listed building – Slight Adverse
- The Haven – Slight Adverse
- 1-3 Portland Terrace category C listed building – Slight Adverse

7.13 References

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8 ROAD DRAINAGE AND THE WATER ENVIRONMENT

8.1 Introduction

This section assesses the potential impacts on the surface water environment and takes into account; surface hydrology and quality; groundwater quality and hydrogeology; and, coastal and fluvial geomorphology. A desktop study of the hydrological and hydrogeological features associated with the proposed A9 route at Berriedale has been undertaken and a site inspection was carried out.

The proposed Berriedale route is to the east of the existing road, around the cemetery and across fields to re-join the existing road to the north, with no new crossings or work within any watercourses proposed.

The topography of the area is dominated by a valley, within which the Langwell and Berriedale Waters are conveyed to the North Sea. From Berriedale the ground slopes up steeply to the north and south, with cliffs along the coast. Although no work will take place within the watercourses themselves, there are however a number of water features which fall within the potential zone of influence of the proposed works, shown in Figure 8.1 - Water Bodies. The significant water features included in this assessment are given below:

- Berriedale Water,
- Langwell Water,
- Achnacraig to Helmsdale coastal water body,
- Thurso bedrock and localised sand and gravel aquifers.

8.2 Water Resources Related Proposals

A full description of the proposed scheme is included in Chapter 2- The Proposed Scheme. The route is off the current road line, across undeveloped rough grassland, and does not come into direct contact with any surface water bodies.

8.2.1 *Existing Road Drainage & Outfalls*

Drainage from the existing road is conveyed by carrier drains, which discharge across the moorland without treatment.

8.2.2 *Proposed Road Drainage & Outfalls*

A new road drainage outfall is planned, collecting drainage from the new section of road only and treating runoff using two levels of SuDS and a proprietary system. Road runoff is to be conveyed using carrier drains, to a cascade, which then passes it to an attenuation basin. The outfall control chamber then transfers the treated runoff, via a Hydrodynamic Vortex Separator and from here it is passed to the single outfall. This outfall would discharge into the Berriedale Water; approximately 20m downstream of the A9 road bridge (see Figure 8.2- Drainage Layout). Drainage from the land above the Scheme will be collected by filter drains and carried via a separate cascade to the single outfall.

Discussion with SEPA and SNH has confirmed the requirement for two levels of SuDS treatment from the carriageway prior to discharge to the Berriedale Water (See correspondence in Appendix 1 – Copy of Consultation Responses). It is proposed that treatment will be a combination of carriageway filter drains and an attenuation basin. Filter Drains and the attenuation basin will be lined to ensure no infiltration of carriageway runoff to the groundwater body occurs. All carriageway drainage design shall be in accordance with HD 33 – Surface and Sub-surface Drainage Systems for Highways and CIRIA Report C697 – SuDS Manual. The proposed location of the treatment basin is shown in Plates 1-3.

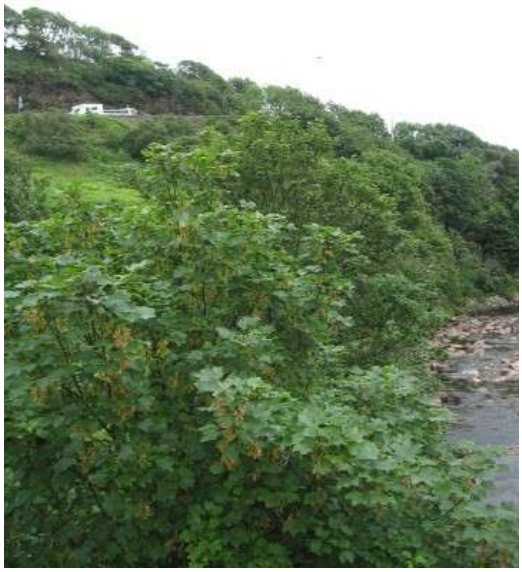


Plate 1 Proposed location of SuDS basin and outfall above the Berriedale Water

Plate 2 Proposed location of SuDS basin and outfall

Plate 3 Proposed location of upstream end of treatment basin and outfall (view from Berriedale Bridge)

8.2.3 ***Proposed cuttings***

In order to construct the proposed Scheme, a number of areas of cutting are required on both sides of the carriageway as shown on Figure 2.1- The Proposed Scheme (which also identifies the chainage locations). These are summarised in the Table 8.1 below:

Table 8.1 - Proposed Rock Cutting Details

Road Chainage	Depth of Cutting	Likely material	Side of Road
40-100	2m	Glacial Till	N
110-200	10.5m	Glacial Till	N
135-200	6m	Glacial Till & Bedrock	S
200-280	-	Bedrock, <2m Glacial Till	N&S
Above 310	-	Glacial Till	S

The majority of the cuttings will be within the superficial deposits only, with only some sections encountering bedrock.

8.3 Approach & Methods

Apart from general statutory and planning requirements for a development of this nature, the water environment aspects are regulated by two key pieces of legislation, namely; the EU Directive 2000/60/EC – the Water Framework Directive (WFD), transposed into the Water Environment and Water Services Act (Scotland) 2003 and The Water Environment (Controlled

Activities) (Scotland) Regulations 2011 in respect of discharges to surface or groundwater. This legislation aims to protect and enhance the status of aquatic ecosystems, prevent further deterioration to such ecosystems, promote sustainable use of available water resources, and contribute to the mitigation of floods and droughts.

The assessment of potential effects on the water environment has been carried out in accordance with the guidance and techniques presented within the "Design Manual for Roads and Bridges" (DMRB), Volume 11, Section 3, Part 10 "Road Drainage and the Water Environment" (HD45/09- Highways Agency 2009) .

8.3.1 *Identifying Baseline Conditions*

Water resources features around the development site were identified initially from Ordnance Survey maps, a desktop review of previous reports and other background information, and data collected from a site visit. This initial review was supplemented by consultations with statutory organisations and further consideration of available data.

Surface Waters

Geomorphological and Hydrological Data

Geomorphological conditions for each water resource feature were evaluated from Ordnance Survey mapping, data collected during the field surveys for this environmental assessment, data collected from a review of the Chapter 6 –Nature Conservation, and information from the ground investigations completed for the engineering design.

No hydrological data was available for any of the watercourses in the study area and therefore assessments of the potential flows in these watercourses and drainage paths were made using standard hydrologic techniques (based on data from the Centre for Ecology and Hydrology, 2009; The Flood Estimation Handbook: CD ROM v3) where necessary.

Flooding information was gained from the SEPA Flood Risk Management Maps (2014) for the surrounding area.

Water Quality Data

SEPA have developed a classification system in line with the requirements of the WFD, which is applied to all significant water bodies in Scotland. This system is based on an assessment of key chemical and ecological indicators. The classification system categorises water bodies into the following bands; High, Good, Moderate, Poor, and Bad. A full description of this system is available on the SEPA website; http://www.sepa.org.uk/water/monitoring_and_classification.aspx).

Groundwater

Groundwater data was obtained from the Ground Investigations undertaken for the engineering design of the scheme (including borehole and trial pit logs, groundwater level measurements, desk top ground investigation, etc.).

The characteristics of the aquifer and its vulnerability to pollution were obtained from mapping derived by SEPA for the characterisation of groundwater for the WFD, including the "Groundwater Vulnerability Map", "Superficial Aquifer Map", and the "Bedrock Aquifer Map".

The current WFD classification of the groundwater for the area was obtained from groundwater data sheets published by SEPA.

Private Water Supplies

Data regarding private water supplies within the study area has been obtained from the local Environmental Health Officer from The Highland Council.

8.3.2 ***Receptor Sensitivity***

The sensitivity of a water environment feature is a synthesis of its environmental importance, socio-economic value, recreational value, and also its resilience to cope with change. The sensitivity of a water environment feature was evaluated using the guidance provided in DMRB Volume 11, Section 3, Part 10, Tables A4.1 "Water Features: Attributes and Indicators of Quality" and A4.3 "Estimating the Importance of Water Environment Attributes" as well as additional criteria based on the professional experience of the assessment team. From this guidance the following objective tests have been used in this Chapter to assess sensitivity: -

- The environmental importance of the water environment feature; e.g. if it has a designation at an international or national level (e.g. Special Area of Conservation, SSSI, etc.) or if the water body has a high or good status and is therefore a valuable pristine habitat, then this would tend to increase the sensitivity value of the receptor,
- The socio-economic value of the water body e.g. if the water body has notable aquatic ecological resources (e.g. an important local or national fishery) or if the surface water or groundwater is in a drinking water protected area as defined in the SEPA WFD Protected Areas Register, then this would tend to increase the sensitivity value of the receptor,
- The recreational value of the water body e.g. if an area is a SEPA designated bathing area or if a watercourse is an important local fishery this would tend to increase the sensitivity value of the receptor, and
- The size of the water body and its ability to buffer flow and water quality changes e.g. if a water body has high potential for dilution then its sensitivity value would tend to be lower.

In accordance with the generic methodology provided in Chapter 4 – Assessment Methodology, sensitivity has been scaled from Negligible to Low to Medium, High and Very High. To ensure the transparency of this assessment, the key environmental, socio-economic, recreational, and resilience indicators used to derive the sensitivity of each water body are identified in Section 8.4, Baseline Conditions.

8.3.3 ***Level of Impact***

Identification of the range, location and extent of potential impacts was based on:

- Review of the proposed site plans, development proposals, construction methods and proposed operating regime in relation to the surrounding water environment,
- Current road drainage regime,
- The guidance within DMRB Volume 11, Section 3, Part 10 (HD 45/09),
- Relevant legislation, policy and guidance (see references in Section 8.10),
- The professional experience of the assessment team,
- Consultation with relevant statutory and non-statutory organisations,
- Desk based research,
- URS, Berriedale Stage 2 Environmental report (2014), and
- Liaison with other members of the EIA project team.

The magnitude of a potential effect on the water resources features was evaluated using the criteria provided in Table A4.4 "Estimating the Magnitude of an Impact on an Attribute" (DMRB), with the addition of the following criteria to cover areas not specifically dealt with in the DMRB criteria.

Major – (equivalent to "Major Adverse" in DMRB) – results in loss of attribute and / or quality and integrity of attribute, such as,

- Loss of EC designated salmonoid fishery,
- Change in WFD classification status of a river reach,
- Compromise employment source,
- Loss of floodplain/increase flood risk,
- Pollution of potable source of abstraction,
- Gross changes to geo-morphological or hydraulic characteristics e.g. loss of natural bank and bed over a length of 50m or more, reduction in flow capacity of an existing river channel by 20% or more, and
- Widespread effect on groundwater movement with a gross change to overall groundwater transfer from up gradient to down gradient resources. Widespread and gross effects on groundwater quality.

Moderate – (equivalent to "Moderate Adverse" in DMRB) – results in effect on integrity of attribute or loss of part of attribute, such as,

- Slight impact on an internationally or nationally designated aquatic ecological resource, or a loss or serious effect on the integrity of a nationally or locally important aquatic ecological resource that is not designated,
- Degrading of either the combined chemical or ecological status indicators (in the case of watercourses) one or more classifications, but no change in overall Status classification,
- Reduction in the economic value of a feature
- Significant, but not gross, changes to geo-morphological or hydraulic characteristics e.g. loss of natural bed and bank over a length of 20m to 50m, reduction in the area of an existing watercourse channel by less than 20%, and
- Widespread effects on groundwater movement with a measurable, but not gross, effect on overall groundwater transfer from up gradient to down gradient resources. Widespread, but not gross, effects on groundwater quality.

Minor – (equivalent to "Minor Adverse" in DMRB) results in some measurable changes in attributes quality or vulnerability, such as,

- Surface Water: EQS failure of either soluble or sediment-bound pollutants
- Degrading of two or more chemical or ecological status indicators (in the case of watercourses), but with no change in either overall Status classification or the individual water or biological quality classifications,
- Slight impact on a nationally or locally important aquatic ecological resource, or the loss of a moderate area of an abundant aquatic ecological resource,
- Minor changes to some geo-morphological or hydraulic characteristics e.g. loss of natural bed and bank over a length of less than 20m, reduction in the area of an existing watercourse channel by less than 5%, and

- Localised effect on groundwater movement but no measurable effect on overall groundwater transfer from up gradient to down gradient resources. Localised, measurable but not gross, effects on groundwater quality.

Negligible – (equivalent to "Negligible" in DMRB) – results in effect on attribute, but of insufficient magnitude to affect the use or integrity, such as,

- A likely change in the water quality or biological makeup of a watercourse, but the change would be difficult to measure against natural fluctuations, and would not lead to a degradation of any one individual chemical or ecological status indicators,
- Potential impact on a small area of an abundant aquatic ecological resource, but the change would be difficult to measure against natural fluctuations,
- Highly localised but not measurable changes in some geo-morphological or hydraulic characteristics, and
- Highly localised effect on groundwater movement but no effect on overall groundwater transfer from up gradient to down gradient resources. Localised, but not measurable, effects on groundwater quality.

Overall Significance is considered to be a product of both the sensitivity of the receptor and the magnitude of the effect. Significance is scaled from neutral to slight, moderate, large and very large. In assessing the product of sensitivity and magnitude, a Matrix for Determination of Level of Impact has been adopted, presented in Table 8.2 below. This approach provides a transparent assessment for each water resources feature.

Only impacts that are "Moderate", "Large" or "Very Large" (shaded) are considered to be Significant. The significance of a potential effect on the water resources features has been evaluated using the guidance provided in Table A4.6 "Qualifying Conditions for Overall Assessment Scores" (DMRB).

It is also noted that it is considered valuable to attribute a level of confidence to the predicted impact. In this assessment all impacts have been given at a high confidence level (on a scale of low, medium, and high) except where stated otherwise.

Table 8.2 Matrix for Determination of Level of Impact

Magnitude of Impact	Sensitivity of Receptor				
	Very High	**High**	**Medium**	**Low**	**Negligible**
Major	**Very Large**	**Large or Very Large**	**Moderate or Large**	Slight or Moderate	Slight
Moderate	**Large or Very Large**	**Moderate or Large**	Moderate	Slight	Neutral or Slight
Minor	**Moderate or Large**	Slight or Moderate	Slight	Neutral or Slight	Neutral or Slight
Negligible	Slight	Slight	Neutral or Slight	Neutral or Slight	Neutral
No Change	Neutral	Neutral	Neutral	Neutral	Neutral

8.3.4 *Mitigation*

Mitigation measures considered appropriate for the avoidance and minimisation of effects on water environment features will be proposed in accordance with the generic guidance provided in Chapter 4 – Assessment Methodology.

No mitigation has been included in Section 8.58.5 -predicted impacts. Mitigation requirements are subsequently noted in Section 8.6, and the residual impacts are subsequently assessed in Section 8.8. Mitigation measures are typically assigned using a hierarchy, starting with the application of standard conditions that would be applied by SEPA or measures that a designer or contractor would be expected to take based on current best practice, and then proceeding to Scheme specific mitigation measures, if required, to offset any significant potential environmental effects.

8.3.5 ***Assessment Years***

The baseline established for this assessment has been assumed to remain constant up to the time when the Scheme is put in place (2016), because the full implementation of improvement measures identified in the first round of River Basin Management Plans will not have significantly progressed. The Berriedale Water has a status of 'Medium' and therefore the objective set by SEPA is for an improvement in status to 'Good' during the 2027 River Basin Management Planning (RBMP) cycle (based on 2010 data from SEPA RBMP Water body information sheet for water body 20053). Therefore, care will be required to ensure that the proposed road drainage does not hinder this planned status improvement.

As the Langwell Water has a current status of "Good", and therefore meets the requirements of the Water Framework Directive, the main objective set by SEPA until 2027 is to ensure that no deterioration occurs (based on 2010 data from SEPA RBMP Water body information sheet for water body 20054). The same is true for the groundwater and coastal water bodies ('Good' and 'High" status respectively).

8.3.6 ***Consultations***

Consultation with the relevant statutory and non-statutory organisations was undertaken for the Stage 3 assessment, (see Chapter3 – Scoping and Consultation), and a summary is given here of the comments related to the water environment.

SEPA

SEPA provided feedback on the screening request for the proposed scheme in a letter dated 24 March 2014 (see Appendix 1- Copy of Consultation Responses); those comments relevant to the water environment as part of the proposed Scheme are listed below:

- The upgraded road should use a two stage SuDS, as this is a legal requirement,
- Construction compounds, temporary roads and areas of hard standing must be drained using SuDS and areas with high pollution risk must be drained to the foul sewer. Where this is not possible, SEPA's advice should be sought.
- The local authority should be consulted regarding post-development runoff rates,
- Any existing groundwater abstractions should be identified and a risk assessment carried out,
- All aspects of site work that might impact upon the environment should be systematically identified, along with potential pollution risks associated with the proposals and the principles of preventative measures and mitigation,
- Principles of the CEMP should be outlined in the ES,
- A draft Schedule of Mitigation should be prepared.

8.4 Baseline Conditions

Waterbodies and watercourses within the study area are shown on Drawing 47066861/10001, Water Bodies. The principal water bodies and types of watercourse are described below. Details for each water body were gained from desktop studies and photographs from a site

visit carried out by an Environmental Specialist. Summaries of the baseline information and sensitivity of each receptor are provided in Tables 8.3-8.6.

8.4.1 *Legislative and Policy Background*

The WFD, enacted in Scotland by the Water Environment & Water Services Act (2003) aims to: protect and enhance the status of aquatic ecosystems; prevent further deterioration to such ecosystems; promote sustainable use of available water resources; and contribute to the mitigation of floods and droughts. A review of the SEPA WFD Interactive Map identified a number of designations for surface and groundwater features, and these have been noted in the following sections, and taken into account in the assessment of sensitivity. Listed below is all relevant legislation for the assessment of the water environment:

- EU Directive 2000/60/EC (Water Framework Directive (WFD)), transposed into the Water Environment and Water Services Act (Scotland) 2003 (the "WEWS" Act)
- EU Fresh Water Fish Directive (2006/44/EC)
- Water Environment (Controlled Activities) (Scotland) Regulations 2011 (CAR) in respect of discharges to surface or groundwater
- Flood Risk Management (Scotland) Act 2009 and the Flood Risk Management (Flood Protection Schemes, Potentially Vulnerable Areas and Local Plan Districts) (Scotland) Regulations 2010
- Private Water Supplies (Scotland) Regulations 2006
- Salmon and Freshwater Fisheries (Consolidation) (Scotland) Act 2003

8.4.2 *Planning Advice Notes (National Policy)*

Planning Advice Notes (PANs) provide additional national guidance on various topics in more detail than the SPP and advice included is typically more technical and specific to relevant topics and aspects of planning. Those relevant to the water environment are listed below:

- PAN 51 - Planning, Environmental Protection and Regulation (Revised 2006)
- PAN 61 - Planning and Sustainable Urban Drainage Systems
- PAN 79 - Water and Drainage (Being consolidated)
- PAN 1/2013 - Environmental Impact Assessment

8.4.3 *Strategic Development Plan (Regional Policy)*

The Highland Wide Local Development Plan (2012) states that;
"The outstanding natural, built and cultural heritage of the Highlands has to be fully considered when development proposals come forward throughout the area. The Plan identifies three categories based on the type and importance of natural, built and cultural heritage they contain. These categories are local and regionally important, nationally important and internationally important." Para 21.1.1

Policy 63 - Water Environment
"The Council will support proposals for development that do not compromise the objectives of the Water Framework Directive (2000/60/EC), aimed at the protection and improvement of Scotland's water environment. In assessing proposals, the Council will take into account the River Basin Management Plan for the Scotland River Basin District and associated Area Management Plans and supporting information on opportunities for improvements and constraints."

Policy 66 - Surface Water Drainage
"All proposed development must be drained by Sustainable Drainage Systems (SuDS) designed in accordance with The SuDS Manual (CIRIA C697) and, where appropriate, the Sewers for Scotland Manual 2nd Edition. Planning applications should be submitted with information in accordance with Planning Advice Note 69: Planning and Building Standards Advice on Flooding paragraphs 23 and 24. Each drainage scheme design must be accompanied by particulars of proposals for ensuring long-term maintenance of the scheme."

8.4.4 ***Berriedale Water***

The principal surface water bodies in the vicinity of the road Scheme are the Berriedale and Langwell Waters which meet immediately downstream of the A9 road bridge at Berriedale. The SEPA Flood Risk Management Maps indicate that both watercourses are subject to out of bank flooding in low to high probability events, particularly around their confluence at the A9 road bridge. However, slopes are steep around the watercourses and therefore the effects of flooding are minor and do not extend far out with the main channels.

The Berriedale Water rises to the east of Knockfin Heights, within the 'Caithness and Sutherland Peatlands' SAC. The catchment area is 100km^2, groundwater input to the system is generally low and rainfall is high. The channel is dominated by bedrock and has a relatively steep gradient. The river is classified by SEPA as having a WFD status of 'Moderate' with medium confidence in 2008, consisting of an ecological status of 'Medium' and a chemical status of 'Pass'. The waterbody does not have 'Good' or 'High' status due to diffuse pollution with no identified source. The target for the waterbody is to improve this to 'Good' during the 2027 RBMP cycle. The watercourse is classified as a Special Area of Conservation (SAC) and protected under the Freshwater Fish Directive, along with the Langwell Water, for small but high quality Atlantic Salmon populations. Evidence of otter activity was found in the watercourse in the study area (see Chapter 6 - Nature Conservation). A view of the watercourse, upstream of the road bridge is provided in Plate 5

Plate 4 - Berriedale Water, upstream of A9 Bridge

Downstream of the A9, at the coast, the watercourse is classed as having 'High' WFD status, made up of an ecological status of 'High' and a chemical status of 'Pass'. The watercourse passes the East Caithness Cliffs SAC and Special Protection Area (SPA) as it flows around rocky outcrops to the sea (Plate 5). The adjacent 150m high Old Red Sandstone cliffs are protected for their seabird populations (see Plate 7).

Plate 5 - Berriedale Water at its outlet to the North Sea

Table 8.3 - Sensitivity of the Berriedale Water

Water Body	Berriedale Water
Water Supply / Quality	WFD Status assessed as 'Moderate' and 'High' (up and downstream of the A9, respectively) **High**
Dilution / Removal of Waste Products	Reasonable catchment size and ability to buffer flows. Only known discharges within study area are relatively minor outfalls across grassland serving parts of the existing A9 **Low**
Recreation	Important fishery **High**
Value to Economy	Used for recreational fishing. Not known to be a significant drinking water supply **Medium**
Conveyance of Flow	Medium size watercourse, moderate area of floodplain **Medium**
Biodiversity	WFD ecological Status assessed as "Moderate". Study area falls within Freshwater Fish Protection Area UKS7865914. Supports Salmon and Otters within study area. **High**
Overall Sensitivity	**High**

8.4.5 ***Langwell Water***

The Langwell Water rises to the west of Berriedale, from Loch Scalbsdale, on the North West side of Creag Scalbsdale. The catchment area is 70km^2, groundwater input to the system is generally low and rainfall is high. The watercourse drains a remote, hilly area, with sparse vegetation cover. Close to Berriedale however, the watercourse flows through a wooded area named Langwell Plantation, where the gradients on the margins are steep, before joining the Berriedale Water downstream of the A9 and flowing to the coast. The watercourse has a WFD status of 'Good' with medium confidence and it is planned to maintain this status through the RBMP cycles. The ecological status of the waterbody is 'Good' and the chemical status is 'Pass'. A view of the watercourse, upstream of the road bridge is provided in Plate 6.

Plate 6 - Langwell Water upstream of A9 Bridge

Table 8.4 - Sensitivity of the Langwell Water

Water Body	Langwell Water
Water Supply / Quality	Water body WFD Status assessed as 'Good' **High**
Dilution / Removal of Waste Products	Reasonable catchment size and ability to buffer flows. Only known discharges within study area are relatively minor outfalls across grassland serving parts of the existing A9 **Low**
Recreation	Important fishery **High**
Value to Economy	Used for recreational fishing. Not known to be a significant drinking water supply

Water Body	Langwell Water
	Medium
Conveyance of Flow	Medium size watercourse, moderate area of floodplain **Medium**
Biodiversity	WFD ecological Status assessed as “Moderate”. Study area falls within Freshwater Fish Protection Area UKS7865914. Supports Salmon and Otters within study area. **High**
Overall Sensitivity	**High**

8.4.6 ***The North Sea***

The coastal water body adjacent to Berriedale, (Achnacraig to Helmsdale) was classified as having a WFD status of ‘High’ in 2008. It is linked with the Eastern Caithness Cliffs SPA and SAC, and is an important source of fish for the seabird populations residing in the area.

Plate 7 - Coastal Water Body

Table 8.5 - Sensitivity of the Coastal Water Body

Water Body	Achnacraig to Helmsdale Coastal Water
Water Supply / Quality	Water body WFD Status assessed as ‘High’ **High**
Dilution / Removal of Waste Products	Only known discharges within study area are relatively minor outfalls across grassland serving parts of the existing A9. Large waterbody, good opportunity to buffer changes. **Low**

Water Body	Achnacraig to Helmsdale Coastal Water
Recreation	Fishing, sailing **Medium**
Value to Economy	Fishing value, tourism related to habitats **Medium**
Conveyance of Flow	Large water body **Low**
Biodiversity	Eastern Caithness cliffs SAC and SPA, important source of food for cliff nesting birds **High**
Overall Sensitivity	**Medium**

8.4.7 ***The Groundwater beneath the Scheme***

Underlying the Scheme are the 'Thurso bedrock and localised sand and gravel aquifers', which have a status of 'Good' for both quality and quantity. The bedrock aquifer is the Berriedale Sandstone formation (Middle Old Red Sandstone), which is moderately productive (in terms of its water bearing potential), and yields some groundwater locally. Overlying the bedrock in the vicinity of the Scheme is a covering of alluvium (restricted to river corridors) and glacial till. No pressures on the water body are identified, there is no trend for pollutants and the groundwater body is classed as a 'Drinking Water Protection Zone'. The Groundwater Vulnerability Map (Scotland) version 2 indicates that the aquifers in the vicinity of the Scheme are highly vulnerable to pollution (categories 5 and 4b). This vulnerability appears to be related to the alluvial deposits along the river corridors but also due to the presence of glacial till overlying much of the area as permeable superficial deposits can convey pollutants more quickly downwards.

Ground Investigation work provided detailed information on groundwater levels in the study area. Groundwater was encountered at various depths during the ground investigations (for more details see the Stage 3 Scheme Assessment Report which accompanies this Environmental Report). Groundwater monitoring has recorded groundwater within the bedrock at 12.5m below ground level (mbgl) and 9mbgl in BH04 and BH05 respectively. Within the superficial deposits groundwater is encountered at various depths, the shallowest being 0.9mbgl (approx.) in BH15.

Table 8.6 - Sensitivity of the Groundwater Body

Water Body	Thurso bedrock and localised sand and gravel aquifers
Water Supply / Quality	Water body WFD Status assessed as 'Good' **High**
Dilution / Removal of Waste Products	Overall groundwater body flowing to the study area is likely to be relatively large, the uppermost aquifer is likely to be "highly vulnerable". WFD quantity status is 'Good' **High**

Water Body	Thurso bedrock and localised sand and gravel aquifers
Recreation	Not directly applicable to groundwater (but indirectly related to water quality of the watercourses and their fisheries, WFD quality status of 'Good') **High**
Value to Economy	Classified as a drinking water protection zone **High**
Conveyance of Flow	Shallow groundwater resource, mainly fracture flow **High**
Biodiversity	Not identified
Overall Sensitivity	**High**

8.4.8 ***Private Water Supplies***

A request was made to THC for information held regarding Private Water Supplies (PWS) in the vicinity of Berriedale. One record is held for Berriedale, which is classed as a Commercial Supply, fed from a spring located on the eastern side of Scaraben (approximately 6km north west of Berriedale), with 5 or more storage tanks between the source and the user. The locations of these tanks are not known. This receptor has been scoped out of the assessment due to the distance of the source from the proposed works.

8.4.9 ***Flooding***

Review of the published SEPA flood map indicates that the proposed Scheme is out with the low (1:1000) to high probability (1:10) flood envelope, either from watercourses or the coast. There are no known reported instances of flooding of the proposed Scheme site due to its elevation above the surrounding watercourses and coastal waters.

8.5 Predicted Impacts

Construction effects on the water environment are often of temporary and short-term duration. Generally speaking, effects are more concentrated during construction compared with the operational phase due to activity levels and actions resulting in a higher likelihood of and potential for pollution and spillages during this period. Effects on the water environment during the operational phase include road drainage and alterations to floodplains and natural drainage pathways.

The following tables set out the range of potential effects expected, their magnitude, and the overall significance based on the sensitivity of the receptor. The effects are split into construction (Tables 8.7 - 8.11) and operation (Tables 8.12 - 8.19) phase effects and are assessed prior to the implementation of mitigation measures.

8.5.1 ***Construction Impacts***

Surface Water Quality

The following assessment considers the potential for sediment release and spillage / discharge of pollutants (e.g. oils, fuels, chemicals) to surrounding waters during the construction phase, and the potential impacts that such a release may have on surface water quality. Impacts are assessed without the application of mitigation measures.

Table 8.7 - Surface Water Quality Predicted Impact Assessment (Construction)

Receptor	Berriedale and Langwell Waters, and Coastal Water body
Relevant Scheme Information	The proposals involve significant earth / rock moving activities during construction. This presents a risk of surface water runoff eroding bare slopes or material stockpiles, which can lead to an increase in suspended solids in watercourses. The construction phase generally presents the potential for fuels, oils, and other chemicals to be spilled via an accident, improper usage, or poor storage. These could reach the receptors directly via discharge of polluted runoff or via seepage into the shallow groundwater. Construction workforce sewage and washing effluent could impact ground and surface waters during the construction phase.
Sensitivity of Receptor(s)	Berriedale and Langwell Waters - **High** Coastal Water Body - **Medium**
Magnitude and Type of Effect	**Moderate** – Direct, short-term, temporary effect. Runoff from the site compound, temporary roads and earthworks could impact the watercourses and coastal water body through the introduction of pollutants and sediment.
Overall Significance	Berriedale and Langwell Waters **- Moderate / Large** Coastal Water Body **- Moderate**

Flooding

This part of the assessment considers whether or not the construction activities could affect the level of flood risk to surrounding land and infrastructure.

Table 8.8 - Flooding Predicted Impact Assessment (Construction)

Receptor	Berriedale and Langwell Waters, and Coastal Water body
Relevant Scheme Information	There are no works planned within the floodplain of the Berriedale and Langwell Waters. Increased runoff from the construction areas and development of the Scheme has the potential to increase flood risk to surrounding land and from the Berriedale Water.
Sensitivity of Receptor(s)	Rural land is considered as having a **Low** sensitivity to increased flood risk, but individual property is considered as having a **High** sensitivity to increased flood risk.
Magnitude and Type of Effect	**Negligible** – Indirect, temporary effect. There may be a slight increase in runoff but no change to the floodplains of the watercourses.
Overall Significance	Surrounding Land – **Neutral / Slight** Adjacent properties – **Slight**

Geomorphology & Hydrology

This assessment considers the potential effects of the construction works on the structure of the bed and bank of affected watercourses, as well as the flow conveyance of these features.

Table 8.9 - Geomorphology & Hydrology Predicted Impact Assessment (Construction)

Receptor	Berriedale and Langwell Waters
Relevant Scheme Information	No works are planned within any watercourses. The release of materials into watercourses has the potential to cause blockages or build-up of sediment, changing their geomorphological and hydrological nature.
Sensitivity of Receptor(s)	Berriedale and Langwell Waters - **High**
Magnitude and Type of Effect	**Negligible** – Indirect, temporary effect. The proposals involve earthworks for the new section of road on the hillside above the Berriedale and Langwell Waters, which could release sediment and has the potential to temporarily affect the passage of flows down the watercourses.
Overall Significance	Berriedale and Langwell Waters – **Slight**

Groundwater

This assessment considers the potential effects of the construction works on the **movement** of the groundwater.

Table 8.10 - Groundwater Movement Predicted Impact Assessment (Construction)

Receptor	Thurso bedrock and localised sand and gravel aquifers
Relevant Scheme Information	The rock cuttings on both sides of the proposed Scheme may encounter groundwater (based on information collected from the boreholes completed for the Ground Investigation (GI), which recorded groundwater at varying levels within the rock and superficial deposits). Based on the findings of the GI this groundwater is likely to be in the form of encountering flow from fractures within the bedrock. Given the short length of slope intercepted in the context of the whole coastline, it is considered that the construction stage will have minimal effects on overall groundwater movement in the context of groundwater flows passing to the coast.
Sensitivity of Receptor(s)	Thurso bedrock and localised sand and gravel aquifers - **High**
Magnitude and Type of Effect	**Negligible** - Direct, highly localised and temporary effect. It is not anticipated that construction work (i.e. rock cut, earthmoving, etc.) will create a significant obstruction to groundwater movement.
Overall Significance	Thurso bedrock and localised sand and gravel aquifers – **Slight**

This assessment considers the potential effects of the construction works on the **quality** of the groundwater.

Table 8.11 - Groundwater Quality Predicted Impact Assessment (Construction)

Receptor	Thurso bedrock and localised sand and gravel aquifers
Relevant Scheme Information	The use of machinery during construction presents a risk of spillage of fuels, oils, concrete, and other chemicals, which can seep into the shallow groundwater. The project will also require at least one major construction compound, providing welfare facilities for the Contractor, and these are likely to retain a store of fuels, oils, and other chemicals.
Sensitivity of Receptor(s)	Thurso bedrock and localised sand and gravel aquifers - **High**
Magnitude and Type of Effect	**Minor** – Indirect and temporary. There is the potential for contaminants being released into the shallow groundwater through spillage or poor site controls.
Overall Significance	Thurso bedrock and localised sand and gravel aquifers – **Slight / Moderate**

8.5.2 ***Operational Impacts***

Surface Water Quality

Discharge of Road Run Off

As described in Section 8.2.2, the surface water drainage from the new section of road will be treated through two levels of SuDS. This will comprise carriageway filter drains and an attenuation pond, which will be lined to prevent contamination of groundwater. Drainage will then outfall to the Berriedale Water through a Hydrodynamic Vortex Separator, downstream of the A9 road bridge (at grid reference ND 311860 922709). Land drainage from above the new road will be diverted to filter drains and removed via the same outfall, without further treatment.

The main contaminants that can be carried into the watercourses from road run-off include suspended solids (including grit, mud, & metal particles), copper and zinc (from deterioration of vehicles), organic materials and hydrocarbons (such as rubber, bitumen, grease, oil and fuel), and salt. DMRB, HD 45/09 provides a number of assessment methods to gauge the potential impact of run-off from roads on the water environment. However, as the Annual Average Daily Traffic (AADT) measured for the A9 at Berriedale (see Chapter 1, Section 1.8-Traffic Conditions) is below the lowest threshold for the assessment tools, it is considered inappropriate to use these tools due to the inaccuracy in the Berriedale situation.

Table 8.12 - Surface Water Quality (Road Run-off) Predicted Impact Assessment (Operation)

Receptor	Berriedale and Langwell Waters
Relevant Scheme Information	Persistent, routine road runoff as well as pollution events have the potential to impact on the water quality of the surface and coastal water bodies in the event of poor design or implementation of drainage systems.
Sensitivity of Receptor(s)	Berriedale and Langwell Waters – **High** Coastal Water Body - **Medium**
Magnitude and Type of Effect	**Minor** - Direct, local to downstream reach of watercourse, permanent. The new section of road is relatively small in relation to the context of the whole hillside and catchment area reaching the watercourses and coastal water body and therefore it is

Receptor	Berriedale and Langwell Waters
	assessed that the impact will be minimal.
Overall Significance	Berriedale and Langwell Waters – **Slight / Moderate** Coastal Water Body – **Slight**

Other road and infrastructure maintenance

This assessment considers whether the maintenance of the road, drainage infrastructure, and soft landscaping is likely to have any effect on the water quality of the surrounding water bodies. There is no specific guidance within DMRB HD 45/09 on assessing the potential impacts from this source of pollution.

Table 8.13 - Surface Water Quality (Maintenance) Predicted Impact Assessment (Operation)

Receptor	Berriedale and Langwell Waters
Relevant Scheme Information	During the operation of the Scheme the principal maintenance activities are likely to be road pavement maintenance (anticipated to be minimal during first 10years), cleaning of the road drainage systems (possibly annual, e.g. filter drains, SuDS basin, etc.), maintenance of roadside verges (e.g. clearing debris, removing invasive species), etc. There will be a moderate increase in the area of carriageway and embankments to be maintained compared to the existing situation, as the existing road is to remain in place as an access to the cemetery.
Sensitivity of Receptor(s)	Berriedale and Langwell Waters – **High** Coastal Water Body - **Medium**
Magnitude and Type of Effect	**Negligible** - Direct, localised, and temporary. Repair of road infrastructure may involve the use of potentially polluting materials and this presents a risk of materials entering watercourses via the road drainage system through spillages or improper use. Maintenance to road drainage systems (e.g. cleaning drains, removal of sediment from SuDS basin, etc.) is expected to have a minimal impact on the water resources features, as material would be flushed towards the SuDS basin and controlled at that point prior to discharge into a watercourse.
Overall Significance	Berriedale and Langwell Waters – **Slight** Coastal Water Body – **Neutral / Slight**

Flooding

This part of the assessment considers whether or not the proposed works would affect the flood risk within any identified floodplains.

Table 8.14 - Flooding Predicted Impact Assessment (Operation)

Receptor	Surrounding land and infrastructure located adjacent to the identified surface water resources features.
Relevant Scheme Information	There are no works planned within the floodplain of the Berriedale and Langwell Waters. Increased runoff from the Scheme has the potential to increase flood risk to surrounding land and from the Berriedale Water.

Receptor	Surrounding land and infrastructure located adjacent to the identified surface water resources features.
Sensitivity of Receptor(s)	Rural land is considered as having a **Low** sensitivity to increased flood risk, but individual property is considered as having a **High** sensitivity to increased flood risk.
Magnitude and Type of Effect	**Negligible** – Indirect, localised, permanent effect. There may be a slight increase in runoff but no change to the floodplains of the watercourses.
Overall Significance	Surrounding Land – **Neutral / Slight** Adjacent properties – **Slight**

Geomorphology & Hydrology

This assessment considers the potential effects of the proposed works on the structure of the bed and bank of affected watercourses, as well as the flow conveyance of these features.

Table 8.15 - Geomorphology Predicted Impact Assessment (Operation)

Receptor	Berriedale and Langwell Waters
Relevant Scheme Information	No works are planned on the bed or banks of the watercourses.
Sensitivity of Receptor(s)	Berriedale and Langwell Waters - **High**
Magnitude and Type of Effect	**No Change -** No changes will be made to the geomorphology of the watercourses
Overall Significance	Berriedale and Langwell Waters – **Neutral**

This assessment considers the potential effects of the presence of the revised road alignment on the natural surface drainage patterns of the surrounding land.

Table 8.16 - Natural Drainage Patterns Predicted Impact Assessment (Operation)

Receptor	Berriedale and Langwell Waters
Relevant Scheme Information	The Scheme changes part of the alignment of the existing A9 across the hillside, which in turn already influences the natural drainage patterns with surface water drainage being conveyed through a carrier drain running beside the road. Further alteration will then be made through the installation of a SuDS attenutaiton pond.
Sensitivity of Receptor(s)	Berriedale and Langwell Waters - **High**
Magnitude and Type of Effect	**Negligible** – Indirect, localised, permanent. There may be a slight change to the existing drainage pattern (currently modified by the exiting A9 route) towards the watercourses and coast but this is insignificant in the context of the whole catchment and coastline.
Overall Significance	Berriedale and Langwell Waters – **Slight**

This assessment considers the potential effects of the surface water runoff from the scheme on the hydrology of the watercourses receiving a surface water drainage discharge.

Table 8.17 - Hydrology Predicted Impact Assessment (Operation)

Receptor	Berriedale and Langwell Waters
Relevant Scheme Information	The Scheme should not increase the volume of surface water captured as it is proposed to landscapethe cut off section of road and provide a separate footpath access to the cemetery.
Sensitivity of Receptor(s)	Berriedale and Langwell Waters - **High**
Magnitude and Type of Effect	**Negligible** - Indirect, highly localised and permanent effects. Any increase in runoff is likely to be insignificant in the context of the catchment of the Berriedale Water.
Overall Significance	Berriedale and Langwell Waters – **Slight**

Groundwater

This assessment considers the potential effects on groundwater **movement** from the presence of the scheme.

Table 8.18 - Groundwater (Movement) Predicted Impact Assessment (Operation)

Receptor	Thurso bedrock and localised sand and gravel aquifers
Relevant Scheme Information	The cuttings required on either side of the carriageway will be predominantly within superficial deposits but in some places are likely to intersect bedrock.
Sensitivity of Receptor(s)	Thurso bedrock and localised sand and gravel aquifers - **High**
Magnitude and Type of Effect	**Minor** - Direct, highly localised and permanent effects. Due to the small scale of the works across the whole hillside, it is not anticipated that the permanent works (i.e. rock cut, etc.) will create a significant obstruction to groundwater movement.
Overall Significance	Thurso bedrock and localised sand and gravel aquifers – **Slight / Moderate**

This assessment considers the potential effects on groundwater **quality** from the operation of the road.

Table 8.19 - Groundwater (Quality) Predicted Impact Assessment (Operation)

Receptor	Thurso bedrock and localised sand and gravel aquifers
Relevant Scheme Information	Routine road runoff, pollution incidents and maintenance activities have the potential to release contaminants into shallow groundwater.
Sensitivity of Receptor(s)	Thurso bedrock and localised sand and gravel aquifers - **High**
Magnitude and Type of Effect	**Negligible** – Indirect, localised and permanent effects**.** The area of new road surface is relatively small within the context of the groundwater catchment area and therefore, any low level, routine runoff will have little impact on the overall groundwater quality and any pollution incidents would have a highly localised effect.
Overall Significance	Thurso bedrock and localised sand and gravel aquifers – **Slight**

8.6 Mitigation

This section describes the mitigation required to address the adverse impacts described in Section 8.5.

8.6.1 *Construction Stage Mitigation*

Table 8.20 – Construction Stage Mitigation Requirements

Specific Issues	Mitigation Requirements
Sediment mobilisation and spillage or discharge of other pollutants into water-courses	The Contractor shall produce a Construction Environmental Management Document (CEMD), which will describe the specific procedures to be put in place to control sediment mobilisation, surface water discharges, and spillages. The CEMD shall be discussed and agreed with SEPA prior to commencement of site works, and all staff on site shall be briefed on and trained in the procedures contained within the CEMD. The CEMD shall incorporate best practice guidance as detailed in PPG's published by SEPA and CIRIA Reports C532 & C648, as a minimum. In particular, the following measures shall be adopted on site: - • A CAR Licence (if required) shall be obtained prior to start on site (note this is a separate consenting regime from the roads order) for the works, and this shall be displayed prominently on a notice board in the site offices, • The Contractor shall put in pace SuDs drainage treatment during the construction period. • The Contractor shall apply for a temporary discharge licence under the Controlled Activity Regulations if required by SEPA for the construction stage, • Identify and clearly sign all surface water features within the construction site during site set up and brief personnel on their location during induction, • The Contractor shall provide bunds around all fuel, oil, and other chemical stores, and shall centralise and minimise the number of these stores, • A formal wheel wash and concrete wash out area shall be set up on site and this shall drain to a lined sump with the surface water either treated on site or disposed of to a licensed facility off site, • Stripped areas, stockpiles, and areas of new embankment / cutting shall have silt fences placed so as to intercept the surface water runoff from these areas. • The Contractor shall give consideration to creating the sustainable drainage system infrastructure at the outset of construction work, and this could then be used to treat some of the construction stage site run off prior to discharge. If this is not done the Contractor shall provide some other form of treatment to the surface water runoff from the site prior to it reaching the watercourses, • Construction materials and other stockpiles shall be stored away from the surface water features (minimum 20m), • Plant shall be stored and maintained away from surface water features, • The Contractor shall instigate re-vegetation of stripped areas and new embankments on a sectional basis as early as possible within the programme to reduce the potential for silt laden run off, • The CEMD shall identify a clear monitoring regime to confirm the application of the above mitigation requirements. It is anticipated that the Contractor's site management personnel would be made responsible for monitoring, and in practice many of the measures

Specific Issues	Mitigation Requirements
	could be monitored based on a daily or weekly inspection of the site and the completion of a "mitigation requirements" tick sheet. These tick sheets would then be retained as auditable evidence of the monitoring of the mitigation requirements.
Disturbance of groundwater movement	None proposed at this stage
Contamination of groundwater	As noted above, the Contractor shall produce a Construction Environmental Management Document (CEMD), which will describe the specific procedures to be put in place to control site discharges and the potential for pollutant spillages. The SMP shall be discussed and agreed with SEPA prior to commencement of site works, and all staff on site shall be briefed on and trained in the procedures contained within the CEMD. The CEMD shall incorporate best practice guidance as detailed in PPG's published by SEPA and CIRIA Reports C532 & C648, as a minimum. In particular, the following measures shall be adopted on site in relation to mitigating the potential effects on groundwater quality: - • Construction workforce sewage and washing effluent should be contained and taken offsite, • The Contractor shall provide bunds around all fuel, oil, and other chemical stores, and shall centralise and minimise the number of these stores, • The Contractor shall complete all servicing, fuelling, and storage of vehicles at construction compounds, • The Contractor shall provide dedicated wash down areas for concrete and other delivery vehicles, • The Contractor shall implement drainage control measures at the site to prevent areas of standing surface water that could become contaminated and infiltrate into the shallow groundwater. Where collection of water at the site is unavoidable (e.g. within excavations), provision should be made for this water to be collected and passed through some form of treatment before discharge), • The Contractor shall liaise with SEPA regarding any proposed discharge from the site in respect to the Controlled Activities Regulations. As noted above, these are to be monitored by the Contractor's site personnel and the Client's Agent based on regular inspections using a tick sheet assessment.

8.6.2 *Operational Stage Mitigation*

Table 8.21 - Operational Stage Mitigation Requirements

Specific Issues	Mitigation Requirements
Discharge of road run off to water-courses	The new sections of road shall incorporate two levels of SuDS as required by SEPA (see email dated 30th June in Appendix 1 – Copy of Consultation Responses). These measures shall incorporate both the treatment and attenuation of road run off using the standard techniques set out in the SuDS Manual (CIRIA C697, e.g. filter drains and a pond). The selected measures shall be designed to provide two full stages of treatment to reduce pollutants and sediment in the road run off. Further treatment of road runoff is provided through the provision of a hydrodynamic vortex separator above the outfall from the attenuation pond. This will provide treatment for hydrocarbons, sediments and organics from routine runoff as well as flood events.

Specific Issues	Mitigation Requirements
Other road and infrastructure maintenance	Future maintenance works to the road infrastructure shall be completed under an approved method statement (approved by route manager within maintenance authority) and shall incorporate best practice measures (including the SEPA Pollution Prevention Guidelines, General Binding Rules, and CIRIA Reports C532 & C632) to reduce the risk of significant sediment disturbance and spillages of potential contaminants to the surrounding water resources features. Provisions for monitoring the application of the best practice measures would also need to be noted in the method statement, and in practice this will likely mean that the supervisor of the works will be responsible for ensuring the application of the best practice measures on site.
Alteration to land drainage patterns	Where the new road embankment isolates an area of land that would naturally drain towards the Berriedale Water, drainage provisions shall be put in place to prevent surface water runoff in this area becoming trapped. This intercepted surface water shall be returned directly or indirectly (through road drainage provisions) to the reach of the Berriedale Water within the study area.
Alteration of hydrology of water bodies	The surface water drainage proposals for the Scheme will include two levels of SuDS measures. These features can therefore be used to provide a level of attenuation of the road run off before discharge to the Berriedale Water. The design shall ensure that the rate of release of the surface water runoff from the road drainage system is in accordance with the guidance provided in CIRIA Report C697 SuDS Manual for allowable rates of run off.
Contamination of groundwater	The surface water drainage proposals for the Scheme will include two levels of SuDS design (as required by SEPA), and these measures will reduce the risk to the groundwater. Filter drains and the attenuation pond will be lined to prevent contamination of groundwater resources.

8.7 Disruption due to Construction

All construction disruption to water environment features has been identified a nd assessed in 8.5.1 “Construction Stage (impacts)”.

8.8 Residual Impacts

Table 8.22 - Construction stage residual impacts

Potential Impact	Feature	Sensitivity	Magnitude of Effect (Pre Mitigation, refer to Section 8.5.1)	Mitigation Requirements (refer to Table 8.20)	Magnitude (and Type) of Effect (Post Mitigation)	Residual Significance
Sediment mobilisation and spillage or discharge of other pollutants into watercourses	Berriedale and Langwell Waters, and Coastal Water Body	Berriedale and Langwell Waters **High** Coastal Water Body **Medium**	**Moderate**	Two level SuDS to be used	**Negligible** (direct, localised). Based on the adoption of the mitigation measures noted, the risk of a significant discharge of polluting substances into the watercourses should be reduced to a low level. The effects of any residual construction stage pollution should be temporary in nature, and therefore no long-term impact on the water quality classification should be experienced.	**Slight** Berriedale and Langwell Waters **Neutral / Slight** Coastal Water Body
Flood risk to surrounding land from development	Surrounding land and propertied	Rural land **Low** Properties **High**	**Negligible**	SuDS to be used to manage runoff	**No Change**	**Neutral**
Alteration of water bodies (Geomorph-ology & Hydrology)	Berriedale and Langwell Waters	Berriedale and Langwell Waters **High** Coastal Water Body **Medium**	**Negligible**	The use of SuDS and other sediment control methods during construction will reduce the amount of soil and sediment to be mobilised	**No Change**	**Neutral**
Disturbance of groundwater movement	Thurso bedrock and localised sand and gravel aquifers	Groundwater **High**	**Negligible**	Site Good Practice Measures to be adopted	**Negligible** (direct, localised temporary). It is not anticipated that the proposed works will create a significant barrier to groundwater movement.	**Slight**
Contamination of groundwater	Thurso bedrock and localised sand and gravel aquifers	Groundwater **High**	**Minor**	Site Good Practice Measures to be adopted, including SuDS	**Negligible** (direct, localised temporary). Based on the adoption of the mitigation measures noted, the likelihood of significant quantities of contaminants being released into the shallow groundwater should be low. Therefore, it is considered that, although there may be a residual risk of some small spills of oil, fuel, or other chemicals, the effects of these will be highly localised.	**Slight**

Table 8.23 - Operation stage residual impacts

Potential Impact	Feature	Sensitivity	Magnitude of Effect (Pre Mitigation, refer to Section 8.5.2)	Mitigation Requirements (refer to Table 8.21)	Magnitude (and Type) of Effect (Post Mitigation)	Residual Significance
Discharge of road run off to watercourses / drainage paths	Berriedale and Langwell Waters, and Coastal Water Body	Berriedale and Langwell Waters **High** Coastal Water Body **Medium**	**Minor**	Two level SuDS to be used	**Negligible** – (direct, localised to downstream reach of watercourse, permanent). The use of a two level SuDS treatment train for the new section of road and the inclusion of a hydrodynamic vortex separator will result in a negligible change in water quality.	**Slight** Berriedale and Langwell Waters **Neutral / Slight** Coastal Water Body
Other road and infrastructure maintenance	Berriedale and Langwell Waters, and Coastal Water Body	Berriedale and Langwell Waters **High** Coastal Water Body **Medium**	**Negligible**	Two level SuDS to be used	**No Change**	**Neutral**
Flood risk to surrounding land from development	Surrounding land and propertied	Rural land **Low** Properties **High**	**Negligible**	SuDS to be used to manage runoff	**No Change**	**Neutral**
Alteration of water bodies	Berriedale and Langwell Waters	Berriedale and Langwell Waters **High**	**No Change**	None proposed	**No Change**	**Neutral**
Alteration of land drainage patterns	Berriedale and Langwell Waters, and Coastal Water Body	Berriedale and Langwell Waters **High** Coastal Water Body **Medium**	**Negligible**	None proposed	**Negligible** (indirect, highly localised, permanent). There may be a slight change to the existing drainage pattern (currently modified by the exiting A9 route) towards the watercourses and coast but this is insignificant in the context of the whole catchment and coastline.	**Slight** Berriedale and Langwell Waters **Neutral / Slight** Coastal Water Body
Alteration to hydrology of water bodies	Berriedale and Langwell Waters, and Coastal Water Body	Berriedale and Langwell Waters **High** Coastal Water Body **Medium**	**Negligible**	Runoff is to be maintained at the greenfield runoff rate as per HA106/04	**No Change**	**Neutral**
Disturbance of groundwater movement	Thurso bedrock and localised sand and gravel aquifers	Groundwater **High**	**Negligible**	None proposed	**Negligible** (direct, highly localised, permanent). It is not anticipated that permanent works will create a significant obstruction to groundwater movement.	**Slight**
Contamination of groundwater	Thurso bedrock and localised sand and gravel aquifers	Groundwater **High**	**Negligible**	Lined SuDS to be used to treat runoff	**No Change**	**Neutral**

8.9 Summary

This chapter addresses the potential effects on the water environment as a result of the proposed Scheme. In the context of these proposals the significant water resources are the Berriedale and Langwell Waters, the Achnacraig to Helmsdale Coastal Water, and the Thurso bedrock and localised sand and gravel aquifers. The WFD status of these water bodies is 'Medium', 'Good', 'High' and 'Good' respectively.

The assessment of effects was divided into four main areas: Surface Water Quality; Flooding; Geomorphology and Hydrology; and Groundwater. The predicted residual significance of impacts ranged from Neutral to Slight, subject to the adoption of a range of mitigation measures identified in Section 8.6. Mitigation measures to be adopted for the protection of the water environment during construction are predominantly best practice measures, commonly adopted for such schemes and include SuDS for site drainage, and the prevention of contamination of watercourses and groundwater from silt and contaminants using a range of measures to be detailed in a Construction Environmental Management Document. Mitigation measures to be adopted for the protection of the water environment during operation are primarily provided by two levels of SuDS treatment, with all drainage features to be lined to prevent release of contaminants to shallow groundwater.

It is considered unlikely that the Scheme would lead to any significant residual impacts on water resources features. On this basis it is considered that the Scheme complies with the relevant policies noted in Section 8.4.1, in that it is not predicted to have a significant adverse effect on the water environment.

8.10 References

- EU Directive 2000/60/EC (Water Framework Directive (WFD)), transposed into the Water Environment and Water Services Act (Scotland) 2003 (the "WEWS" Act)
- The Water Environment (Controlled Activities) (Scotland) Regulations 2011 in respect of discharges to surface or groundwater
- Scottish Government, 2009; Flood Risk Management (Scotland) Act
- Scottish Government, 2014; National Planning Framework for Scotland 3
- Scottish Government, 2014; SPP (Scottish Planning Policy) - Flooding & Drainage and Environmental Impact Assessment
- Scottish Environmental Protection Agency, 2011; Policy No. 41 - Planning Authority Protocol, Development at Risk of Flooding: Advice and Consultation
- Scottish Environmental Protection Agency, 2009; Interim Position Statement on Planning and Flooding
- Scottish Environmental Protection Agency, 2009; Policy No. 19 - Groundwater Protection Policy for Scotland V3
- Highways Agency / Scottish Executive Development Department, 2009; Design Manual for Roads and Bridges, Volume 11, Section 3, Part 10, HD 45/09
- Scottish Natural Heritage, 2009; A Handbook on Environmental Impact Assessment; Guidance for Competent Authorities, Consultees and others involved in the Environmental Impact Assessment Process in Scotland.
- Centre for Ecology and Hydrology, 2009; The Flood Estimation Handbook: CD ROM v3.
- CIRIA, 2001; Report C532 Control of water pollution from construction sites
- CIRIA, 2007; Report C697 – SUDS Manual
- CIRIA, 2006; Report C648 Control of water pollution from linear construction projects
- Scottish Environment Protection Agency, 2012; Water-body Data Sheets and WFD Interactive Map
- Scottish Environment Protection Agency, 2014; Online Flood Management Map
- British Geological Survey, 2013; online geology maps, 1:50,000
- SNIFFER, 2011; Vulnerability of Groundwater in the Uppermost Aquifer, version 2, Scale 1:100,000
- British Geological Survey / Scottish Environment Protection Agency, 2004; Bedrock Aquifer Map and Superficial Aquifer Map, Scale 1:100,000
- British Geological Survey, 2011; User guide: Aquifer Productivity (Scotland) GIS Datasets. Version 2
- Ordnance Survey, 2014; Digital mapping 1:10,000 maps
- Microsoft Corporation, 2014; Bing maps aerial images
- Private water supplies data provided by The Highland Council

9 NOISE AND VIBRATION

9.1 Introduction

This chapter details the predicted noise and vibration impacts of the proposed A9 Berriedale Improvement Scheme. The Scheme would potentially affect traffic noise and vibration levels as experienced by sensitive receptors, such as residential properties, in the vicinity of the scheme.

The Design Manual for Roads and Bridges (DMRB) Volume 11, Section 2, Part 7, Noise and Vibration HD 213/11-Revision 1 (issued November 2011) focuses on a risk based approach using three assessment levels:

- scoping;
- simple; and
- detailed.

A scoping level assessment of various options was completed in 2013 as part of the Stage 2 Assessment. From the results of this assessment a Preferred Scheme has been developed. This report contains a detailed level assessment of the Preferred Scheme.

The assessment considers both changes in traffic noise levels and the effect on residents in terms of annoyance.

The assessment considers the following traffic scenarios:

- 2014 current baseline conditions;
- 2015 year of opening Do-Minimum (2015 DM), without the scheme;
- 2015 year of opening Do-Something (2015 DS), with the scheme;
- 2030 future assessment year 15 years after opening Do-Minimum (2030 DM), without the scheme; and
- 2030 future assessment year 15 years after opening Do-Something (2030 DS), with the scheme.

Temporary noise and vibration impacts arising from the construction works associated with the Scheme are also discussed. No specific information on the construction activities, plant or programme is currently available and therefore a qualitative assessment has been completed.

9.2 Approach & Methods

9.2.1 *Planning Policy*

PAN 1/2011 ‘Planning and Noise’ is the current advice note on considering noise in the planning system. With regard to road schemes the accompanying Technical Advice Note refers to the DMRB assessment methodology when assessing new road schemes.

The first round of strategic noise mapping in Scotland, required under the Environmental Noise Directive, was completed in 2007 and the second round in 2013. Traffic flows along the relevant section of the A9 are relatively low; therefore the area of the proposed A9 Berriedale improvement Scheme was not included in either round of mapping.

Where noise from a new or altered road exceeds a certain trigger level, and meets other qualifying criteria, the Land Compensation (Scotland) Act 1973 provides, through the Noise Insulation (Scotland) Regulations 1975 (NISR), for insulation work to be carried out, or a grant

to be made in respect of that insulation work. Under the NISR, the Land Compensation (Scotland) Act 1973 also confers a right to compensation for depreciation in the value of land caused by public works under certain circumstances.

At the local scale, discussions with the Environmental Health Department of The Highland Council have established no relevant specific local policies. However, with regard to construction impacts they have advised that standard working hours (08:00-18:00 Monday – Friday, and 08:00-12:00 on Saturdays) should be adhered to.

9.2.2 ***Significance of Effects***

The significance of the effects of the Scheme is assessed based on the combination of the sensitivity of the receptor and the magnitude of the impact, as detailed in Table 9.1.

Table 9.1: Matrix for Determination of the Significance of Effect

Magnitude of Impact	Sensitivity of Receptor				
	Very High	**High**	**Medium**	**Low**	**Negligible**
Major	**Very Large**	**Large or Very Large**	**Moderate or Large**	Slight or Moderate	Slight
Moderate	**Large or Very Large**	**Moderate or Large**	Moderate	Slight	Neutral or Slight
Minor	**Moderate or Large**	Slight or Moderate	Slight	Neutral or Slight	Neutral or Slight
Negligible	Slight	Slight	Neutral or Slight	Neutral or Slight	Neutral
No Change	Neutral	Neutral	Neutral	Neutral	Neutral

With specific regard to this Scheme the sensitivity of the identified receptors is detailed in Table 9.2.

Table 9.2: Sensitivity of Receptor

Sensitivity	Receptor
Very High	None identified
High	Residential properties, Designated Ecological receptors (Sites of Special Scientific Interest (SSSIs), Special Protection Areas (SPA) & Special Area of Conservation (SAC))
Medium	Village Hall, Church, Designated Heritage receptors (Scheduled Monuments)
Low	Public Footpaths
Negligible	Commercial premises

The approach to determining the magnitude of impact is detailed in each section below. Receptors of low and negligible sensitivity have been scoped out of the assessment.

9.2.3 *Construction Noise and Vibration*

The noise levels generated by construction activities and experienced by nearby sensitive receptors, such as the occupants of residential properties, depends upon a number of variables, the most significant of which are:

a) the noise generated by plant or equipment used on site, generally expressed as a sound power level (L_w);

b) the periods of operation of the plant on the site, known as its 'on-time';

c) the distance between the noise source and the receptor; and

d) the attenuation due to ground absorption and barrier effects.

BS 5228: 2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites' provides a methodology for the estimation of likely construction noise levels as an equivalent continuous noise level averaged over a suitable assessment period, for example a one-hour period ($L_{Aeq,1h}$).

BS 5228 contains a database of the noise emission from individual items of equipment and routines which can be used to predict noise from construction activities at identified receptors. The prediction method gives guidance on the effects of different types of ground, barrier attenuation and how to assess the impact of fixed and mobile plant.

In order to quantify the likely noise from construction works in accordance with the methods and guidance in BS 5228, it is necessary to define the various activities to be undertaken and the equipment to be used, based upon the anticipated programme of work. At this stage no such details are available, therefore a qualitative discussion of the likely magnitude of construction noise impacts and the resulting significance of effects is provided. This is based on the identification of residential properties and other potentially sensitive receptors in the vicinity of the Scheme, the identification of activities which could have a significant effect, and best practice noise control measures.

Some blasting to create the route of the new section of road will be required. Blasting can result in impacts in terms air overpressure (including audible noise) and ground borne vibration. A qualitative discussion of the potential magnitude of impacts and significance of effects from blasting is provided.

Piling works to reinforce the slope between chainage 75 and 100 may be required, though this is dependent on the outcome of the ground investigation works. Depending on the type of piling required ground borne vibration may be generated by these works. In the absence of specific details a qualitative assessment has been completed based on the proximity of the works to residential receptors.

With regard to construction traffic, an estimate of the likely construction traffic required for the works has been used to determine the impact on existing traffic noise levels along the A9. The magnitude of impact scale for short term traffic noise level changes, as detailed in Table 9.3 below, is used in the assessment of construction traffic noise impacts.

9.2.4 *Operational Traffic Noise Study Area*

At the detailed assessment stage the Study Area for the operational traffic noise impact assessment is defined in the DMRB as follows:

a) The study area must include the proposed Scheme, any existing routes that are being bypassed or improved, and all surrounding existing roads that are predicted to be subject to a change in traffic noise level of 1 dB(A) or more in the short term (2015 DM

to 2015 DS) or 3 dB or more in the long term (2015 DM to 2030 DS) as a result of the proposed Scheme. These road links are defined as 'affected routes' and are identified by analysis of the provided traffic data;

b) The study area of the detailed quantitative assessment of noise impacts is defined as a corridor 600 m either side of the proposed Scheme, any existing routes that are bypassed, and a set of corridors 600 m either side of all affected routes within 1 km of the proposed Scheme;

c) For dwellings and other sensitive receptors that are within 1 km of the Scheme, but more than 600 m from an affected route, a qualitative assessment of the noise and vibration impacts should be undertaken; and

d) For affected routes which are outside the 1 km boundary from the Scheme, an assessment should be undertaken by estimating the 'Calculation of Road Traffic Noise' (CRTN) Basic Noise Level on these roads (the traffic noise level at 10 m) with and without the proposed Scheme.

The extent of the scheme, and identified potentially sensitive receptors within 600 m and 1 km of the Scheme and the section of the existing A9 bypassed by the Scheme, are illustrated in Figure 9.1- Noise Location Plan. The extent of the available traffic data is limited to the A9 itself. Therefore, no affected routes have been identified for this Scheme either within or outside the 1 km study.

9.2.5 *Operational Traffic Noise*

Noise from a flow of road traffic is generated by both vehicles' engines and the interaction of tyres with the road surface. The traffic noise level at a receptor, such as an observer at the roadside or residents within a property, is influenced by a number of factors including traffic flow, speed, composition (% Heavy Goods Vehicles (HGV)), gradient, type of road surface, distance from the road and the presence of any obstructions between the road and the receptor.

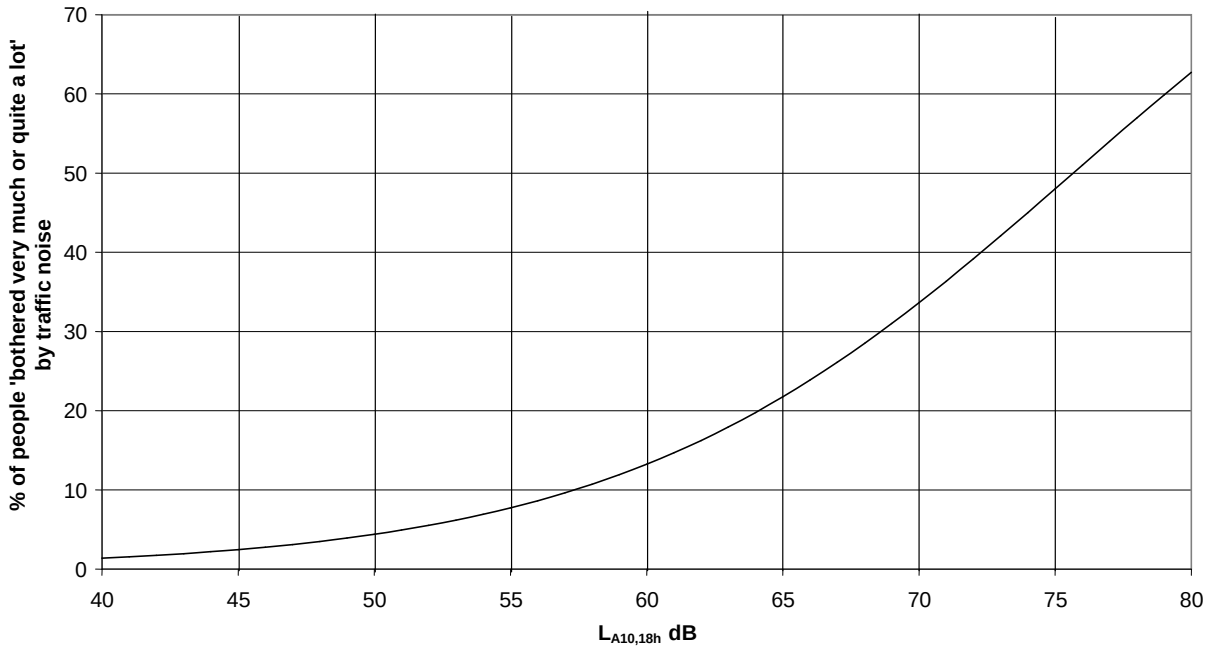
Noise from a stream of traffic is not constant; therefore, to assess the noise impact a single figure estimate of the overall noise level is necessary. The index adopted by the Government in 'The Calculation of Road Traffic Noise' (CRTN) to assess traffic noise is $L_{A10,18h}$. This value is determined by taking the highest 10 % of noise readings in each of the eighteen 1 hour periods between 06:00 and 24:00, and then calculating the arithmetic mean. A reasonably good correlation has been shown to exist between this index and residents' perception of traffic noise over a wide range of exposures.

CRTN provides the standard methodology for predicting the $L_{A10,18h}$ road traffic noise level. Noise levels are predicted at a point 1 m measured horizontally from the external façade of the building.

The DMRB also requires an assessment of night time traffic noise levels ($L_{night,outside}$), however, this parameter is not predicted by the standard CRTN methodology. Three methods of estimating $L_{night,outside}$ are outlined in the DMRB. Method 1 uses individual 1 hour traffic data over the night-time (23:00-07:00), method 2 uses 8 hour average night time traffic, and method 3 estimates the $L_{night,outside}$ from the $L_{A10,18h}$ traffic noise level. The façade level predicted by CRTN must be reduced by 2.5 dB to give the free-field $L_{night,outside}$ level. Method 3 has been used for the purposes of this assessment.

Once the traffic noise level has been predicted it can be used to provide an indication of the likely annoyance to residents caused by traffic noise. Individuals vary widely in their response to the same level of traffic noise. However, the average or community response from a large number of people to the same level of traffic noise is fairly stable; therefore, a community average degree of bother caused by traffic noise can be related to the long-term steady state noise level. The DMRB illustrates the relationship between the steady state traffic noise level and the estimated annoyance experienced, expressed as the percentage of people 'bothered very much or quite a lot' is illustrated in Plate 1 (taken from DMRB). This shows, for example, that approximately 13% of all residents would be 'bothered very much or quite a lot' at a façade road traffic noise level of 60 dB $L_{A10,18h}$.

Plate 1: Estimation of Traffic Noise Annoyance - Steady State



In addition, research has shown that people are more sensitive to abrupt changes in traffic noise, for example following the opening of a new road, than would be predicted from the steady state relationship between traffic noise and nuisance (described above). These effects last for a number of years, however, in the longer term the perceived noise annoyance tends towards the steady state level due to familiarisation. The percentage change in the traffic noise annoyance due to an abrupt change in the traffic noise is illustrated in Plate 2 (taken from DMRB HD 213/11).

Plate 2: Estimation of Traffic Noise Annoyance - Immediate Change in % people 'bothered very much or quite a lot' by traffic noise

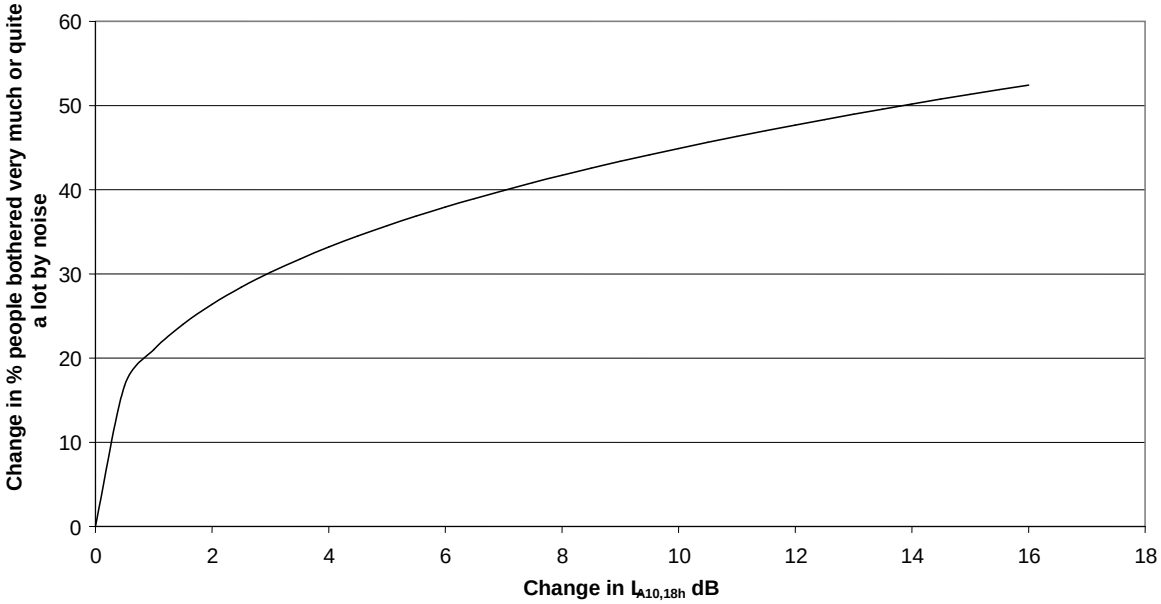


Plate 2 shows, for example, that with an abrupt (and permanent) increase of 10 dB(A) there would be a net change of 45% residents 'bothered very much or quite a lot' by road traffic noise. If the initial noise level was 60 dB $L_{A10,18h}$ (with 13% people already bothered) then there would be a total of 58% bothered immediately after an increase to 70 dB $L_{A10,18h}$. This would eventually diminish in the long term due to familiarisation to become approximately 34% bothered (Plate 1).

The objective of the assessment, as set out in the DMRB, is to gain an overall appreciation of the noise and vibration climate, both with (Do-Something) and without (Do-Minimum) the proposed Scheme. These conditions are assessed for the baseline year (the year of opening) and the future assessment year (15 years after opening). The DMRB outlines the steps to be carried out at the detailed assessment stage:

a) identify the study area, as discussed in section 9.2.4, and predict 18 hour (06:00-00:00) and 8 hour night-time (23:00-07:00) traffic noise levels at all residential properties within 600 m of the proposed Scheme and the existing bypassed section of the A9. Predictions are required for the Do-Minimum and Do-Something scenarios in the year of opening and 15 years after opening. The computer noise modelling software SoundPLAN version 7.3, which implements the CRTN methodology and the estimation of $L_{night,outside}$ levels from $L_{A10,18h}$ levels, has been used to complete the traffic noise predictions. Further technical details of the noise modelling and data sources are provided in Appendix 4A – Noise Appendix.

b) carry out the following comparisons for each property in order to identify the number of properties which undergo an increase or decrease in traffic noise levels and annoyance:

- the Do-Minimum scenario in the baseline year against the Do-Minimum scenario in the future assessment year (long term) (2030 DM - 2015 DM);
- the Do-Minimum scenario in the baseline year against the Do-Something scenario in the baseline year (short term) (2015 DS - 2015 DM); and

- the Do-Minimum scenario in the baseline year against the Do-Something scenario in the future assessment year (long term) (2030 DS – 2015 DM).

For night time traffic noise levels, just the two long term comparisons are required and only properties where the $L_{night,outside}$ level is 55 dB(A) or more in one or more scenarios at one or more facades, need to be considered.

Clearly different façades of the same property can experience different changes in traffic noise level. DMRB requires that each of the above comparisons of traffic noise levels are based on the façade which experiences the worst case change i.e. the largest increase, or, if all facades undergo a decrease, the smallest decrease. Additionally, DMRB requires that the above comparisons of annoyance use the highest levels of annoyance in the first 15 years. For properties which experience an increase in noise due to the proposed scheme, the greatest annoyance is likely to be immediately after opening (Plate 2). For properties which experience a decrease (and also in the Do-Minimum comparison), the greatest annoyance is the steady state level of annoyance in the long term (Plate 1);

c) assess the impact on sensitive receptors, other than residential properties, within the 600 m study area. This is based on 18 hour (06:00-00:00) traffic noise levels and considers the same three comparisons as outlined above for residential properties. Other sensitive receptors considered include hospitals, schools, community facilities (such as places of worship) designated ecological areas (Areas of Outstanding Natural Beauty (AONB), National Parks, Special Areas of Conservation (SAC), Special Protection Areas (SPA) and Site of Special Scientific Interest (SSSI)), heritage sites (Scheduled Monuments - SM) and public rights of way (PRoW);

d) complete a qualitative assessment of sensitive receptors which are within 1 km of the Scheme but more than 600 m from the Scheme and the bypassed section of the A9; and

The DMRB provides two classifications for the magnitude of the noise impact of a road Scheme, as outlined in Tables 9.3 and 9.4. These relate to short term changes in traffic noise levels and long term changes in traffic noise levels.

Table 9.3: Magnitude of Impact in the Short Term

Traffic Noise Change $L_{A10,18h}$ dB	Magnitude of Impact
0	No change
0.1-0.9	Negligible
1.0-2.9	Minor
3.0-4.9	Moderate
5+	Major

Table 9.4: Magnitude of Impact in the Long Term

Traffic Noise Change $L_{A10,18h}$ dB	Magnitude of Impact
0	No change
0.1-2.9	Negligible
3.0-4.9	Minor
5.0-9.9	Moderate
10+	Major

The above classifications are used to describe the magnitude of the operational noise impacts of the Scheme.

Finally, the predicted noise levels at each façade of each property have been used to carry out an initial assessment of the likelihood of any properties qualifying under the Noise Insulation (Scotland) Regulations 1975 (NISR). The NISR grant the power to a Highway Authority to provide noise attenuation measures including secondary glazing and mechanical ventilation to habitable rooms of residential properties affected by road traffic noise from a new or altered highway, such as the realigned A9, which meet the following criteria:

- the combined expected maximum traffic noise level, i.e. the relevant noise level, from the new or altered highway together with other traffic in the vicinity must not be less than the specified noise level, 68 dB $L_{A10,18h}$;
- the relevant noise level is at least 1.0 dB(A) more than the prevailing noise level, i.e. the total traffic noise level existing before the works to construct or improve the highway were begun; and
- the property is within 300m of the new or altered highway or at the end of the Scheme within a triangle extending 50m from the end of the Scheme and 300m from the side of the scheme, and, a straight line can be drawn from the property to the new or altered highway without passing through another building.

The results of the traffic noise impact assessment have been used to determine if any properties within 300 m of the Scheme are likely to meet the criteria. It should be noted that if the Scheme goes ahead a dedicated NISR assessment is required, as a full assessment is beyond the scope of this report. In addition, the NISR specifies a methodology for predicting traffic noise levels which pre-dates CRTN and is therefore similar to, but not identical, to the prediction method used in this assessment.

9.2.6 *Operational Traffic Vibration*

Vibration from traffic can be transmitted through the air or through the ground. Airborne vibration is produced by the engines and exhausts of road vehicles, with dominant frequencies typically in the range 50 - 100 Hz. Ground borne vibration is produced by the interaction of the vehicle tyres and the road surface with dominant frequencies typically in the range 8 - 20 Hz. The passage of vehicles over irregularities in the road surface can be a source of ground borne vibration.

Traffic vibration can potentially have an effect on buildings and cause disturbance to occupiers. DMRB reports that extensive research on a wide range of buildings has found no evidence of traffic induced ground borne vibration being a source of significant damage to buildings. And also, that there is no evidence that exposure to airborne vibration has caused even minor damage.

Airborne vibration is noticed by occupiers more often than ground borne vibration as it may result in detectable vibrations in building elements such as windows and doors.

The DMRB limits the consideration of operational vibration impacts at residential properties to properties within 40 m of a road. Only two properties are located within 40 m of the proposed Scheme, both of which are also within 40 m of the existing A9.

Vibration has not been identified as an issue on the existing A9 through discussions with the Local Authority and observations while on site. The DMRB states that perceptible vibration only occurs in rare cases and identifies that the normal use of a building, such as closing doors and operating domestic appliances can generate similar levels of vibration to that from traffic. Therefore, a quantitative assessment of operational vibration effects, in terms of

annoyance to occupiers or effects at any other receptors, is not considered to be required and has been scoped out.

9.2.7 *Baseline Noise Survey*

The purpose of the baseline noise survey is to provide data on existing ambient noise levels at a selection of receptors close to the Scheme. The data is used in both the construction noise assessment in rating the significance of the construction noise effect, and the operational noise assessment, to check that the noise modelling is performing adequately.

Long term measurements over a 24/48 hour period were undertaken at three locations in proximity to the existing and proposed route of the relevant section of the A9:

- N1 – Shore Cottages. The noise monitoring equipment was located to the rear of the Cottages. This location is in close proximity to the sea and is at a significantly lower elevation than the A9 at its closest approach.
- N2 – The Smithy. The noise monitoring equipment was located to the south of the property facing the A9. This location is only slightly higher than the A9 at its closest approach.
- N3 – The White House. The noise monitoring equipment was located to the south of the property facing towards the proposed new bend in the A9.

Long-term unattended ambient noise measurements were undertaken at Locations N1 to N3 between Monday 16th June and Wednesday 18th June 2014.

Additional short-term (3 hour) measurements were also taken on the 18th June 2014 at one location:

- N4 – The top of the cliff which forms the edge of the East Caithness Cliffs SAC/SPA and Berriedale Cliffs SSSI. The designated ecological site relates to the cliffs themselves, to which access was not possible, therefore the noise meter was located at the top edge of the cliffs. This position is elevated above the A9 at its closest approach.

All noise monitoring locations are illustrated in Figure 9.1 – Noise Location Plan. Details of the instrumentation used during the ambient noise survey are provided in Appendix 4B- Nosie Appendix.

All measurements were taken at approximately 1.5m above ground level, complying with the requirements of British Standard BS 7445. Locations N1, N2 and N4 were located at least 3.5m from any reflecting surface, other than the ground (i.e. free-field). Location N3 was positioned 1m from the façade of the property.

The noise instrumentation was programmed to log various parameters including the L_{Aeq} and L_{A10} values in one hour contiguous intervals at all monitoring locations.

The calibration of the equipment was checked prior to, and after, the monitoring periods - no significant changes (± 0.1 dB) were noted.

Weather conditions were suitable throughout the monitoring with no rain and low wind speeds from a northerly or westerly direction observed on site.

9.2.8 *Assumptions and Limitations*

Only limited information is currently available on the nature and duration of the construction works. No details of specific activities or plant are currently available, which are required to complete a quantitative noise assessment.

The traffic noise predictions are based on the supplied traffic data in terms of the 18 hour annual average weekday traffic (AAWT) and the % HGV. The provided traffic data are based on traffic count data from 2010 which has been factored forward in 5 year bands:

- 2011-2016
- 2016-2021
- 2021-2026; and
- 2026-2031

Therefore, the same data has been used for 2014, the current situation, and 2016 the year of opening. The traffic survey data did not include any information on traffic speeds therefore an estimated speed on the affected section of the A9 of 40 mph has been applied for all scenarios.

With regard to road surfacing, standard hot rolled asphalt (HRA) has been assumed on the A9 for all scenarios.

The operation of the Scheme is not anticipated to change the nature of the traffic on the A9, therefore, the traffic data for the corresponding Do-Minimum and Do-Something scenarios is the same, the only difference is due to the alignment of the road.

During the baseline noise survey traffic management was in place on the bend in the A9 which would be realigned with the Scheme. This section of the A9 was reduced to one lane controlled by temporary traffic lights. This is likely to have affected the speed of traffic on the A9 in the vicinity of the baseline monitoring locations. The implications of this are discussed further in the baseline conditions section below. At the time of the baseline noise monitoring the traffic management measures had been in place for a number of months, and was likely to remain for the foreseeable future. Therefore, it was not possible within the programme to reschedule the baseline survey to avoid the traffic management. It is understood the traffic management was required as a safety measure following an accident involving a HGV on the bend in the A9 to be realigned by the Scheme.

9.3 Baseline Conditions

9.3.1 *Baseline Noise Monitoring Survey*

A summary of the long term measured ambient noise levels is provided in Table 9.5. In addition, the predicted 2014 $L_{A10,18h}$ traffic noise levels at each monitoring location are also provided. The monitoring locations are shown in Figure 9.1- Noise Location Plan. The measured levels are provided for the 12 hour day (07:00 to 19:00), the 4 hour evening (19:00 to 23:00) and the 8 hour night (23:00 to 07:00). In addition, the measured 18 hour L_{A10} level, which is the main parameter for road traffic noise assessments, is also provided

Time histories of the monitoring data at each long term location are provided in Appendix 4B – Noise Appendix. At all the locations the expected diurnal cycle of noise levels, i.e. peaking during the day and falling to a minimum in the early hours of the morning, is observed.

Table 9.5 Summary of Measured Long Term Ambient Noise and Predicted Traffic Noise

Location	Long Term Measured Ambient Noise				Predicted Traffic Noise
	$L_{Aeq,12h}$ dB Day	$L_{Aeq,4h}$ dB Evening	$L_{Aeq,8h}$ dB Night	$L_{A10,18h}$ dB	$L_{A10,18h}$ dB
N1 Shore Cottages	47.4	46.7	45.6	48.2	44.8
N2 The Smithy	53.6	50.8	50.6	54.1	56.0
N3 The White House	52.0	51.0	49.5	53.7	55.3

A summary of the short term attended monitoring at N4 is provided in Table 9.6. As the measurements conformed to the 'shortened measurement procedure' in CRTN the $L_{A10,18h}$ noise level has been estimated from the 3 hour monitoring data. However, it should be noted that in comparison to the long term measurements (completed over a full 18 hour period), the 3 hour measurements are a less reliable indicator of the $L_{A10,18h}$.

Table 9.6: Summary of Measured Short Term Ambient Noise and Predicted Traffic Noise

Location	Measured Average $L_{Aeq,3h}$ dB	Measured Average $L_{A10,1h}$ dB	Calculated from measured $L_{A10,18h}$ dB	Predicted Traffic Noise $L_{A10,18h}$ dB
N4 close to edge of SPA/SAC/SSSI	43.0	43.9	42.9	44.8

As would be expected the highest ambient noise levels were measured at N2 and N3 which are closest to the existing A9. The lowest levels were monitored at N4 which is set back approximately 180 m from the A9. At N2, N3 and N4 traffic noise on the A9 was noted as the dominant noise source; regular bird calls were also noted. At N1 the noise of the sea was noted as the dominant noise source, though traffic on the A9 and birdcalls were also noted.

The measured $L_{A10,18h}$ noise levels at N1 are around 3.5 dB higher than the predicted traffic noise levels. This is due to the dominance of the noise of the sea at this location, which is obviously not included in the traffic noise predictions. At N2, N3 and N4 the measured $L_{A10,18h}$ levels are 1.6 to 1.9 dB lower than the predicted traffic noise levels. This is likely to be due to the influence of the reduced traffic speeds on the A9 during the noise survey.

A perfect correlation between the measured and predicted levels would not be expected as the noise model is based on average traffic data and estimated vehicle speeds. The model cannot incorporate variations in traffic conditions, weather conditions and other local noise sources experienced during the monitoring. A difference in the measured and predicted traffic noise levels of 3 dB or less is generally considered to be a good match. As the model is predicting slightly higher traffic noise levels than measured, at the locations where traffic noise was the dominant source, the model is considered to provide a robust representation of traffic noise levels in the area.

9.3.2 *Future Do-Minimum*

A summary of overall Do-Minimum traffic noise levels and the change from the baseline year to the future assessment year is provided in Table 9.7. A total of 22 properties have been identified within 600 m of the Scheme, and the section of the A9 bypassed by the Scheme.

However, only 1 property: Sunnybrae approximately 400 m to the north of the scheme, meets the DMRB criterion of 55 dB $L_{night,outside}$ at one or more façade in one or more scenarios for inclusion in the night time traffic noise assessment.

Potentially sensitive receptors other than residential properties within 600 m of the Scheme consist of:

- SAC: Berriedale And Langwell Waters;
- SAC/SPA: East Caithness Cliffs/SSSI: Berriedale Cliffs;
- SSSI: Berriedale Water;
- Scheduled Monument: Rinsary, broch and post-medieval farmstead;
- Scheduled Monument: Langwell Castle or Achastle;
- Scheduled Monument: Berriedale Castle;
- Village Hall (Old School House);
- Berriedale Church; and
- One Public Right of Way.

All these receptors are identified on Figure 9.1. At the ecology and heritage receptors the assessment is based on free-field traffic noise levels at the closest approach to the Scheme. As for residential receptors, façade traffic noise levels are used in the assessment of the Village Hall and Berriedale Church. Due to the linear nature of the public right of way, its low sensitivity, and position well away from the Scheme, it has been scoped out of the assessment.

Table 9.8 contains a summary of the change in traffic noise annoyance at residential properties from the baseline year to the future assessment year, as required by the DMRB.

Tables 9.7 and 9.8 are based on the façade at each building which undergoes the worst change in traffic noise level from the 2015 to 2030 Do-Minimum scenarios.

Table 9.7 Long-term Change in Do-Minimum Traffic Noise Levels (2015 DM to 2030 DM)

Change in Traffic Noise Level		Daytime		Night-time
		Number of dwellings	Number of other sensitive receptors	Number of dwellings
Increase in noise level Daytime $L_{A10,18h}$ dB Night-time $L_{night,outside}$ dB	0.1-2.9	22	8	1
	3.0-4.9	0	0	0
	5.0-9.9	0	0	0
	≥10	0	0	0
No Change	0	0	0	0
Decrease in noise level Daytime $L_{A10,18h}$ dB Night-time $L_{night,outside}$ dB	0.1-2.9	0	0	0
	3.0-4.9	0	0	0
	5.0-9.9	0	0	0
	≥10	0	0	0

Table 9.8 Long-term Change in Do-Minimum Traffic Noise Annoyance (2015 DM to 2030 DM)

Change in % Annoyed		Daytime
		Number of dwellings
Increase in Annoyance level	<10%	22
	10<20%	0
	20<30%	0
	30<40%	0
	≥40%	0
No Change	0	0
Decrease in Annoyance level	<10%	0
	10<20%	0
	20<30%	0
	30<40%	0
	≥40%	0

All residential properties and non-residential receptors undergo a negligible increase (0.1-2.9 dB) in daytime traffic noise in the long term from 2015 to 2030 in the absence of the Scheme. This is to be expected as in the absence of the Scheme traffic flows are generally predicted to increase slightly over time. The negligible increase in road traffic noise levels from 2015 to 2030 in the absence of the Scheme, results in a corresponding increase in annoyance due to road traffic noise. All properties fall within the <10% increase in annoyance band.

The change from 2015 to 2030 is presented as a noise contour plot in Figure 9.2 – Long Term Traffic noise Change 2015 Do Minimum to 2030 Do Minimum. The map is based on free-field traffic noise levels at first floor level (4 m above ground) calculated on a 5m x 5m grid. The positions chosen to represent the ecology and heritage receptors are also illustrated on Figure 9.2 – Long Term Traffic noise Change 2015 Do Minimum to 2030 Do Minimum.

9.4 Consultation Responses

The ambient noise climate in the area and the potential noise impacts of the Scheme have been discussed with the Environmental Health Department of The Highland Council. No specific concerns or requirements were raised other than the preference for works to be completed within standard working hours (08:00-18:00 Monday – Friday and 08:00-12:00 on Saturdays).

Scottish Natural Heritage (SNH) has raised the potential impact of disturbance from pile-driving and blasting on nesting birds at the Berriedale Cliffs SSSI and East Caithness Cliffs SAC/SPA, to the south east of the Scheme.

9.5 Predicted Operational Impacts

Table 9.9 summarises the short term change in traffic noise levels in 2015 between the Do-Minimum and Do-Something scenarios at both residential properties and other sensitive receptors within the 600 m study area, see Figure 9.1- Noise Location Plan. Table 9.10 summarises the long term change between the 2015 Do-Minimum and 2030 Do-Something scenarios. Table 9.11 outlines the worst case change in annoyance. All the comparisons are based on the façade experiencing the worst case change in traffic noise levels for that comparison.

Table 9.9 Short-term Change in Do-Something Traffic Noise Levels (2015 DM to 2015 DS)

Change in Traffic Noise Level		Daytime	
		Number of dwellings	Number of other sensitive receptors
Increase in noise level Daytime $L_{A10,18h}$ dB	0.1-0.9	8	4
	1.0-2.9	4	1
	3.0-4.9	0	0
	≥5	0	0
No Change	0	7	1
Decrease in noise level Daytime $L_{A10,18h}$ dB	0.1-0.9	3	2
	1.0-2.9	0	0
	3.0-4.9	0	0
	≥5	0	0

Table 9.10 Long-term Change in Do-Something Traffic Noise Levels (2015 DM to 2030 DS)

Change in Traffic Noise Level		Daytime		Night-time
		Number of dwellings	Number of other sensitive receptors	Number of dwellings
Increase in noise level Daytime $L_{A10,18h}$ dB Night-time $L_{night,outside}$ dB	0.1-2.9	22	7	1
	3.0-4.9	0	1	0
	5.0-9.9	0	0	0
	≥10	0	0	0
No Change	0	0	0	0
Decrease in noise level Daytime $L_{A10,18h}$ dB Night-time $L_{night,outside}$ dB	0.1-2.9	0	0	0
	3.0-4.9	0	0	0
	5.0-9.9	0	0	0
	≥10	0	0	0

Table 9.11 Worst Case Change in Traffic Noise Annoyance

Change in % Annoyed		Daytime
		Number of dwellings
Increase in Annoyance level	<10%	15
	10<20%	3
	20<30%	4
	30<40%	0
	≥40%	0
No Change	0	0
Decrease in Annoyance level	<10%	0
	10<20%	0
	20<30%	0
	30<40%	0
	≥40%	0

The short term change in $L_{A10,18h}$ traffic noise levels in 2015 between the Do-Minimum and Do-Something scenarios is illustrated in Figure 9.3 – Short Term Traffic Noise Change 2015 Do Minimum to 2015 Do Something. Figure 9.4 – Long Term Traffic Noise Change 2015 Do minimum to 2030 Do Something, illustrates the long term change between the 2015 Do-Minimum and 2030 Do-Something scenarios. The maps are based on free-field traffic noise levels at first floor level (4 m above ground) calculated on a 5m x 5m grid. The position chosen to represent the ecology and heritage receptors is also illustrated. As would be expected, the relocation of the A9 to the east generally results in an increase in a traffic noise levels to the east and a reduction to the west.

A negligible (0.1–0.9 dB) increase in traffic noise levels is predicted at the church, Village Hall, Berriedale Castle Scheduled Monument and Berriedale Water SSSI, in the short term. No change in the short term is predicted at Langwell Castle/ Achastle Scheduled Monument and a negligible decrease in the short term at Berriedale and Langwell Waters SAC and the Rinsary, broch and post-medieval farmstead Scheduled Monument. A minor (1.0-2.9 dB) increase in the short term is predicted at a very small area of the East Caithness Cliffs SAC/SPA and Berriedale Cliffs SSSI, the majority of the SAC/SPA/SSSI is predicted to experience a negligible increase. It should be noted that the absolute predicted noise levels on the cliffs both with and without the scheme, are very low, less than 40 dB, $L_{A10,18h}$ at the selected position. Based on the noise monitoring at Shore Cottages (N1) actual ambient noise levels at the cliffs are likely to be a little higher due to the contribution from noise from the sea. Therefore, the change in ambient noise levels in the short term due to the Scheme is likely to be rather less than illustrated by the change in traffic noise levels alone.

In the long term the majority of non-residential receptors are predicted to experience a negligible increase in traffic noise, only the East Caithness Cliffs SAC/SPA and Berriedale Cliffs SSSI is predicted to experience a minor increase at a very small area of the SAC/SPA/SSSI. Although as detailed above the actual increase in ambient noise levels is likely to be rather less due to the influence of noise from the sea at the cliffs.

The significance of the effect of the Scheme on all non-residential receptors is classed as neutral, except for the East Caithness Cliffs SAC/SPA/ Berriedale Cliffs SSSI where the effect is classed as slight adverse.

At sensitive receptors located beyond the 600 m quantitative study area but within the overall 1 km area, the significance of the effect of the Scheme is considered to be neutral in the short term and long term.

In the short term, 8 of the 22 identified residential properties are predicted to experience a negligible (0.1 - 0.9 dB) increase in traffic noise and four a minor (1.0-2.9 dB) increase. At The White House, the closest property to the scheme, a negligible increase is predicted at the south façade facing the scheme. A negligible decrease is predicted at the façade facing the A9 as the alignment of the A9 is shifted slightly further away from the property.

The four properties predicted to experience a minor increase in the short term are the four Shore Cottages. Based on the noise monitoring results from N1 actual ambient noise levels at the cottages are likely to be a little higher due to the contribution from noise from the sea. Therefore, the change in ambient noise levels in the short term due to the Scheme is likely to be rather less than illustrated by the change in traffic noise levels alone.

Seven properties are predicted to undergo no change in traffic noise levels in the short term and three a negligible (0.1-0.9 dB) decrease.

In the long term, all 22 identified residential properties are predicted to experience a negligible (0.1 - 2.9 dB) increase in traffic noise levels.

As for the Do-Minimum comparison, at the single property which falls into the night time traffic noise assessment a negligible (0.1 - 2.9 dB) increase in night time traffic noise levels is predicted in the long term with the Scheme in operation.

The magnitude of the change in road traffic noise levels in both the short and long term results in a corresponding increase in annoyance due to road traffic noise. Based on the worst case change in annoyance (short or long term), the majority of properties fall into the <10% increase band, the four Shore Cottages properties fall into the 20-30% increase band.

The worst case significance of the effect of the Scheme on residential receptors is classed as slight adverse in both the short term and long term.

A full list of the $L_{A10,18h}$ traffic noise results for all scenarios at all facades of the 22 identified residential properties and all the non-residential receptors in the 600 m study area is provided in Appendix 4C – Noise Appendix .

The results of the preliminary Noise Insulation (Scotland) Regulations assessment indicate no properties are likely to meet the criteria. However, as outlined in section 9.2.5, a dedicated NISR assessment will be required once the design is finalised, if the Scheme goes ahead.

9.6 Mitigation

9.6.1 *Construction Noise & Vibration*

A range of good site practices should be adopted by the contractor in order to mitigate construction phase noise. It is assumed that the contractor will follow best practicable means to reduce the noise impact on the local community, including:

- fixed and semi-fixed ancillary plant such as generators, compressors etc. which can be located away from receptors to be positioned so as to cause minimum noise disturbance. If necessary, acoustic barriers or enclosures to be provided for specific items of fixed plant;
- all plant used on site will comply with the EC Directive on Noise Emissions for Outdoor Equipment (2000/14/EC), where applicable;
- selection of inherently quiet plant where appropriate. All major compressors to be 'sound reduced' models fitted with properly lined and sealed acoustic covers which are kept closed whenever the machines are in use, and all ancillary pneumatic percussive tools to be fitted with mufflers or silencers of the type recommended by the manufacturers;
- all plant used on site will be regularly maintained, paying particular attention to the integrity of silencers and acoustic enclosures;
- machines in intermittent use to be shut down in the intervening periods between work or throttled down to a minimum;
- drop heights of materials from lorries and other plant will be kept to a minimum;
- adherence to the codes of practice for construction working and piling given in British Standard BS 5228 and the guidance given therein for minimising noise emissions from the site; and
- local residents will be kept informed and provided with a contact name and number for any queries or complaints.

The residential properties Strathview and The White House are located within approximately 10 m of the closest approach of the works. However, the works in this location to slightly realign the existing road past the properties are very minor in nature and will be completed

quickly, within approximately 4 weeks. The use of localised temporary noise barriers/site hoarding at the boundary of these works and the properties has been considered but is not practical at this location as it would reduce visibility and pose a safety hazard.

The need for additional mitigation at other locations will be reviewed once a contractor is appointed and detailed information available.

The Highland Council recommend construction working hours are limited to 08:00-18:00 on weekdays and 08:00-12:00 on Saturdays, with no working on Sundays and Bank Holidays. No works outside of these hours are currently anticipated.

With regards to SNH's concerns over the potential impact of disturbance from pile-driving and blasting on nesting birds at the East Caithness Cliffs SPA/SAC and Berriedale Cliffs SSSI to the south east of the Scheme, it is understood that the potential for significant effects is limited to specific months of the year (March to July). The total duration of the works is estimated as 12 months, blasting to create the route of the new section of road would be required for a short period of time within the overall works. It is anticipated that blasting could be restricted to the months August to February which are not sensitive in terms of nesting birds.

With regards to piling a bored piling method is proposed, if required, rather than driven impact piling, therefore minimising the potential for disturbance to both nesting birds and nearby residents.

Planning Advice Note (PAN) 50 'Controlling the environmental effects of surface mineral workings' outlines a range of general good practice measures with regard to blasting including:

- completion of face surveys;
- blast design, including the size of maximum instantaneous charges and detonating sequence, to minimise environmental effects;
- checking the setting out of holes and recording of any deviations;
- revising the design, if necessary;
- using correct stemming; and
- monitoring the blast to provide feed-back for future blast designs.

Specifically to limit ground vibration:

- minimise maximum instantaneous charges e.g. by using decked charges.

Specifically to minimise overpressure:

- avoid the use of surface detonating cord and secondary blasting where possible;
- minimise the area of heave and the total charge; and
- avoid blasting in adverse weather conditions when feasible, especially when the wind is towards sensitive premises and there is low cloud.

The contractor will carry out measurements of vibration at a selection of the closest properties to the works resulting from one or more trial blasts. The results of these trial blasts can then be used to determine the maximum instantaneous charge of the explosive which is likely to result in satisfactory magnitudes of vibration, in accordance with the methodology in BS 6472-2:2008. Ongoing monitoring of vibration throughout the blasting works is proposed.

9.6.2 *Operational Traffic Noise*

Noise mitigation is incorporated into the design of the Scheme in terms of the 3d alignment of the A9, which minimises the propagation of traffic noise towards the closest property: The White House.

Based on the worst case 'slight' significance of effect, no additional mitigation is considered to be required.

9.7 Disruption due to Construction

Construction works will involve standard site clearance, earthworks and road construction works. In addition, some blasting will be required to create the route for the new section of road. Piling works to reinforce the slope between chainage 75 and 100 may be required, though this is dependent on the outcome of the ground investigation works. The total duration of construction works is estimated at 12 months.

During construction, with the exception of blasting, potentially significant effects are likely to be limited to the closest receptors to the works i.e. individual residential properties: The White House and Strathview which are within approximately 10 m of the closest works; and properties on the edge of Berriedale village such as The Smithy, approximately 85 m from the works, and Shore Cottages, approximately 60 m from the works. Based on the available information, the magnitude of the impact of construction noise from standard construction works is classed as moderate at the closest affected residential properties, resulting in the potential for adverse effects of moderate significance.

Due to the distance between the potential area of piling and the closest residential properties of over 50 m, vibration impacts from piling are not anticipated. As detailed in the mitigation section, if piling is required, mitigation (in terms of the method of piling) will be implemented to minimise the generation of ground borne vibration. The magnitude of the potential impact of vibration from piling works is classed as no change, and the significance of the effect neutral.

Some blasting to create the route of the new section of road will be required. Blasting can result in impacts in terms of air overpressure (including audible noise) and ground borne vibration.

Whenever blasting is carried out, energy is transmitted from the blast site in the form of airborne pressure waves. These pressure waves comprise energy over a wide range of frequencies, some of which are higher than 20 Hz and therefore perceptible as audible noise, whereas the majority are below 20 Hz and hence inaudible, but can be sensed as concussion. It is the combination of the noise and concussion that is known as air overpressure.

Vibration from a blast is transmitted directly through the ground and is therefore dependent on the specific local geology. In addition, air overpressure can generate secondary vibrations at an audible frequency within buildings (such as rattling windows) and it is usually this effect which gives rise to comment from occupants.

Meteorological conditions such as temperature, cloud cover, humidity, wind speed, turbulence and direction all affect the intensity of air overpressure at a specific location. Due to the uncertainties with meteorological conditions it is not accepted practice to set specific limits for air overpressure. Instead the focus is on best practice measures to minimise its generation at source.

BS 6472:2:2008 states that there is no known evidence of structural damage occurring in the United Kingdom as a result of air overpressure levels from blasting associated with mineral extraction. The highest levels normally measured in the United Kingdom are generally less than 1% of the levels known to cause structural damage.

PAN 50 advises that a person will generally become aware of blast induced vibration at levels of around 1.5 mms^{-1}, although under some circumstances this can be as low as 0.5 mms^{-1}. Even though such vibration is routinely generated within any property and is also entirely safe, when it is induced by blasting activities it is not unusual for such a level to give rise to subjective concern. Such concern is also frequently the result of the recent discovery of cracked plaster or brickwork that in fact has either been present for some time, or has occurred due to natural processes and unrelated to blast induced vibration.

BS 6472-2:2008 gives maximum satisfactory magnitudes of vibration with respect to human response. Satisfactory magnitudes for up to three blasts a day are given as peak particle velocity (ppv) levels of 6 to 10 mms^{-1} at a 90% confidence level, as measured outside of a building on a well-founded hard surface as close to the building as possible. As detailed in the mitigation section the contractor will carry out measurements of vibration at a selection of the closest properties to the works resulting from one or more trial blasts. The results of these trial blasts can then be used to determine the maximum instantaneous charge of the explosive which is likely to result in satisfactory magnitudes of vibration, in accordance with the methodology in BS 6472-2:2008. Ongoing monitoring of vibration throughout the blasting works is proposed.

Assuming good blast design and compliance with the guidance in PAN50 and BS 6472-2:2008, the magnitude of the impact of blasting on nearby residential properties is classed as moderate, therefore the significance of the adverse effect is also moderate. The magnitude of the impact of blasting on East Caithness Cliffs SPA/SAC and Berriedale Cliffs SSSI is 'no change' as mitigation in terms of the timing of the works will be implemented. The significance of the effect is therefore classed as neutral.

An estimate of the volume of material required to be removed from site has been made as 60,000 m^3.(considering a worst case scenario that no material is re-used on site) In terms of numbers of trucks required this has been estimated as 30 return truck journeys per day for 200 days, travelling along the A9 from Berriedale towards Wick. This would be expected to results in a negligible increase (0.1-0.9 dB) in traffic noise at receptors along the A9. The significance of the effect of construction traffic at receptors such as residential properties is classed as slight adverse.

9.8 Residual Impacts

9.8.1 *Construction Noise & Vibration*

With regard to standard construction works, the use of best practice noise and vibration control measures, the choice of rotary bored piling, complying with the Council's standard working hours and keeping residents informed, are all assumed within the assessment. The need for additional mitigation at other locations will be reviewed once a contractor is appointed and detailed information available. The magnitude of the impacts and significance of the effects therefore remain unchanged from that detailed in section 9.7.

With regard to blasting, impacts on East Caithness Cliffs SPA/SAC and Berriedale Cliffs SSSI are avoided through the timing of the works. Best practice measures control measures are assumed within the assessment to minimise the impact at residential properties. The magnitude of the impact and significance of the effect therefore remain unchanged from that detailed in section 9.7.

With regards to construction traffic no additional mitigation is feasible. Therefore, the magnitude of the impact and significance of the effect remain unchanged from that detailed in section 9.7.

9.8.2 *Operational Traffic Noise*

No additional mitigation measures are proposed in addition to those incorporated into the 3d design of the Scheme. The magnitude of the impacts and significance of the effects therefore remain unchanged from that detailed in section 9.5.

9.9 Summary

The proposed Scheme will result in both temporary noise impacts during the construction works and permanent noise impacts due to the operation of the scheme. In addition, blasting works required during the construction will result in temporary air overpressure and vibration impacts.

With regard to standard construction works the potential for significant adverse construction noise effects is likely to be limited to the closest properties to the works, in particular The White House and Strathview. A range of best practice measures are proposed, the need for specific additional mitigation will be reviewed once a contractor is appointed and detailed information available. Based on the currently available information, the magnitude of the impact of construction noise from standard construction works is classed as moderate at the closest affected residential properties, resulting in the potential for adverse effects of moderate significance.

Piling may be required at a specific section of the Scheme, depending on the results of the ground investigation works. If piling is required a rotary bored method of piling is proposed, instead of driven impact piling, to minimise the generation of vibration and impact noise. Therefore, based on the distance to residential properties no vibration impacts due to piling are anticipated. The significance of the effect is classed as neutral.

Blasting will result in air overpressure and/or vibration impacts at residential properties in the vicinity. Assuming good blast design and compliance with the guidance in PAN50 and BS 6472-2:2008, the magnitude of the impact of blasting on nearby residential properties is classed as moderate, therefore the significance of the adverse effect is also moderate. Impacts at the East Caithness Cliffs SPA/SAC and Berriedale Cliffs SSSI are avoided through the timing of the works.

In the absence of the Scheme, road traffic noise levels in the 600 m study area increase slightly from the baseline year 2015 to the future assessment year of 2030 due to the general increase in traffic flows over time.

With the Scheme in place, in the long term, all the identified residential properties within 600 m undergo an increase in daytime traffic noise levels of negligible magnitude and therefore of slight significance. A negligible increase in traffic noise levels in the long term is also predicted at all the identified non-residential receptors, except for the East Caithness Cliffs SPA/SAC and Berriedale Cliffs SSSI, where a small area is predicted to experience a minor increase. The vast majority of the SPA/SAC/SSSI is predicted to experience a negligible increase. The actual increase in ambient noise levels at the cliffs is likely to be rather less due to the influence of noise from the sea. The significance of the effect of changes in operational traffic noise on the East Caithness Cliffs SPA/SAC and Berriedale Cliffs SSSI is classed as slight.

9.10 References

- British Standard Institute BS 5228:2009+A1:2014: (2014) 'Noise and Vibration control on construction and open sites'
- British Standard Institute BS 6472-2: (2008) 'Guide to evaluation of human exposure to vibration in buildings Part 2: Blast-induced vibration'
- British Standard Institute BS 7445: (2003) 'Description and measurement of environmental noise'
- Department of Transport and the Welsh Office (1998) Calculation of Road Traffic Noise
- Highways Agency (2011) Design Manual for Roads and Bridges (DMRB) Volume 11 Part 7 HD213/11 Revision 1
- Land Compensation (Scotland) Act (1973) Chapter 56.
- The Noise Insulation (Scotland) Regulations (1975), Statutory Instrument No. 460 (S.60)
- The Scottish Government (1996) PAN 50: Controlling the Environmental Effects of Surface Mineral Workings
- The Scottish Government (2000) PAN 50 Annex D: The Control of Blasting at Surface Mineral Workings
- The Scottish Government (2011) Planning and Noise (PAN) 1/2011
- The Scottish Government (2011) Technical Advice Note Assessment of Noise

10 MATERIALS

10.1 Introduction

The Highways Agency (HA) is currently modernising Volume 11 (Environmental Assessment) of the Design Manual for Roads and Bridges (DMRB). The Aims and Objectives of Environmental Assessment (DMRB, Vol.11, Part1: HA 200/08) identifies in Table 1.1 the Environmental Impact Assessment Topics. One of the topics identified here is Materials for which no previous guidance has been available. The consideration of the effects of the A9 Berriedale Braes scheme on Materials has been undertaken with reference to Draft Guidance published for Materials - DMRB Volume 11 – Environmental Assessment – Section 3, Part 6 (HD 212/11).

This assessment applies the guidance to the scheme currently being considered for the A9 Berriedale Braes Improvement and identifies the likely materials required and waste generated.

10.1.1 *Context and Rationale*

A significant proportion of the environmental impact of construction arises from the use of resources – principally energy, water and materials. Using materials more efficiently (called 'material resource efficiency') is a highly effective sustainability strategy and involves a balanced approach, ensuring that at each stage in construction (which includes demolition) materials are used in an efficient manner. Implementing materials resource efficiency at the design stage is commonly referred to as 'Designing out Waste'.

Resource efficiency requires an assessment of both material selection and waste management, for example effective ordering of materials to meet exact need, reusing materials generated onsite and recycling and excess materials generated (on or off site) all result in material resource efficiency. The diagram below shows some examples of how material resource efficiency can be approached.

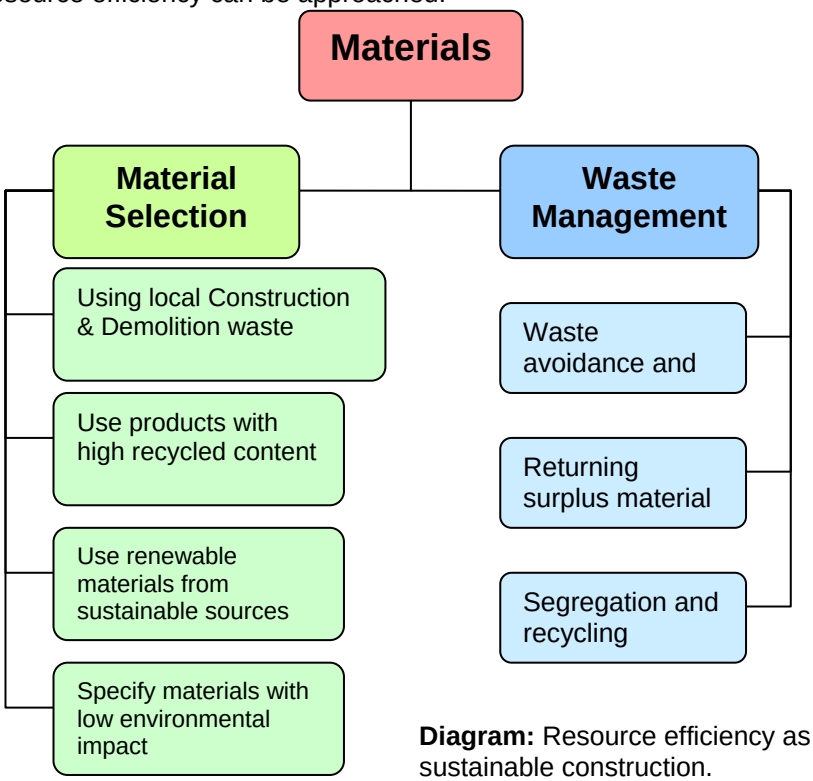


Diagram: Resource efficiency as part of sustainable construction.

Major improvements in materials resource efficiency are possible and can lead to cost savings by:

- Reducing the amount of materials used;
- Reducing the quantity of materials being sent to landfill during the construction process by Designing out Waste and by effective waste management;
- Reusing, recycling and recovering waste materials wherever feasible; and
- Utilising more recycled materials and mainstream products containing high levels of recycled material.

Drivers to Reduce Waste

The Waste Hierarchy is defined in the Article 4 of the Revised Waste Framework Directive (2008/98/EC), which states: The following waste hierarchy shall apply as a priority order in waste prevention and management legislation and policy:

a) prevention;

b) preparing for re-use;

c) recycling;

d) other recovery, e.g. energy recovery, and;

e) disposal.

The efficient use of materials reduces the quantity of materials required in the first instance, lowers the material purchasing costs, minimises waste and eliminates the need for subsequent handling and disposal costs. Developing a strategy to reduce waste is one of the most effective ways to address waste in construction. Once effective waste reduction measures are in place, it is then necessary to also consider how to reuse, recycle, recover or finally dispose of waste in a structured way.

Scheme Objectives

The Scheme Objectives are detailed in Chapter 1 of this Environmental Report. The most pertinent objective with regards to this assessment is the last objective to improve the sustainability in design and construction and this assessment seeks to ensure this is addressed from an early stage in the scheme design.

10.2 Approach & Methods

10.2.1 *Level of assessment*

The construction of the Scheme will necessitate the consumption of materials and will also generate waste. This assessment will seek to identify and mitigate the environmental impacts associated with material demand and waste generation by assessing materials resources required for the Scheme and by developing strategies to reduce waste.

The guidance identifies two levels of assessment which may be undertaken, a simple assessment or a detailed assessment.

The purpose of the simple assessment is to assemble data and information that is readily available to come to a better understanding of the likely environmental effects of the project. ‘The outcomes should inform the final design or contribute to reaching an understanding of the likely environmental effects which identify the need for detailed assessment. It will need an

appreciation of the proposed project, including an appreciation of the materials required and the construction methods to be employed where this information is available' (Draft Guidance DMRB Vol. 11, Section 3, Part 6 (HD 212/11) paragraph 4.27).

'A detailed assessment should be applied where there is the potential for the use and consumption of materials and the production and management of waste to cause significant environmental effects and where the extent of these can be quantified after the simple assessment' (Draft Guidance DMRB Vol. 11, Section 3, Part 6 (HD 212/11) paragraph 4.40).

Furthermore a detailed assessment is based on quantifying the magnitude of change associated with a project's material requirements in absolute terms. 'The magnitude of the environmental impact is assigned through the use of a proxy in the shape of the embodied carbon emissions associated with specific material or construction products. This provides a mechanism to normalise the magnitude of the use and consumption of materials to permit the comparison of different materials and also between different scheme options where different materials might be required. As well as quantifying the magnitude of change, the detailed assessment provides a measure of the scale of the magnitude of change. The magnitude of the impact, and hence the scale can be ranked without regard to the value of a resource/receptor' (Draft Guidance DMRB Vol. 11, Section 3, Part 6 (HD 212/11) paragraph 4.42).

Transport Scotland has developed a Carbon Management System (CMS) Project Tool which can be used to estimate greenhouse gas (GHG) emissions associated with major road projects. This tool was made available to the project team at the start of this assessment and as such it was agreed that a detailed assessment, to quantify materials and waste impacts associated with the scheme, would be appropriate at this stage given the level of information available for the project and also the availability of the CMS tool.

The methodology used to assess both materials and waste is sourced from the Draft Materials DMRB guidance for a detailed assessment.

10.2.2 *Baseline*

The baseline will identify any relevant legislative and policy drivers. A context for treatment of Construction and Demolition waste both nationally and regionally will be acknowledged along with existing waste management infrastructure within the locale.

Project and baseline data will be assembled to come to a better understanding of the likely environmental impacts of the Scheme. Information will be gathered on:

- Description of the site and type of scheme;
- Information about construction methods and techniques (where this is available at the time of assessment);
- Statutory requirements, such as the need for a Site Waste Management Plan and other regulatory requirements;
- High Level policy and strategy targets influencing materials use and waste management; and
- Data on material resource use and waste.
- Assessment of available waste management infrastructure including:
  - Types of waste management facilities, including landfill sites, materials recovery facilities, transfer stations and locations relative to the site.

10.2.3 ***Materials Resource Assessment***

In order to assess the material resource consumption of this project it is necessary to first identify all the construction elements required. This will provide a framework for the assessment. Volume 1 of the Manual of Contract Documents for Highway Works (MCHW) - Specification for Highway Works (SHW) contains the material specifications required in all components of the construction, improvement or maintenance of the Trunk Road network and has been drawn upon for this assessment. Transport Scotland's carbon management system (CMS) assesses the carbon emissions associated with construction of a road scheme using a framework aligned to the SHW series, and it provides a range of different SHW certified materials and techniques for each specific construction component.

The first step in assessing material resource use requires the identification of all the likely materials required, along with an estimated quantity for each of the options. By utilising the CMS to quantify carbon emissions for the various elements of the scheme, this also provides the opportunity to quantify the material resource efficiency by using carbon emissions as a proxy. The carbon impacts will also be determined for using potential sourcing distances, which range from 900km to on-site from the scheme and are dependent upon the type of material required.

Population of the CMS provides a systematic approach to ensure that all facets of the design are considered during the assessment. Furthermore, by applying the CMS to the project it is possible to screen which components of the design are likely to cause the greatest carbon emissions in terms of their material resource and to estimate this quantitatively.

It is necessary to estimate both the quantity of materials required and the likely embedded carbon impacts to provide evidence of the greatest potential impacts as the carbon footprint on its own is not a sufficient indicator. For example, the material need for one element of the project may be large in quantity but result in minimal carbon impacts and vice versa a material need may be small in quantity but by its composition may have large carbon impacts.

The scale of the magnitude of impact for materials is ranked according to scale summarised in the Table10.1 below (sourced from DMRB Draft Guidance HD 212/11):

Table 10.1: Scale of impact magnitude

Scale of impact magnitude	Total CO_2e of materials (tonnes)
No change	<1,000
Negligible	1,000 – 5,000
Minor	5,000 – 20,000
Moderate	20,000 – 40,000
Major	> 40,000

10.2.4 ***Waste Assessment***

In order to provide a meaningful assessment of waste it is necessary to identify and estimate all the likely wastes arising as a result of the scheme, these will be estimated for site clearance and excavation as well as surplus construction waste.

The assessment will also consider potential for onsite reuse to meet material need for the scheme. The cut and fill balance will also be assessed and the potential for reuse of materials on site estimated.

Identification will then be made of all likely wastes arising that cannot be reused on site along with an indication of the available waste infrastructure in the local area.

The methodology for the waste element of the materials assessment determines the sensitivity of identified receptors using the following terminology (sourced from DMRB Draft Guidance HD 212/11):

Table 10.2 - Sensitivity of receptor(s)

Very High	There is no available waste management capacity for any waste arising from the project.
High	There is limited waste management capacity in relation to the forecast waste arising from the project.
Medium	There is adequate waste management capacity for the majority of wastes arising from the project.
Low	There is adequate available waste management capacity for all wastes arising from the project.

The nature and characteristic of the impact is established and described to enable the magnitude of impacts to be determined. The impact is quantified where possible and the known characteristics are clearly stated. Magnitude of impact is recorded against the following scale (sourced from DMRB Draft Guidance HD 212/11):

Table 10.3 - Magnitude of impact

Major	Waste is predominantly disposed of to landfill or to incineration without energy recovery with little or no prior segregation.
Moderate	Wastes are predominantly disposed of to incineration with energy recovery.
Minor	Wastes are predominantly segregated and sent for composting, recycling or for further segregation and sorting at a materials recovery facility.
Negligible	Wastes are predominantly re-used on site or at an appropriately licensed or registered exempt site elsewhere.

The nature of each impact is classified as being:

- Adverse – Detrimental or negative impact to an environmental resource or receptor; or
- Beneficial – Advantageous or positive impact to an environmental resource or receptor.

The assessment of significance is based on the characteristics of the impact and the sensitivity of the receptor. By establishing the sensitivity / value of the receptor and the magnitude / nature of the impact Table 10.4 below (sourced from DMRB Draft Guidance HD 212/11) is used to determine the significance level of the environmental effect.

Table 10.4 - Matrix for Determination of Significance/Level of Impact of waste effects

Magnitude of Impact	**Sensitivity of Receptor**				
	Very High	**High**	**Medium**	**Low**	**Negligible**
Major	**Very Large**	**Large or Very Large**	**Moderate or Large**	Slight or Moderate	Slight
Moderate	**Large or Very Large**	**Moderate or Large**	Moderate	Slight	Neutral or Slight
Minor	**Moderate or Large**	Slight or Moderate	Slight	Neutral or Slight	Neutral or Slight

Magnitude of Impact	Sensitivity of Receptor				
	Very High	**High**	**Medium**	**Low**	**Negligible**
Negligible	Slight	Slight	Neutral or Slight	Neutral or Slight	Neutral
No Change	Neutral	Neutral	Neutral	Neutral	Neutral

10.2.5 ***Mitigation***

Mitigation measures will be proposed in the form of measures to minimise the impacts associated with the need and use of materials and also for waste generation.

10.3 Consultation

A copy of all consultation relating to the scheme can be found in Appendix 1 – Copy of Consultation Responses.

With reference to materials, SEPA requested that the amount of aggregate required for construction be assessed. Specifically this report includes an estimate of the construction material required for the Scheme by information on where this material will be sourced from (e.g. won from the site, new borrow pit on site or elsewhere, use of existing quarry) and likely environmental implications.

10.4 Baseline Conditions

In order to provide a context for the scheme, it is necessary to establish the baseline policy and legislative drivers which might influence the assessment. In addition, the local waste infrastructure will be identified and the existing capacity to deal with the likely waste arisings from the scheme. Due to the relatively small size of this scheme, this baseline does not include the current waste arisings from the operation of the road which are considered to be negligible.

10.4.1 ***Construction methods and techniques***

The construction of the scheme will consist of several stages which will be programmed to ensure disruption is kept to a minimum. The proposed stages are as follows;

- • Site setup and site clearance;
- • Construction of offline works, where possible
- • Construction of online tie-in works
- • Finishing Works

The works will require the disposal of materials off site. The works will also require the importation of construction materials.

It is expected that most of the waste generated on site will be Construction and Demolition (C&D) waste and further information is provided on the classification in Section 10.4.4.

10.4.2 ***Description of the site and type of scheme***

For details of the proposed Scheme, refer to Chapter 2 –The Proposed Scheme

10.4.3 ***Policy Drivers / Regulatory Framework***

The following sections summarise the policy and legal framework for the sustainable use of resources. This is provided as baseline information, and no assessment is provided against the policy framework as the drivers detailed below support the production of this assessment and its aspiration to reduce the environmental impacts associated with material resource use and waste generation.

Climate Change (Scotland) Act

In 2009 the Climate Change (Scotland) Act was passed through Parliament. The Act is key commitment of the Scottish Government to address climate change by reducing greenhouse gas emissions and transitioning to a low carbon economy. Part 1 of the Act, creates the statutory framework for greenhouse gas emissions reductions in Scotland by setting an interim 42 per cent reduction target for 2020, with the power for this to be varied based on expert advice, and an 80 per cent reduction target for 2050.

Part 4 of the Act places duties on public bodies relating to climate change These duties require that a public body must, in exercising its functions, act in the way best calculated to contribute to the delivery of emissions reduction targets (known as 'mitigation'), in the way best calculated to help deliver any statutory climate change adaptation programme, and in a way that it considers is most sustainable.

The Low Carbon Economic Strategy

In addition, the Scottish Government produced a flagship set of publications on climate change, energy and the low carbon economy which aims to support this transition and describe the benefits and opportunities of building a low carbon Scotland. In particular, 'The Low Carbon Economic Strategy' (November 2010) sets the policy direction for low carbon economic opportunities, and aims to strengthen business confidence in exploiting those opportunities. This document makes reference to Transport Scotland's CMS tool and the benefits of using the tool to in order to manage and incentivise consistent, sustained and long-term carbon reductions throughout the transport delivery cycle. Sustainable Procurement is also addressed in the Low Carbon Economic Strategy recognising that Transport Scotland is a major procurer of goods and services. To address this, The Scottish Sustainable Procurement Action Plan was launched in October 2009.

Scotland's Zero Waste Plan

Scotland's Zero Waste Plan (2010) outlines a vision for a zero waste society where all types of waste are dealt with regardless of where they come from. The plan sets out several objectives which include:

- Eliminating the unnecessary use of raw materials. This leads to further reductions in Greenhouse Gas Emissions in areas such as mining of raw materials, manufacturing and transport. There are also financial savings; and
- Producing energy savings from making products from recycled materials, rather than from virgin materials.

The Plan considers C&D waste and outlines ways in which future policy can be developed to support higher targets in recycling and recovery levels in this area.

Transport Scotland Corporate Plan (2012-2015)

- The Scottish Government aims to lead the way in tackling climate change. The Government's Economic Strategy includes sustainability targets to reduce greenhouse gas emissions over the period to 2015 and to reduce emissions by 80 per cent by

2050. Transport Scotland through its management of Scotland's road and rail networks can make significant positive contributions to the Government's targets to mitigate climate change and to promote both economic growth and environmental quality and responsibility.

- The Corporate Plan sets out the role of Transport Scotland for the period between 2012 and 2015, as it helps to deliver increased sustainable economic growth, set in the context of the Government Economic Strategy's six strategic priorities which are critical to economic growth. Transport Scotland will continue its efforts to deliver a single integrated focus for developing national transport projects and policies, and the low carbon economy.
- The Corporate Plan period 2012 to 2015 makes commitments, which are relevant to this Materials Assessment, to;
  - 'Fully integrate our Carbon Management System (CMS) to influence and support low carbon decision-making across the design and delivery of transport infrastructure projects and network maintenance
  - Utilise our CMS - in tandem with our Carbon Management Plan - to facilitate annual sustainability reporting
  - Embed resource efficiency into our practices and adopt the next generation of Waste & Resources Action Programme (WRAP) Construction Commitments; and
  - Support sustainable design, construction, maintenance and operations through the adoption of infrastructure assessment schemes'

Highland-wide Local Development Plan (HWLDP) and the Highland Council Waste Management Strategy (HCWMS)

As the project falls within the Highland's local authority area, The Highland Council has responsibility for management and disposal of waste.

The HWLDP and HCWMS both acknowledge the important role that the planning system has in the delivery of a waste management network capable of processing waste arising from all sectors including construction and demolition.

The HWLDP also indicates that the Council are signed up to the Zero Waste Plan which sets a target of 70% recycling by 2025 for all waste arising in Scotland, restrictions on inputs to energy from waste plants, as well as progressive bans on the types of materials permitted for landfill. The waste plan also sets targets, using the waste hierarchy of prevention, reduction, recycling, other recovery (e.g. energy recovery) and finally disposal, which is endorsed by the HWLDP.

Legislation

There is a range of legislation that is applicable to the management of waste from European Directives through to a national Acts and Regulations. This includes but is not limited to the following:

- Directive on Waste (2008/98/EC) - Known as the Waste Framework Directive (WFD), the Directive establishes a framework for the management of waste across the European Community. It requires Member States to give priority to waste prevention and encourage reuse and recovery of waste.
- Environmental Protection Act 1990, Part II - This Act provides the basis for licensing controls and other provisions aimed at ensuring that waste handling, disposal and recovery options do not harm the environment

- Environmental Protection (Duty of Care) Regulations 1991, as amended - These regulations impose a duty of care on anyone who imports, produces, carries, keeps, treats or disposes of controlled waste to ensure it is not unauthorised or harmfully deposited, treated or disposed of; and if transferred, is only given to an authorised person.
- Landfill (Scotland) Regulations 2003 - The Landfill (Scotland) Regulations transposes the requirements of the Landfill Directive (Council Directive 1999/31/EC), which aims to prevent, or to reduce as far as possible, the negative environmental effects of landfill.
- Waste Management Licensing (Scotland) Regulations 2011 - these regulations implement the revised Waste Framework Directive 2008 and cover applications for waste management licences, which authorise the deposit, disposal and treatment of controlled waste.
- Waste (Scotland) Regulations 2012 - These regulations implement the remaining parts of the Waste Framework Directive 2008 that are not covered by the Waste Management Licensing (Scotland) Regulations 2011. A number of amendments to related legislation are included, such as the Environmental Protection Act 1990, Pollution Prevention and Control (Scotland) Regulations 2000, Landfill (Scotland) Regulations 2003 and the Waste Management Licensing (Scotland) Regulations 2011.

10.4.4 ***Waste Treatment in Scotland and local area***

It is assumed that a large amount of waste generated from the project will be Construction and Demolition (C&D) waste. WRAP defines Construction and Demolition (C&D) wastes as waste materials arising from UK commercial C&D sites. It includes, but not limited to, off-cuts and waste timber, plastics (such as uPVC & HDPE), glass (such as windows), packaging waste materials (for example card, wood and plastic film) and inert materials such as soils. The definition also includes aggregate materials (such as masonry, brick and block, paving, tiles and ceramics) and plasterboard in mixed waste.

SEPA produces reports relating to C&D waste arising and treatment in Scotland. In their report, 'Construction and Demolition waste produced and managed in Scotland' (2009) it was identified that the C&D waste managed in the Highland Council area for 2009 was 231,229 tonnes. Of this 143,656 tonnes were exempt activities, 7,311 tonnes was disposed of to landfill, 6,171 tonnes was treated by metal recycler, 23,551 tonnes was treated at multiple activity site, 49,132 tonnes was treated at a transfer station and 1,408 tonnes was processed through a treatment plant.

The 'SEPA Waste sites and capacity report for Scotland 2012' (2012) report identified that the Annual capacity in 2012 (tonnes) of operational sites in the Highland was 1,253,542 and the Waste accepted in 2012 (tonnes) was 362,647. The anticipated waste produced by the Scheme is not anticipated to exceed 100,000 tonnes, therefore, it is considered that there will be available capacity for the waste produced by the Scheme.

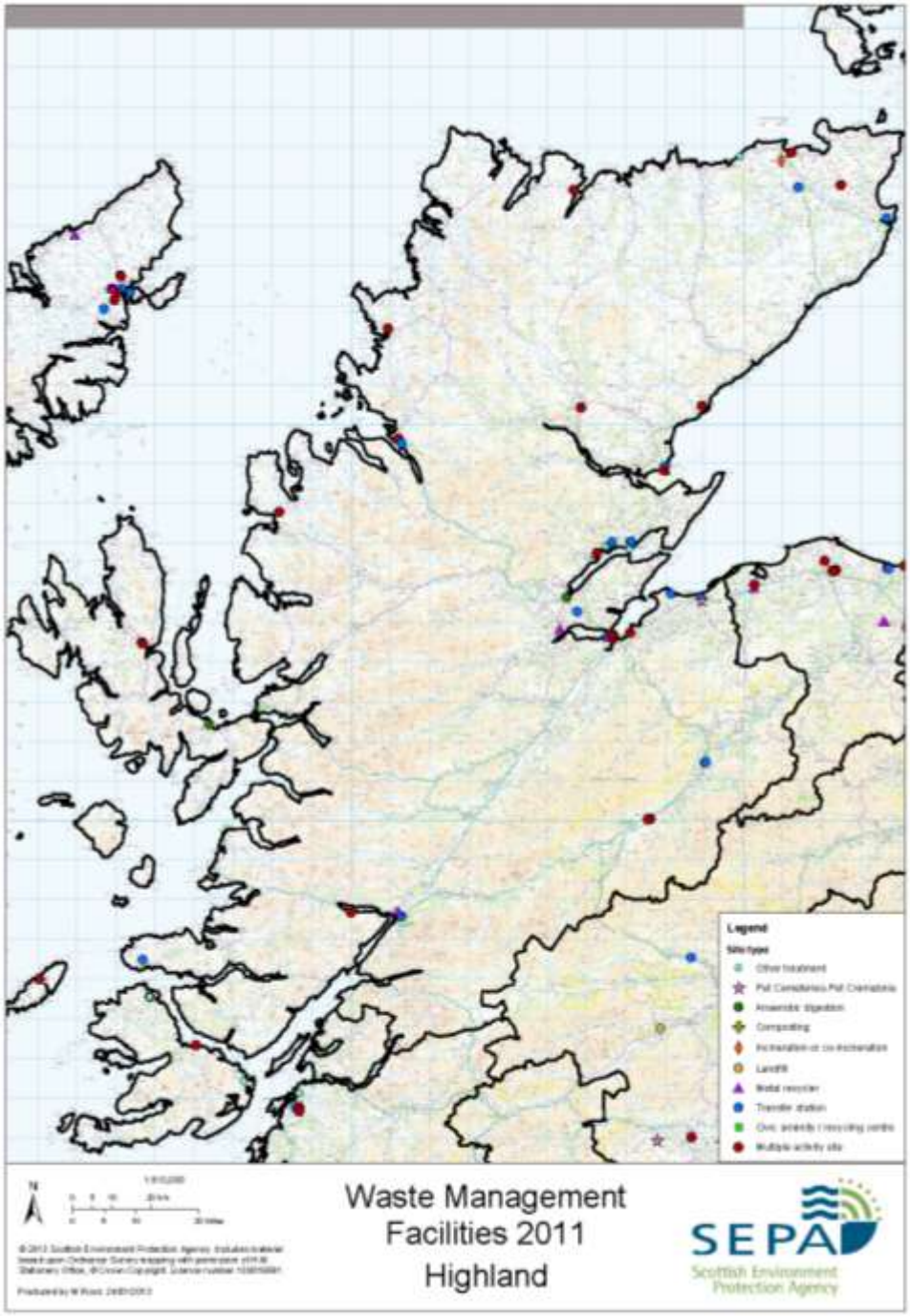
10.4.5 ***Existing Waste management infrastructure***

SEPA produces maps that illustrate the waste management facilities in Scotland at a national and local authority scale. The most recent of these shows available facilities in 2011 and was produced in 2010. Figure 10.1 below provides a map of Waste Management Facilities in the Highland area by type.

It is evident from the SEPA map of Waste Management Facilities in the Highland and also the breakdown of waste treatment in the Highland that facilities exist in the local area for both disposal and recycling of construction and demolition waste. Using the SEPA map it is clear that the nearest waste management facility is located in Wick, therefore this has been used to calculate transport emissions associated with the disposal of waste from the scheme. This

represents a worst-case scenario and the preference would be that the Contractor can find an opportunity to re-use the material as close to source as possible in consultation with SEPA and The Highland Council.

Figure 10.1 – Waste Management facilities in the Highland Area



SEPA's Waste Management Facilities 2011 for the Highland area. Source: (http://www.sepa.org.uk/waste/waste_infrastructure_maps.aspx)

10.4.6 ***Sourcing recycled materials***

A number of sites have been identified who recycle and produce recycled building materials within the Highland Council area and that these sources could be utilised during construction of the project.

10.5 Predicted Impacts

This assessment will determine the impact of each option in terms of material use and waste by considering the material requirements for each option and also the likely wastes arising based on current available information.

10.5.1 ***Potential Material Requirements***

The following is a summary of the likely potential materials required for construction of the scheme based on the current designs including quantity estimates.

Table 10.5- An estimate of the quantity of materials required for the scheme.

Material Resource	Approximate Material Quantity (tonnes)
Series 0300: Fencing	
Timber	5.96
Series 0400: Road Restraint System	
N2 Safety Barrier Material	12.7
H2 Safety Barrier Material	10.6
Series 0500: Drainage	
Filter Material	801.7
HDPE pipe	1.7
Series 0600: Earthworks	
Excavated Materials (Soil/General Fill)	36,130.6
Series 0700: Road Pavements	
Sub-base	12,454.1
Base	2,887.4
Surfacing	552.9
Planing	740.4
Series 1100: Kerbs, Footways and Paved Areas	
Kerb (concrete)	19.2
Footways (Asphalt)	28.8
Series 1200: Traffic Signs and Road Markings	
Road Markings	1.9
Signs	14.22
Series 1600: Piling	
Augured piles (Concrete)	458.0
Series 1700: Structural Concrete	
Concrete	50.4
Steel	154.0
TOTAL (tonnes)	**42940.98**

10.5.2 ***Material Resource Assessment***

The carbon emissions associated with the materials as detailed in Table 10.5 have been broken into two separate components (below in Table 10.6), the embodied carbon (total primary energy consumed during resource extraction, transportation, manufacturing and fabrication of a material) and the transport associated emissions. Transport associated

emissions use a range of potential sourcing distances which are dependent upon the type of material required.

Table 10.6 - The total embodied carbon contained and the associated transport emissions within each SHW Series component

Material Resource	Embodied Carbon Emissions (tCO_2)	Transport Associated Emissions (tCO_2)	Transport distance (km)
Series 0300: Fencing	0.04	0.41	400
Series 0400: Road Restraint System	77.30	3.70	900
Series 0500: Drainage	7.00	0.10	400 / re-used from on-site
Series 0600: Earthworks (re-used on site)	867.10	0.00	Re-used from on-site
Series 0700: Road Pavements	299.50	28.50	20 / 0.25 / re-used from on-site
Series 1100: Kerbs/Footways/ Paved Areas	6.10	0.90	48
Series 1200: Traffic Signs & Road Markings	5.00	5.10	900
Series 1600: Piling	124.80	6.10	32
Series 1700: Structural Concrete	118.50	23.80	30 / 400 / 900
Total Embodied Carbon Emissions (tCO_2)	**1,505.34**	**68.61**	

Table 10.7 shows the total amount of emissions within each design component based on the approximate quantities detailed in Table 10.6 combined with transport emissions. Road pavement has assumed sub-base would be recycled aggregate.

Table 10.7- The total emissions summary contained within each SHW Series component

Material Resource	Emissions Summary(tCO_2)
Series 0300: Fencing	0.45
Series 0400: Road Restraint System	81.00
Series 0500: Drainage	7.10
Series 0600: Earthworks	867.10
Series 0700: Road Pavements	328.00
Series 1100: Kerbs/Footways/Paved Areas	7.00
Series 1200: Traffic Signs & Road Markings	10.10
Series 1600: Piling	130.90
Series 1700: Structural Concrete	142.30
Total Emissions Summary (tCO_2)	**1,573.95**

Summary of Material Resource Assessment

It is evident from the above assessment (Table10.7) that the Earthworks fares worst in terms of the embedded carbon of material resources required to construct the scheme with a total to

867.10 (tCO2) estimated. With regards to transport associated emissions of material resources required to construct the scheme it is clear from the above assessment that Road Pavements fares worst with a total of 28.50 (tCO2) estimated. When the two are combined it is clear that Earthworks fares worst in terms of total associated emissions.

The overall associated carbon required to construct the scheme is 1,573.95 (tCO2) estimated, classified as a Negligible Adverse impact.

10.5.3 ***Likely waste arisings***

The main waste arising due to the construction of the scheme is detailed in Table 10.8 below.

Table 10.8 - The likely waste arisings

Material Resource	Waste Summary (tonnes)	Transport Associated Emissions (tCO_2)
Series 0600: Earthworks (Exported Material)	87,681.8	1,391.5
Series 0700: Road Pavements (Planing)	2,693.8	38.8
Total Waste (tonnes)	**90,375.6**	**1430.3**

Summary of waste assessment

From Table 10.8 above it is clear that the earthworks are the main component which will create waste during construction. In addition to excess earthworks materials the earthworks cuttings which are unacceptable for re-use as part of the scheme will have to be exported off site. Some of the excavated material will be reused on site and provide landscape re-profiling of the old redundant road. However for the purpose of this assessment a worst case scenario has been assessed as only 23% of material to be excavated from the site is likely to be re-used on site.

It is not possible at this stage in the assessment to determine how the waste generated will be treated. It is clear from the baseline that there is the waste management infrastructure within the area to deal with construction and demolition waste but it is not possible to determine what quantities would be recycled or disposed of to landfill etc. This assessment is based upon a worst case scenario, of all wastes arisings being disposed of, and has included the associated transport emissions of this disposal to waste management facilities in Wick as explained in section 10.4.5.

Following the DMRB guidance it is assessed that there is likely to be adequate waste management capacity for all wastes arising from the projects and is therefore considered of Low Sensitivity. It is also assumed at this stage that wastes will be predominately segregated and sent for composting, recycling or for further segregation and sorting at materials recovery facility (minor Impact).

Therefore the significance of the likely waste arisings is expected to be Neutral to Slight Impact.

10.5.4 ***Commentary on assessment***

Pavement

The SHW permits recycled materials to be used in the makeup of all pavement layers. It also provides guidance on the proportion of re-cycled materials that can be used in each of the pavement layers and defines maximum allowable percentages. The figures above assumed recycled material has been incorporated into the sub-base in the form of recycled aggregates and some planing will be reused on site. Following the Stage 3 Assessment, the next phase of

the project will be to tender the works through a Design & Build contract. At this stage the Design & Build contractor will make a more accurate assessment of the re-use of the materials following detailed design of the works.

Reuse onsite

Road Pavement

It is the intention to construct as much of the new alignment offline while keeping the existing road open to traffic. For the construction of all of the new road there is potential for the existing materials to be re-used as recycled aggregate. The figures quantified at this stage are shown in Table 10.9 which assumes a reasonable re-use of material on site.

Earthworks

Approximate quantities of excavated material have been calculated based on the current scheme proposals shown in Table 10.9. These quantities are based on the assumption that of the total excavated material (84,803m^3) a total of approximately 24,747m^3 will be required for earthworks filling. Both the excavated soils and the excavated rock are expected to be able to be re-used on site for engineering fill. The extent of re-use for the rock being dependent on on-site processing and further testing on the rock mass. Both the soil and rock could also meet the specification for certain acceptable landscape fill materials. The following describes the various materials found on site and whether they are suitable or unsuitable for re-use.

Topsoil has been identified within the study area and depths vary from 0.2m to 1.0m. The deeper topsoil is found in the south of the scheme. It is assumed that this topsoil and sub soil, quantities shown in Table 10.9, can be stockpiled and re-used as landscape material.

The made ground in the study area is associated with the existing A9, e.g. road pavement and existing fill. Since there is a surplus of good engineering material to be excavated within the site it is unlikely that any made ground will need to be re-used.

The ground conditions consist of variable depths of superficial deposits and weathered bedrock overlying bedrock at depths of between 0.5m and 12m. The deeper superficial deposits in the south of the scheme are predominantly Glacial Till. In the north the superficial deposits are shallower, reducing to 0.5m on the highest ground, and comprise weathered bedrock and Glacial Till.

The Glacial Till is found to be a silty gravelly sand and occasionally a sandy clay which, testing has found, may be suitable for engineering purposes as a Class 2C fill (occasionally Class 2A and Class 1A) or landscape fill. It was not suitable for Class 6I or 6J fill to reinforced soil, which forms a large amount of the total required fill.

The bedrock is moderately strong to very strong fine grained sandstone, described as micaceous. Occasional siltstone bands are present within the rock mass. Rock outcrops are exposed at the surface towards the higher central point of the site. Where the rockhead is shallow weathered rock may be encountered above the fresh bedrock in the form of sands and gravels with occasional/frequent fragments of the parent rock. Geotechnical assessments of the site have identified that the majority of the rock mass could be excavated by easy to hard ripping. However, since there is a possibility of stronger rock zones within the excavation area, blasting should be considered as a prospective means of excavation. The total quantity of excavation bedrock is 47,031m^3, shown in Table 10.9 (below).

Re-use of the excavated rock for engineering purposes would be possible provided the rock was crushed and sorted to the correct sizes, any siltstone units were removed (as these are argillaceous and therefore unsuitable for some fills) and that more extensive testing on the rock mass found the rock to have the required properties. Even if the rock is suitable a

Contractor may feel that such processing, sorting and testing is not economical to produce the relatively small amount of fill required for the Scheme..

Soils Balance

Consultation with Scottish Environment Protection Agency (SEPA) highlighted the need for a soils/peat balance for the works which demonstrates how much material will be disturbed and how and where it can be reused, either on or off site'. The soils balance shown in Table 10.9 below is provided. Peat has not been considered as it is not expected to be present on site. The soils balance shows a surplus of excavated material of 60,056m^3 and this value has been inserted into the CMS along with the 24,747m^3 assumed to be re-used on site. In calculating this we have assumed a reasonable re-use on site for sub-base and filter stone (although further testing on the rock mass is required to confirm the rock is suitable for these purposes) along with Class 6A and general fill, along with a 2,000m^3 allowance for landscaping fill.

Table 10.9: Approximate Earthworks Quantities for Stage 3 Assessment

EXCAVATION	(m3)
Excavation of Top Soil	7,751
Excavation of Sub Soil	30,021
Excavation of Rock	47,031
Total excavated material	**84,803**
FILLING & RE-USE ON SITE	
Top Soil	7,751
General Fill	5,515
Filling of Class 6A	6,481
Landscape fill	2,000
Re-use of material on site at 50% for sub-base and filter stone	3,000
Total Re-use on site	**24,747**
Surplus Excavated Material (84,803-24,747)	**60,065**

10.5.5 ***Detailed Assessment Reporting Matrix***

The Detailed Assessment Reporting Matrix (Table 10.10) shown below identifies the impacts / effects arising from the various elements of work identified in Tables 10.5 to 10.9. The summaries on the material resource and waste assessments above state the total embodied carbon associated with the production and transport of the materials and the quantity of waste likely to be produced on site. The matrix provides a description of the impacts along with a description of the mitigating measures. In addition to the mitigating measures an additional column has been added to provide a description of how the measures will be implemented, measured and monitored.

Table 10.10 - Detailed Assessment Reporting Matrix

Project Activity	Potential impacts associated with material use/ waste production	Description of the impacts	Brief description of mitigating measures (including where known the scale of the mitigating effect)	A description of how the measures will be implemented, measured and monitored
Site remediation / preparation	Impacts associated with Site Clearance – production of inert waste.	Waste requires disposal / treatment off site. Adequate waste capacity, Impact Minor medium sensitivity, short term, localised and adverse. **Significance: Slight**	Ensure disposal / treatment / recycling facility is located as close to site as possible to minimise transport emissions. A Construction Environment Management Document (CEMD) shall be put in place to address the likely waste arising. A Waste Management Plan (WMP) shall also be produced.	These measures will be reviewed regularly to ensure waste strategy is implemented. A Construction Environment Management Document (CEMD) and a Waste Management Plan (WMP) shall be put in place and adhered to by the contractor (see section 10.6). All waste should be managed by following the waste hierarchy: 'reduce, reuse, and recycle' The Contractor shall carry out the Works in such a way to minimise the amount of spoil and waste requiring disposal. The Contractor shall identify the waste category, quantities, opportunities for recycling and or reuse, disposal routes and licensing requirements for all spoil and waste. The contractor should seek opportunities for re-use of any surplus material as close to source as possible and comply with mitigation detailed in section 10.6.
Demolition	There are no proposed demolition works for this project.	N/A	N/A	N/A
Site construction	Use of materials for fencing quantities as shown in Table 10.5.	Based on the CMS tool the overall carbon impacts (tCO_2) is 0. 45. This figures is considerably less than 1000 (tCO_2), the impact will be adverse and permanent. **Scale of Impact: No change**	Ensure materials / suppliers are sourced as close to the site as possible to minimise transport emissions. Re-use as much material as possible to reduce overall demand from external sources. Procurement of products and materials with high levels of recycled content. Materials should be ordered to arrive when required for construction and the quantities	Review of suppliers and location of sourced materials. Review of waste prior to removal off site. Review of material quantities used.

Project Activity	Potential impacts associated with material use/ waste production	Description of the impacts	Brief description of mitigating measures (including where known the scale of the mitigating effect)	A description of how the measures will be implemented, measured and monitored
			should be accurately predetermined. Use of renewable materials from legal and sustainable sources.	
	Production of waste arising from erecting fences and installing concrete footings to fence posts.	Minor production of timber and concrete waste which will require segregation with scope for recycling at a materials recovery facility. Adequate waste capacity, impact negligible, low sensitivity, short term, localised and adverse. **Significance: Neutral / Slight**	Materials should be ordered to arrive when required for construction and the quantities should be accurately predetermined. Damage during receiving and storage should be minimised by ensuring storage in accordance with manufacturers' guidelines and in designated areas with offloading supervised by competent personnel using appropriate equipment. Use of renewable materials from legal and sustainable sources. Explore material exchange with other construction projects within the vicinity of the works.	Monitor production of waste; re-use materials on site if possible prior to recycling or disposal. A CEMD shall be put in place to address the likely waste arising. A WMP shall also be produced. All waste should be dealt following the waste hierarchy: 'reduce, reuse, and recycle' The Contractor shall carry out the Works in such a way to minimise the amount of spoil and waste requiring disposal. The Contractor shall identify the waste category, quantities, opportunities for recycling and or reuse, disposal routes and licensing requirements for all spoil and waste. The contractor should seek opportunities for re-use of any surplus material as close to source as possible and comply with mitigation detailed in section 10.6.
	The use of materials for road restraint systems, quantities as shown in Table 10.5.	Based on the CMS tool the overall carbon impact (tCO2) is 81.00. The above figure is less than 1000 (tCO_2), the impact will be adverse and permanent **Scale of Impact: No change**	Ensure suppliers are sourced as close to the site as possible to minimise transport emissions. Re-use as much material as possible to reduce overall demand from external sources. Procurement of products and materials with high levels of recycled content. Materials should be ordered to arrive when required for construction and the quantities should be accurately predetermined. Damage during receiving and storage should be minimised by ensuring storage	Review of suppliers and location of sourced materials. Review of waste prior to removal off site. Review of material quantities used.

Project Activity	Potential impacts associated with material use/ waste production	Description of the impacts	Brief description of mitigating measures (including where known the scale of the mitigating effect)	A description of how the measures will be implemented, measured and monitored
			in accordance with manufacturers' guidelines and in designated areas with offloading supervised by competent personnel using appropriate equipment.	
	Production of waste arising from erecting road restraint systems and installing concrete footings to fence posts.	Minor production of metal and concrete waste which will require segregation with scope for recycling at a materials recovery facility. Adequate waste capacity, impact negligible, low sensitivity, short term, localised and adverse. **Significance: Neutral / Slight**	Minimise waste. Accurate estimation of quantities required. Minimise damage to materials during transport and storage.	Monitor production of waste; re-use materials on site if possible prior to recycling or disposal. A CEMD shall be put in place to address the likely waste arising. A WMP shall also be produced. All waste should be dealt following the waste hierarchy: 'reduce, reuse, and recycle' The Contractor shall carry out the Works in such a way to minimise the amount of spoil and waste requiring disposal. The Contractor shall identify the waste category, quantities, opportunities for recycling and or reuse, disposal routes and licensing requirements for all spoil and waste. The contractor should seek opportunities for re-use of any surplus material as close to source as possible and comply with mitigation detailed in section 10.6.
	The use of materials for drainage systems, quantities as shown in Table 10.5.	Based on the CMS tool the overall carbon impacts (tCO_2) is 7.10. The figure is considerably less than 1000 (tCO_2), the impact will be adverse and permanent **Scale of Impact: No change**	Ensure suppliers are sourced as close to the site as possible to minimise transport emissions. Minimise use of virgin material where possible. Re-use as much material as possible to reduce overall demand from external sources. Procurement of products and materials with high levels of recycled content. Materials should be ordered to arrive when	Review of suppliers and location of sourced materials. Review of waste prior to removal off site. Review of materials and quantities used.

Project Activity	Potential impacts associated with material use/ waste production	Description of the impacts	Brief description of mitigating measures (including where known the scale of the mitigating effect)	A description of how the measures will be implemented, measured and monitored
			required for construction and the quantities should be accurately predetermined. Damage during receiving and storage should be minimised by ensuring storage in accordance with manufacturers' guidelines and in designated areas with offloading supervised by competent personnel using appropriate equipment.	
	Production of waste arising from installing drainage systems.	Minor production of waste which will require segregation with scope for recycling at a materials recovery facility. Adequate waste capacity, impact negligible, low sensitivity, short term, localised and adverse. **Significance: Neutral / Slight**	Minimise waste. Accurate estimation of quantities required. Minimise damage to materials during transport and storage.	Monitor production of waste; re-use materials on site if possible prior to recycling or disposal. A CEMD shall be put in place to address the likely waste arising. A WMP shall also be produced. All waste should be dealt following the waste hierarchy: 'reduce, reuse, and recycle' The Contractor shall carry out the Works in such a way to minimise the amount of spoil and waste requiring disposal. The Contractor shall identify the waste category, quantities, opportunities for recycling and or reuse, disposal routes and licensing requirements for all spoil and waste. The contractor should seek opportunities for re-use of any surplus material as close to source as possible and comply with mitigation detailed in section 10.6.

Project Activity	Potential impacts associated with material use/ waste production	Description of the impacts	Brief description of mitigating measures (including where known the scale of the mitigating effect)	A description of how the measures will be implemented, measured and monitored
	The use of materials for earthworks, quantities as shown in Table 10.5.	Based on the CMS tool the overall carbon impacts (tCO_2) is 867.10. The impact of the material will be adverse and permanent. **Scale of Impact: No change**	Ensure borrow pits and quarries are sourced as close to the site as possible to minimise transport emissions. Re-use as much material as possible to reduce overall demand from external sources. Minimise haul routes and double handling of materials.	Review of suppliers and location of sourced materials. Review of waste prior to removal off site. Review of material quantities used.
	Production of inert waste arising from earthworks, quantities as shown in Table 10.8.	Production of inert waste which will require treatment/disposal off site. Adequate waste capacity, medium sensitivity, temporary, localised and adverse. **Significance: Neutral / Slight**	Ensure disposal / treatment / recycling facility is located as close to site as possible to minimise transport emissions. Re-use materials on site if possible prior to recycling or disposal. Topsoil can be removed, stockpiled and re-used as landscape material. Made ground has been identified where there are signs of historical development – there is scope for this material to be re-used subject to testing. Soft materials from excavated cut should be reused on site. Peat and other organic rich soils may be present in localised areas; this material is unsuitable for re-use and will require removal off site. Superficial deposits, glacial till and bedrock have all been identified and may be suitable for re-use as engineering fill subject to testing.	Monitor production of waste. A CEMD shall be put in place to address the likely waste arising. A WMP shall also be produced. The Contractor shall carry out the Works in such a way to minimise the amount of spoil and waste requiring disposal. The Contractor shall identify the waste category, quantities, opportunities for recycling and or reuse, disposal routes and licensing requirements for all spoil and waste. The contractor should seek opportunities for re-use of any surplus material as close to source as possible and comply with mitigation detailed in section 10.6.

Project Activity	Potential impacts associated with material use/ waste production	Description of the impacts	Brief description of mitigating measures (including where known the scale of the mitigating effect)	A description of how the measures will be implemented, measured and monitored
	The use of materials for road pavements, quantities as shown in Table 10.5.	Based on the CMS tool the overall carbon impacts (tCO_2) is 328.00. The impact of the material will be adverse and permanent. **Scale of Impact: No Change**	Ensure materials / suppliers are sourced as close to the site as possible to minimise transport emissions. Re-use as much material as possible to reduce overall demand from external sources. Procurement of products and materials with high levels of recycled content. Materials should be ordered to arrive when required for construction and the quantities should be accurately predetermined.	Review of suppliers and location of sourced materials. Review of waste prior to removal off site. Review of material quantities used.
	Production of waste arising from planing road pavements at tie-in locations, quantities as shown in Table 10.8.	Minor production of waste which will require segregation with scope for recycling at a materials recovery facility. Adequate waste capacity, impact slight, medium sensitivity, short term, localised and adverse. **Significance: Slight**	Recycle planed material from the existing pavement in the makeup of new pavement layers as permitted by the SHW. Use of recycled material reduces need for disposal off site.	A CEMD shall be put in place to address the likely waste arising. A WMP shall also be produced. All waste should be dealt following the waste hierarchy: 'reduce, reuse, and recycle' The Contractor shall carry out the Works in such a way to minimise the amount of spoil and waste requiring disposal. The Contractor shall identify the waste category, quantities, opportunities for recycling and or reuse, disposal routes and licensing requirements for all spoil and waste. The contractor should seek opportunities for re-use of any surplus material as close to source as possible and comply with mitigation detailed in section 10.6.
	Production of waste arising from grubbing up road pavements, quantities as shown in Table 10.8.	Minor production of waste which will require segregation with scope for recycling at a materials recovery facility. Adequate waste capacity, impact slight, medium sensitivity, short term, localised and adverse.	Recycle grubbed up material in the makeup of new pavement layers and landscaping/earthworks as permitted by the SHW. Recycling reduces need for disposal off site.	A CEMD shall be put in place to address the likely waste arising. A WMP shall also be produced. Ensure as much material is recycled as possible by reviewing waste output. All waste should be dealt following the waste hierarchy:

Project Activity	Potential impacts associated with material use/ waste production	Description of the impacts	Brief description of mitigating measures (including where known the scale of the mitigating effect)	A description of how the measures will be implemented, measured and monitored
		Significance: Slight		'reduce, reuse, and recycle' The Contractor shall carry out the Works in such a way to minimise the amount of spoil and waste requiring disposal. The Contractor shall identify the waste category, quantities, opportunities for recycling and or reuse, disposal routes and licensing requirements for all spoil and waste. The contractor should seek opportunities for re-use of any surplus material as close to source as possible and comply with mitigation detailed in section 10.6.
	The use of materials for kerbs, footways and paved areas, quantities as shown in Table 10.5.	Based on the CMS tool the overall carbon impacts (tCO_2) is 7.00. The impact of the material will be adverse and permanent. **Scale of Impact: No Change**	Ensure materials / suppliers are sourced as close to the site as possible to minimise transport emissions. Re-use as much material as possible to reduce overall demand from external sources. Procurement of products and materials with high levels of recycled content. Materials should be ordered to arrive when required for construction and the quantities should be accurately predetermined.	Review of suppliers and location of sourced materials. Review of waste prior to removal off site. Review of material quantities used.
	Production of waste arising from... associated with kerbs, footways and paved areas.	The amount of kerbs, footways and paved areas to be constructed is low. Therefore Minor to negligible production of waste which will require segregation with scope for recycling at a materials recovery facility. Adequate waste capacity, impact slight, medium sensitivity, short term, localised and adverse. **Significance: Slight to Negligible**	Ensure disposal / treatment / recycling facility is located as close to site as possible to minimise transport emissions. Re-use materials on site if possible prior to recycling or disposal.	A CEMD shall be put in place to address the likely waste arising. A WMP shall also be produced. Ensure as much material is recycled as possible by reviewing waste output. All waste should be dealt following the waste hierarchy: 'reduce, reuse, and recycle' The Contractor shall carry out the Works in such a way to minimise the amount of spoil and waste requiring disposal. The Contractor shall identify the waste category,

Project Activity	Potential impacts associated with material use/ waste production	Description of the impacts	Brief description of mitigating measures (including where known the scale of the mitigating effect)	A description of how the measures will be implemented, measured and monitored
				quantities, opportunities for recycling and or reuse, disposal routes and licensing requirements for all spoil and waste. The contractor should seek opportunities for re-use of any surplus material as close to source as possible and comply with mitigation detailed in section 10.6.
	The use of materials for traffic signs and road markings, quantities as shown in Table 10.5.	Based on the CMS tool the overall carbon impacts (tCO_2) is 10.10. The impact of the material will be adverse and permanent. **Scale of Impact: No Change**	Ensure materials / suppliers are sourced as close to the site as possible to minimise transport emissions. Re-use as much material as possible to reduce overall demand from external sources. Procurement of products and materials with high levels of recycled content. Materials should be ordered to arrive when required for construction and the quantities should be accurately predetermined.	Review of suppliers and location of sourced materials. Review of waste prior to removal off site. Review of material quantities used.
	Production of waste arising from associated with traffic signs and road markings.	The amount of traffic signs and road markings to be constructed is low. Therefore Minor to negligible production of waste which will require segregation with scope for recycling at a materials recovery facility. Adequate waste capacity, impact slight, medium sensitivity, short term, localised and adverse. Significance: Slight to Negligible	Ensure disposal / treatment / recycling facility is located as close to site as possible to minimise transport emissions. Re-use materials on site if possible prior to recycling or disposal.	A CEMD shall be put in place to address the likely waste arising. A WMP shall also be produced. Ensure as much material is recycled as possible by reviewing waste output. All waste should be dealt following the waste hierarchy: 'reduce, reuse, and recycle' The Contractor shall carry out the Works in such a way to minimise the amount of spoil and waste requiring disposal. The Contractor shall identify the waste category, quantities, opportunities for recycling and or reuse, disposal routes and licensing requirements for all spoil and waste. The contractor should seek opportunities for re-use of any surplus material as close to source as possible and comply with mitigation detailed in section 10.6.

Project Activity	Potential impacts associated with material use/ waste production	Description of the impacts	Brief description of mitigating measures (including where known the scale of the mitigating effect)	A description of how the measures will be implemented, measured and monitored
	The use of materials for piling works, quantities as shown in Table 10.5.	Based on the CMS tool the overall carbon impacts (tCO_2) is 130.90. The impact of the material will be adverse and permanent. **Scale of Impact: No Change**	Ensure suppliers are sourced as close to the site as possible to minimise transport emissions. Re-use / recycle as much material as possible to reduce overall demand from external sources.	Review of suppliers and location of sourced materials. Review of waste prior to removal off site. Review of material quantities used.
	The use of materials for structural concrete, quantities as shown in Table 10.5.	Based on the CMS tool the overall carbon impacts (tCO_2) is 142.30. The impact of the material will be adverse and permanent. **Scale of Impact: No Change**	Ensure suppliers are sourced as close to the site as possible to minimise transport emissions. Re-use / recycle as much material as possible to reduce overall demand from external sources. Assumptions in CMS assumed little scope for use of recycled material; further work will increase scope to consider use of recycled materials. Further information is required so alternative mixes can be investigated in the design stage. Such alternatives may include the use of GGBS or PFA in the concrete.	Review of suppliers and location of sourced materials. Review of waste prior to removal off site. Review of material quantities used.
Operation and maintenance	It is expected that the new scheme will have a similar use of materials and production of waste as to the current arrangement. Therefore, no additional impacts expected.	Magnitude of change not anticipated to be significant. Therefore, no overall change. **Significance: Neutral**	Existing mitigation measures for material resource use and waste management will be implemented during the operational phase.	These measures will be reviewed regularly to ensure waste strategy is implemented.

The main impact regarding materials and waste will arise from the Site construction and Site clearance, preparation and earthworks stage. This arises as there are no proposed demolition works for this project and it is expected that the new scheme will have a similar use of materials and production of waste as to the current arrangement. Therefore, resulting in no additional impacts expected for the operation and maintenance of the asset.

10.6 Mitigation

General overarching mitigation strategy which should be adhered to is described below:

- Minimise the total material demand of the design by ensuring that material inputs match demand as closely as possible;
- Minimise waste by matching material demand with material supply as closely as possible. Material supply can be met from the following prioritised sources:
    1. On-site reuse/ recycled;
    2. Off-site reuse/ recycled/ secondary materials/ sustainable sources; and
    3. Off-site primary material.
- Seek source materials in descending order of priority shown above, taking account of the associated impacts from transport and supply of materials;
- Conform to waste hierarchy as strategy for dealing with any waste generated on site;
- Reduce the carbon emissions associated with the design as far as possible; and
- Devise a Construction Environment Management Document (CEMD) for both material procurement and waste management (this would include a Waste Management Plan).

The following mitigation specific measure should be adhered to:

A Construction Environment Management Document (CEMD) should be developed the project and this should be included as part of the Employers Requirements. The CEMD should develop upon the mitigation measures detailed within Table 10.10

- As part of the CEMD a Waste Management Plan (WMP) should be produced.

Standard Practice requires compliance with legal requirements; Good and Best Practice goes beyond this to identify and implement ways to achieve significant reductions in waste and improvement in the materials resource efficiency of the project. At a minimum any strategy for dealing with waste arising from the project should seek to align choices to the waste hierarchy.

The Contractor shall carry out the Works in such a way that, as far as is practicable, the amount of spoil and waste to be disposed of is minimised.

The Contractor shall identify the waste category and quantities, opportunities for recycling and or reuse, disposal routes and licensing requirements for all spoil and waste arising from the Works. This assessment has been based on a worst case scenario of all waste being disposed of to a waste management facility in Wick. There is a preference for the contractor to re-use material onsite where possible and to seek opportunities to re-use surpus material as close to source as possible in consultation with SEPA and The Highland Council. The contractor should refer to SEPA guidance on *Sustainable Reuse of Greenfield Soils in Construction.*

10.6.1 *Material Resource Strategy*

The procurement process is essential to cutting waste in construction. Waste minimisation in procurement involves producing accurate and reliable estimates of material quantities required

on a project and sourcing more resource efficient materials. The following recommendations should be taken into account within the CEMD:

- Procurement of products and materials with good practice levels of recycled content (relative to other products meeting the same specification);
- Material exchange with other construction projects within the vicinity of the works should be explored;
- Materials should be ordered to arrive when required for construction and the quantities should be accurately predetermined;
- Damage during receiving and storage should be minimised by ensuring storage in accordance with manufacturers' guidelines and in designated areas with offloading supervised by competent personnel using appropriate equipment;
- Ensure storage areas are safe, secure and weatherproof (where required); and
- Use of renewable materials from legal and sustainable sources (such as timber with appropriate certification).

Make use of existing waste management infrastructure for sourcing non-virgin and recycled materials. The baseline section identified a range of waste management facilities within the area. These facilities are also a source for recycled construction materials in Scotland in addition to accepting C&D waste for recycling. Sourcing materials as locally as possible will reduce impacts associated with transportation, and the identification of these sites in the locale confirm that recycled construction materials are readily available.

10.7 Summary

It is clear from the assessment that in terms of material resources the earthworks stage will generate the most carbon emissions and the most amount of waste.

The scheme does not generate amounts of carbon emissions that could generate significant environmental impacts and are assessed as either negligible or no change in terms of the scale of magnitude provided within the guidance.

For waste generation the impact has been determined to be a neutral to slight impact given the existing waste management infrastructure existing in the area and also the likely disposal methods.

As the design progresses, opportunities should be reviewed to increase the recycled content of materials required and also opportunities to design out waste should be investigated.

10.8 References

- The Highland Council Waste Management Strategy
- BA 92/07. The use of recycled concrete aggregate in structural concrete. http://www.standardsforhighways.co.uk/dmrb/vol2/section3/ba9207.pdf.
- BD 90/05. Design of FRP Bridges and Highway Structures. (http://www.standardsforhighways.co.uk/dmrb/vol1/section3/bd9005.pdf)
- HD 35/04 Conservation and the use of secondary and recycled materials, http://www.standardsforhighways.co.uk/dmrb/vol7/section1/hd3504.pdf
- Manual of Contract Documents for Highway Works Volume 1 - Specification for Highway Works. http://www.standardsforhighways.co.uk/mchw/vol1/index.htm
- NetRegs: various legislative information on waste.
- http://www.environment-agency.gov.uk/netregs/legislation/current/63588.aspx
- http://www.environment-agency.gov.uk/netregs/legislation/future/118469.aspx
- Scottish Government, (2010), Scotland's Zero Waste Plan. http://scotland.gov.uk/Resource/Doc/314168/0099749.pdf
- Scottish Environment Protection Agency (SEPA), (2010), Highlands Waste Management Facilities Map 2010. http://sepa.org.uk/waste/waste_infrastructure_maps/local_authority_maps.aspx
- Scottish Environment Protection Agency (SEPA), Construction and Demolition Waste Produced and Managed in Scotland in 2009, http://sepa.org.uk/waste/waste_data/commercial__industrial_waste/construction__demolition.aspx
- Scottish Environment Protection Agency (SEPA), (2006). Construction and demolition wastes in Scotland (2006): An estimation of the quantities and management of construction and demolition wastes managed across Scotland in 2006. http://www.sepa.org.uk/waste/waste_data/commercial__industrial_waste/construction__demolition.aspx
- Transport Scotland (2008) Transport Scotland Corporate Plan 2012–2015. www.transportscotland.gov.uk/report/j236392-00.htm
- Directive 2008/98/EC, Waste Framework Directive, (2008). http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:312:0003:0030:EN:PDF
- Waste Management Licensing (Scotland) Regulations 2011 SSI 228
- Waste (Scotland) Regulations 2012 (No. 148)
- WRAP (2010) Opportunities Application - Opportunities to Use Recycled and Secondary Aggregates (RSA) http://aggregain.wrap.org.uk/opportunities/applications/index.html.
- WRAP Report Designing out Waste: A design team guide for buildings (2009) www.wrap.org.uk/document.rm?id=7167

11 SUMMARY OF EFFECTS AND MITIGATION

11.1 Introduction

This chapter provides a summary of the environmental impacts that have been described in each environmental topic chapter.

Table 11.1 below reports the environmental impacts associated with the scheme, proposed mitigation where appropriate, and the identification of residual effects. The Mitigation Item No's assigned in this table are translated into Table 12.1 in Chapter 12 – Schedule of Environmental Commitments.

Table 11.1 - Environmental Impact Tables (continued over)

Item	Description of Potential Impact	Mitigation Objective and Commitment	Sensitivity / Value of Receptor	Duration of impact Short / Long term	Significance of Effect prior to mitigation	Significance of Effect with mitigation	Mitigation Item No.
Landscape and Visual (Chapter 5)							
1.	Effects of construction including; removal of vegetation, traffic management works, movement of materials, earthworks operations.	Minimise vegetation clearance and potential short term effects during construction. Incorporate planting to compensate for any loss.	Medium	Short Term	Significant	Significant	LV1
2.	Loss of existing vegetation, scrub and woodland	Minimise loss of existing vegetation, especially mature trees which may help screen the works. Incorporate planting to compensate for any loss.	Medium	Short Term	Not significant	Not significant	LV2
3.	Impact on landscape designations and landscape character type.	Minimise potential long term effects by ensuring good landscape integration. Provide landscape design including landform re-profiling and planting.	Medium to High	Long Term	Locally significant	Not significant	LV3
4.	Impact on visual amenity to adjacent receptors and effects on views from the wider area.	Minimise potential long term effects by provide landscape design including landform re-profiling and screen planting.	Medium	Long Term	Locally significant	Locally significant	LV4
5.	Introduction of engineered landform of the road cuttings and new rock face into the landscape and views.	Ensure optimal landscape fit of scheme through landform manipulation and incorporation of planting. Minimise need for rock fall netting and rock bolts.	Medium	Long Term	Locally significant	Locally significant	LV5

Item	Description of Potential Impact	Mitigation Objective and Commitment	Sensitivity / Value of Receptor	Duration of impact Short / Long term	Significance of Effect prior to mitigation	Significance of Effect with mitigation	Mitigation Item No.
Nature Conservation (Chapter 6)							
6.	Construction disturbance of SPA breeding birds	Avoid disturbance of SPA breeding birds by sensitive timing of works.	District value	Short Term	Large Adverse	Neutral	NC1
7.	Construction pollution of or landslide into SPA, SACs or SSSIs	Avoid pollution/landslide into designated sites through best practice and design.	International value	Short Term	Very Large Adverse	Neutral	NC2
8.	Hydrological effects on terrestrial habitats	None required because no significant impacts expected.	Up to County value	Long Term	Neutral	Neutral	n/a
9.	Loss of semi-natural woodland and unimproved coastal neutral grassland	Compensate for felling of trees, enhance scrub diversity.	District value	Long Term	Slight Adverse	Slight Adverse	NC3
10.	Loss of species-rich unimproved acid grassland	None required because no significant impacts expected.	Local/Parish value	Long Term	Slight Adverse	Slight Adverse	n/a
11.	Loss of other terrestrial habitats	Provide compensatory neutral grassland/scrub	Zone of influence value	Long Term	Slight Adverse	Neutral	NC4
12.	Construction disturbance of otter	Meet legal requirements for otters including pre-construction survey and licensing.	Local/Parish value	Short Term	Slight Adverse	Neutral	NC5
13.	Construction disturbance of bats/bat roosts	Meet legal requirements for bats including pre-construction survey and (if required) licensing.	Local/Parish value	Short Term	Slight Adverse	Neutral	NC6
14.	Loss of foraging habitat for bats	None required because no significant impacts expected.	Local/Parish value	Short Term	Neutral	Neutral	n/a
15.	Construction disturbance of and loss of habitat for non-SPA breeding birds	Meet legal requirements for breeding birds by timing of vegetation clearance; provide suitable habitat.	Up to District value	Short Term	Slight Adverse	Neutral or Slight Beneficial	NC7
16.	Construction harm to and loss of habitat for common reptiles	Avoid harm to common reptiles; provide suitable habitat.	Local/Parish value	Short Term	Neutral	Slight Beneficial	NC8

Item	Description of Potential Impact	Mitigation Objective and Commitment	Sensitivity / Value of Receptor	Duration of impact Short / Long term	Significance of Effect prior to mitigation	Significance of Effect with mitigation	Mitigation Item No.
17.	Operational disturbance of SPA breeding birds	None required because no significant impacts expected.	District value	n/a	Neutral	Neutral	n/a
18.	Operational pollution of SPA, SACs or SSSIs	Avoid operational pollution of designated sites through SUDS.	International value	Long Term	Slight Adverse	Slight Beneficial	NC9
19.	Operational disturbance of otter	None required because no significant impacts expected.	Local/Parish value	n/a	Neutral	Neutral	n/a
20.	Operational disturbance of bats	None required because no significant impacts expected.	Local/Parish value	n/a	Neutral	Neutral	n/a
Cultural Heritage (Chapter 7)							
21. 3438 – Berriedale Castle SM	Temporary setting impact from construction of scheme – reduction in tranquil setting of asset through noise and visual intrusion	No mitigation is proposed as the nature of the impact, the noise and visual intrusion cannot be effectively reduced. No impact identified during operation	High	Short Term	Moderate adverse	Moderate Adverse	n/a
22. 3437 – Langwell Castle SM	Temporary setting impact from construction of scheme – reduction in tranquil setting of asset through noise and visual intrusion	No mitigation is proposed as the nature of the impact, the noise and visual intrusion cannot be effectively reduced. No impact identified during operation	High	Short Term	Slight adverse	Slight Adverse	n/a
23. 577 – Rinsary broch SM	No impact on the setting or direct impact on this asset from the construction or operation of the scheme	No mitigation required	High	n/a	Neutral	Neutral	n/a
24. 460 – Langwell House cairn SM	No impact on the setting or direct impact on this asset from the construction or operation of the scheme	No mitigation required	High	n/a	Neutral	Neutral	n/a

Item	Description of Potential Impact	Mitigation Objective and Commitment	Sensitivity / Value of Receptor	Duration of impact Short / Long term	Significance of Effect prior to mitigation	Significance of Effect with mitigation	Mitigation Item No.
25. Langwell Lodge GDL	Temporary setting impact on the ability to appreciate the tranquil and rural outlook from the GDL	No mitigation is proposed as the nature of the impact, the noise and visual intrusion cannot be effectively reduced. No impact identified during operation	Medium	Short Term	Slight adverse	Slight adverse	n/a
26. MHG1113 - Craft township	Permanent, physical impacts from the construction of the road scheme and cuttings. Potential to entirely remove the asset	Trial trenching in the location of the asset to locate and record any remains prior to removal via construction	Low	Long Term	Moderate Adverse	Slight Adverse	CH01
27. MHG1110 - Cemetery	Permanent setting impacts from the construction and operation of the scheme – reducing the tranquillity of the asset and severing the connection with the former Manse	No mitigation during the construction phase, mitigation during the operation phase landscaping will reduce the impact	Low	Long Term	Moderate Adverse	Moderate Adverse (construction) Slight Adverse (Operation)	CH02
28. MHG20179 - Structure	Permanent, physical impacts from the construction of the road scheme and cuttings. Potential to entirely remove the asset	Trial trenching in the location of the asset to locate and record any remains prior to removal via construction	Low	Long Term	Slight Adverse	Slight Adverse	CH03
29. MHG30470 – military trap	Permanent, physical impacts from the construction of the road scheme and cuttings. Potential to entirely remove the asset	Trial trenching in the location of the asset to locate and record any remains prior to removal via construction	Low	Long Term	Moderate Adverse	Slight Adverse	CH04
30. URS13	Physical, permanent impact to the HLA unit slightly reducing the archaeological and historic legibility	No mitigation is proposed as the HLA area is large. There is no mitigation appropriate.	Low	Long Term	Slight Adverse	Slight Adverse	n/a

Item	Description of Potential Impact	Mitigation Objective and Commitment	Sensitivity / Value of Receptor	Duration of impact Short / Long term	Significance of Effect prior to mitigation	Significance of Effect with mitigation	Mitigation Item No.
31. URS10	Temporary setting impact on HLA of Berriedale reducing the scenic and tranquil setting.	No mitigation during the construction phase, mitigation during the operation phase landscaping will reduce the impact	Low	Short Term	Slight Adverse	Slight Adverse	n/a
32. 7927 – White House Listed C	Setting impacts during construction and operation of the scheme through a reduction in tranquillity and also a severing of the former manse form the cemetery	No mitigation during the construction phase, mitigation during the operation phase landscaping will reduce the impact	Low	Long Term	Slight Adverse	Slight Adverse	CH02
33. 7924 – Shore Cottages listed C	Temporary setting impact on the assets during construction through reduction of tranquillity and scenic, isolated nature of the buildings.	No mitigation during the construction phase, mitigation during the operation phase landscaping will reduce the impact	Low	Short Term	Slight Adverse	Slight Adverse	CH02
34. 7925 – Fishing store and Ice house listed C	Temporary setting impact on the assets during construction through reduction of tranquillity and scenic, isolated nature of the buildings.	No mitigation during the construction phase, mitigation during the operation phase landscaping will reduce the impact	Low	Short Term	Slight Adverse	Slight Adverse	CH02
35. MHG52675 – The Haven	Temporary setting impact on the assets during construction through reduction of tranquillity and scenic, isolated nature of the buildings.	No mitigation during the construction phase, mitigation during the operation phase landscaping will reduce the impact	Low	Short Term	Slight Adverse	Slight Adverse	CH02
36. 7923 – 1-3 Portland Cottages listed C	Temporary setting impact on the assets during construction through reduction of tranquillity and scenic, isolated nature of the buildings.	No mitigation during the construction phase, mitigation during the operation phase landscaping will reduce the impact	Low	Short Term	Slight Adverse	Slight Adverse	CH02

Item	Description of Potential Impact	Mitigation Objective and Commitment	Sensitivity / Value of Receptor	Duration of impact Short / Long term	Significance of Effect prior to mitigation	Significance of Effect with mitigation	Mitigation Item No.
Road Drainage and the Water Environment (Chapter 8)							
37.	Sediment mobilisation and spillage or discharge of other pollutants into watercourses	Prevent contamination of watercourses and coastal water through controlling sediment mobilisation, surface water discharges, and spillages.	Watercourses - High Coastal Waterbody - Medium	Short Term (Construction)	Berriedale and Langwell Waters - Moderate / Large Coastal Water Body - Moderate	Not Significant	DWE1
38.	Flood risk to surrounding land from development	To minimise an increase in runoff during the construction works	Rural land - Low Residential properties - High	Short Term (Construction)	Surrounding Land – Neutral / Slight Adjacent properties – Slight	Not Significant	DWE1
39.	Alteration of water bodies (Geomorphology & Hydrology)	To minimise physical alterations to watercourses during the construction works	Watercourses - High	Short Term (Construction)	Slight	Not Significant	DWE1
40.	Disturbance of groundwater movement	To minimise the disturbance to groundwater movement below the site during construction works	Thurso bedrock and localised sand and gravel aquifers - High	Short Term (Construction)	Slight	Not Significant	DWE1
41.	Contamination of groundwater	To minimise contamination to the groundwater below the site during construction works	Thurso bedrock and localised sand and gravel aquifers - High	Short Term (Construction)	Slight / Moderate	Not Significant	DWE1

Item	Description of Potential Impact	Mitigation Objective and Commitment	Sensitivity / Value of Receptor	Duration of impact Short / Long term	Significance of Effect prior to mitigation	Significance of Effect with mitigation	Mitigation Item No.
42.	Discharge of road run off to watercourses	To prevent contamination of watercourses, coastal water and groundwater through the treatment and attenuation of runoff	Watercourses - High Coastal Waterbody - Medium	Long Term (Operation)	Berriedale and Langwell Waters – Slight / Moderate Coastal Water Body – Slight	Not Significant	DWE2
43.	Other road and infrastructure maintenance	To ensure that maintenance activities during operation of the Scheme will have minimal impact on the water environment	Watercourses - High Coastal Waterbody - Medium	Long Term (Operation)	Berriedale and Langwell Waters – Slight Coastal Water Body – Neutral / Slight	Not Significant	DWE2
44.	Flood Risk to surrounding land from development	To minimise an increase in runoff during the operation of Scheme	Watercourses - High Coastal Waterbody - Medium	Long Term (Operation)	Surrounding Land – Neutral / Slight Adjacent properties – Slight	Not Significant	DWE2
45.	Alteration of water bodies (Geomorphology & Hydrology)	To minimise physical alterations to the water environment features from the presence of the Scheme	Watercourses - High Coastal Waterbody - Medium	Long Term (Operation)	Neutral	Not Significant	-
46.	Disturbance of groundwater movement from the new road	To minimise the disturbance to groundwater movement below the site during operation of Scheme	Thurso bedrock and localised sand and gravel aquifers - High	Long Term (Operation)	Slight	Not Significant	-

Item	Description of Potential Impact	Mitigation Objective and Commitment	Sensitivity / Value of Receptor	Duration of impact Short / Long term	Significance of Effect prior to mitigation	Significance of Effect with mitigation	Mitigation Item No.
47.	Contamination of groundwater	To minimise contamination to the groundwater below the site during operation of Scheme	Thurso bedrock and localised sand and gravel aquifers - High	Long Term (Operation)	Slight	Not Significant	DWE2
Noise and Vibration (Chapter 9)							
48.	Standard Construction Works - Construction Noise	Adhere to best practice mitigation measures, adhere to Council working hours requirements and keep residents informed. Review need for additional mitigation once a contractor appointed and detailed information available	High	Temporary	-	Moderate Adverse	NV1
49.	Standard Construction – Construction Vibration from Piling (if required)	Use of rotary bored piling methods instead of driven impact piling	High	Temporary	-	Neutral	NV2
50.	Blasting – Construction Air Overpressure and Vibration	Good blast design and compliance with the guidance in PAN50 and BS 6472-2:2008	High	Temporary	-	Moderate Adverse	NV3
51.	Changes in Road Traffic Noise	Incorporated into the 3d scheme design	Medium and High	Long Term	-	Worst Effect- Slight adverse	NV4

Item	Description of Potential Impact	Mitigation Objective and Commitment	Sensitivity / Value of Receptor	Duration of impact Short / Long term	Significance of Effect prior to mitigation	Significance of Effect with mitigation	Mitigation Item No.
52.	Nesting birds at the SAC/SPA East Caithness Cliffs/SSSI Berriedale Cliffs	Timing the works to coincide with the non-sensitive period August to February	High	Temporary	-	Neutral	NV5
Materials (Chapter 10)							
53.	Site Clearance – production of inert waste.	Ensure disposal / treatment / recycling facility is located as close to site as possible to minimise transport emissions. A Construction Environment Management Document (CEMD) shall be put in place to address the likely waste arising. A Waste Management Plan (WMP) shall also be produced.	Medium	Short Term	Slight adverse impact	Not Significant	M1

Item	Description of Potential Impact	Mitigation Objective and Commitment	Sensitivity / Value of Receptor	Duration of impact Short / Long term	Significance of Effect prior to mitigation	Significance of Effect with mitigation	Mitigation Item No.
54.	Use of materials for Site construction – fencing, road restraint systems, drainage systems, earthworks, road pavements, piling works, structural concrete, traffic signs and road markings and kerbs, footways and paved areas	Ensure materials / suppliers are sourced as close to the site as possible to minimise transport emissions. Re-use as much material as possible to reduce overall demand from external sources. Procurement of products and materials with high levels of recycled content. Materials should be ordered to arrive when required for construction and the quantities should be accurately predetermined. Use of renewable materials from legal and sustainable sources.	-	Long Term	Neutral	Not Significant	M2
55.	Production of waste arising from Site construction – fencing, road restraint systems, drainage systems, earthworks, road pavements, piling works, structural concrete, traffic signs and road markings and kerbs, footways and paved areas	Production of inert waste which will require treatment/disposal off site and also waste which will require segregation with scope for recycling at a materials recovery facility. A Construction Environment Management Document (CEMD) shall be put in place to address the likely waste arising. A Waste Management Plan (WMP) shall also be produced.	Medium	Short Term	Slight adverse impact	Not Significant	M3

12 SCHEDULE OF ENVIRONMENTAL COMMITMENTS

12.1 Introduction

This chapter provides a summary of the environmental commitments that have been described in each environmental topic chapter, which will need to be part of the scheme implementation. The Contractor will be required to carry forward to detailed design the mitigation measures outlined within this report.

Table 12.1 below reports the specific mitigation commitments outlined in each environmental topic chapter. This table should be read in conjunction with Table 11.1 which describes the potential effects of the Scheme and assigns a Mitigation Item No. which is carried forward into Table 12.1.

In addition to the specific mitigation measures identified in this Environmental Report, the contractor for the Scheme should produce a Construction Environmental Management Document (CEMD) prior to work on site, as requested by SEPA in their consultation response. The CEMD should also include the mitigation measures included in this report where appropriate. This approach provides a useful link between the principles of development which need to be outlined at the early stages of the project and the method statements which are usually produced following award of contract.

The CEMD should highlight how the contractor will incorporate the principles of all proposed pollution prevention and mitigation for all elements of the construction process capable of giving rise to pollution.

It should set out the principles of how waste should be minimised should be detailed and should demonstrate that:

- Construction practices minimise the use of raw materials and maximise the use of secondary aggregates and recycled or renewable materials; and
- Waste material generated by the proposal is reduced and re-used or recycled where appropriate on site (for example in landscaping not resulting in excessive earth moulding and mounding). There may be opportunities to utilise surplus soils for sustainable purposes elsewhere.

It should also detail:

- Monitoring proposals, contingency measures and emergency plans for all polluting activities
- Details of how the works will be programmed to avoid any adverse impacts on sensitive receptors
- Surface water management plan
- Control of sediment and dust
- Fuel transportation and storage
- Welfare arrangements
- Site restoration
- Site environmental management – including details of the environmental manager and any Ecological Clerk of Works

SEPA produces a series of Pollution Prevention Guidelines (PPGs) and the principles of any relevant PPGs should be incorporated into proposals. Particular attention should be paid to the Construction PPGs:

- PPG 1 General guide to the prevention of pollution
- PPG 5 Works and maintenance in or near water
- PPG 6 Working at construction and demolition sites

Reference should be made to the joint SEPA and Highland Council guidance note on 'Construction Environmental Management Process for Large Scale Projects' (August 2010).

Table 12.1 - Schedule of Environmental Commitments (continued over)

Mitigation Item no.	Approximate chainage / location	Mitigation Objective and Commitment	Potential Mitigation Measure	Potential Timing of Mitigation Measure	Potential Monitoring Requirements	Potential Additional Consultation Required
Landscape and Visual (Chapter 5)						
LV1	Whole Scheme	Minimise vegetation clearance and potential short term effects during construction. Incorporate planting to compensate for any loss.	Native species woodland and scrub planting, reinstatement of all areas disturbed during construction. Careful consideration of the location of site compounds and storage of materials.	Detailed Design/ During Construction	Post Construction establishment/ maintenance supervision	Highland Council
LV2	Whole Scheme	Minimise loss of existing vegetation, especially mature trees which may help screen the works. Incorporate planting to compensate for any loss.	Identify important trees to be retained and incorporate tree protection measures into the construction specification. Native species woodland and scrub planting, reinstatement of all areas disturbed during construction.	Detailed Design/ During Construction	Post Construction establishment/ maintenance supervision	Highland Council
LV3	Whole Scheme, including section of redundant carriageway	Minimise potential long term effects by ensuring good landscape integration. Provide landscape design including landform re-profiling and planting.	Re-profiling of landform along redundant carriageway and provision of native species woodland and scrub planting, reinstatement of all areas disturbed during construction.	Detailed Design/ During Construction	Post Construction establishment/ maintenance supervision	Highland Council
LV4	Whole Scheme, including section of redundant carriageway	Minimise potential long term effects by provide landscape design including landform re-profiling and screen planting.	Re-profiling of landform along redundant carriageway and provision of native species woodland and scrub planting, reinstatement of all areas disturbed during construction.	Detailed Design/ During Construction	Post Construction establishment/ maintenance supervision	Highland Council
LV5	Whole Scheme, including section of redundant carriageway. Rock cut face at chainage	Ensure optimal landscape fit of scheme through landform manipulation and incorporation of planting. Minimise need for rock fall netting and rock bolts.	Grade out slopes where possible to allow natural transition. Use variable gradients rather than uniform slope face. Incorporate native woodland and scrub planting. Hydro-seed exposed	Detailed Design/ During Construction	Post Construction establishment/ maintenance supervision	Highland Council

Mitigation Item no.	Approximate chainage / location	Mitigation Objective and Commitment	Potential Mitigation Measure	Potential Timing of Mitigation Measure	Potential Monitoring Requirements	Potential Additional Consultation Required
	150-210		rock faces.			
Nature Conservation (Chapter 6)						
NC1	New cutting / retaining wall	Avoid disturbance of SPA breeding birds by sensitive timing of works.	Rock-blasting/piling only in period September to February inclusive to avoid breeding seabirds (August may be acceptable if Ecological Clerk of Works (ECoW) confirms breeding season is finished by then). Bored (not impact) piling.	During Construction	ECoW to verify seabirds finished breeding if blasting/piling in August.	None.
NC2	Whole scheme	Avoid pollution/landslide into designated sites through best practice and design.	Construction Environmental Management Document, Construction Method Statements incorporating good practice pollution controls and contingencies, monitoring by ECoW.	During Construction	ECoW to monitor pollution controls	SNH/SEPA to approve CEMD/CMS's
NC3	Road verges, around SUDS, section of current A9 to be removed.	Compensate for felling of trees, enhance scrub diversity.	Compensatory planting of suitable native species (ash/elm/oak/birch around SUDS; birch/rowan/Scots pine elsewhere; juniper/hawthorn in scrub areas). Residual impact remains because plantations will not become semi-natural for many decades.	Following construction	None	None
NC4	Road verges	Provide compensatory neutral grassland/scrub	Leave significant areas of road verges unplanted with trees to provide compensatory neutral grassland/scrub.	Following construction	None	None
NC5	Berriedale Water vicinity and between this river and the scheme	Meet legal requirements for otters including pre-construction survey and licensing.	Pre-construction survey and licensing of holt disturbance (or destruction with appropriate compensation if necessary). No works in hours of darkness. Trenches/pipes to be covered overnight.	3 to 12 months before construction for survey/licensing, else during construction	Post-construction monitoring to fulfil conditions of license.	SNH for licensing

Mitigation Item no.	Approximate chainage / location	Mitigation Objective and Commitment	Potential Mitigation Measure	Potential Timing of Mitigation Measure	Potential Monitoring Requirements	Potential Additional Consultation Required
			Any other measures required by licence			
NC6	Trees in or at edge of scheme particularly where felling likely.	Meet legal requirements for bats including pre-construction survey and (if required) licensing.	Pre-construction survey and (in the unlikely event that it is required) licensing. No works in hours of darkness. Any other measures required by licence (if required).	3 to 12 months before construction (not in winter) for survey/licensing, else during construction	Possible post-construction monitoring if license needed (considered unlikely).	SNH for licensing
NC7	Whole scheme.	Meet legal requirements for breeding birds by timing of vegetation clearance; provide suitable habitat.	Clear vegetation outside breeding bird season or ECoW to supervise. Automatic suitable habitat (possible increase) on verges/around SUDS.	During construction	None	None
NC8	Bracken/rough grass requiring clearance.	Avoid harm to common reptiles; provide suitable habitat.	Strim bracken/grass before clearance. The planting of the verges will automatically provide suitable habitat for reptiles.	During construction	None	None
NC9	SUDS locations	Avoid operational pollution of designated sites through SUDS.	Implement SUDS approved by SEPA.	During construction	None	None
Cultural Heritage (Chapter 7)						
CH01	Heritage asset MHG1113 shown on Figure 7.2	To undertake archaeological recording to preserve by record the archaeological characteristics and evidence provided by the asset	Trial trench evaluation in location of asset – followed by excavation if required	Prior to construction	Specification will need to be prepared by the Employers Archaeologist and the works on site monitored by the Employers Archaeologist	Highland Council
CH02	Along scheme	To reduce visual impact of the operational scheme from a	Landscaping proposals put forward in Chapter 5	Post-construction	None	Highland Council

Mitigation Item no.	Approximate chainage / location	Mitigation Objective and Commitment	Potential Mitigation Measure	Potential Timing of Mitigation Measure	Potential Monitoring Requirements	Potential Additional Consultation Required
		number of heritage assets				
CH03	Heritage asset MH20179 shown on Figure 7.2	To undertake archaeological recording to preserve by record the archaeological characteristics and evidence provided by the asset	Trial trench evaluation in location of asset – followed by excavation if required	Prior to construction	Specification will need to be prepared by the Employers Archaeologist and the works on site monitored by the Employers Archaeologist	Highland Council
CH04	Heritage asset MHG30470 shown on Figure 7.2	To undertake archaeological recording to preserve by record the archaeological characteristics and evidence provided by the asset	Trial trench evaluation in location of asset – followed by excavation if required	Prior to construction	Specification will need to be prepared by the Employers Archaeologist and the works on site monitored by the Employers Archaeologist	Highland Council
Road Drainage and the Water Environment (Chapter 8)						
DWE1	Construction areas	To prevent contamination of watercourses, coastal water and groundwater through controlling sediment mobilisation, surface water discharges, and spillages.	The Contractor shall produce a Construction Environmental Management Document (CEMD), incorporating best practice measures.	Prior to / during Construction	Some monitoring may be required as part of CEMP	SNH/SEPA
DWE2	Roadside areas	To prevent contamination of watercourses, coastal water and groundwater through the treatment and attenuation of runoff.	Two levels of SuDS treatment to be provided.	During Operation	Inspection and maintenance of the SuDS will be required	SNH/SEPA

Mitigation Item no.	Approximate chainage / location	Mitigation Objective and Commitment	Potential Mitigation Measure	Potential Timing of Mitigation Measure	Potential Monitoring Requirements	Potential Additional Consultation Required
Noise and Vibration (Chapter 9)						
NV1	Length of Scheme	Minimise noise disturbance to residents during standard construction works	Adhere to best practice mitigation measures, adhere to Council working hour requirements and keep residents informed. Review need for additional mitigation once a contractor appointed and detailed information available	During Construction	None	-
NV2	Length of Scheme	Minimise vibration due to piling, if required	Use of rotary bored piling methods instead of driven impact piling	During Construction	None	-
NV3	Length of Scheme	Minimise disturbance to residents during blasting	Good blast design and compliance with the guidance in PAN50 and BS 6472-2:2008	During Construction	Vibration monitoring during initial trial blasts and throughout blasting works at selection of closest properties	-
NV4	Length of Scheme	Minimise increases in traffic noise at nearby receptors	Mitigation incorporated into 3D scheme design	During Construction	None	-
NV5	Length of Scheme	Avoid disturbance to nesting birds at the SAC/SPA East Caithness Cliffs/SSSI Berriedale Cliffs during blasting	Timing the works to coincide with the non-sensitive period August to February	During Construction	-	
Materials (Chapter10)						
M1	Material Used for construction of scheme	Ensure materials / suppliers are sourced as close to the site as possible to minimise transport emissions. Re-use as much material as possible to reduce overall demand from external	Produce a Construction Environmental Management Document (CEMD) and as part of this a Waste Management Plan (WMP)	During Construction	Review of suppliers and location of sourced materials. Review of waste prior to removal off site. Review of material quantities used.	SEPA/ Highland Council

Mitigation Item no.	Approximate chainage / location	Mitigation Objective and Commitment	Potential Mitigation Measure	Potential Timing of Mitigation Measure	Potential Monitoring Requirements	Potential Additional Consultation Required
		sources. Procurement of products and materials with high levels of recycled content. Materials should be ordered to arrive when required for construction and the quantities should be accurately predetermined. Use of renewable materials from legal and sustainable sources.				
M2	Waste produced during site preparation / clearance and construction of scheme	Production of inert waste which will require treatment/disposal off site and also waste which will require segregation with scope for recycling at a materials recovery facility. A Construction Environment Management Document (CEMD) shall be put in place to address the likely waste arising. A Waste Management Plan (WMP) shall also be produced.	Produce a Construction Environmental Management Document (CEMD) and as part of this a Waste Management Plan (WMP)	During Construction	A CEMD shall be put in place to address the likely waste arising. A WMP shall also be produced. Ensure as much material is recycled as possible by reviewing waste output. All waste should be dealt following the waste hierarchy: 'reduce, reuse, and recycle' The Contractor shall carry out the Works in such a way to minimise the amount of spoil and waste	SEPA/ Highland Council

Mitigation Item no.	Approximate chainage / location	Mitigation Objective and Commitment	Potential Mitigation Measure	Potential Timing of Mitigation Measure	Potential Monitoring Requirements	Potential Additional Consultation Required
					requiring disposal. The Contractor shall identify the waste category, quantities, opportunities for recycling and or reuse, disposal routes and licensing requirements for all spoil and waste.	