

# A9 Dualling Dalraddy to Slochd

Stage 2 Scheme Assessment

Report Volume 1 –

Part 3 Environmental Assessment

March 2017



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## Part 3 – Environmental Assessment

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## 6. Summary of Previous Environmental Assessment

### 6.1. Introduction

6.1.1. This chapter provides a summary of the previous studies and assessments that have been undertaken to date since the initial A9 Route Action Plan and Route Strategy<sup>i</sup>. The route wide assessment work on the A9 dualling has culminated in the production of a Design Manual for Roads and Bridges (DMRB) Stage 1 Report<sup>ii</sup> and associated Strategic Environmental Assessment (SEA)<sup>iii</sup> which were commissioned by Transport Scotland following the commitment by the Scottish Government to dual the A9 between Inverness and Perth by 2025.

### 6.2. Background and Context

6.2.1. The Dalraddy to Slochd Scheme (hereafter referred to as the 'Proposed Scheme') presented in this DMRB Stage 2 Environmental Assessment Report (EAR) forms part of a wider programme to dual the A9 trunk road between Perth and Inverness which was identified in the Strategic Transport Projects Review (STPR)<sup>iv</sup> as a priority Trunk Road intervention.

### 6.3. Previous A9 Dualling Studies and Assessments

#### Strategic Transport Projects Review (STPR)

6.3.1. The STPR was published by Transport Scotland in 2008 and it defined the most appropriate strategic investments in Scotland's national transport network to 2022. The STPR and the associated SEA assessed the wider strategic transport corridor between Perth and Inverness and identified the following objectives with respect to the A9 corridor:

- To promote journey time reductions, particularly by public transport, between the central belt and Inverness primarily to allow business to achieve an effective working day when travelling between these centres;
- To improve the operational effectiveness of the A9 as it approaches Perth and Inverness;
- To reduce journey time and increase opportunities to travel between Inverness and Perth (and hence onwards to the central belt); and
- To address issues of driver frustration relating to inconsistent road standard, with attention to reducing accident severity.

6.3.2. The STPR was subject to SEA which concluded that the dualling of the A9 would result in a moderate to major adverse effect (however it was acknowledged that there was a high degree of uncertainty regarding the accuracy of the impacts at the strategic level) resulting from impacts upon receptors such as Natura 2000 sites, the Cairngorms National Park and nationally designated sites such as Sites of Special Scientific Interest (SSSI) and National Nature Reserves (NNRs). Beneficial impacts were also identified as potentially occurring with population, human health and materials all likely to see minor benefits as a result of the dualling.

6.3.3. The outcome of the STPR process was a commitment by the Scottish Government to dual the A9 between Dunblane and Inverness. This final intervention identified in the

STPR considers the full dualling and wider improvement of the A9 between Dunblane and Inverness.

6.3.4. The STPR stated that the A9 dualling would be:

*“expected to provide a significant contribution to the Scottish Government’s purpose of increasing sustainable economic growth. In addition this will also contribute to the national objectives of promoting journey time reductions between the Central Belt and Inverness and the reduction in accident rates. The intervention also addresses the corridor specific objectives of improving the operational effectiveness of the A9 on approaches to Perth and addressing issues of driver frustration”.*

## 6.4. A9 Programme Level Assessments

6.4.1. In December 2011, Ministers committed to dual the A9 between Perth and Inverness by 2025. This commitment was announced in the Scottish Government Infrastructure and Investment Plan (IIP)<sup>v</sup> which supports the Government Economic Strategy by setting out the Scottish Government’s plans for infrastructure investment. Following the publishing of the IIP, two corridor wide commissions, the Preliminary Engineering Support Services (PES) study<sup>ii</sup> and SEA<sup>iii</sup> (both forming components of the DMRB Stage 1 study) were carried out during the period 2012-2014 to help develop a consistent approach to dualling design and assessment, and to meet legal requirements. The findings of these studies (and the associated reports) have informed the design approach being undertaken for the Proposed Scheme. The latest version of the IIP<sup>vi</sup>, published in 2015, restates the commitment to A9 dualling (Perth to Inverness) completion by 2025.

### Strategic Environmental Assessment (SEA)

6.4.2. In Scotland, SEA is legislated through the Environmental Assessment (Scotland) Act 2005, which requires SEA for all public sector plans, programmes and strategies with the potential to present significant effects on the environment.

6.4.3. As the A9 dualling programme manages the process of route alignment selection, design, local level environmental impact assessment and the progress of construction activities along the route between Perth and Inverness, SEA Screening determined that the programme has the potential to present significant environmental effects on the environment, and SEA was therefore deemed to be required for the overarching programme.

6.4.4. The SEA supported the formal selection of a 200m wide online dualling corridor (i.e. 100m either side of the existing A9 trunk road carriageway). This online corridor was identified as a ‘soft’ boundary for further more detailed study and DMRB Stage 2 dualling alignment options development.

6.4.5. Following the publication of the SEA Environmental Report (ER)<sup>iii</sup> a subsequent Addendum was produced. The purpose of the SEA ER Addendum (2014)<sup>vii</sup> was to address consultation comments received on the ER and to provide a further opportunity for formal consultation on any significant changes or progress on the following:

- Clarifying the linkage between route-wide SEA, project-level Environmental Impact Assessment (EIA) and the stages of assessment required by the Design Manual for Roads and Bridges (DMRB);
- SEA strategic studies;
- PES Strategic Studies;





- Consideration of cumulative effects (in-combination with the Highland Main Line); and
- The approach moving forward.

6.4.6. The SEA Post Adoption Statement (PAS) 2014<sup>viii</sup> was the last formal output of the A9 Dualling Programme SEA process. It outlines how the assessment findings and the comments received through consultation, on the dualling programme and the ER (and subsequent Addendum), have been taken into account.

#### *Monitoring Framework*

6.4.7. The PAS set out a series of nine monitoring framework tables, one for each single carriageway (dualling project). The monitoring framework was designed to present an approach which requires each design and environmental assessment team appointed for the DMRB process to specifically document how the range of headline constraints, identified through the SEA process, have been considered at each of the next DMRB design stages. The aim is to secure a clearly documented audit trail of assessment from the SEA, through DMRB Stage 2 and onto Stage 3, which can be monitored and confirmed.

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<sup>i</sup> Scott Wilson Kirkpatrick (1997), A9 (T) Perth to Inverness Development of a Route Strategy – Phase 3 Final Report.

<sup>ii</sup> Jacobs (2014), A9 Dualling Preliminary Engineering Support Services – DMRB Stage 1 Assessment.

<sup>iii</sup> Halcrow Group Ltd (2013), A9 Dualling Programme – Strategic Environmental Assessment, Environmental Report.

<sup>iv</sup> Scottish Government (2008), Strategic Transport Projects Review.

<sup>v</sup> Scottish Government (2011), Infrastructure Investment Plan.

<sup>vi</sup> Scottish Government (2015), Infrastructure Investment Plan.

<sup>vii</sup> Halcrow Group Ltd (2014), A9 Dualling Programme – Strategic Environmental Assessment, Environmental Report Addendum.

<sup>viii</sup> Halcrow Group Ltd (2014), A9 Dualling Programme – Strategic Environmental Assessment, Post Adoption SEA Assessment.

## 7. Overview of Environmental Assessment

### 7.1. Introduction

- 7.1.1. This chapter outlines the approach undertaken for the Design Manual for Roads and Bridges (DMRB) Stage 2 Environmental Assessment of the Proposed Scheme Options and includes the following:
- A description of the Proposed Scheme Options;
  - A description of the scope of the DMRB Stage 2 Environmental Assessment;
  - An outline of the structure of the environmental report; and
  - An overview of the consultation process.
- 7.1.2. The DMRB Stage 2 Assessment identifies the factors to be taken into account in choosing alternative routes or improvement schemes and to identify the environmental, engineering and traffic advantages, disadvantages and constraints associated with those routes or schemes.
- 7.1.3. The Proposed Scheme Options being subject to assessment have been developed to an appropriate level of detail to enable rigorous evaluation, however, it is important to note that these are indicative designs. The preferred options at the conclusion of Stage 2 will be developed further during the DMRB Stage 3 as part of an iterative design process taking into account emerging findings from Stage 3 environmental survey work.

### 7.2. Proposed Scheme Development

- 7.2.1. The Dalraddy to Slochd scheme is approximately 25km in length, the majority of this being within the Cairngorms National Park. The southern end of the scheme ties into the Kincaig to Dalraddy dualling scheme (due to be completed in 2017). The first 16km of the scheme generally runs in a northerly direction passing Aviemore and Kinveachy (both to the east of the route) before crossing the River Dulnain to the west of Carrbridge. In the vicinity of Carrbridge the route begins to follow a westerly course, passing Black Mount (to the north), as it ascends towards Slochd. At Slochd the route begins to veer to the northwest towards Slochd Summit, the second highest point on the A9, beyond which is the northern tie-in point with the existing dual carriageway.
- 7.2.2. During the initial stages of option development, different mainline alignment options, junction locations and junction layout options were identified for the Proposed Scheme. Sifting exercises were conducted to identify feasible options to be taken forward to the DMRB Stage 2 Route Options Assessment Process. The sifting processes considered engineering and environmental impacts and operational performance.

#### Mainline

- 7.2.3. Three mainline options (all within a 200m wide corridor which was identified in the Preliminary Engineering Services (PES) Study<sup>i</sup>) were considered in the mainline sifting exercise<sup>ii</sup>:
- widening to the northbound side of the existing A9;
  - symmetrical widening on both sides of the existing A9; and
  - widening on the southbound side of the existing A9.

7.2.4. The scheme route was divided into 13 sections to aid the evaluation process and output comprised the identification of the sections considered viable and that would merit further consideration as part of the DMRB Stage 2 Assessment. The symmetrical option was sifted out at this stage due to buildability issues including the increased risk of accidents and delay to the travelling public. Table 7.1 presents a summary of the mainline sifting exercise findings.

**Table 7.1: Mainline Sifting Summary**

Sifting Sections				Sifting Conclusions		
Section	Start ch.	End ch.	Length (m)	Predominantly Northbound	Symmetrical	Predominantly Southbound
1	0	2500	2500	✓	-	✓
2	2500	3500	1000	-	-	✓
3a	3500	5500	2000	✓	-	✓
3b	5500	6700	1200	✓	-	✓
4	6700	7900	1200	✓	-	✓
5	7900	10400	2500	✓	-	✓
6a	10400	11700	1300	-	-	✓
6b	11700	13000	1300	✓	-	✓
7	13000	16300	3300	✓	-	✓
8	16300	17600	1300	✓	-	✓
9	17600	20900	3300	✓	-	✓
10	20900	23100	2200	-	-	✓
11	23100	25780	2680	-	-	✓

7.2.5. The sifting process concluded that there would be three mainline alignment options assessed as part of the DMRB Stage 2 assessment (as presented in Table 7.2. and discussed further in Section 7.3 below):

- Option 1 – southbound widening for the entire route;
- Option 1A – southbound widening, as per Option 1, but with the exception of a short hybrid section to the south of Aviemore (within Sections 2, 3a and 3b, ch. 2500 to 6700); and
- Option 2 – predominantly northbound widening but with southbound widening at Sections 2, 6a, 10 and 11.



**Table 7.2: Mainline Alignment Options to be Assessed at DMRB Stage 2**

Section	Mainline Alignment Options to be Assessed at DMRB Stage 2					
	Option 1 (Southbound Widening)		Option 1A (Option 1 with Hybrid at Aviemore South)		Option 2 (Predominantly Northbound Widening)	
	Northbound	Southbound	Northbound	Southbound	Northbound	Southbound
1		✓			✓	
2		✓		Alignment differs from Option 1 due to hybrid at Section 3a		✓
3a		✓		Hybrid to avoid all properties	✓	
3b		✓		Alignment differs from Option 1 due to hybrid at Section 3a	✓	
4		✓			✓	
5		✓			✓	
6a		✓				✓
6b		✓			✓	
7		✓			✓	
8		✓			✓	
9		✓			✓	
10		✓				✓
11		✓				✓

### Junction Locations

7.2.6. Four locations for grade separated junctions were considered during the initial stages of option development. These included a location immediately to the south of the existing Aviemore South junction with the B9152; an entirely new location between Aviemore and Craigellachie Nature Reserve at Aviemore Central; and locations at both the existing Granish junction with the A95 (to the north of Aviemore) and the existing Black Mount junction with the B9153 (to the north of Carrbridge). The junction at Aviemore Central was eliminated at an early stage. Sifting<sup>iii</sup> confirmed significant environmental and engineering constraints at this location including impacts on Craigellachie SSSI/NNR, ancient woodland, Non-Motorised Users (NMU) routes and the requirement for substantial earthworks with attendant constructability constraints. Public opinion as gauged at the February 2016 public exhibitions indicated little or no public support for a junction at this location.

### Junction Layouts

7.2.7. A substantial number of different junction layouts were considered for each of the junction locations during the initial options development stage. Roundabouts at the grade separated junctions were sifted out at particular locations during the sifting process, a key factor also being that the route corridor shall not be illuminated with street lighting (as per the existing situation) which is required in the case of this form of

junction. The exception being a half-dumbbell layout at Granish which has been included in the Stage 2 assessment due to its reduced land take requirement in comparison with other options.

- 7.2.8. As part of the junction options sifting exercise<sup>iii</sup>, 7 junction layouts for the Aviemore South location were evaluated along with 10 layouts for Granish and 12 layouts for Black Mount. Following sifting, a total of 13 junction options were identified for further assessment at DMRB Stage 2 as listed in Table 7.3 below.

**Table 7.3: Junction Options to be Assessed at DMRB Stage 2**

Junction Options	Description
<b>Aviemore South Junction Options</b>	
Option A02	Half Clover leaf Quadrants 1&4 (overbridge/southbound mainline widening)- Sections 1&2 (applicable to all mainline options)
Option A09	Diamond Left-right Stagger with Ghost Island (overbridge/southbound mainline widening)- Sections 1&2 (applicable to all mainline options)
Option A18	Diamond Left-right Stagger with B9152 Realigned (overbridge/southbound mainline widening)- Sections 1&2 (applicable to all mainline options)
<b>Granish Junction Options</b>	
Option C18	Diamond (underbridge/northbound mainline widening)– Section 5 (applicable to mainline option 2)
Option C21	Half Dumbbell Clover leaf (underbridge/northbound mainline widening)– Section 5 (applicable to mainline option 2)
Option C31	Diamond (underbridge/southbound mainline widening)– Section 5 (applicable to mainline options 1 and 1A)
Option C34	Half Dumbbell Clover leaf (underbridge/southbound mainline widening)– Section 5 (applicable to mainline options 1 and 1A)
<b>Black Mount Junction Options</b>	
Option D02	Diamond with Left-right Stagger (overbridge/northbound mainline widening) – Section 9 (applicable to mainline option 2)
Option D03 (Restricted Movements)	Half Diamond (North Facing Slips) (overbridge/southbound mainline widening) – Section 9 (applicable to mainline options 1 and 1A)
Option D07	Half Clover leaf Quadrants 2&4 (overbridge/northbound mainline widening) – Section 9 (applicable to mainline option 2)
Option D12	Diamond with Left-right Stagger (overbridge/southbound mainline widening) – Section 9 (applicable to mainline options 1 and 1A)
Option D13 (Restricted Movements)	Half Diamond (North Facing Slips) (overbridge/northbound mainline widening) – Section 9 (applicable to mainline option 2)

Option D51	Half Clover leaf Quadrants 2&4 (overbridge/southbound mainline widening) – Section 9 (applicable to mainline options 1 and 1A)
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### 7.3. Stage 2 Assessment Scheme Options Summary

7.3.1. Given that 13 junction layout options were identified (through the sifting evaluation) to be taken forward into the DMRB Stage 2 Assessment, it was not considered feasible to combine the mainline alignment options and junction options into assimilated route options given the large number of possible permutations. As such the assessment of mainline alignment options and junction options has been carried out separately. For continuity and to assist with the ongoing design development and identification of preferred options, key features and impacts will be referenced, where possible, on the basis of the 13 section framework developed for sifting. A summary of the mainline alignment options and junctions options assessed at DMRB Stage 2 are presented in Table 7.4 below (see Figures 7.1 to 7.6). Detailed engineering description of the options is included at Chapter 5.

**Table 7.4: Proposed Scheme Options Summary**

Section	Mainline Alignment Options to be Assessed at DMRB Stage 2					
	Option 1 (Southbound Widening)		Option 1A (Option 1 with Hybrid at Aviemore South)		Option 2 (Predominantly Northbound Widening)	
	Northbound	Southbound	Northbound	Southbound	Northbound	Southbound
1 Ch0 – ch2500		✓		✓	✓	
2 ch2500 – ch3500 (includes Aviemore South Junction)		✓ Junctions A02, A09, A18		Junctions A02, A09, A18 Alignment differs from Option 1 due to hybrid at Section 3a		✓ Junctions A02, A09, A18
3a ch3500 – ch5500		✓		Hybrid to avoid all properties	✓	
3b ch5500 – ch6700		✓		Alignment differs from Option 1 due to hybrid at Section 3a	✓	
4 ch6700 – ch7900		✓		✓	✓	
5 ch7900 – ch10400 (includes Granish Junction)		✓ Junctions C31, C34		✓ Junctions C31, C34	✓ Junctions C18, C21	



Section	Mainline Alignment Options to be Assessed at DMRB Stage 2					
	Option 1 (Southbound Widening)		Option 1A (Option 1 with Hybrid at Aviemore South)		Option 2 (Predominantly Northbound Widening)	
	Northbound	Southbound	Northbound	Southbound	Northbound	Southbound
6a ch10400 – ch11700		✓		✓		✓
6b ch11700 – ch13000		✓		✓	✓	
7 h13000 – ch16300		✓		✓	✓	
8 ch16300 – ch17600		✓		✓	✓	
9 ch17600 – ch20900 (includes Black Mount Junction)		✓ Junctions D03, D12, D51		✓ Junctions D03, D12, D51	✓ Junctions D02, D07, D13	
10 ch20900 – ch23100		✓		✓		✓
11 ch23100 - 25030		✓		✓		✓

### Mainline Alignment Option 1

7.3.2. Mainline Option 1 consists of a fully southbound widening with localised adjustments at the northern end of the scheme to minimise rock cuts in the area of Slochd Summit (see Figure 7.1). The following junction options are associated with Mainline Option 1:

- Aviemore South Junction Options A02, A09 and A18
- Granish Junction Options C31 and C34
- Black Mount Junction Options D03, D12 and D51

### Mainline Alignment Option 1A

7.3.3. Mainline Option 1A is similar to Option 1 with the exception of a hybrid section between chainages 2500 to 6700 (Sections 2, 3a and 3b) to avoid properties in this area (See Figure 7.2). The junction options associated with this alignment are the same as those listed above for Mainline Alignment Option 1.

## Mainline Alignment Option 2

- 7.3.4. Mainline Option 2 consists of northbound widening with four deviations to southbound through the following chainages: 2500 to 3500 (Section 2); 10400 to 11700 (Section 6a); and 20900 to 25030 (Sections 10 & 11) – see Figure 7.3. As with Option 1, there will be localised adjustments at the northern end of the scheme to minimise rock cuts in area of Slochd summit. The following junction options are associated with Mainline Option 2:
- Aviemore South Junction Options A02, A09 and A18
  - Granish Junction Options C18 and C21
  - Black Mount Junction Options D02, D07 and D13

### Aviemore South Junction Options

#### *Junction Option A02*

- 7.3.5. Junction Option A02 is a half cloverleaf and maintains the existing alignment and priority for local traffic on the B9152 (see Figure 7.4). The structural form of the overbridge is expected to be of simple structural appearance with potential for a single span square overbridge structure.

#### *Junction Option A09*

- 7.3.6. Junction Option A09 is a diamond with a left right stagger which, as per layout A02, maintains the existing alignment and priority for local traffic on the B9152 (see Figure 7.4). The structural form of the overbridge is also expected to be a single span square overbridge structure.

#### *Junction Option A18*

- 7.3.7. Junction Option A18 is a diamond with a left right stagger with the B9152 realigned between the A9 and B9152 (see Figure 7.4). The structural form of the overbridge is expected to be a more complex structural form with potential for a three span square overbridge structure due to the skew angle of the bridge and the subsequently larger span than for A02 and A09 layouts.

### Granish Junction Options

#### *Junction Options C18 and C31*

- 7.3.8. Junction Options C18 (northbound widening) and C31 (southbound widening) are diamonds with a left right stagger and maintain the existing priority for local traffic on the B9152 (see Figure 7.5). The underbridge is expected to be a single span square underbridge of simple structural form.

#### *Junction Options C21 and C34*

- 7.3.9. Junction Options C21 (northbound widening) and C34 (southbound widening) are a half dumbbell and cloverleaf arrangement (see Figure 7.5). As with junction options C18 and C31, the structural form of the underbridge is expected to be a single span square structure.

## Black Mount Junction Options

### *Junction Options D02 and D12*

- 7.3.10. Junction Options D02 (northbound widening) and D12 (southbound widening) are diamonds with a left right stagger (see Figure 7.6). The overbridge is expected to be a single span square overbridge of simple structural form.

### *Junction Options D07 and D51*

- 7.3.11. Junction Options D07 (northbound widening) and D51 (southbound widening) are half clover leaf layout forms (see Figure 7.6). The overbridge is expected to be a single span square overbridge of simple structural appearance.

### *Junction Options D03 and D13*

- 7.3.12. Junction Options D03 (southbound widening) and D13 (northbound widening) are restricted movement diamonds, with north facing slips (see Figure 7.6). As with the other full movement layouts the structural form of the overbridge is expected to be a single span square overbridge of simple form.

## Structures / Watercourse Crossings

- 7.3.13. There are 13 bridges, 29 culverts, 3 livestock creeps and 2 sign gantries currently in existence within the extents of the proposed scheme. New structures will be required for grade separated junctions, local road crossings, river/watercourse crossings and drainage infrastructure. Major structures will be required at Dulnain Bridge and Slochd Beag Bridge. All existing culverts will be replaced with new structures (or extended where the potential exists) designed to accommodate 1 in 200 year flood peak discharge flows. Design of structures and watercourse crossings will commence at DMRB Stage 3 when the Preferred Scheme Options will have been identified.

## Road Drainage

- 7.3.14. Preliminary road drainage design proposals have been developed for each of the Proposed Mainline Alignment Options in order to indicate the extent of outfalls, catchment areas, and Sustainable Drainage Systems (SuDS) required for stormwater treatment and attenuation. These indicative proposals (shown on Figures 7.1 – 7.3) have been developed to inform the Stage 2 assessment and may be subject to relocation and refinement at later stages in the design work, and do not represent the final form or dimensions of the features.

### *Sustainable Drainage System (SuDS)*

- 7.3.15. Pre-earthworks drains (ditches where land take permits or filter drains) will be considered to control surface water run-off from embankments, cuttings, existing hillside etc. and where existing ground profiles require them to act as interception drains to prevent off-site runoff entering the road corridor.
- 7.3.16. Surface water from the proposed A9 embankment slopes will discharge to filter drains or ditches constructed at the toe. Additional earthworks drainage may be required where seepages are envisaged.
- 7.3.17. Surface water run-off arising from the Proposed Scheme Options will be generally subjected to a minimum of two levels of treatment. The first level of treatment will be achieved through the use of carriageway filter drains. Carriageway filter drains will also



drain the sub-base material in cuttings. Special measures may be required to reduce seepage from filter drains in any areas of embankments, and to protect filter drains in areas of peat.

- 7.3.18. Attenuation SuDS (retention ponds and infiltration basins) will provide another level of treatment. Discharges to both surface waters and groundwater are proposed.
- 7.3.19. In line with The Highland Council's Flood Risk and Drainage Impact: Supplementary Guidance (The Highland Council, 2013)<sup>iv</sup>, attenuation SuDS proposals will contribute to controlling discharge rates to theoretical existing runoff rates for design storms up to the 200 year Return Period.
- 7.3.20. Attenuation SuDS have been positioned outwith the mapping extents of SEPA's medium flood risk zones. The extents of these zones will be subject to further verification in the DMRB Stage 3 Assessment, and allowances will be considered for compensatory floodplain storage if required.
- 7.3.21. The impact of increased run-off volume associated with the proposed carriageway will be controlled and attenuated within the SuDS features by provision of long-term storage using the methods outlined in the SuDS Manual section 24.10 (CIRIA C753, 2016)<sup>v</sup>.
- 7.3.22. Surface water run-off arising from side roads will be generally subjected to a minimum of one level of treatment.

### Embedded Mitigation

- 7.3.23. The development of the Proposed Scheme Options has included consideration of the environmental constraints present within the A9 Corridor and has sought to mitigate, where possible, the potential for adverse environmental impact. Such mitigation has been embedded into the design of the Proposed Scheme Options and has focussed on the avoidance of features of environmental interest/importance and on achieving best fit within the existing environment. The following considerations have therefore been included in the evaluation of options and have defined the options being taken forward in this DMRB Stage 2 assessment:
- Minimising potential impact on people and communities by avoiding direct encroachment onto property, optimising land take and facilitating access requirements;
  - Avoidance of designated cultural heritage assets;
  - Horizontal and vertical alignments designed to be as close to the existing A9 as possible to minimise earthwork embankments and land take;
  - Minimising encroachment into areas of ancient woodland;
  - Preliminary consideration of earthwork slopes. Opportunities for potential for variation of slope gradients to achieve best landscape fit and to reduce impact on Ancient Woodland Inventory exist and have been identified through preliminary studies. These will be explored further as part of DMRB Stage 3;
  - Minimising encroachment into areas at risk of flooding;
  - Surface water runoff arising from the proposed A9 dual carriageway will be subjected to a minimum of two levels of treatment. Attenuation SuDS have been positioned outside the mapping extents of SEPA's medium flood risk zones, the extents of these zones will be subject to further verification in DMRB Stage 3, and contributions to compensatory floodplain storage will be considered where required;
  - Avoidance of known areas of deeper peat; and

- Alignments designed to facilitate access through the A9 corridor for Non-Motorised Users with specific consideration to the National Cycle Network, Rights of Way and Core Paths.

## Earthworks

- 7.3.24. Mainline Alignment Options earthworks slopes have been designed on the basis of a high level review considering geotechnical stability and landscape fit to provide a realistic representation of potential extents. For junction options a universal 1 in 3 slope gradient has been applied and further refinement of all earthworks slopes will be undertaken upon selection of the Preferred Scheme Options as part of the detailed design process at Stage 3. For the purposes of the DMRB Stage 2 Assessment a 3m off-set to include for maintenance activity has been included in calculating areas of land take.

## Lay-bys

- 7.3.25. There are currently 16 parking lay-bys within the scheme extent. The SEA<sup>vi</sup> identified 6 potential enhanced lay-by locations within the scheme extent and these are currently under consideration. Consideration is also being given to the identification of suitable locations for standard lay-bys. Given the early stage of feasibility work, enhanced and standard lay-bys have not been assessed in this DMRB Stage 2 Assessment.

## Ongoing Design Development

- 7.3.26. Further design development will be undertaken at DMRB Stage 3 and will be supported by the ongoing EIA process, stakeholder, public and landowner consultation. As a part of the next stage of design and assessment, further detailed consideration will be given to the form and function of the junctions required and the extent of the infrastructure improvements required for the Preferred Scheme. This will include alternative side road connections, private and agricultural accesses and accommodation works requirements. The developing design will also take account of the findings of the additional survey and assessment work carried out at DMRB Stage 3.
- 7.3.27. In addition to refining the overall scheme design, it is anticipated that the key design elements that will be developed in further detail at DMRB Stage 3 will include the following:
- Residential, agricultural and NMU access facilities;
  - Land-take requirements;
  - Earthwork profiles;
  - Road drainage specification;
  - Structures and watercourse crossings; and
  - Environmental mitigation.

## 7.4. Environmental Assessment Process

- 7.4.1. DMRB sets out guidance on the development of trunk road schemes and is therefore applicable to the Proposed Scheme. Volume 11 of the DMRB specifically provides guidance on the environmental assessment of trunk road schemes, including the level of assessment required at key stages of development.



- 7.4.2. The purpose of the DMRB Stage 2 assessment is to identify the factors to be taken into account in choosing alternative routes and to identify the advantage, disadvantages and constraints (environmental, engineering, economic and traffic) associated with those routes. The Stage 2 Environmental Assessment helps to ensure that the importance of predicted environmental impacts, and the opportunity for reducing them, is properly understood and fully incorporated into the engineering and economics of the scheme development.
- 7.4.3. Annex E of Circular 8/2007 '*The Environmental Impact Assessment (Scotland) Regulations 1999*' (2007)<sup>vii</sup> provides guidance on the Environmental Impact Assessment (EIA) of trunk road projects. Although '*The Environmental Impact Assessment (Scotland) Regulations 2011*'<sup>viii</sup> consolidated, updated and replaced Part II of the EIA (Scotland) Regulations 1999, Parts III and IV of the 1999 Regulations concerning Roads, Bridges and Land Drainage, remain extant. As such, the guidance contained in Circular 8/2007 applies to the Proposed Scheme.

## 7.5. Environmental Assessment Topics

- 7.5.1. The Proposed Scheme Options have been assessed in relation to the topics listed below (reported in Chapters 8 to 19 respectively):
- Chapter 8: Community and Private Assets;
  - Chapter 9: Geology, Soils and Groundwater;
  - Chapter 10: Road Drainage and the Water Environment;
  - Chapter 11: Ecology and Nature Conservation;
  - Chapter 12: Landscape;
  - Chapter 13: Visual;
  - Chapter 14: Cultural Heritage;
  - Chapter 15: Air Quality;
  - Chapter 16: Noise and Vibration;
  - Chapter 17: Effects on all Travellers;
  - Chapter 18: Materials; and
  - Chapter 19: Policies and Plans.
- 7.5.2. The topics generally mirror those suggested in Interim Advice Note (IAN) 125/15 Environmental Assessment Update<sup>ix</sup> with the following exceptions:
- The 'People and Communities' assessment, as defined in IAN 125/15, is reported as two separate chapters, namely Community and Private Assets and Effects on All Travellers due to the large amount of information to be presented.
  - The 'Geology and Soils' assessment is reported under the chapter entitled 'Geology, Soils and Groundwater'.
  - The 'Landscape' assessment is reported as two separate chapters ('Landscape' and 'Visual') due to its complexity and the large amount of information to be presented.
  - IAN 125/15 suggests that consideration of the impact of the options on 'Policies and Plans' should be absorbed into each of the topic chapters. Given that many of the policies are relevant to more than one topic chapter, the assessment of compliance against each policy is presented together in a separate chapter (Chapter 19 Policies and Plans).



## 7.6. Cumulative Impacts

- 7.6.1. The longer term dualling of the A9 from Perth to Inverness was identified through the SEA process as having the potential to have a cumulative impact in terms of impacts on traffic volumes and the potential consequent environmental impacts that may be experienced. As all of the Proposed Scheme Options (across each of the A9 Dualling sections) are likely to result in cumulative environmental impacts, these will be considered in detail as part of the DMRB Stage 3 EIA.
- 7.6.2. European Commission guidelines (European Commission, 1999)<sup>x</sup> define cumulative impacts as those that result *‘from incremental changes caused by other past, present or reasonably foreseeable actions together with the project’*. Cumulative impacts can be identified as either the combined effect of different environmental impacts on a single receptor/resource, or the combined effect of impacts from a number of different proposed developments.
- 7.6.3. During consideration of route options at DMRB Stage 2 there is limited opportunity to identify cumulative impacts, due to factors such as the early development of the design; absence of details on construction programming and methods; and the need to consider multiple route options. However, at this stage of assessment, it is noted that any potential cumulative impacts would be broadly comparable between route options, and would therefore be unlikely to influence route option selection.
- 7.6.4. The EIA Regulations require cumulative impacts to be considered as part of a statutory EIA, and as such this will form part of the scope for EIA at DMRB Stage 3. This will include identification of other major projects that could contribute to a cumulative impact. Due to the likelihood of overlapping construction programmes for some of the A9 dualling projects, this will be a particular focus.
- 7.6.5. It should be noted that whilst not reported as part of DMRB Stage 2 assessment, the potential for cumulative impacts is being considered at a strategic level, with discussions underway with statutory consultees through the A9 Environmental Steering Group (ESG). Similarly, opportunities for maximising benefits in terms of mitigation effectiveness are under consideration (for example reviewing woodland connectivity across several project study areas).

## 7.7. Environmental Reporting

- 7.7.1. The environmental chapters as listed in Section 7.5 provide the following:
- An introduction to the subject area, an outline of the focus of the assessment and a summary of any aspects that have been scoped out of the assessment;
  - A description of the study area within which each environmental assessment is undertaken;
  - The approach and methods used in the assessment;
  - A description of the baseline conditions;
  - Potential impacts of the Proposed Scheme Options under consideration;
  - Potential mitigation, an outline of potential mitigation proposed to address adverse impacts;
  - Summary of the Route Options impacts;
  - The scope of the DMRB Stage 3 Assessment; and
  - References.

## Introduction

- 7.7.2. An introduction to the environmental topic is provided along with an overview of the main features of the assessment. Aspects which have been scoped out of the assessment are clearly identified and the study area is defined.

## Baseline Conditions

- 7.7.3. The impact assessment for each environmental topics has been undertaken in comparison with the 'baseline' situation. The 'baseline' refers to the existing site conditions and how these are predicted to change if the Proposed Scheme did not proceed.
- 7.7.4. Baseline information has been gathered through site visits, the review of maps, data collection, consultation with statutory and non-statutory organisations and field surveys.

## Potential Impacts

- 7.7.5. Predicted impacts arising from the Proposed Scheme Options have been identified and described, and an assessment of the level of significance for each impact determined as far as practical at this stage in the assessment process.
- 7.7.6. The significance of impact varies according to the environmental discipline and the context in which the assessment is made. However, in general, the level of significance of impacts has been determined through a combination of the sensitivity of the environmental aspect and the magnitude of impact. The significance of impacts has been defined where applicable for each environmental parameter in the appropriate sections.
- 7.7.7. Sensitivity has generally been defined according to the relative value or importance of the feature, and the magnitude of impact has been determined by reference to any legislative or policy standards or guidelines, and the following factors:
- The degree to which the environment is affected, e.g. whether the quality is enhanced or impaired;
  - The scale of the change, e.g. the size of land area or number of people affected and degree of change from the existing situation;
  - The scale of change resulting from impacts; and
  - Whether the impact is temporary or permanent.
- 7.7.8. The nature of impacts may vary and may be direct or indirect, secondary, cumulative, short, medium or long-term, permanent or temporary and positive or adverse. These types of impacts have all been considered.

## Potential Mitigation

- 7.7.9. The design at DMRB Stage 2 has not been sufficiently developed to allow detailed mitigation measures to be developed. The assessments presented for each environmental discipline therefore identify potential mitigation taking into account best practice, legislation and appropriate guidance.
- 7.7.10. Where mitigation measures have been developed the guidance provided in Planning Advice Note 1/2013<sup>xi</sup> on EIA as illustrated in Table 7.5 below has been followed. This considers mitigation as a hierarchy of measures ranging from prevention of



environmental impacts by avoidance, through to compensatory measures for impacts that cannot be remedied.

**Table 7.5: Hierarchy of mitigation**

Level of Mitigation	Definition
Avoid	To prevent adverse environmental impacts at source for example through choice of site or specification of construction equipment.
Reduce	If adverse impacts cannot be prevented, steps taken to reduce them through such methods as minimisation of cause of impact at source, abatement on site and abatement at receptor.
Remedy / Offset	When impacts remain that cannot be prevented or reduced, they are offset by such remedial or compensatory action as provision of environmental improvements, opportunities for access and informal recreation, creation of alternative habitats and prior excavation of archaeological features.

- 7.7.11. Once the preferred options been developed to take forward for assessment at DMRB Stage 3 the mitigation measures required for the Proposed Scheme would be further developed and refined. The DMRB Stage 3 assessment will also consider any identified enhancement measures that will result in net benefits to the environment being achieved.

### Summary of Route Option Impacts

- 7.7.12. This section of each environmental assessment undertaken sets out a summary of the assessment of each Proposed Scheme Option, and where possible, takes into account potential mitigation to provide an indication of the likely residual impacts. A comparative appraisal is also provided to enable differentiators between the options to be identified.

### Scope of DMRB Stage 3 Assessment

- 7.7.13. Based upon the findings of the DMRB Stage 2 assessments carried out each environmental discipline will summarise the proposed scope of the DMRB Stage 3 assessments to be carried out for the Preferred Route. The proposed scope will be subject to further refinement and consultation with the appropriate environmental consultees prior to assessment work being undertaken.

## 7.8. Consultation and Engagement

- 7.8.1. Early and pro-active relations with statutory and non-statutory consultees has been established to support the design, assessment and reporting period. Engagement is ongoing through established groups and forums and through specific meetings as outlined below.
- 7.8.2. Detailed stakeholder consultations have been undertaken with statutory organisations (i.e. those with responsibilities for protecting the environment and regulating any activities which may adversely affect existing environmental conditions), landowners and other non-statutory bodies with a particular interest in the environment on a scheme by scheme basis.
- 7.8.3. Such consultation has:

- ensured that stakeholders are updated on the development of the Proposed Scheme and are provided with an opportunity to comment on the Proposed Scheme Options under consideration;
- provided additional baseline information regarding existing environmental site conditions;
- identified key issues which have required more detailed study and those which can be justifiably excluded from further assessment at DMRB Stage 2; and
- provided a means of identifying the most appropriate methods of impact assessment to be undertaken at DMRB Stage 2.

### **Environmental Steering Group, Environmental Forum and Non-Motorised User (NMU) Forum**

7.8.4. Engagement with statutory and non-statutory stakeholders has been ongoing through the A9 programme development and has been facilitated through the following groups and forums that meet at regular intervals:

- Environmental Steering Group;
- Environmental Forum; and
- Non-Motorised User Forum

7.8.5. The purpose of these groups / forums is to facilitate consultation between A9 consultants and stakeholders; to provide an opportunity to discuss requirements relating to statutory responsibilities and other issues; and to provide regular updates on and an opportunity for organisations to review emerging design work.

7.8.6. The groups and forums comprise representatives from various agencies (listed below), Transport Scotland, the A9 consultants and other stakeholders.

#### *Environmental Steering Group*

7.8.7. An Environmental Steering Group (ESG) comprises the following statutory stakeholders:

- Scottish Environment Protection Agency (SEPA);
- Scottish Natural Heritage (SNH);
- Historic Environment Scotland (HES);
- Cairngorms National Park Authority (CNPA);
- Perth and Kinross Council (PKC); and
- The Highland Council (THC).

#### *Environmental Forum*

7.8.8. The Environmental Forum (EF) comprises statutory and non-statutory environmental stakeholders) including the following:

- SEPA;
- SNH;
- CNPA;
- Forestry Commission Scotland;
- RSPB Scotland;



- Tay District Fisheries Board;
- Spey District Fishery Board;
- Badenoch and Strathspey Conservation group;
- Buglife – The Invertebrate Conservation Trust;
- Scottish Badgers;
- British Deer Society;
- Scottish Wildlife Trust; and
- Findhorn, Nairn and Lossie Fisheries Trust.

#### *Non-Motorised Users (NMU) Forum*

- 7.8.9. The NMU Forum has also been developed and includes a mixture of statutory and non-statutory bodies with walking, cycling and equestrian interests.

### **Scheme Specific Consultations**

- 7.8.10. Additional face-to-face consultations were also carried out for the Proposed Scheme during 2015 and 2016 with Sustrans, The Highland Council Planning and Building Standards, the Cairngorms National Park Access Officers, Scotways and The Highland Council Access Officer.

#### *Landowner Consultations*

- 7.8.11. Landowner identification commenced in 2015 and involved door-to-door enquiries, written enquiries and meetings with both landowners and their agents. Landowners were asked to identify their property interests and to provide any further information available, including:
- Details of the owners and occupiers of land;
  - The extent of ownership information relating to any other land which was occupied either under lease, or through another informal agreement; and
  - Information relating to the type of land use.
- 7.8.12. Information was recorded in meeting notes, and the information gathered during the landowner identification and consultation process has been used to inform the project development.

#### *Public Exhibitions and Drop-in Sessions*

- 7.8.13. A series of public exhibitions and drop-in sessions have been held at various locations throughout the area surrounding the Proposed Scheme, the dates of the public consultations have included:
- 23<sup>rd</sup> September 2015 – Carrbridge (drop-in);
  - 24<sup>th</sup> September 2015 – Aviemore (drop-in)
  - 2<sup>nd</sup> February 2016 – Carrbridge (public exhibition)
  - 3<sup>rd</sup> February 2016 – Aviemore (public exhibition)
  - 16<sup>th</sup> June 2016 – Aviemore (public exhibition); and
  - 17<sup>th</sup> June 2016 – Carrbridge (public exhibition).





- 7.8.14. The exhibitions provided the general public with information on the Proposed Scheme proposals, the exhibitions were attended by key representatives from the project team including representatives from Transport Scotland and AMJV. Exhibitions have also allowed the opportunity for public comment on the developing scheme design.
- 7.8.15. These exhibitions and drop-in sessions supplemented the exhibitions that were undertaken during the development of the A9 Dualling Programme Level Assessments.

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<sup>i</sup> Jacobs (2014), A9 Dualling Preliminary Engineering Support Services – DMRB Stage 1 Assessment.

<sup>ii</sup> AMJV (2015), Mainline Sifting Report A9P11-AMJ-HGN-Z\_ML000\_XX-RP-RD-001

<sup>iii</sup> AMJV (2016), Tier 1 Junction Location and Layout Sifting Report A9P11-AMJ-HGN-Z\_JCZZZ\_ZZ-RP-CI-001

<sup>iv</sup> The Highland Council (2013), The Highland Council Flood Risk and Drainage Impact Assessment Supplementary Guidance.

<sup>v</sup> CIRIA (2016), CIRIA Report C753 The SUDS Manual.

<sup>vi</sup> Halcrow (2013), A9 Dualling Programme – Strategic Environmental Assessment, Environmental Report.

<sup>vii</sup> Scottish Government (2007), Planning Circular 8/2007: The Environmental Impact Assessment (Scotland) Regulations 1999.

<sup>viii</sup> Scottish Government (2011), The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2011.

<sup>ix</sup> Highways England (2015), Interim Advice Note (IAN) 125/15, Supplementary guidance for users of DMRB Volume 11 'Environmental Assessment'.

<sup>x</sup> European Commission (1999), Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions.

<sup>xi</sup> Scottish Government (2013), Planning Advice Note 1/2013: Environmental Impact Assessment.

## 8. Community and Private Assets

### 8.1. Introduction

- 8.1.1. This chapter presents the assessment of the Proposed Scheme Options on community and private assets. This includes agricultural, sporting and forestry interests, as well as community, residential, commercial and development land.
- 8.1.2. The assessment in this chapter focuses on land-take as a direct result of the proposed scheme, changes in access to properties and community land and community severance. Impacts on pedestrians, cyclists and equestrians, paths and land used for recreation are assessed in Chapter 17 (Effects on All Travellers).
- 8.1.3. This chapter considers permanent operational and temporary construction impacts of the Proposed Scheme Options.
- 8.1.4. The Strategic Environmental Assessment (SEA) Environmental Report for the A9 dualling was published in June 2013<sup>i</sup>. Information gathered for the SEA that is relevant to this assessment includes Land Capability for Agriculture (LCA) data, information on land holdings and land managed for forestry. Information from the SEA has been reviewed and updated where necessary.
- 8.1.5. A review of the Inland Waterway Restoration & Development Projects in England, Wales & Scotland Third Review Report by the Inland Waterways Amenity Advisory (IWAAC, 2006)<sup>ii</sup> revealed there are no proposals for the restoration of waterways in the vicinity of the Proposed Scheme and therefore this has not been considered further in this assessment.

### Study Area

- 8.1.6. The study area varied according to the aspects of private and community assets under consideration. The study area is defined for the different receptors considered in the assessment as follows:
- Residential and commercial: receptors where land-take or changes in access would be required to accommodate the Proposed Scheme Options.
  - Community land: areas that would be subject to direct land-take or changes in access as a result of the Proposed Scheme Options.
  - Development land: planning applications and development plan allocations that are situated within 500m of the Proposed Scheme Options.
  - Agricultural, sporting and forestry interests: the area of land farmed and managed by the land interests that would be subject to the land-take or changes in access as a result of the Proposed Scheme Options.
- 8.1.7. In addition to the above, potential socio-economic impacts on people and communities that may be affected by the Proposed Scheme were assessed. The study area for businesses is defined as those that rely on access to this section of the A9 for trade or would be subject to land-take due to the Proposed Scheme and those in the settlements of Aviemore and Carrbridge.



## 8.2. Approach and Methods

- 8.2.1. This assessment has been undertaken in accordance with the DMRB Volume 11, Section 3, Part 6<sup>iii</sup> and Part 8<sup>iv</sup> following the structure presented in IAN 125/09<sup>v</sup> and cognisance of IAN 125/15. The approach used to establish the baseline conditions and assess the significance of potential impacts on community and private assets is explained in this section.

### Baseline Data Collection

#### *Residential and Commercial Properties and Land*

- 8.2.2. The assessment of impacts of the Proposed Scheme Options on residential and commercial land uses is concerned with the changes in access, parking arrangements or the loss of homes, facilities, amenities, services or employment associated with land-take.
- 8.2.3. Baseline conditions for residential and commercial uses were determined through a review of Ordnance Survey (OS) maps, Geographical Information System (GIS) data, OS Address Base Plus data and visits to the site.

#### *Community Facilities and Land*

- 8.2.4. For the purposes of this assessment, community land is considered to relate to areas that provide an established public recreational resource, such as playing fields, country parks, waterways or areas identified as open space within local plans.
- 8.2.5. As noted in Chapter 17 (Effects on All Travellers), the Land Reform (Scotland) Act 2003 establishes statutory rights of responsible access on and over most land, including inland water. It is therefore acknowledged that additional areas of privately owned land may be used informally by the community. Undesignated areas of open space and woodland of known amenity value are therefore also considered in the assessment.
- 8.2.6. Community facilities, such as schools, health care facilities, community halls and sites of religious worship, have been considered in this assessment, with regard to potential land-take and changes in access.
- 8.2.7. The assessment of community impacts relates to potential severance of communities in accordance with DMRB Volume 11, Section 3, Part 8 and the potential to impact local communities in terms of employment and access to community facilities.
- 8.2.8. Baseline conditions were determined through an initial desk study including a review of relevant OS maps, GIS data, OS Address Base Plus data, local plans, site visits and community consultation events.

#### *Development Land*

- 8.2.9. For the purposes of this assessment, development land relates to areas allocated for development as identified in strategic and local development plans, as well as relevant planning applications lodged with the planning authorities.
- 8.2.10. Potential development land was identified using land allocations set out in the relevant development plans:
- Cairngorms National Park Local Development Plan (2015) (CNP LDP)<sup>vi</sup>.
  - The Highland-wide Local Development Plan (2012)<sup>vii</sup>.

- The Inner Moray Firth Local Development Plan (2015)<sup>viii</sup>.

8.2.11. An internet search for planning applications using The Highland Council<sup>ix</sup> and Cairngorms National Park<sup>x</sup> planning portals was also undertaken in June 2016.

8.2.12. The review of planning applications included only those approved. Planning applications excluded were: householder applications for improvements/extensions, change of use and enforcement actions, withdrawn or refused applications. Applications for developments that have been completed and/or for a site that has become operational were excluded from the assessment as they were assumed to form part of the existing baseline conditions.

### *Agricultural Land, Sporting Interests and Commercial Forestry*

8.2.13. For the purposes of this assessment, agriculture is considered to be the practice of cultivating the land or rearing stock to produce food products. Sporting interests include activities such as shooting and stalking over agricultural land and woodland, as well as water and fishing activities in and on lochs, reservoirs, rivers, burns, canals and ponds. Commercial forestry is defined in relation to the growing of trees to produce wood and wood products for commercial purposes.

8.2.14. The identification of baseline conditions involved a combination of:

- Desk-based research of information sources in relation to agricultural, sporting and forestry uses; including OS maps, GIS, aerial photographs and LCA data published by The James Hutton Institute.
- Identification of characteristics and extent of different agricultural, sporting and forestry land management activities along the length of the Proposed Scheme.
- Interviews with the landowners and tenants whose land would be affected by the Proposed Scheme Options. The agricultural business units are defined on the basis of their operation and in some instances may include areas of land under different ownership.

### **Consultation**

8.2.15. An overview of the DMRB Stage 2 consultation and engagement process is provided in Chapter 7 (Overview of Environmental Assessment). Consultation relevant to community and private assets is described below.

8.2.16. Information on land holdings within 500m of the Proposed Scheme extents was provided by Brodies LLP and augmented through consultation with landowners during 2015 and 2016.

8.2.17. Public exhibitions, community council meetings and drop-in sessions were attended during 2015 and 2016. Information from these events has been used to assess the location, status and importance of community land and facilities.

8.2.18. The Highland Council planning officers were consulted to identify and discuss relevant planning applications during February 2016.

### **Assessment of Impacts**

8.2.19. The significance of impacts on residential, commercial, community land and agricultural, sporting and forestry land uses were assessed taking into account receptor sensitivity and impact magnitude. Where a Proposed Scheme Option would not require land-take,

a different approach was applied to the assessment of development land as standard significance terms are not appropriate.

### *Resource Value*

- 8.2.20. As shown in Table 8.1, the resource value of community land is defined by the geographical scale at which visitors are attracted (i.e. local, regional or national), this is based on the designation of the site, e.g. a national park is considered to attract visitors nationally. Although cemeteries are generally used by the local community, they are considered to have high value. The loss of residential or commercial property through demolition or where buildings become uninhabitable is also assessed as high value. Land-take from residential or commercial property is considered of lesser value, so is assessed as medium value with derelict/ unoccupied buildings considered having least value.
- 8.2.21. Where a property is used for both residential and business purposes, the higher value criteria is assumed.

**Table 8.1: Residential, Commercial and Community Land Resource Value**

Resource Value	Description
High	Residential or commercial buildings. Property used by the community (e.g. schools, doctor surgeries). Community land that attracts users nationally (e.g. national parks). Cemeteries.
Medium	Residential or commercial land e.g. gardens. Land used by the community on a regional scale (e.g. Country Parks, forests and other land managed in such a way as to attract visitors from a regional catchment).
Low	Derelict or unoccupied buildings. Locally used community land (e.g. local parks and playing fields).

### *Magnitude of Impact*

- 8.2.22. As indicated in Table 8.2, the magnitude of impacts was determined largely based on the degree of change from baseline conditions in terms of land-take and/or access severance. Professional judgement was used to adjust the magnitude for other impacts associated with demolition and land-take, including changes to access and amenity.
- 8.2.23. Land-take was calculated based on the area affected by the anticipated land required for the Proposed Scheme plus an assumed 3m buffer for maintenance purposes.

**Table 8.2: Residential, Commercial and Community Land Magnitude of Impact**

Magnitude	Description
High	Demolition of property, >50% loss of land and/or complete severance due to land-take.
Medium	Between 15% and 50% loss of land and/or major severance due to land-take.
Low	<15% land loss and/or partial severance due to land-take.
Negligible	Very slight change from the baseline condition. Change hardly discernible, approximating to a 'no change' in conditions.

### Significance of Impact

- 8.2.24. The overall significance of impact was determined taking into account resource value and magnitude, as set out in Table 8.3. This assessment included a wide range of considerations, the final significance category was adjusted in some instances using professional judgement. Where such an adjustment was made, an explanation is provided within the assessment. For the purposes of this assessment, impacts were considered to be 'significant' where the assessment results indicated impacts of Moderate or higher significance.
- 8.2.25. It should be noted that where Proposed Scheme Options would not require land-take from a property or land holding a score of 'No Impact' will be recorded.

**Table 8.3: Residential, Commercial and Community Land Impact Significance**

Resource Value	Magnitude of Impact			
	Negligible	Low	Medium	High
High	Slight	Slight/ Moderate	Moderate/ Substantial	Substantial
Medium	Negligible/ Slight	Slight	Moderate	Moderate/ Substantial
Low	Negligible	Negligible/ Slight	Slight/ Moderate	Moderate

### Development Land and Planning Applications

- 8.2.26. The assessment of impacts on development land and planning applications was undertaken using the following criteria:
- Beneficial – the land would still be available for the proposed use and the development of the Proposed Scheme Option would improve the viability of the site for the proposed development. Impacts on the amenity of the site would not interfere with its proposed use or the impact on the amenity would be beneficial, in that the Proposed Scheme Option would improve the site's appropriateness for its proposed use.
  - Neutral – the land would still be available for the proposed use and there would be no discernible impact on the viability of the site for the proposed development. There would be no impact on the amenity of the site that would interfere with its proposed use.
  - Adverse – some of, or the entire site would no longer be available for the proposed use and the Proposed Scheme Option would reduce viability of the development taking place or would impact the amenity of the site in such a way as to interfere with its proposed use.
  - Mixed – assessment of potential impacts includes some adverse and some beneficial factors.

### Agricultural Land, Sporting Interests and Commercial Forestry

- 8.2.27. The assessment of impacts on agricultural, sporting and forestry interests was undertaken by determining the resource value and magnitude of impact according to the criteria in Table 8.4 and Table 8.5. The significance of impact was determined using Table 8.3.

### Resource Value

- 8.2.28. Professional judgement was used to consider the range of resource value characteristics found during the baseline data collection process for each agricultural, sporting and commercial forestry land interests, and a resource value rating was assigned accordingly. Table 8.4 provides an indication of the characteristics used to inform the assignment of resource value for land holdings.

**Table 8.4: Agricultural, Sporting Interests and Commercial Forestry Resource Value**

Resource Value	Description
High	Presence of prime quality agricultural land (Class 1, 2 and 3.1). Commercial sporting activity (e.g. salmon fishing, pheasant shooting, rough shooting). Forestry of national, commercial or recreational importance.
Medium	Presence of agricultural land of moderate quality (Class 3.2 and 4). Forestry of value regionally/ locally.
Low	Presence of land of low quality (Class 5, 6 and 7). Trees of low quality and other land of no specific importance.

### Magnitude of Impact

- 8.2.29. As indicated in Table 8.5, the magnitude of impacts was determined taking into account factors such as land-take and severance. Severance impacts refer to situations where the Proposed Scheme Options would cut through land parcels, potentially affecting access and also creating field sizes and shapes which may become impractical for agricultural use; and/or the main farm steading would be separated from land parcels.
- 8.2.30. Land-take was calculated based on the area affected by the anticipated land required for the Proposed Scheme plus a 3m buffer for maintenance purposes.

**Table 8.5: Criteria for Magnitude of Impacts on Agricultural, Sporting Interests and Commercial Forestry**

Magnitude of Impact	Description
High	Loss of more than 10% of the land holding. High degree of severance extending to more than 20% of the land holding. Major disruption to sporting interests. Noticeable change to the forestry over a wide area or an intensive change over a limited area.
Medium	Loss of between 5% and 10% of the land holding. Moderate degree of severance extending to between 10% and 20% of the land holding. Medium disruption to sporting interests. Small changes to the forestry over a wide area or a noticeable change over a limited area.
Low	Loss of less than 5% of the land holding. Low degree of severance extending to less than 10% of the land holding. Minimal change in access to agricultural, sporting and forestry land. Low disruption to sporting interests.





Magnitude of Impact	Description
	Very minor changes to the forestry over a wide area or minor changes over a limited area.
Negligible	Negligible change to all of the above factors

### *Significance of Impact*

- 8.2.31. The significance of impact was determined taking into account resource value and magnitude of impact, as set out in Table 8.3 above. For the purposes of this assessment, impacts were considered to be ‘significant’ where the assessment results indicated impacts of Moderate or higher significance.

### **Access to Community and Private Assets**

- 8.2.32. At this stage of the Proposed Scheme Options design work has not been undertaken on access to property and land. This will be developed and assessed in detail during DMRB Stage 3. For the purpose of this DMRB Stage 2 assessment accesses that are likely to be affected by the Proposed Scheme Options have been identified and potential impacts to access considered where they may differ between Proposed Scheme Options.
- 8.2.33. A broad discussion of changes to journey length in relation to Proposed Scheme Options is provided in Chapter 17 (Effects on All Travellers). A detailed assessment of potential impacts associated with increased journey length and amenity brought about by the construction and operation of alternative access routes will be further assessed during the DMRB Stage 3 Assessment.

### **Construction Phase Impacts**

- 8.2.34. At this stage in the design process, detailed information regarding the location and programme for construction activities is not known and therefore an assessment of construction using the application of significance has not been undertaken. This will be completed at DMRB Stage 3.
- 8.2.35. As part of this assessment a high level exercise has been undertaken to identify potential impacts to community and private assets during the construction of the Proposed Scheme and to highlight any impacts that differ between Proposed Scheme Options.

### **Limitations of the Assessment**

- 8.2.36. The estimated land-take used for this assessment is based on the footprint of the Proposed Scheme Options (including groundworks) and a 3m buffer for maintenance purposes. It does not include land that may be required for mitigation such as ecological habitats, landscape planting, drainage systems or flood compensation, which at this stage cannot be accurately quantified. Detailed mitigation proposals, drainage system locations and flood compensation measures will be developed during the DMRB Stage 3 Assessment.
- 8.2.37. An assessment of future business viability for commercial properties has not been completed at this stage, this will be completed at DMRB Stage 3.
- 8.2.38. The Proposed Scheme estimated land-take footprint includes land within the existing A9 highway corridor. As a result, the estimated land-take to land that is classified by the LCA system also includes land which is within the existing A9 highway corridor and



would not be additional land-take required as part of the Proposed Scheme. However, a calculation of LCA classes' land that would be required for the Proposed Scheme is included at this stage to compare options. A significance of impact score has not been applied to LCA class land. Further assessment of agricultural land will be undertaken at DMRB Stage 3 when the Preferred Scheme is available, including impacts to agricultural boundaries which has not been completed at this stage.

- 8.2.39. Information on user numbers of community facilities/ land and catchment areas has not been collated at this stage. Therefore, it has not been possible to quantitatively assess the numbers of users that would be affected by the Proposed Scheme Options. Where available information on user numbers will be collected at DMRB Stage 3.
- 8.2.40. Detailed information on increases to journey length is not available and will be undertaken as part of the DMRB Stage 3 Assessment.
- 8.2.41. Land that has been identified as being used for sporting interests has been based on review of online information, consultation and professional judgement. It has largely been identified on large sporting estates found within the vicinity of the Proposed Scheme. A precautionary approach has been adopted at this stage with estate land considered high value. Further analysis of the value of estate land will be undertaken at DMRB Stage 3. It should be noted other land within the Proposed Scheme area may be used for sporting interests.

## 8.3. Baseline Conditions

### Settlements

- 8.3.1. Within the Proposed Scheme area, the main settlement, in terms of population and facilities, is Aviemore. The town is located approximately 32 miles south of Inverness towards the southern end of the Proposed Scheme. The town borders the A9 to the east between the A9 and the River Spey. According to the 2011 Census<sup>xi</sup> the Aviemore settlement zone had a population of 3,613, an increase of 36% from 2,657 recorded during the 2001 Census.
- 8.3.2. The CNP LDP identifies Aviemore's strategic importance within Badenoch and Strathspey region, with its role as the main settlement in the settlement hierarchy. The CNP LDP highlights Aviemore's importance as a tourist centre, its rise in residential numbers and conservation activity.
- 8.3.3. The village of Carrbridge lies approximately 7 miles north of Aviemore. The majority of the village is situated to the east of the A9. In the 2011 Census, Carrbridge's recorded population was 792, increasing by 12% from 708 recorded during the 2001 Census.
- 8.3.4. Carrbridge is an intermediate settlement in the settlement hierarchy that forms a focus for local people and tourists to the area.

### Residential Properties

- 8.3.5. The majority of residential properties in the area are located in the settlements of Aviemore and Carrbridge. In addition, farmhouses and scattered residential properties are located within the Proposed Scheme extents. These include residences at Ballinluig Farm, Druim Mhor, Lynwilg Farm, Kinakyle, Granish Farm, Avielochan Farm, Red Stag Lodge and Kinveachy Lodge.

8.3.6. The location of residential properties directly affected by land-take or potential changes to access as a result of the Proposed Scheme Options are shown on Figures 8.1a to 8.1i.

### Commercial Properties and Tourism

- 8.3.7. The majority of commercial properties are based in and around Aviemore. Many commercial activities are linked to the tourist industry. Aviemore is a key location in Scotland’s tourist industry and an economic driver for the CNP. It is a year round destination with snowsports being a popular winter activity and walking, climbing, mountain biking and other outdoor activities drawing visitors in the summer. There is a substantial amount and wide range of accommodation provided in the town with resort hotels, hotels, bed and breakfasts, guest houses, holiday lets, caravan parks (there is also a caravan park being developed at Granish Farm), chalets, lodges and log cabins all available.
- 8.3.8. Leisure facilities that provide employment and attract visitors include the Strathspey Steam Railway, Cairngorm Reindeer Centre, Cairngorm Brewery, TreeZone Aviemore, Macdonald Spey Valley Golf and Country Club and various outdoor adventure centres.
- 8.3.9. There is also a network of local businesses in the town that include estate agents, property services, accountants, car dealerships, website design, building services and others. Industrial and business facilities are located at the Dalfaber Industrial Estate, Cairngorm Technology Park, Myrtlefield Industrial Estate and Granish Farm industrial units.
- 8.3.10. Carrbridge is also a popular tourist destination with hotels, guest houses and holiday lets in the village. Leisure attractions include the Landmark Forest Adventure Park, Carrbridge Trekking Centre and Carrbridge Golf Club. There are also commercial properties west of the A9, including a timber merchants and industrial units.
- 8.3.11. Outside of these settlements the Proposed Scheme passes through rural land used for agriculture. Estates manage land for commercial purposes such as forestry and sporting interests. Slochd Mhor Lodge operates as a hostel/ bunk house, which also provides an activity business that includes bike building and bike/ ski trailing. Other commercial properties consist of holiday lets located close to the A9 including Kinveachy Lodge and Avielochan Farm.
- 8.3.12. The location of commercial properties directly affected by land-take or potential changes to access as a result of the Proposed Scheme Options are shown on Figures 8.1a to 8.1i.

### Community Facilities and Community Land

8.3.13. Community facilities are focussed around the population centres of Aviemore and Carrbridge. A list of community facilities within the study area is provided in Table 8.6 and their location is shown on Figure 8.1a to 8.1i.

**Table 8.6: Community Facilities**

Community Facilities	Name
Places of Worship	St Aidans
	St John’s Episcopal Church
	St Andrew’s
	Alvie Church



Community Facilities	Name
Cemetery	Carrbridge Cemetery
Library	Aviemore Library, Aviemore Community Centre
Health Centre	Aviemore Medical Practice
Dentist	Aviemore Dental Practice
	Your Perfect Smile Dental Clinic
Emergency Services	Ambulance Station, Aviemore
	Fire Station, Aviemore
	Police Station, Aviemore
	Fire Station, Carrbridge
Post Office	Aviemore Post Office
Education Facilities	Aviemore Primary School
	Carrbridge Primary School
Tourist Information	Tourist Information Centre, Aviemore
Village Green	Village Green, Aviemore
Community Buildings	Aviemore Community Centre
	Carrbridge Village Hall
Child Care	Aviemore Community Children's Group, Aviemore Community Centre
	Carrbridge Baby and Toddler Group, Carrbridge Village Hall
Play Areas	Ellanwood Road Play Area, Carrbridge
	Burnside Road Play Area, Aviemore
	Braeriach Court Play Area, Aviemore
	Morlich Court Play Area, Aviemore
	Strathspey Avenue Play Area, Aviemore
Leisure Centres	Leisure Centre, Aviemore Community Centre
	Aviemore Activity Centre, Macdonald Aviemore Resort
Sport and Recreation	Aviemore Bowling Club
	Rothiemurchus And Aviemore Tennis Club, Aviemore
	Curling Pond, Carrbridge

8.3.14. There are a number of local groups and clubs that are based in the study area, these include Cairngorm Runners, Cairngorm Cycling Club, Strathspey Rugby Club, Aviemore Bowling Club, Cairngorm Ski Club, Cairngorm Snowboard Club, Aviemore Youth Club, Knitting for All and Cairngorm Bridge Club.

8.3.15. Informal outdoor recreation areas that are used by the community are listed below (further information on core paths is provided in Chapter 17, and their location is shown on Figures 17.2a to 17.2i):

- An area of privately of woodland designated as the Craigellachie National Nature Reserve (NNR) (Figure 8.1b: COM2) – land to the west of the A9 accessed via an underpass at Chainage 5290. The woodland has three core paths that are open to the public. These are the Craigellachie All-Abilities Path (LBS38), Craigellachie Nature Reserve Path (LBS39) and the Craigellachie Viewpoint Path (LBS138).



- Milton Woods (privately owned) (Figure 8.1c: COM3/COM4) – woodland to the east of the A9. The Aviemore Orbital Core Path (LBS30) passes through the woods connecting with three A9 underpasses (two solely for Non-Motorised Users (NMUs)) that provide access to properties west of the A9 and facilities such as the MacDonald Highland Resort, Aviemore Primary School and Craigellachie NNR east of the A9.
- Land surrounding the Highburnside housing estate (Figure 8.1c: COM5) – community amenities include informal footpaths that connect with the Aviemore Orbital Path and Craigellachie NNR passing through a wooded area with a pond feature. There is also a grass area used for sporting and leisure activities.

8.3.16. Public transport is provided through railway stations located at Aviemore and Carrbridge, both are on the Highland Mainline railway (HML) and are served at regular intervals by Scotrail with direct services north to Inverness and south to Edinburgh and Glasgow. Virgin Trains East Coast also operate a service between Inverness and London.

8.3.17. Bus services that serve the area include long distance bus services that stop in Aviemore from Inverness to Edinburgh and a daily service from London to Inverness. Local bus services that serve Aviemore and Carrbridge connect to Grantown-on-Spey, Boat of Garten and Nethy Bridge and Inverness as well as locations outside of the main settlements including Ballinluig Farm, Torr Alvie Cottages and Aviemore Dalnavert Cottages. The location of bus stops is shown on Figure 8.1a to 8.1i.

## Development Land

### *Local Development Plans*

#### [Cairngorms National Park Local Development Plan \(2015\)](#)

8.3.18. The majority of the Proposed Scheme area lies within the Cairngorms National Park Authority administrative boundary (Chainage 0 to 23550). Policies and proposals for development and land use within the Cairngorm National Park Authority boundary are set out in the Cairngorms National Park Local Development Plan (2015) (CNP LDP).

8.3.19. Individual community plans identify parcels of land where development can help provide support for and maintain sustainable communities across the park. Within the vicinity of the Proposed Scheme CNP LDP community plans exist for 'Aviemore and vicinity' and 'Carrbridge'.

8.3.20. Aviemore is seen as playing a strategic role in the growth of the Badenoch and Strathspey region and has already seen considerable growth in recent years. Proposals for development within the Aviemore community boundary are listed in Table 8.7 and their location is shown on Figure 8.2b and Figure 8.2c.

**Table 8.7: Aviemore and vicinity development land allocations**

Site name (no. of units)	Existing allocations and Consents	LDP allocation
<b>Housing</b>		
EP1: Horsefield Units (161 units)	Consent for 140 units	Identified as existing consent
EP2/ EP3: Dalfaber Units (93 units)	Consent for 93 units	Identified as existing consent





Site name (no. of units)	Existing allocations and Consents	LDP allocation
EP4: Grampian Road (46 units)	Consent for 20 units	Identified as existing consent
EP5: Highburnside (46 units)	Consent for 46 units	Identified as existing consent
EP6: Milton Place (25 units)	Consent for 25 units	Identified as existing consent
EP7: Granish Way (6 units)	Consent for 6 units	Not allocated in the LDP. Identified as an existing consent.
Additional windfall sites (8 units)	Consent for 8 units	Not allocated in the LDP. Identified as an existing consent.
<b>Employment Land (ED)</b>		
ED1: Dalfaber Industrial Estate		Allocated as Economic Development
ED2: South of Dalfaber Industrial Estate		Allocated as Economic Development
ED3: Myrtlefield Industrial Estate		Allocated as Economic Development
ED4: Supermarket Site	Consent – for superstore	Allocated as Economic Development
EP8: Aviemore Highland Resort		Identified as existing consent
<b>Open space (C)</b>		
C1: Land at Dalfaber Drive between the Bowling Green and Main Railway Line		Provides an important community resource and will be protected for community use
C2: land at the former school playing fields		Should be protected from inappropriate development. The land adjacent to the old primary school is therefore allocated for community use.

Table Source: Cairngorms National Park Local Development Plan (Adopted 2015)

8.3.21. Details of development land allocations within the Carrbridge settlement boundary are listed in Table 8.8 and are shown on Figure 8.2f.

**Table 8.8: Carrbridge development land allocations**

Site name (no. of units)	Existing allocations and Consents	LDP allocation
<b>Housing</b>		
H1: Carr Road (72 Units)	Within boundary of EP1	Allocated as Housing
H2: Crannich Park (22 Units)	Within boundary of EP1	Allocated as Housing
EP1: Land by Crannich Park, Rowan Park and Carr Road (117 Units)	Consent for 117 Units	Identified as existing Consent



Site name (no. of units)	Existing allocations and Consents	LDP allocation
Additional windfall sites (9 Units)	Consent for 9 Units	Not allocated identified through updated Housing Land Audit (HLA) as existing consent
<b>Economy/ Employment Land</b>		
ED1: Land at Railway Station		Allocated as Economic Development
ED2: Garage	Existing allocation	Allocated as Economic Development
<b>Tourism</b>		
T1: Landmark	Existing allocation	Allocated as Tourism Development

Table Source: Cairngorms National Park Local Development Plan (Adopted 2015)

[The Highland-wide Local Development Plan \(2012\) \(HwLDP\) and Inner Moray Firth Local Development Plan \(IMFLDP\) \(2015\)](#)

- 8.3.22. A section of the Proposed Scheme (Chainage 23550 to 25800) is outside the CNPA administrative boundary. The Highland-wide Local Development Plan (HwLDP) (2012) and Inner Moray Firth Local Development Plan (IMFLDP) (2015) provide the framework for development and policies for determining planning applications for this section.
- 8.3.23. There is no land allocated for development in the HwLDP or the IMFLDP within the Proposed Scheme study area.

### Planning Approvals

- 8.3.24. Within the Proposed Scheme area planning applications are made to The Highland Council to be determined. However, the CNPA has powers to 'call in' applications that are within the CNP boundary to make a determination.
- 8.3.25. Approved applications have been provided a reference for the purpose of this assessment, they are listed alongside a description of the proposal in Table 8.9. The location of sites with planning approval are shown on Figure 8.2a to 8.2i.

**Table 8.9: Planning Approvals.**

Ref. (Highland Council/ CNPA Application Ref.)	Location/ Proposal	Planning Consented
11/02684/FUL	Erection of two houses.	Approved by CNPA
13/02037/PIP	Proposed new house plot and access in garden ground.	Application Permitted
14/01926/OHL	New 11000 volt overhead line.	Permission Granted by Scottish Ministers
14/01109/FUL	Erection of two holiday lodges to supplement existing resort accommodation.	Approved by CNPA
15/00131/FUL	Demolition of chalet and re-erection of log cabin for self-catering letting.	Application Permitted
13/03403/FUL	Erection of two biomass boiler housings to service proposed housing development.	Approved by CNPA



Ref. (Highland Council/ CNPA Application Ref.)	Location/ Proposal	Planning Consented
14/00737/S42	To erect a new fifty three bedroom "Travelodge" type hotel with associated siteworks and landscaping.	Approved by CNPA
14/00864/FUL	Installation of radio mast (retrospective).	Application Permitted
14/00638/S42	Erection of house.	Application Permitted
13/03624/FUL	Erect paladin fencing to enclose two small gas tanks.	Application Permitted
15/00154/FUL	Installation of DSLAM cabinet measuring (Broadband Project).	Application Permitted
13/03166/ADV	Wooden directional path signs. Plot 215m north-east of plot 19 Dalfaber Industrial Estate and street outside 3 Dalfaber Park and 130m east of Birchrock Craig Na Gower Avenue and 190m north-west of 25 Grampian Road, Aviemore.	Application Permitted
15/00507/FUL	Installation of DSLAM cabinet.	Application Permitted
14/03928/FUL	Bio-mass boiler housing unit to serve housing development.	Approved by CNPA
14/03929/FUL	Affordable house type substitutions to plots 12 to 15.	Approved by CNPA
13/02896/OHL	Erection of additional pole on existing 11000 overhead line.	Permission Granted by Scottish Ministers
13/04415/FUL	Construction of double garage with self- contained accommodation within attic space.	Permission Granted
15/01603/FUL	Installation of one DSLAM cabinet.	Application Permitted
15/01060/FUL	Erection of house (amended house design and site layout).	Application Permitted
15/01848/FUL	Erection of garage and gym.	Application Permitted
16/00613/FUL	Installation of one DSLAM cabinet.	Application Permitted
16/00122/FUL	Erection of butterfly-house visitor attraction. Landmark, Carrbridge.	Application Permitted
15/03992/FUL	New building to house biomass boiler associated plant and chip store.	Application Permitted
05/306/CP	Erection of 140 dwellings, construction of roads and services and landscaping. To date 27 dwellings have been constructed.	Application Permitted and Implemented

## Agriculture, Forestry and Field Sports Land

### *Land Capability for Agriculture*

- 8.3.26. There is no prime agricultural land (LCA Class 1 to 3.1) within the Proposed Scheme corridor.
- 8.3.27. Non-prime agricultural land within the Proposed Scheme corridor ranges from LCA Class 3.2 – land capable of producing a moderate range of crops, to, LCA Class 6.3 – land capable of use only as rough grazing. In general, higher quality agricultural land is located on land bordering the route of the A9 as it runs through lower lying land in the



Spey Valley. Lower quality agricultural land lies west of the A9 on higher elevated land and as the route rises towards Slochd Summit.

- 8.3.28. LCA classes relevant to the Proposed Scheme are described in Table 8.10 and extents shown on Figure 8.4a to 8.4i.

**Table 8.10: Land Capability for Agriculture Classifications and Descriptions**

LCA Class	Description
3.2	Land capable of producing a moderate range of crops. Land in this division is capable of average production but high yields of barley, oats and grass are often obtained. Other crops are limited to potatoes and forage crops. Grass leys are common and reflect the increasing growth limitations for arable crops and degree or risk involved on their production.
4.2	Land capable of producing a narrow range of crops. Land in this division is primarily grassland with some limited potential for other crops. Grass yields can be high but the difficulties of conservation or utilisation may be severe, especially in areas of poor climate or on very wet soils. Some forage cropping is possible and occasional cereal crop.
5.2	Land capable of use as improved grassland. Sward establishment presents no difficulties but moderate or low trafficability, patterned land and/or strong slopes cause maintenance problems. Growth rates are high and despite some problems of poaching satisfactory stocking rates are achievable.
5.3	Land capable of use as improved grassland. Land in this division has properties which lead to serious trafficability and poaching difficulties and although sward establishment may be easy, deterioration in quality is often rapid. Patterns of soil, sward, and wetness may seriously interfere with establishment and/or maintenance. The land cannot support high stock densities without damage and this may be serious after heavy rain even in summer.
6.2	Land capable of use as rough grazing. Moderate quality herbage such as white and flying bent grasslands, rush pastures and herb rich moorlands or mosaics of high and low grazing values characterise land in this division.
6.3	Land capable of use as rough grazing. This vegetation is dominated by plant communities with low grazing values. Particularly heather moor, bog heather moor and blanket bog.

### *Agricultural Land Holdings*

- 8.3.29. There are a total of six agricultural enterprises located within the extents of the Proposed Scheme. These are Ballinluig Farm (part of the Kinrara Estate), Granish Farm (Strathspey Estate tenant), Avielochan Farm (Strathspey Estate tenant), a croft holding located at Carrbridge, Auchterblair Farm and agricultural land at Dalrachney and North Sluggan currently farmed by a Strathspey Estate Tenant.
- 8.3.30. Further information on these farm holdings is provided in Table 8.11, including the location of holdings within the Proposed Scheme corridor, a description of the holdings, and resource value. The location of agricultural land holdings is shown on Figure 8.3a to 8.3i.



**Table 8.11: Agricultural Land Holdings**

Ref. (Figure 8.3a to 8.3i)	Landowner (Chainage Location)	Other Land-Uses	Description of Holding	Resource Value (based on Table 8.4 criteria)
LH3 LH4 LH5	Ballinluig Farm Kinrara Estate (Chainage 560 to 4100)	Sporting Interests	The farm holdings are located towards the southern end of the Proposed Scheme, south of Aviemore. This land is used for winter feeding for the estate's sheep enterprise and silage making. The sheep enterprise also provides tick management for the estate's grouse population.  Land within these holdings is in LCA classes 3.2, 4.2 and 6.3.  Farm buildings are located at Ballinluig Farm. Land-use in the wider estate includes for sporting interests (deer, grouse, pheasant and duck).	Medium
LH8 LH9 LH10	Granish Farm Strathspey Estate Tenants (Chainage 7740 to 9140)	None	Holdings located immediately north of the Aviemore urban area. The majority of agricultural land is situated to the east of the southbound carriageway with a smaller parcel adjacent to the northbound carriageway. Land is used for livestock grazing (sheep and cattle). There are some small industrial units on the farm providing local employment. Farm buildings are located at Granish Farm. Land within these holdings is in LCA class 4.2.	Medium
LH11 LH12 LH13 LH14 LH15	Avielochan Farm Strathspey Estate Tenants (Chainage 9900 to 13090)	None	Holdings located north of Aviemore around Avie Lochan, adjacent to both carriageways of the A9.  Land is used livestock grazing (sheep and cattle).  Farm buildings are located at Avielochan Farm.  The majority of land within these holdings is in LCA class 4.2, with smaller areas of LCA class 5.2 and 6.3.	Medium
LH21	Croft at Carrbridge (Chainage 16630 to 17050)	None	Holding between the A9 southbound carriageway and HML at Carrbridge. Connects to rest of croft holding and farm buildings via railway underpass and access point at northern end of the holding. Grazing land.  Land within these holdings is in LCA class 3.2 and 4.2.	Medium
LH22	Auchterblair Farm (Chainage 16630 to 17000)	None	Holding adjacent to the northbound A9 carriageway at Carrbridge. Farm buildings are located outwith the Proposed Scheme study area. Land used for arable practices (cereal/ grass rotation).  Land within these holdings is in LCA class 3.2 and 4.2.	Medium





Ref. (Figure 8.3a to 8.3i)	Landowner (Chainage Location)	Other Land-Uses	Description of Holding	Resource Value (based on Table 8.4 criteria)
LH23	Agricultural land at Dalrachney and North Sluggan (Strathspey Estate Tenant) (Chainage 17230 to 21000)	None	Agricultural holding adjacent to the northbound A9 carriageway used for livestock grazing. Land within these holdings is in LCA class 3.2, 4.2, 5.2 and 5.3.	Medium

### Commercial Forestry

- 8.3.31. There are two forestry enterprises located within the extents of the Proposed Scheme. Information on forestry holdings is provided in Table 8.12, including the location of holdings within the Proposed Scheme corridor, a description of the holdings, and resource value. The location of forestry holdings is shown on Figure 8.3a to 8.3i.

**Table 8.12: Commercial Forestry Land Holdings**

Ref. (Figure 8.3a to 8.3i)	Landowner	Other Land-Uses	Description of Holding	Resource Value (based on Table 8.4 criteria)
LH1, LH2	Alvie Estate (Chainage 0 to 560)	Sporting Estate	Commercial forestry holdings located adjacent to the northbound and southbound carriageways of the existing A9. Other land-uses within the wider estate include sporting interests (deer and grouse).	High
LH6, LH7, LH16, LH17, LH20, LH24, LH25, LH26	Strathspey Estate (Chainage 9150 to 21700)	Sporting Estate	Forestry holdings adjacent to the northbound and southbound carriageways of the A9. Also with sporting interest (deer). Timber flows are north and south from most access points.	High

### Sporting Estates

- 8.3.32. Two areas of land are identified as being primarily used for sporting interests, these are listed in Table 8.13 below alongside a resource value rating. Their location is shown on Figure 8.3g to 8.3i.

**Table 8.13: Sporting Estate Land Holdings**

Ref.	Landowner	Description of Holding	Resource Value (based on Table 8.4 criteria)
LH27	Strathspey Estate	Predominantly grouse moor.	High
LH28	Corrybrough Estate	Predominantly grouse moor.	High





## 8.4. Potential Impacts

### Introduction

- 8.4.1. This section discusses the potential impacts to community and private assets during the construction and operation of the Proposed Scheme Options. Proposed Scheme Options assessed as having the same impact to receptors have been grouped together to avoid repetition.

### Construction Phase Impacts

- 8.4.2. As discussed in Section 8.2, a detailed assessment of construction impacts including assigning significance ratings will be completed during DMRB Stage 3 when more information on construction activities is available. A high level discussion of potential impacts is provided below.
- 8.4.3. In general, the impacts to community and private assets identified in the operation phase assessment will also apply during the construction phase. For example, alterations to property, land-use and access will be begin as the Proposed Scheme is constructed.
- 8.4.4. Impacts specific to construction activities are likely to be disruption to journeys due to temporary road closures and diversions and/ or traffic management put in place. It is also likely that during construction there would be noise, air quality and visual impacts associated with the use of construction vehicles/ plant/ equipment in the proximity of private property. Please see Chapter 13 (Visual Effects), Chapter 15 (Air Quality) and Chapter 16 (Noise and Vibration) of this report for a discussion on construction impacts relating to these topics.

### Operational Phase Impacts

#### Impacts Common to All Mainline Alignment Options

##### Access

- 8.4.5. There a total of 35 at-grade access junctions and 10 underpasses within the Proposed Scheme extents, see Figure 8.3a to 8.3i for their locations.
- 8.4.6. Table 8.14 details residential properties, commercial properties, community facilities and land, agricultural land, commercial forestry and land with sporting interests that are currently accessed via an A9 at-grade junction or through an underpass.
- 8.4.7. As detailed in paragraph 8.2.31, at this stage of the scheme design, development of access arrangements has not been undertaken. However, in line with the wider A9 dualling strategy current proposals are to close at-grade access points and therefore it is anticipated that all mainline alignment options would permanently alter current arrangements for at-grade junctions. It is expected that the Preferred Scheme design would provide alternate access to properties. Facilities specific to each access will be considered further at DMRB Stage 3.
- 8.4.8. There may be potential impacts to journey time to and from these residential properties and residential properties in the wider study area and this will be considered further at DMRB Stage 3.

**Table 8.14: Access to Residential Properties**

Ref.	Holding	Access (Figure 8.3a to 8.3i Reference)
<b>Residential Properties</b>		
R1	Kinrara Estate	At-grade access onto the A9 southbound carriageway. Chainage 2220 (Access point 4).
R2	Lynwilg Farmhouse	At-grade access onto the A9 northbound carriageway. Chainage 3280 (Access point 9).
R5	March Cottage, Aviemore	At-grade access directly onto the A9 northbound carriageway. Chainage 4650 (Access point 10). Alternative vehicle access is provided via an underpass that links to the B9152 south of Aviemore. Chainage 4740 (Access point 11).
R6	Craig Dhu, Aviemore	
R7	Lagnacallich, Aviemore	
R8	Lagavulin, Aviemore	
R9	Kinmundy, Aviemore	
R13	Kinveachy Lodge – Let Cottage	At-grade access directly onto the A9 northbound carriageway. Chainage 12400 (Access point 27).
<b>Commercial Properties</b>		
C2	MacDonald Aviemore Highland Resort	At-grade access onto the A9 southbound carriageway. Chainage 5650 (Access point 14). The Highland Resort can also be accessed via Grampian Road within Aviemore.
C3	Scottish Water Site	At-grade access to the A9 northbound carriageway. Chainage 5650 (Access point 13). This provides access for vehicles to a Scottish Water site within the NNR.
C5	Kinveachy Lodge	At-grade access onto the A9 northbound carriageway. Chainage 12400 (Access point 27).
<b>Community Facilities and Land</b>		
COM1	Alltnacriche – Cristian centre/ outdoor pursuits	At-grade access point directly onto the A9 southbound carriageway – Chainage 3280 (Access point 9).
COM2	Woodland west of the A9 designated as the Craigellachie NNR.	Pedestrian access via an A9 underpass that links to the Aviemore Orbital Path. Chainage 5290 (Underpass point 12). There is also a gated at-grade access to the A9 northbound carriageway. Chainage 5650 (Access point 13). This provides access for vehicles to a Scottish Water site within the NNR.
COM4	Milton Woods	Pedestrian access via an A9 underpass that links to the Aviemore Orbital Path. Chainage 7000 (Underpass point 15).



Ref.	Holding	Access (Figure 8.3a to 8.3i Reference)
COM5	Land west of the A9 around the Highburnside housing estate. Links to the Craigellachie NNR.	Pedestrian access via an A9 underpass that links to the Aviemore Orbital Path. Chainage 7000 (Underpass point 15).
<b>Agricultural Land</b>		
LH3, LH4, LH5	Ballinluig Farm Kinrara Estate) (Chainage 560 to 4100)	There are nine access points to these holdings located within the Proposed Scheme area. These include three underpasses and five at-grade access. (Access points 1, 2, 3, 4, 5, 6, 7, 9)
LH8, LH9, LH10	Granish Farm Strathspey Estate Tenants (Chainage 7740 to 9140)	There is one at-grade access located on the A9 northbound carriageway. (Access point 18).
LH11, LH12, LH13, LH14, LH15	Avielochan Farm Strathspey Estate Tenants (Chainage 9900 to 13090)	There are eight access points to these holdings within the Proposed Scheme area. These include seven at-grade access points and one underpass. (Access points 22, 23 24, 25, 26, 27, 28).
LH21	Croft at Carrbridge (Chainage 16630 to 17050)	One at-grade access point. (Access point 37).
LH22	Auchterblair Farm (Chainage 16630 to 17000)	One at-grade access point. (Access point 36).
LH23	Strathspey Estate Tenant at Dalrachney and North Sluggan (Chainage 17230 to 21000)	Three at-grade access points. (Access points 36, 38 and 40).
<b>Commercial Forestry</b>		
LH6, LH7, LH16, LH17, LH20, LH24, LH25, LH26	Strathspey Estate (Chainage 9150 to 21700)	A total of 14 at-grade access points within the Proposed Scheme area. (Access points 17, 20, 22, 27, 29, 30, 31, 32, 33, 34, 38, 40 and 41).
<b>Sporting Interests</b>		
LH27	Strathspey Estate	One at-grade access. (Access point 42).
LH28	Corrybrough Estate	One at-grade access point. (Access point 45).

### Development

#### Local Development Plans

- 8.4.9. All of the Mainline Alignment Options are anticipated to have a Neutral impact on CNP LDP development zones EP1/ EP4 and EP5. The overall viability of the zones for housing is not expected to be affected. The land-take and percentage of the overall zone that will be lost for each of the Mainline Alignment Options is provided in Table 8.15.



**Table 8.15: All Mainline Alignments – Common Impacts to CNP LDP**

CNP LDP (2015) Development Zone	Mainline Option	Land-Take ha	Land-Take (% of Zone)	Potential Impact	Impact Description
EP1/ EP4 (Housing)	1	0.95ha	2.3%	Neutral	Relatively small area of the overall site would be lost. It is not expected that the overall viability or amenity of the site would be affected for its proposed use as housing.
	1A	0.93ha	2.2%		
	2	0.03ha	0.1%		
EP5 (Housing)	1	0.02ha	0.2%	Neutral	Relatively small area of the overall site would be lost. It is not expected that the overall viability or amenity of the site would be affected for its proposed use as housing.
	1A	0.02ha	0.1%		
	2	0.43ha	2.9%		

*Agricultural Land, Commercial Forestry and Sporting Estates*

Agricultural Land Holdings

8.4.10. Potential impacts to agricultural holdings that are common for all of Mainline Alignment Options are listed in Table 8.16 (potential impacts to Avielochan Farm, Auchterblair Farm and the Croft at Carrbridge are specific to Mainline Alignment Options, see Table 8.22, 8.29 and 8.36). All of the Mainline Option Alignments are expected to have a significance of impact of Slight adverse at Ballinluig Farm, Granish Farm and to agricultural land located at Dalrachney and North Sluggan, currently farmed by a Strathspey Estate tenant.

**Table 8.16: All Mainline Alignments – Common Impacts to Agricultural Land Holdings**

Ref.	Landowner	Mainline Option	Land-Take (ha)	Land-Take (% of holding)	Resource Value	Magnitude of Impact	Significance of Impact
LH3 LH4 LH5	Ballinluig Farm Kinrara Estate	1	7.12ha	0.4%	Medium	Low	Slight
		1A	7.06ha	0.4%			
		2	7.69ha	0.4%			
LH8 LH9 LH10	Granish Farm Strathspey Estate Tenants	1	1.24ha	0.8%	Medium	Low	Slight
		1A	1.24ha	0.8%			
		2	2.01ha	1.3%			
LH23	Strathspey Estate Tenant – Dalrachney and North Sluggan	1	0.36ha	0.2%	Medium	Low	Slight
		1A	0.36ha	0.2%			
		2	3.62ha	1.5%			

### Commercial Forestry

- 8.4.11. All the Mainline Alignment Options would require land-take to land used for forestry within the Alvie and Strathspey Estates. A description of potential impacts to forestry holdings and a significance of impact rating is provided in Table 8.17.
- 8.4.12. Potential impacts are not expected to be significant to commercial forestry operations for all of the Mainline Alignment Options. It is anticipated that a relatively low area of commercial forestry land would be lost in relation to the Alvie and Strathspey Estates overall forestry holdings. As a result a significance of impact of Slight adverse is expected to the Alvie Estate, and Slight/ Moderate adverse to the Strathspey Estate forestry operations.
- 8.4.13. There are no potential impacts identified that are specific to any of the Mainline Alignment Options.

**Table 8.17: All Mainline Alignments – Common Impacts to Forestry Holdings**

Ref.	Landowner	Mainline Option	Land-Take (ha)	Land-Take (% holding)	Resource Value	Magnitude of Impact	Significance of Impact
LH1, LH2	Alvie Estate	1	1.96ha	0.7%	High	Negligible	Slight
		1A	1.96ha	0.7%			
		2	1.94ha	0.7%			
LH6, LH7, LH16, LH17, LH18, LH20, LH24, LH25, LH26	Strathspey Estate	1	12.24ha	1.9%	High	Low	Slight/ Moderate
		1A	12.39ha	1.9%			
		2	15.92ha	2.5%			

### Sporting Estates

- 8.4.14. Potential land-take impacts to two sporting estates are common for all of the mainline alignment options, see Table 8.18. All of the Mainline Option Alignments are expected to have a significance of impact no greater than Slight/ Moderate adverse.

**Table 8.18: All Mainline Alignments – Common Impacts to Sporting Estate Holdings**

Ref.	Landowner	Mainline Option	Land-Take (ha)	Land-Take (% holding)	Resource Value	Magnitude of Impact	Significance of Impact
LH27	Strathspey Estate	1	11.51ha	6.0%	High	Low	Slight/ Moderate
		1A	11.68ha	6.1%			
		2	12.92ha	6.7%			
LH28	Corrybrough Estate	1	7.13ha	0.5%	High	Negligible	Slight
		1A	7.16ha	0.5%			
		2	7.14ha	0.5%			

## Impacts Specific to Mainline Alignment Option 1

### Residential Properties

- 8.4.15. Mainline Alignment Option 1 would require land-take from six residential properties. A description of potential impacts and a significance of impact rating for each property is provided in Table 8.19.
- 8.4.16. Potential impacts to five properties (Kinakyle, Birch View Cottage, 2 Broom Cottages, Carrbridge and Avielochan Farmhouse) are expected to be significant (i.e. above Moderate), due to demolition of property buildings and loss of surrounding land.

**Table 8.19: Mainline Alignment Option 1 – Potential Impacts to Residential Properties**

Ref.	Residential Property	Land-Take (ha)	Land-Take (% of holding)	Resource Value	Magnitude of Impact	Significance of Impact	Potential Impact Description
R3	Kinakyle, Aviemore,	0.19ha	52.7%	High	High	Substantial (Significant)	Demolition of property building, loss of large area of the property land, severance of access road.
R4	Birch View Cottage, Aviemore	0.13ha	18.4%	High	High	Substantial (Significant)	Demolition of property building, land-take, severance of access road.
R10	High Range House, Aviemore	0.10ha	13.3%	High	High	Substantial (Significant)	Demolition of property building, land-take.
R11	Red Stag Lodge	0.01ha	6.7%	Medium	Low	Slight	Loss of land at the rear of the property.
R12	Avielochan Farmhouse	0.09ha	95.3%	High	High	Substantial (Significant)	Demolition of property building, loss of majority of the property land.
R14	2 Broom Cottages, Carrbridge	0.04ha	46.4%	High	High	Substantial (Significant)	Demolition of outbuildings, loss of large area of the property land.

### Commercial Properties

- 8.4.17. Mainline Alignment Option 1 would require land-take from three commercial properties. A description of potential impacts and a significance of impact rating for each property is provided in Table 8.20.
- 8.4.18. It is not expected that potential impacts to these commercial properties would be significant, with significance of impact expected no greater than Slight adverse.



**Table 8.20: Mainline Alignment Option 1 – Potential Impacts to Commercial Properties**

Ref.	Residential Property	Land-Take (ha)	Land-Take (% of holding)	Resource Value	Magnitude of Impact	Significance of Impact	Potential Impact Description
C1	High Range Developments Limited	0.28ha	8.3%	Medium	Low	Slight	Loss of land bordering the west of the site.
C2	MacDonald Aviemore Highland Resort	0.91ha	3.1%	Medium	Low	Slight	Loss of land bordering the west of the site.
C4	Caravan Park – Under Development	0.07ha	2.9%	Medium	Low	Slight	Loss of land bordering the west of the site.
C6	John Gordon & Son Limited. Timber Merchants	<0.01ha	<0.01%	Medium	Negligible	Negligible/Slight	Minor loss of land at the east of the site.

### *Community Facilities and Land*

- 8.4.19. Mainline Alignment Option 1 would require land-take from four areas of land used by the community. A description of potential impacts and a significance of impact rating for each area of community land is provided in Table 8.21.
- 8.4.20. It is not expected that potential impacts to community land would be significant, with significance of impact expected of no greater than Slight adverse.

**Table 8.21: Mainline Alignment Option 1 – Potential Impacts to Community Facilities and Land**

Ref.	Community Facilities and Land	Land-Take (ha)	Land-Take (% of holding)	Resource Value	Magnitude of Impact	Significance of Impact
COM2	Woodland west of the A9 designated as the Craigellachie NNR*	0.06ha	0.1%	High	Negligible	Slight
COM3	MacDonald Aviemore Highland Resort – Aviemore Orbital Path	0.44ha	4.9%	Low	Low	Negligible/Slight
COM4	Strathspey Estate – Aviemore Orbital Path and Milton Woods	1.14ha	10.2%	Low	Low	Negligible/Slight
COM5	Land Surrounding Highburnside	0.03ha	0.3%	Low	Negligible	Negligible

\*Note – the private land-ownership boundary was used to calculate land-take from COM2. This results in a minor difference in land-take to the calculation presented in Chapter 11 Ecology and Nature Conservation where the Craigellachie NNR boundary is used.

### *Agricultural Land*

- 8.4.21. Mainline Alignment Option 1 would require land-take from a total of six farms (three with potential impacts common to all the mainline options [see Table 8.16] and three potential impacts specific to this option). A description of potential impacts and a significance of impact rating for each farm is provided in Table 8.22.
- 8.4.22. Potential impacts to a croft holding at Carrbridge are expected to be significant with the loss of a field bordering the A9 southbound carriageway. Potential impacts to Avielochan Farm and Auchterblair Farm are not anticipated to be significant, with an expected significance of impact no greater than Slight adverse.

**Table 8.22: Mainline Alignment Option 1 – Potential Impacts to Agricultural Land Holdings**

Ref.	Commercial Facility/ Land	Land-Take (ha)	Land-Take (% of holding)	Resource Value	Magnitude of Impact	Significance of Impact	Potential Impact Description
LH11 LH12 LH13 LH14 LH15	Avielochan Farm Strathspey Estate Tenants	9.56ha	4.1%	Medium	Low	Slight	Loss of relatively small area of agricultural land in relation to the overall holding.
LH21	Croft at Carrbridge	0.98ha	24.1%	Medium	High	Moderate/ Substantial	Loss of field adjacent to the A9 southbound carriageway and significant area of overall holding.
LH22	Auchterblair Farm, Carrbridge.	0.06ha	0.1%	Medium	Negligible	Negligible/ Slight	Loss of relatively minor area of agricultural land in relation to the overall holding.

### Land Classification for Agriculture (LCA)

- 8.4.23. The potential land required for this option to LCA land is shown in Table 8.23 (including land within the existing A9 road boundary). The majority of LCA land taken would be from classes 4.2 and 6.3.

**Table 8.23: Mainline Alignment Option 1 – Potential Land-Take to LCA land**

LCA Class	Land-take ha	% of land-take
3.2	7.5ha	4.7%
4.2	85.4ha	53.5%
5.2	10.9ha	6.8%
5.3	1.0ha	0.6%
6.2	1.1ha	0.6%
6.3	53.6ha	33.6%
Total	159.5ha	

## Development

### Local Development Plans

- 8.4.24. Mainline Alignment Option 1 is anticipated to have an adverse impact on land identified as Open Space in the CNP LDP. Development of the Proposed Scheme Option would result in the permanent loss of an area of the site and impacts to the amenity value with proximity of a new dual carriageway with associated impacts including noise, air quality and visual. The land-take and percentage of the Open Space lost is shown in Table 8.24.

**Table 8.24: Mainline Alignment Option 1 – Potential Impacts to CNP LDP**

CNP Local Development Zone	Land-Take (ha)	Land-Take (% of Zone)	Potential Impact	Impact Description
Open Space (OS) – land north the MacDonald Highland Resort including Milton Woods and the Aviemore Orbital Path.	0.79ha	7.6%	Adverse	An area of land would be permanently developed and no longer available for the intended use as Open Space. The amenity value of the site would be adversely affected.

### Planning Applications

- 8.4.25. Mainline Alignment Option 1 is anticipated to have an adverse impact on one site with valid planning permission. The land-take in hectares, percentage of the site taken and description of impacts is provided in Table 8.25.

**Table 8.25: Mainline Alignment Option 1 – Potential Impacts to Planning Applications**

Ref. (Highland Council/ CNPA Application Ref.)	Land-Take (ha)	Land-Take (% of site)	Potential Impact	Impact Description
05/306/CP Erection of 140 dwellings, construction of roads and services and landscaping.	0.44ha	4.9%	Adverse	A relatively small percentage of the site would no longer be available for the intended use. Land-take would be from land identified for planting within the planning application. It is considered that there would be loss in amenity value of the site but the overall viability of the site would not be affected.

## Impacts Specific to Mainline Alignment Option 1A

### Residential Properties

- 8.4.26. Mainline Alignment Option 1A would require land-take from nine residential properties. A description of potential impacts and a significance of impact rating for each property is provided in Table 8.26. It should be noted that impacts outside of the hybrid section are not specific to Option 1A as they apply to Option 1, however, for completeness these impacts are reported below.



8.4.27. Potential impacts to two properties (Avelochan Farmhouse and 2 Broom Cottages, Carrbridge) are expected to be significant, due to demolition of a property building and the loss of surrounding land.

**Table 8.26: Mainline Alignment Option 1A – Potential Impacts to Residential Properties**

Ref.	Residential Property	Land-Take (ha)	Land-Take (% of property)	Resource Value	Magnitude of Impact	Significance of Impact	Potential Impact Description
R3	Kinakyle, Aviemore	<0.01ha	<0.01%	Medium	Negligible	Negligible/Slight	Loss of minor area of land surrounding the property.
R4	Birch View Cottage, Aviemore	<0.01ha	0.2%	Medium	Negligible	Negligible/Slight	Loss of minor area of land surrounding the property.
R5	March Cottage, Aviemore	<0.01ha	9.8%	Medium	Low	Slight	Loss of relatively small area of land surrounding the property.
R8	Lagavulin, Aviemore	<0.01ha	0.1%	Medium	Negligible	Negligible/Slight	Loss of minor area of land surrounding the property.
R9	Kinmundy, Aviemore	<0.01ha	2.8%	Medium	Low	Slight	Loss of relatively small area of land surrounding the property.
R10	High Range House, Aviemore	0.01ha	1.4%	Medium	Low	Slight	Loss of relatively small area of land surrounding the property.
R11	Red Stag Lodge	0.01ha	6.9%	Medium	Low	Slight	Loss of relatively small area of land surrounding the property.
R12	Avelochan Farmhouse	0.09ha	98.3%	High	High	Substantial (Significant)	Demolition of the property building, loss of majority of the property land.
R14	2 Broom Cottages, Carrbridge	0.04ha	46.4%	High	High	Substantial (Significant)	Demolition of the property building, loss of large area of the property land.

### *Commercial Properties*

8.4.28. Mainline Alignment Option 1A would require land-take from four commercial properties. A description of potential impacts and a significance of impact rating for each property is provided in Table 8.27. Potential impacts due to land-take from commercial properties are not anticipated to be significant, with a significance of impact no greater than Slight adverse expected.



**Table 8.27: Mainline Alignment Option 1A – Potential Impacts to Commercial Properties**

Ref.	Residential Property	Land-Take (ha)	Land-Take (% of holding)	Resource Value	Magnitude of Impact	Significance of Impact	Potential Impact Description
C1	High Range Developments Limited	0.07ha	1.9%	Medium	Low	Slight	Loss of land bordering the west of the site.
C2	MacDonald Aviemore Highland Resort	0.89ha	2.9%	Medium	Low	Slight	Loss of land bordering the west of the site.
C4	Caravan Park – Under Development	0.07ha	2.9%	Medium	Low	Slight	Loss of land bordering the west of the site.
C6	John Gordon & Son Limited. Timber Merchants	<0.01ha	<0.01%	Medium	Negligible	Negligible/Slight	Minor loss of land at the east of the site.

### *Community Facilities and Land*

8.4.29. Mainline Alignment Option 1A would require land-take from four areas of land used by the community. A description of potential impacts and a significance of impact rating for each area of community land is provided in Table 8.28. Potential impacts due to land-take from community land are not anticipated to be significant, with a significance of impact no greater than Slight adverse expected.

**Table 8.28: Mainline Alignment Option 1A – Potential Impacts to Community Facilities and Land**

Ref.	Community Facilities and Land	Land-Take (ha)	Land-Take (% of holding)	Resource Value	Magnitude of Impact	Significance of Impact
COM2	Woodland west of the A9 designated as the Craigellachie NNR*	0.04ha	0.1%	High	Negligible	Slight
COM3	MacDonald Aviemore Highland Resort – land including Aviemore Orbital Path and Milton Woods	0.44ha	4.9%	Low	Low	Negligible/Slight
COM4	Strathspey Estate – Aviemore Orbital Path and Milton Woods	1.15ha	10.3%	Low	Low	Negligible/Slight
COM5	Land Surrounding Highburnside	0.02ha	0.2%	Low	Negligible	Negligible

Ref.	Community Facilities and Land	Land-Take (ha)	Land-Take (% of holding)	Resource Value	Magnitude of Impact	Significance of Impact
*Note – the private land-ownership boundary was used to calculate land-take from COM2. This results in a minor difference in land-take to the calculation presented in Chapter 11 Ecology and Nature Conservation where the Craigellachie NNR boundary is used.						

### Agricultural Land

#### Agricultural Land Holdings

- 8.4.30. Mainline Alignment Option 1A would require land-take from a total of six farms (three with potential impacts common to all the mainline options [see Table 8.16] and three potential impacts specific to this option). A description of potential impacts and a significance of impact rating for each farm is shown in Table 8.29.
- 8.4.31. Potential impacts to a croft holding at Carrbridge are expected to be significant with the loss of a field bordering the A9 southbound carriageway and significant portion of the overall croft holding. A moderate/ substantial adverse significance of effect is anticipated.
- 8.4.32. Potential impacts to Avielochan Farm and Auchterblair Farm are not anticipated to be significant, with an expected significance of impact no greater than Slight adverse.

**Table 8.29: Mainline Alignment Option 1A – Potential Impacts to Agricultural Land Holdings**

Ref.	Agricultural Land Holding	Land-Take (ha)	Land-Take (% of holding)	Resource Value	Magnitude of Impact	Significance of Impact	Potential Impact Description
LH11 LH12 LH13 LH14 LH15	Avielochan Farm Strathspey Estate Tenants	9.54ha	4.0%	Medium	Low	Slight	Loss of relatively small area of farm holdings in relation to the overall farm holdings.
LH21	Croft at Carrbridge	0.98ha	24.1%	Medium	High	Moderate/ Substantial (Significant)	Loss of field adjacent to the A9 southbound carriageway. Loss of significant proportion of the overall croft holding.
LH22	Auchterblair Farm, Carrbridge.	0.06ha	0.1%	Medium	Negligible	Negligible/ Slight	Loss of relatively minor area of the farm holding.

#### Land Classification for Agriculture (LCA)

- 8.4.33. The potential land required for this option to LCA land is shown in Table 8.30 (including land within the existing A9 road boundary). The majority of LCA land taken would be from classes 4.2 and 6.3.



**Table 8.30: Mainline Alignment Option 1A – Potential Impacts to LCA Land**

LCA Class	Land-take ha	% Land-take
3.2	7.0ha	4.4%
4.2	85.3ha	53.6%
5.2	10.9ha	6.8%
5.3	1.1ha	0.7%
6.2	1.1ha	0.7%
6.3	53.9ha	35.0%
Total	159.3ha	

*Development*

Local Development Plan

- 8.4.34. Mainline Alignment Option 1A is anticipated to have an adverse impact on land identified as Open Space in the CNP LDP. Development of the Proposed Scheme Option would result in the permanent loss of an area of the site and impacts to the amenity value with proximity of a new dual carriageway and associated adverse impacts to noise, air quality and visual. The land-take and percentage of the Open Space lost is shown in Table 8.31.

**Table 8.31: Mainline Alignment Option 1A – Potential Impacts to CNP LDP**

CNP Local Development Zone	Land-Take (ha)	Land-Take (% of proposal)	Potential Impact	Impact Description
Open Space (OS) – land north the MacDonald Highland Resort including Milton Woods and the Aviemore Orbital Path.	0.81ha	7.7%	Adverse	An area of land would be permanently developed and no longer available for the intended use as Open Space. The amenity value of the site would be adversely affected.

Planning Applications

- 8.4.35. Mainline Alignment Option 1A is anticipated to have an adverse impact on one site with valid planning permission. The land-take in hectares, percentage of the site taken and description of impacts is provided in Table 8.32.

**Table 8.32: Mainline Alignment Option 1A – Potential Impacts to Planning Applications**

Ref. (CNPA Application Ref.)	Land-Take (ha)	Land-Take (% of site)	Potential Impact	Impact Description
05/306/CP Erection of 140 dwellings, construction of roads and services and landscaping.	0.44ha	4.9%	Adverse	A relatively small percentage of the site would no longer be available for the intended use. Land-take would be from land identified for planting within the planning application. It is considered that there would be



Ref. (CNPA Application Ref.)	Land-Take (ha)	Land-Take (% of site)	Potential Impact	Impact Description
				loss in amenity value of the site but the overall viability of the site would not be affected.

## Impacts Specific to Mainline Alignment Option 2

### *Residential Properties*

- 8.4.36. Mainline Alignment Option 2 would require land-take from eight residential properties. A description of potential impacts and a significance of impact rating for each property is provided in Table 8.33.
- 8.4.37. Land-take for this option is not anticipated to result in a significant impact to residential properties, with an expected significance of impact no greater than Slight adverse.

**Table 8.33: Mainline Alignment Option 2 – Potential Impacts to Residential Properties**

Ref.	Residential Property	Land-Take (ha)	Land-Take (% of property)	Resource Value	Magnitude of Impact	Significance of Impact	Potential Impact Description
R2	Lynwilg Farmhouse	<0.01ha	0.2%	Medium	Low	Slight	Loss of relatively small area of land surrounding the property.
R3	Kinakyle, Aviemore	<0.01ha	<0.01%	Medium	Negligible	Negligible/Slight	Loss of minor area of land surrounding the property.
R5	March Cottage, Aviemore	<0.01ha	0.1%	Medium	Negligible	Negligible/Slight	Loss of relatively small area of land surrounding the property.
R8	Lagavulin, Aviemore	<0.01ha	0.4%	Medium	Negligible	Negligible/Slight	Loss of minor area of land surrounding the property.
R9	Kinmundy, Aviemore	0.01ha	7.4%	Medium	Low	Slight	Loss of relatively small area of land surrounding the property.
R12	Avielochan Farmhouse	0.01ha	12.3%	Medium	Low	Slight	Loss of relatively small area of land surrounding the property.
R13	Kinveachy Lodge – Let Cottage	<0.01ha	4.2%	Medium	High	High	Loss of outbuildings and relatively small





Ref.	Residential Property	Land-Take (ha)	Land-Take (% of property)	Resource Value	Magnitude of Impact	Significance of Impact	Potential Impact Description
							area of land surrounding the property.
R15	Slochd Cottage	<0.01ha	2.9%	Medium	Low	Slight	Loss of relatively small area of land surrounding the property.

### Commercial Properties

- 8.4.38. Mainline Alignment Option 2 would require land-take from three commercial properties. A description of potential impacts and a significance of impact rating for each commercial property is shown in Table 8.34.
- 8.4.39. Land-take for this option is not anticipated to result in a significant impact to commercial properties, with an expected significance of impact no greater than Slight adverse.

**Table 8.34: Mainline Alignment Option 2 – Potential Impacts to Commercial Properties**

Ref.	Residential Property	Land-Take (ha)	Land-Take (% of holding)	Resource Value	Magnitude of Impact	Significance of Impact	Potential Impact
C2	MacDonald Aviemore Highland Resort	0.09ha	0.3%	Medium	Negligible	Negligible/Slight	Land-take
C4	Caravan Park – Under Development	<0.01ha	0.2%	Medium	Negligible	Negligible/Slight	Land-take
C6	John Gordon & Son Limited. Timber Merchants	0.06ha	11.7%	Medium	Low	Slight	Land-take

### Community Facilities and Land

- 8.4.40. Mainline Alignment Option 2 would require land-take from four areas of land used by the community. A description of potential impacts and a significance of impact rating for each area of community land is provided in Table 8.35.
- 8.4.41. Potential impacts due to land-take from community land are not anticipated to be significant, with a significance of impact no greater than Slight/ Moderate adverse expected.



**Table 8.35: Mainline Alignment Option 2 – Potential Impacts to Community Land**

Ref.	Community Facilities and Land	Land-Take (ha)	Land-Take (% of holding)	Resource Value	Magnitude of Impact	Significance of Impact
COM2	Woodland west of the A9 designated as the Craigellachie NNR*.	2.53ha	2.3%	High	Low	Slight/ Moderate
COM3	MacDonald Aviemore Highland Resort – land including Aviemore Orbital Path and Milton Woods	0.02ha	0.2%	Low	Negligible	Negligible
COM4	Strathspey Estate – land including the Aviemore Orbital Path and Milton Woods	0.17ha	1.5%	Low	Negligible	Negligible
COM5	Land Surrounding Highburnside	0.49ha	5.3%	Low	Low	Negligible/ Slight

\*Note – the private land-ownership boundary was used to calculate land-take from COM2. This results in a minor difference in land-take to the calculation presented in Chapter 11 Ecology and Nature Conservation where the Craigellachie NNR boundary is used.

### *Agricultural Land*

#### Agricultural Land Holdings

- 8.4.42. Mainline Alignment Option 2 would require land-take from a total of six farms (three with potential impacts common to all the mainline options and three potential impacts specific to this option). A description of potential impacts and a significance of impact rating for the land holding is shown in Table 8.36.
- 8.4.43. Potential impacts at two farms; Avielochan Farm and a croft holding at Carrbridge are expected to be significant (Moderate adverse).

**Table 8.36: Mainline Alignment Option 2 – Potential Impacts to Agricultural Land Holdings**

Ref.	Agricultural Land Holding	Land-Take (ha)	Land-Take (% of holding)	Resource Value	Magnitude of Impact	Significance of Impact	Potential Impact Description
LH11 LH12 LH13 LH14 LH15	Avielochan Farm Strathspey Estate Tenants.	12.16ha	5.1%	Medium	Medium	Moderate (Significant)	The loss of agricultural land is expected to have a significant impact on the overall
LH21	Croft at Carrbridge.	0.34ha	8.5%	Medium	Medium	Moderate (Significant)	Loss of field adjacent to the A9 southbound carriageway. Loss relatively large amount of land in relation to

Ref.	Agricultural Land Holding	Land-Take (ha)	Land-Take (% of holding)	Resource Value	Magnitude of Impact	Significance of Impact	Potential Impact Description
							the overall croft holding.
LH22	Auchterblair Farm, Carrbridge.	0.92ha	1.3%	Medium	Low	Slight	Loss of relatively minor area of the farm holding.

#### Land Classification for Agriculture

- 8.4.44. The potential land required for this option to LCA land is shown in Table 8.37 (including land within the existing A9 road boundary). The majority of LCA land taken would be from classes 4.2 and 6.3.

**Table 8.37: Mainline Alignment Option 2 – Potential Impacts to LCA Land**

LCA Class	Land-take ha	% of Land-Take
3.2	6.5ha	3.7%
4.2	90.6ha	51.6%
5.2	8.6ha	4.9%
5.3	1.3ha	0.7%
6.2	1.2ha	0.7%
6.3	67.5ha	38.4%
Total	175.7ha	

#### *Development*

#### Local Development Plans

- 8.4.45. Mainline Alignment Option 2 is anticipated to have a Neutral impact on land identified as Open Space in the CNP LDP. Development of the Proposed Scheme Option would result in the permanent loss of a relatively minor area of the site and impacts to the amenity value are not expected to adversely affect the sites proposed use as Open Space. The land-take and percentage of the Open Space lost is shown in Table 8.38.

**Table 8.38: Mainline Alignment Option 2 – Potential Impacts to CNP LDP**

CNP Local Development Zone	Land-Take (ha)	Land-Take (% of Zone)	Potential Impact	Impact Description
Open Space (OS) – land to the north the MacDonald Highland Resort including Milton Woods and the Aviemore Orbital Path.	0.11ha	1.0%	Neutral	Relatively small area of the overall site would be lost. It is not expected that the overall viability or amenity of the site would be affected for its proposed use as open space.

### Planning Applications

- 8.4.46. Mainline Alignment Option 2 is anticipated to have a neutral impact on one site with valid planning permission. The land-take in hectares, percentage of the site taken and description of impacts is provided in Table 8.39.

**Table 8.39: Mainline Alignment Option 2 – Potential Impacts to Planning Applications**

Ref. (CNPA Application Ref.)	Land-Take (ha)	Land-Take (% of site)	Potential Impact	Impact Description
05/306/CP Erection of 140 dwellings, construction of roads and services and landscaping.	0.02ha	0.2%	Neutral	A small percentage of the site would no longer be available for the intended use. The land-take would be from an area identified for planting within the planning application. There would be no discernible impact on the amenity of the site.

## Impacts Specific to Aviemore South Junction Options

### *Introduction*

- 8.4.47. Junction Option A02, A09 and A18 potential impacts relate to agricultural holdings and residential properties.

### *Impacts Specific to Junction Option A02*

#### Agricultural Land Holdings

- 8.4.48. It is not expected that the option would result in a significant impact to the Ballinluig Farm as a relatively minor area of agricultural land would be lost in relation to the overall farm holdings. The land-take for the junction and a significance of impact rating for the farm are shown in Table 8.40. The option (including land within the existing A9 road boundary) would require land from LCA class 3.2 (2.6ha) and LCA 4.2 (4.5ha).
- 8.4.49. The junction would sever fields either side of the A9, potentially isolating areas of land. Severed land is not expected to exceed 10% of the overall farm holdings.

**Table 8.40: Junction Option A02– Potential Impacts to Agricultural Land Holdings**

Ref.	Land Holding	Land-Take (ha)	Land-Take (% of holding)	Resource Value	Magnitude of Impact	Significance of Impact
LH3, LH4, LH5	Ballinluig Farm (Kinrara Estate)	6.44ha	0.4%	Medium	Low	Slight



### Impacts Specific to Junction Option A09

#### Residential Properties

- 8.4.50. The junction is not expected to result in a significant impact to Lynwilg Farmhouse (Figure 8.1b: R2), land would be lost adjacent to the A9 southbound carriageway. Land-take and a significance of impact rating for property are shown in Table 8.41.

**Table 8.41: Junction A09 – Potential Impacts to Residential Properties**

Ref.	Residential Property	Land-Take (ha)	Land-Take (% of holding)	Resource Value	Magnitude of Impact	Significance of Impact
R2	Lynwilg Farmhouse	0.03ha	12.2%	Medium	Low	Slight

#### Agricultural Land Holdings

- 8.4.51. It is not expected that the option would result in a significant impact to the Ballinluig Farm as a relatively minor area of agricultural land would be lost in relation to the overall farm holdings. Land-take and a significance of impact rating for the farm are shown in Table 8.42. The option (including land within the existing A9 road boundary) would require land from LCA class 3.2 (1.7ha) and LCA 4.2 (7.4ha).
- 8.4.52. However, the junction would sever fields either side of the A9, potentially isolating areas of land. Severed land is not expected to exceed 10% of the overall farm holdings.

**Table 8.42: Junction Option A09 – Potential Impacts to Agricultural Land Holdings**

Ref.	Land Holding	Land-Take (ha)	Land-Take (% of holding)	Resource Value	Magnitude of Impact	Significance of Impact
LH3, LH4, LH5	Ballinluig Farm (Kinrara Estate)	8.21ha	0.5%	Medium	Low	Slight

### Impacts Specific to Junction Option A18

#### Residential Properties

- 8.4.53. The junction would require the demolition of a property and loss of land at Lynwilg Farmhouse (Figure 8.1b: R2) for the north-bound on-slip, the potential impact is expected to be significant. It would also require land from a residential property on the Kinrara Estate (Figure 8.1a: R1), this potential impact is not expected to be significant. Land-take and a significance of impact rating for the properties are shown in Table 8.43.

**Table 8.43: Junction Option A18 – Potential Impacts to Agricultural Land Holdings**

Ref.	Residential Property	Land-Take (ha)	Land-Take (% of holding)	Resource Value	Magnitude of Impact	Significance of Impact
R1	Kinrara Estate	<0.01ha	0.3%	Medium	Negligible	Negligible/Slight

Ref.	Residential Property	Land-Take (ha)	Land-Take (% of holding)	Resource Value	Magnitude of Impact	Significance of Impact
R2	Lynwilg Farmhouse	0.06ha	25.5%	High	High	Substantial (Significant)

### Agricultural Land Holdings

- 8.4.54. It is not expected that the option would result in a significant impact to the Ballinluig Farm as a relatively minor area of agricultural land would be lost in relation to the overall farm holdings. A description of potential impacts and a significance of impact rating for the farm is provided in Table 8.44. The option (including land within the existing A9 road boundary) would require land from LCA class 3.2 (4.6ha) and LCA 4.2 (8.2ha).
- 8.4.55. However, the junction would sever fields either side of the A9, potentially isolating areas of land. Severed land is not expected to exceed 10% of the overall farm holdings.

**Table 8.44: Junction Option A18 – Potential Impacts to Agricultural Land Holdings**

Ref.	Land Holding	Land-Take (ha)	Land-Take (% of holding)	Resource Value	Magnitude of Impact	Significance of Impact
LH3, LH4, LH5	Ballinluig Farm (Kinrara Estate)	10.45ha	0.6%	Medium	Low	Slight

## Impacts Specific to Granish Junction Options

### *Introduction*

- 8.4.56. Impacts specific to Junction Options C18, C21, C31 and C34 relate to impacts to residential properties, agricultural land and commercial forestry.

### *Impacts Specific to Junction Option C18*

#### Residential Properties

- 8.4.57. Junction Option C18 would require land associated with Red Stag Lodge (Figure 8.3c: R11) for the southbound on-slip. The potential impact is expected to be significant, with a significance of impact Moderate adverse, as a result of the area of land lost at the holding for development. Potential impacts are provided in Table 8.45.

**Table 8.45: Junction Option C18 – Potential Impacts to Residential Properties**

Ref.	Residential Property	Land-Take (ha)	Land-Take (% of property)	Resource Value	Magnitude of Impact	Significance of Impact
R2	Lynwilg Farmhouse	0.06ha	25.5%	High	High	Substantial (Significant)
R11	Red Stag Lodge	0.04ha	17.7%	Medium	Medium	Moderate (Significant)

### Agricultural Land Holdings

- 8.4.58. Junction Option C18 would require agricultural land associated with Granish Farm. It is not expected that the option would result in a significant impact to Granish Farm as a relatively small area of agricultural land would be lost in relation to the overall farm holdings. Land-take and a significance of impact rating for the farm is provided in Table 8.46. The option (including land within the existing A9 road boundary) would require land from LCA class 4.2 (9.0ha) and LCA 6.3 (0.6ha).
- 8.4.59. A section of Granish Farm land holding LH8 would be severed, however this is considered relatively minor in relation to the overall holding and would not result in a significant impact.

**Table 8.46: Junction Option C18 – Potential Impacts to Agricultural Land Holdings**

Ref.	Land Holding	Land-Take (ha)	Land-Take (% of holding)	Resource Value	Magnitude of Impact	Significance of Impact
LH8, LH9, LH10	Granish Farm (Strathspey Estate Tenants)	6.09ha	4.0%	Medium	Low	Slight

### Commercial Forestry

- 8.4.60. Junction Option C18 would require Strathspey Estate forestry land for the junction northbound on-slip and southbound off-slip. Land-take would be relatively minor in relation to the overall land holding and is not expected to have a significant impact on the commercial forestry operation. Land-take and a significance of impact rating are provided in Table 8.47.

**Table 8.47: Junction Option C18 – Potential Impacts to Commercial Forestry**

Ref.	Land Holding	Land-Take (ha)	Land-Take (% of holding)	Resource Value	Magnitude of Impact	Significance of Impact
LH6, LH7, LH16, LH17, LH18, LH20, LH24, LH25, LH26	Strathspey Estate	0.51ha	0.1%	High	Negligible	Slight

### *Impacts Specific to Junction Option C21*

#### Residential Properties

- 8.4.61. Junction Option C21 would require land associated with Red Stag Lodge (Figure 8.1c: R11) for the junction southbound on-slip. The potential impact is not expected to be significant, with a significance of impact assessed as Slight adverse. Land-take and impact assessment are shown in Table 8.48.

**Table 8.48: Junction Option C21 – Potential Impacts to Residential Properties**

Ref.	Residential Property	Land-Take (ha)	Land-Take (% of property)	Resource Value	Magnitude of Impact	Significance of Impact
R11	Red Stag Lodge	0.03ha	14.7%	Medium	Low	Slight

Agricultural Land Holdings

- 8.4.62. Junction Option C21 would require agricultural land associated with Granish Farm. It is not expected that the option would result in a significant impact to Granish Farm as a relatively small area of agricultural land would be lost in relation to the overall farm holdings. Land-take and a significance of impact rating for the farm is provided in Table 8.49. The option (including land within the existing A9 road boundary) would require land from LCA class 4.2 (7.7ha) and LCA 6.3 (1.1 ha).
- 8.4.63. A section of Granish Farm land holding LH9 would be severed, however this is considered relatively minor area of land in relation to the overall holding and is not expected to result in a significant impact.

**Table 8.49: Junction Option C21 – Potential Impacts to Agricultural Land Holdings**

Ref.	Land Holding	Land-Take (ha)	Land-Take (% of holding)	Resource Value	Magnitude of Impact	Significance of Impact
LH8 LH9 LH10	Granish Farm Strathspey Estate Tenants	5.17ha	3.4%	Medium	Low	Slight

Commercial Forestry

- 8.4.64. Junction Option C21 would require land used for commercial forestry by the Strathspey Estate for the junction northbound on-slip and southbound off-slip. Land-take would be relatively minor in relation to the overall land holding and is not expected to have a significant impact on the commercial forestry operation. Land-take and a significance of impact rating are shown in Table 8.50.

**Table 8.50: Junction Option C21 – Potential Impacts to Commercial Forestry**

Ref.	Land Holding	Land-Take (ha)	Land-Take (% of holding)	Resource Value	Magnitude of Impact	Significance of Impact
LH6 LH7 LH16 LH17 LH18 LH20 LH24 LH25 LH26	Strathspey Estate	0.03ha	<0.01%	High	Negligible	Slight

## Impacts Specific to Junction Option C31

### Residential Properties

- 8.4.65. Junction Option C31 would require demolition of Red Stag Lodge (Figure 8.1c: R11) and land-take from the surrounding land associated with the property for the junction southbound on-slip. The potential impact is expected to be significant, with a significance of impact assessed as Substantial adverse. Land-take and a significance of impact rating are shown in Table 8.51.

**Table 8.51: Junction Option C31 – Potential Impacts to Residential Properties**

Ref.	Residential Property	Land-Take (ha)	Land-Take (% of property)	Resource Value	Magnitude of Impact	Significance of Impact
R11	Red Stag Lodge	0.21ha	57.1%	High	High	Substantial (Significant)

### Agricultural Land Holdings

- 8.4.66. Junction Option C31 would require agricultural land associated with Granish Farm. It is not expected that the option would result in a significant impact to Granish Farm as a relatively small area of agricultural land would be lost in relation to the overall farm holdings. Land-take and a significance of impact rating for the farm is provided in Table 8.52. The option (including land within the existing A9 road boundary) would require land from LCA class 4.2 (9.4ha) and LCA 6.3 (0.2ha).
- 8.4.67. A section of Granish Farm land holdings LH8 and LH9 would be severed, however this is considered relatively small area of land in relation to the overall holding and is not expected to result in a significant impact.

**Table 8.52: Junction Option C31 – Potential Impacts to Agricultural Land Holdings**

Ref.	Land Holding	Land-Take (ha)	Land-Take (% of holding)	Resource Value	Magnitude of Impact	Significance of Impact
LH8 LH9 LH10	Granish Farm Strathspey Estate Tenants	6.81ha	4.5%	Medium	Low	Slight

### Commercial Forestry

- 8.4.68. Junction Option C31 would require land used for commercial forestry by the Strathspey Estate for the junction northbound on-slip and southbound on-slip and off-slip. Land-take would be relatively minor in relation to the overall land holding and is not expected to have a significant impact on the commercial forestry operation. Land-take and a significance of impact are shown in Table 8.53.

**Table 8.53: Junction Option C31 – Potential Impacts to Commercial Forestry**

Ref.	Land Holding	Land-Take (ha)	Land-Take (% of holding)	Resource Value	Magnitude of Impact	Significance of Impact
LH6 LH7 LH16 LH17 LH18 LH20 LH24 LH25 LH26	Strathspey Estate	0.31ha	0.1%	High	Negligible	Slight

*Impacts Specific to Junction Option C34*

Residential Properties

- 8.4.69. Junction Option C34 would require demolition of Red Stag Lodge (Figure 8.1c: R11) and land-take from the surrounding land associated with the property for the junction southbound on-slip. The potential impact is expected to be significant, with a significance of impact assessed as Substantial adverse. Potential impacts are provided in Table 8.54.

**Table 8.54: Junction Option C34 – Potential Impacts to Residential Properties**

Ref.	Residential Property	Land-Take (ha)	Land-Take (% of property)	Resource Value	Magnitude of Impact	Significance of Impact
R11	Red Stag Lodge	0.08ha	38.2%	High	High	Substantial (Significant)

Agricultural Land Holdings

- 8.4.70. Junction Option C34 would require agricultural land associated with Granish Farm. It is not expected that the option would result in a significant impact to Granish Farm as a relatively small area of agricultural land would be lost in relation to the overall farm holdings. Land-take and a significance of impact rating for the farm is shown in Table 8.55. The option (including land within the existing A9 road boundary) would require land from LCA class 4.2 (7.4ha) and LCA 6.3 (0.7ha).
- 8.4.71. A section of Granish Farm land holding LH9 would be severed, however this is considered relatively minor area of land in relation to the overall holding and is not expected to result in a significant impact.

**Table 8.55: Junction Option C34 – Potential Impacts to Agricultural Land Holdings**

Ref.	Land Holding	Land-Take (ha)	Land-Take (% of holding)	Resource Value	Magnitude of Impact	Significance of Impact
LH8 LH9 LH10	Granish Farm (Strathspey Estate Tenants)	5.37ha	3.6%	Medium	Low	Slight



### Commercial Forestry

- 8.4.72. Junction Option C34 would require land used for commercial forestry by the Strathspey Estate for the junction northbound on-slip and southbound on-slip and off-slip. Land-take would be relatively minor in relation to the overall land holding and is not expected to have a significant impact on the commercial forestry operation. Land-take and a significance of impact rating for the farm are shown in Table 8.56.

**Table 8.56: Junction Option C34 – Potential Impacts to Commercial Forestry**

Ref.	Land Holding	Land-Take (ha)	Land-Take (% of holding)	Resource Value	Magnitude of Impact	Significance of Impact
LH6 LH7 LH16 LH17 LH18 LH20 LH24 LH25 LH26	Strathspey Estate	0.40ha	0.1%	High	Negligible	Slight

### **Impacts Specific to Black Mount Junction Options**

#### *Introduction*

- 8.4.73. Impacts specific to Junction Options D02, D03, D07, D12, D13, D51 relate to impacts to agricultural land and commercial forestry.

#### *Impacts Specific to Junction Option D02*

#### Agricultural Land Holdings

- 8.4.74. Junction Option D02 would require land-take from agricultural land adjacent to the A9 northbound carriageway at Dalrachney and North Sluggan currently occupied by a tenant to the Strathspey Estate. It is not expected that the option would result in a significant impact to the holding as a relatively small area of agricultural land would be lost in relation to the overall farm holdings. Land-take and a significance of impact rating for the farm is provided in Table 8.57. The option (including land within the existing A9 road boundary) would require land from LCA class 4.2 (10.3ha).

**Table 8.57: Junction Option D02 – Potential Impacts to Agricultural Land Holdings**

Ref.	Land Holding	Land-Take (ha)	Land-Take (% of holding)	Resource Value	Magnitude of Impact	Significance of Impact
LH23	Agricultural land at Dalrachney and North Sluggan (Strathspey Estate Tenant)	3.28ha	1.3%	Medium	Low	Slight

### Commercial Forestry

- 8.4.75. Junction Option D02 would require land used for commercial forestry by the Strathspey Estate on land on the southbound carriageway side of the A9 to accommodate the junction and the re-aligned A938. Land-take would be relatively small in relation to the overall land holding and is not expected to have a significant impact on the commercial

forestry operation. Land-take and a significance of impact rating are shown in Table 8.58.

- 8.4.76. The re-aligned A938 would sever an area of forestry, however it is not expected to have a significant impact as it is relatively small parcel of land in relation to the overall holding.

**Table 8.58: Junction Option D02 – Potential Impacts to Commercial Forestry**

Ref.	Land Holding	Land-Take (ha)	Land-Take (% of holding)	Resource Value	Magnitude of Impact	Significance of Impact
LH25	Strathspey Estate	6.18ha	0.9%	High	Low	Slight/ Moderate

### *Impacts Specific to Junction Option D03*

#### Agricultural Land Holdings

- 8.4.77. Junction Option D03 would require land-take from agricultural land adjacent to the A9 northbound carriageway at Dalrachney and North Sluggan currently occupied by a tenant to the Strathspey Estate. It is not expected that the option would result in a significant impact to the holding as a relatively small area of agricultural land would be lost in relation to the overall farm holdings. Land-take and a significance of impact rating for the farm is provided in Table 8.59. The option (including land within the existing A9 road boundary) would require land-take from LCA class 4.2 (5.4ha).

**Table 8.59: Junction Option D03 – Potential Impacts to Agricultural Land**

Ref.	Land Holding	Land-Take (ha)	Land-Take (% of holding)	Resource Value	Magnitude of Impact	Significance of Impact
LH23	Agricultural land at Dalrachney and North Sluggan (Strathspey Estate Tenant)	0.82ha	0.3%	Medium	Low	Slight

#### Commercial Forestry

- 8.4.78. Junction Option D03 would require land used for commercial forestry by the Strathspey Estate on land on the southbound carriageway side of the A9 for the re-aligned A938. Land-take would be relatively small in relation to the overall land holding and is not expected to have a significant impact on the commercial forestry operation. Land-take and a significance of impact rating are shown in Table 8.60.

**Table 8.60: Junction Option D03 – Potential Impacts to Commercial Forestry**

Ref.	Land Holding	Land-Take (ha)	Land-Take (% of holding)	Resource Value	Magnitude of Impact	Significance of Impact
LH25	Strathspey Estate	4.04ha	0.6%	High	Negligible	Slight

### Impacts Specific to Junction Option D07

#### Agricultural Land Holdings

- 8.4.79. Junction Option D07 would require land-take from agricultural land adjacent to the A9 northbound carriageway at Dalrachney and North Sluggan currently occupied by a tenant to the Strathspey Estate. It is not expected that the option would result in a significant impact to the holding as a relatively small area of agricultural land would be lost in relation to the overall farm holdings. Land-take and a significance of impact rating for the farm is provided in Table 8.61. The option (including land within the existing A9 road boundary) would require land from LCA class 4.2 (10.3ha) and 5.3 (0.2ha).

**Table 8.61: Junction Option D07 – Potential Impacts to Agricultural Land Holdings**

Ref.	Land Holding	Land-Take (ha)	Land-Take (% of holding)	Resource Value	Magnitude of Impact	Significance of Impact
LH23	Agricultural land at Dalrachney and North Sluggan (Strathspey Estate Tenant)	3.21ha	1.3%	Medium	Low	Slight

#### Commercial Forestry

- 8.4.80. Junction Option D07 would require land used for commercial forestry by the Strathspey Estate on land on the southbound carriageway side of the A9 for the junction and re-aligned A938. Land-take would be relatively small in relation to the overall land holding and is not expected to have a significant impact on the commercial forestry operation. Land-take and a significance of impact rating are shown in Table 8.62.
- 8.4.81. The re-aligned A938 would sever an area of forestry, however it is not expected to have a significant impact as it is relatively small parcel of land in relation to the overall holding.

**Table 8.62: Junction Option D07 – Potential Impacts to Commercial Forestry**

Ref.	Land Holding	Land-Take (ha)	Land-Take (% of holding)	Resource Value	Magnitude of Impact	Significance of Impact
LH6 LH7 LH16 LH17 LH18 LH20, LH24 LH25 LH26	Strathspey Estate	6.52ha	1.0%	High	Low	Slight/ Moderate

### Impacts Specific to Junction Option D12

#### Agricultural Land Holdings

- 8.4.82. Junction Option D12 would require land-take from agricultural land adjacent to the A9 northbound carriageway at Dalrachney and North Sluggan currently occupied by a tenant to the Strathspey Estate. It is not expected that the option would result in a significant impact to the holding as a relatively small area of agricultural land would be

lost in relation to the overall farm holdings. Land-take and a significance of impact rating for the farm are shown in Table 8.63. The option (including land within the existing A9 road boundary) would require land from LCA class 4.2 (10.7ha).

**Table 8.63: Junction Option D12 – Potential Impacts to Agricultural Land Holdings**

Ref.	Land Holding	Land-Take (ha)	Land-Take (% of holding)	Resource Value	Magnitude of Impact	Significance of Impact
LH23	Agricultural land at Dalrachney and North Sluggan (Strathspey Estate Tenant)	2.82ha	1.2%	Medium	Low	Slight

### Commercial Forestry

- 8.4.83. Junction Option D12 would require land used for commercial forestry by the Strathspey Estate on the southbound carriageway side of the A9 for the junction and re-aligned A938. Land-take would be relatively small in relation to the overall land holding and is not expected to have a significant impact on the commercial forestry operation. Land-take and a significance of impact rating is provided in Table 8.64.
- 8.4.84. The re-aligned A938 would sever an area of forestry, however it is not expected to have a significant impact as it is relatively small parcel of land in relation to the overall holding.

**Table 8.64: Junction Option D12 – Potential Impacts to Commercial Forestry**

Ref.	Land Holding	Land-Take (ha)	Land-Take (% of holding)	Resource Value	Magnitude of Impact	Significance of Impact
LH25	Strathspey Estate	6.58ha	1.0%	High	Low	Slight/ Moderate

### *Impacts Specific to Junction Option D13*

#### Agricultural Land Holdings

- 8.4.85. Junction Option D13 would require land-take from agricultural land adjacent to the A9 northbound carriageway at Dalrachney and North Sluggan currently occupied by a tenant to the Strathspey Estate. It is not expected that the option would result in a significant impact to the holding as a relatively small area of agricultural land would be lost in relation to the overall farm holdings. Land-take and a significance of impact rating for the farm are shown in Table 8.65. The option (including land within the existing A9 road boundary) would require land from LCA class 4.2 (5ha).

**Table 8.65: Junction Option D13 – Potential Impacts to Agricultural Land Holdings**

Ref.	Land Holding	Land-Take (ha)	Land-Take (% of holding)	Resource Value	Magnitude of Impact	Significance of Impact
LH23	Agricultural land at Dalrachney and North Sluggan (Strathspey Estate Tenant)	1.10ha	0.5%	Medium	Low	Slight

Commercial Forestry

- 8.4.86. Junction Option D13 would require land used for commercial forestry by the Strathspey Estate on land on the southbound carriageway side of the A9 for the junction and re-aligned A938. Land-take would be relatively small in relation to the overall land holding and is not expected to have a significant impact on the commercial forestry operation. Land-take and a significance of impact rating is provided in Table 8.66.

**Table 8.66: Junction Option D13 – Potential Impacts to Commercial Forestry**

Ref.	Land Holding	Land-Take (ha)	Land-Take (% of holding)	Resource Value	Magnitude of Impact	Significance of Impact
LH6 LH7, LH16 LH17 LH18 LH20 LH24 LH25 LH26	Strathspey Estate	3.50ha	0.6%	High	Negligible	Slight

Impacts Specific to Junction Option D51

Agricultural Land Holdings

- 8.4.87. Junction Option D51 would require land-take from agricultural land adjacent to the A9 northbound carriageway at Dalrachney and North Sluggan currently occupied by a tenant to the Strathspey Estate. It is not expected that the option would result in a significant impact to the holding as a relatively small area of agricultural land would be lost in relation to the overall farm holdings. Land-take and a significance of impact rating for the farm is provided in Table 8.67. The option (including land within the existing A9 road boundary) would require land from LCA class 4.2 (11.9ha) and 5.3 (0.1ha).

**Table 8.67: Junction Option D13 – Potential Impacts to Agricultural Land Holdings**

Ref.	Land Holding	Land-Take (ha)	Land-Take (% of holding)	Resource Value	Magnitude of Impact	Significance of Impact
LH23	Agricultural land at Dalrachney and North Sluggan (Strathspey Estate Tenant)	2.76ha	1.1%	Medium	Low	Slight

### Commercial Forestry

- 8.4.88. Junction Option D51 would require land used for commercial forestry by the Strathspey Estate on land on the southbound carriageway side of the A9 to accommodate the junction and the re-aligned A938. Land-take would be relatively small in relation to the overall land holding and is not expected to have a significant impact on the commercial forestry operation. Land-take and a significance of impact rating are shown in Table 8.68.
- 8.4.89. The re-aligned A938 would sever an area of forestry, however it is not expected to have a significant impact as it is relatively small in relation to the overall holding.

**Table 8.68: Junction Option D13 – Potential Impacts to Commercial Forestry**

Ref.	Land Holding	Land-Take (ha)	Land-Take (% of holding)	Resource Value	Magnitude of Impact	Significance of Impact
LH6 LH7, LH16 LH17 LH18 LH20 LH24 LH25 LH26	Strathspey Estate	8.26ha	1.3%	High	Low	Slight/ Moderate

## 8.5. Potential Mitigation

- 8.5.1. At DMRB Stage 2 the Proposed Scheme Options have not been sufficiently developed to allow detailed mitigation measures to be identified. However, based on the above assessment potential mitigation measures to minimise impacts to community and private assets have been identified during both the construction and operation of the Proposed Scheme. During the DMRB Stage 3 Assessment, the Preferred Option design would be reviewed and detailed mitigation measures developed.
- 8.5.2. The refinement of the scheme design at DMRB Stage 3 would also seek to avoid or reduce impacts to community and private assets by, where possible, minimising the overall scheme land-take; avoiding land-take from properties, private land-holdings and garden areas, including if required, structural solutions such as groundworks and retaining walls.
- 8.5.3. Potential mitigation measures (to reduce the impacts upon the various land-uses of the study area) include the following.

### **Mitigation during Construction**

- Demarcation of the construction working corridor once defined, in order to prevent disturbance to adjacent areas;
- Careful soil removal and handling procedures during site clearance and restoration;
- Restoration of disturbed areas during construction;
- During construction, temporary diversions ensuring access to private property, community facilities and agricultural land would be maintained throughout the works; and
- Restoring areas used for temporary construction compounds to previous use post construction.





## Mitigation during Operation

- Where a vehicular access to residential and commercial properties would be temporarily or permanently affected, alternative access should be provided.

## 8.6. Summary of Route Option Impacts

- 8.6.1. The following tables summarise the potential impacts identified during the operation of the Proposed Scheme for the Mainline and Junction Options.



**Table 8.69: Summary of Impacts – Mainline Alignment Options**

Sub-topic	Receptor (Reference)	Potential Impact	Impact Significance (Residual Impacts)			Comparative Appraisal
			Mainline Alignment Options			
			Option 1	Option 1A	Option 2	
<b>Operational Phase Impacts</b>						
Residential Properties	Kinakyle, Aviemore (R3)	Demolition of property building/ land-take/ severance of access (Option 1) Land-take (Option 1A, 2)	Substantial (Significant)	Negligible/ Slight	Negligible/ Slight	Option 1 would result in demolition of the property building, over 50% land-take to the property and severance of the access road. Option 1A and 2 would require the loss of a minor area of land surrounding the property.
Residential Properties	Birch View Cottage, Aviemore (R4)	Demolition of property building, land-take, severance of access road (Option 1) Land-take (Option 1A)	Substantial (Significant)	Negligible/ Slight	No Impact	Option 1 would result in demolition of property building, land-take, and severance of the access road. Option 1A would result in the loss of a minor area of land surrounding the property.
Residential Properties	March Cottage, Aviemore (R5)	Land-take (Option 1A, 2)	No Impact	Slight	Negligible/ Slight	Option 1A would require greater land-take than Option 2.
Residential Properties	Lagavulin, Aviemore (R8)	Land-take (Option 1, 1A)	Negligible/ Slight	Negligible/ Slight	No Impact	Negligible difference in land-take between Option 1 and 1A.
Residential Properties	Kinmundy, Aviemore (R9)	Land-take (Option 1A, 2)	No Impact	Slight	Slight	Option 2 would require greater land-take than Option 1A

Sub-topic	Receptor (Reference)	Potential Impact	Impact Significance (Residual Impacts)			Comparative Appraisal
			Mainline Alignment Options			
			Option 1	Option 1A	Option 2	
Residential Properties	High Range House, Aviemore (R10)	Demolition of property building, land-take (Option 1) Land-take (Option 1A)	Substantial (Significant)	Slight	No Impact	Option 1 would result in demolition of property building, land-take. Option 1A would result in loss of relatively small area of land surrounding the property
Residential Properties	Red Stag Lodge (R11)	Land-take (Option 1, 1A)	Slight	Slight	No Impact	Negligible difference in land-take between Option 1 and 1A.
Residential Properties	Avielochan Farmhouse (R12)	Demolition of property building, land-take (Option 1, 1A) Land-take (Option 2)	Substantial (Significant)	Substantial (Significant)	Slight	Option 1 and 1A would result in demolition of the property building and land-take to the majority of the property. Option 2 would result in the loss of a relatively small area of land surrounding the property.
Residential Properties	Kinveachy Lodge – Let Cottage (R13)	Land-take (Option 2)	No Impact	No Impact	Substantial (Significant)	Option 2 would result in the demolition of outbuildings.
Residential Properties	2 Broom Cottages, Carrbridge (R14)	Demolition of property building, land-take (Option 1, 1A)	Substantial (Significant)	Substantial (Significant)	No Impact	No difference in land-take between Option 1 and 1A.
Residential Properties	Slochd Cottage (R15)	Land-Take (Option 2)	No Impact	No Impact	Slight	There would be no land-take with Option 1 and 1A. Option 2 would require land-take from the property.

Sub-topic	Receptor (Reference)	Potential Impact	Impact Significance (Residual Impacts)			Comparative Appraisal
			Mainline Alignment Options			
			Option 1	Option 1A	Option 2	
Residential Properties	Kippenross House (R1), Lynwilg Farmhouse (R2), March Cottage (R5), Craig Dhu (R6), Lagnacallich (R7), Lagavulin (R8), Kinmundy (R9), Kinveachy Lodge – Let Cottage (R13)	Permanent alteration to at-grade access to the properties. Potential impacts to journey time to and from residential properties.	Currently proposed that all options will close at-grade access junctions to the A9.			All options are proposed to close at-grade access junctions. No differentiators identified.
Commercial Properties	High Range Developments Limited (C1)	Land-take (Option 1,1A)	Slight	Slight	No Impact	Option 1 would require greater land-take than Option 1A.
Commercial Properties	MacDonald Aviemore Highland Resort (C2)	Land-take (all options)	Slight	Slight	Negligible/Slight	Negligible difference in land-take between Option 1 and 1A. Option 2 would require the least land-take.
Commercial Properties	Caravan Park – Under Development (C4)	Land-take (all options)	Slight	Slight	Negligible/Slight	Negligible difference in land-take between Option 1 and 1A. Option 2 would require the least land-take.
Commercial Properties	John Gordon & Son Limited. Timber Merchants (C6)	Land-take (all options)	Negligible/Slight	Negligible/Slight	Slight	Option 2 would require the greatest land-take. Option 1 and 1A would require the same land-take.
Commercial Properties	MacDonald Aviemore Highland Resort (C2) Scottish Water water collection and supply site (C3) Kinveachy Lodge (C5)	Permanent alteration to at-grade access. Potential impacts to journey time to and from commercial properties.	Currently proposed that all options will close at-grade access junctions to the A9.			All options are proposed to close at-grade access junctions. No differentiators identified.



Sub-topic	Receptor (Reference)	Potential Impact	Impact Significance (Residual Impacts)			Comparative Appraisal
			Mainline Alignment Options			
			Option 1	Option 1A	Option 2	
Community Land	Craigellachie NNR (COM2)	Land-take (all options)	Slight	Slight	Slight/ Moderate	Option 2 would require greatest land-take. Negligible difference in land-take between Option 1 and 1A.
Community Land	MacDonald Aviemore Highland Resort – land including Aviemore Orbital Path (COM3)	Land-take (all options)	Negligible/ Slight	Negligible/ Slight	Negligible	Option 2 would require least land-take. Negligible difference in land-take between Option 1 and 1A.
Community Land	Strathspey Estate – Aviemore Orbital Path and Milton Woods (COM4)	Land-take (all options)	Negligible/ Slight	Negligible/ Slight	Negligible	Option 2 would require least land-take. Negligible difference in land-take between Option 1 and 1A.
Community Land	Land Surrounding Highburnside (COM5)	Land-take (all options)	Negligible	Negligible	Negligible/ Slight	Option 2 would require greatest land-take. Negligible difference in land-take between Option 1 and 1A.
CNP LDP Development Zones (2015)	EP1/ EP4 (Housing)	Loss or reduction in viability for intended development (all options)	Neutral			Option 2 would require least land-take. Negligible difference in land-take between Option 1 and 1A.
CNP LDP Development Zones (2015)	EP5 (Housing)	Loss or reduction in viability for intended development (all options)	Neutral			Option 2 would require greatest land-take. Negligible difference in land-take between Option 1 and 1A.

Sub-topic	Receptor (Reference)	Potential Impact	Impact Significance (Residual Impacts)			Comparative Appraisal
			Mainline Alignment Options			
			Option 1	Option 1A	Option 2	
CNP LDP Development Zones (2015)	Open Space (OS) – land north of the MacDonald Highland Resort including Milton Woods and the Aviemore Orbital Path.	Loss or reduction in viability for intended development/preservation (all options)	Adverse	Adverse	Neutral	Negligible difference in land-take between Option 1 and 1A.
Planning Application	05/306/CP Erection of 140 dwellings, construction of roads and services and landscaping.	Land-take to the site, loss of amenity.	Adverse	Adverse	Neutral	Land-take and loss of amenity would be the same for Option 1 and 1A. Option 2A would require the least land-take
Agricultural Land Holdings	Ballinluig Farm (Kinrara Estate) (LH3, LH4, LH5)	Loss of agricultural land (all options)	Slight			Option 2 would require the greatest land-take. Negligible difference in land-take between Option 1 and 1A.
Agricultural Land Holdings	Granish Farm (Strathspey Estate Tenants) (LH8, LH9, LH10)	Loss of agricultural land (all options)	Slight			Option 2 would require the greatest land-take. Negligible difference in land-take between Option 1 and 1A.
Agricultural Land Holdings	Agricultural land at Dalrachney and North Sluggan (Strathspey Estate Tenant) (LH23)	Loss of agricultural land (all options)	Slight			Option 2 would require the greatest land-take. Negligible difference in land-take between Option 1 and 1A.
Agricultural Land Holdings	Avielochan Farm (Strathspey Estate Tenants) (LH11 LH12 LH13 LH14 LH15)	Loss of agricultural land (all options)	Slight	Slight	Moderate (Significant)	Option 2 would require the greatest land-take. Negligible difference in land-take between Option 1 and 1A.



Sub-topic	Receptor (Reference)	Potential Impact	Impact Significance (Residual Impacts)			Comparative Appraisal
			Mainline Alignment Options			
			Option 1	Option 1A	Option 2	
Agricultural Land Holdings	Croft at Carrbridge (LH21)	Loss of agricultural land (all options)	Moderate/ Substantial (Significant)	Moderate/ Substantial (Significant)	Moderate (Significant)	Option 2 would require the least land-take. Negligible difference in land-take between Option 1 and 1A.
Agricultural Land Holdings	Auchterblair Farm. (LH22)	Loss of agricultural land (all options)	Negligible/ Slight	Negligible/ Slight	Slight	Option 2 would require the greatest land-take. Negligible difference in land-take between Option 1 and 1A.
Land Classification for Agriculture (LCA)		Loss of LCA land (all options)	LCA3.2 – 7.5ha LCA4.2 – 85.4ha LCA5.2 – 10.9ha LCA5.3 – 1.0ha LCA6.2 – 1.1ha LCA6.3 – 53.6ha	LCA3.2 – 7.0ha LCA4.2 – 85.3ha LCA5.2 – 10.9ha LCA5.3 – 1.1ha LCA6.2 – 1.1ha LCA6.3 – 53.9ha	LCA3.2 – 6.5ha LCA4.2 – 90.6ha LCA5.2 – 8.6ha LCA5.3 – 1.3ha LCA6.2 – 1.2ha LCA6.3 – 67.5ha	No prime quality agricultural land would be lost for any of the options. No differentiators identified
Commercial Forestry	Alvie Estate (LH1, LH2)	Disruption to commercial forestry operation (all options)	Slight			Negligible difference in land-take between the options. No differentiators identified
Commercial Forestry	Strathspey Estate (LH6, LH7, LH16, LH17, LH18, LH20, LH24, LH25, LH26)	Disruption to commercial forestry operation (all options)	Slight/ Moderate			Option 2 would require the greatest land-take. Negligible difference in land-take between Option 1 and 1A.

Sub-topic	Receptor (Reference)	Potential Impact	Impact Significance (Residual Impacts)			Comparative Appraisal
			Mainline Alignment Options			
			Option 1	Option 1A	Option 2	
Sporting Estate	Strathspey Estate (LH27)	Disruption to sporting interests (all options)	Slight/ Moderate			Option 2 would require the greatest land-take.
Sporting Estate	Corrybrough Estate (LH28)	Disruption to sporting interests (all options)	Slight			Option 1 and 1A would require the greatest land-take.

**Table 8.70: Summary of Impacts – Aviemore South Junction Options**

Sub-topic	Receptor (Reference)	Potential Impact	Impact Significance (Residual Impacts)			Comparative Appraisal
			Aviemore South Junction Options (Route Sections 1 & 2)			
			Option A02	Option A09	Option A18	
<b>Operational Phase Impacts</b>						
Residential Property	Kinrara Estate (R1)	Loss of land (Option A18)	No Impact	No Impact	Negligible/ Slight	A18 would require a small amount of land loss.
Residential Property	Lynwilg Farmhouse (R2)	Loss of land (Option A09) Demolition of property (Option A18)	No Impact	Slight	Substantial (Significant)	A18 would require demolition of the property and the greatest land-take. A09 would require loss of land.
Agricultural Land Holdings	Ballinluig Farm (Kinrara Estate) (LH11 LH12 LH13 LH14 LH15)	Loss of agricultural land Severance of agricultural holding (all options)	Slight			A18 would require the greatest land-take. A02 would require the least land-take.

**Table 8.71: Summary of Impacts – Granish Junction Options**

Sub-topic	Receptor	Potential Impact	Impact Significance (Residual Impacts)				Comparative Appraisal
			Granish Junction Options (Route Section 5)				
			Option C18	Option C21	Option C31	Option C34	
<b>Operational Phase Impacts</b>							
Residential Properties	Red Stag Lodge (R11)	Demolition of property building, land-take (Option C31, C34) Land-take (Option C18, C21)	Moderate (Significant)	Slight	Substantial (Significant)	Substantial (Significant)	C34 and C31 would require demolition of the property building. C31 would require the greatest land-take.
Agricultural Land Holding	Granish Farm (Strathspey Estate Tenants) (LH8, LH9, LH10)	Loss of agricultural land Severance of agricultural holding (all options)	Slight	Slight	Slight	Slight	No differentiators identified
Commercial Forestry	Strathspey Estate (LH6 LH7 LH16 LH17 LH18 LH20 LH24 LH25 LH26)	Disruption to commercial forestry operation (all options)	Slight	Slight	Slight	Slight	C21 would require the least land-take. Negligible difference between other options.

**Table 8.72: Summary of Impacts – Black Mount Junction Options**

Sub-topic	Receptor	Potential Impact	Impact Significance (Residual Impacts)						Comparative Appraisal
			Black Mount Junction Options (Route Section 9)						
			Option D02	Option D03	Option D07	Option D12	Option D13	Option D51	
<b>Operational Phase Impacts</b>									
Agricultural Land Holding	Agricultural land at Dalrachney and North Sluggan (Strathspey Estate Tenant)	Loss of agricultural land (all options)	Slight	Slight	Slight	Slight	Slight	Slight	D02 and D07 would require the greatest land-take. D03 would require the least land-take
Commercial Forestry	Strathspey Estate (LH25)	Disruption to commercial forestry operation Severance of commercial forestry land (all options)	Slight/ Moderate	Slight	Slight/ Moderate	Slight/ Moderate	Slight	Slight/ Moderate	D03 and D13 would require the least land-take and severance of forestry land. D51 would require the greatest land-take.

## 8.7. Scope of DMRB Stage 3 Assessment

- 8.7.1. The DMRB Stage 3 assessment will provide an assessment of potential impacts of the Preferred Option on future and existing land-use, and community severance. It will involve a review and update, where necessary, of the data and conclusions from the DMRB Stage 2 Assessment.
- 8.7.2. The DMRB Stage 3 assessment will be undertaken in accordance with guidance provided in the DMRB Volume 11, Part 6, Land-Use and Part 8 Pedestrians, Equestrians and Cyclists; and will include the following:
- A detailed consideration of the number of properties potentially at risk of demolition or land-take. It will also include the likely impact of the Preferred Option and the probable effect on any affected business's future viability;
  - Further consultation to identify community land and facilities and their associated catchment areas. Consideration of any provision of exchange community land will also be completed;
  - A review of the status of planning applications identified during DMRB Stage 2 and any new applications, including consultation with the local planning authority;
  - Further assessment of impacts to agricultural, forestry and field sports interests land holdings, including an assessment of likely future viability. Will include site visits to examine land-uses and management issues as well as consultation with the owners/managers of affected land holdings.
  - Detailed assessment of impacts to access including consultation with land holders and affected parties during the development of access proposals.

<sup>i</sup> CH2MHill, (2014); A9 Dualling Programme Strategic Environmental Assessment (SEA) Environmental Report

<sup>ii</sup> Inland Waterways Amenity Advisory Council (2006); Inland waterway restoration & development projects in England, Wales & Scotland Third Review Report.

<sup>iii</sup> Highways Agency et al. (2001); Design Manual for Roads and Bridges, Volume 11, Section 3, Part 6 Land Use.

<sup>iv</sup> Highways Agency et al. (2001); Design Manual for Roads and Bridges, Volume 11, Section 3, Part 8 Pedestrians, Cyclists, Equestrians and Community Effects.

<sup>v</sup> Highways Agency et al. (2009); Interim Advice Note 125/09 – Supplementary Guidance for Users of DMRB Volume 11 Environmental Assessment.

<sup>vi</sup> Cairngorms National Park Authority, April 2015, Cairngorm National Park Local Development Plan

<sup>vii</sup> The Highland Council (2012); Highland-wide Local Development Plan.

<sup>viii</sup> The Highland Council (2015); Inner Moray Firth Local Development Plan.

<sup>ix</sup> The Highland Council. Planning Portal [online]. Available at <http://wam.highland.gov.uk/wam/>. [Accessed June 2016].

<sup>x</sup> Cairngorms National Park. Planning Portal [online]. Available at <http://cairngorms.co.uk/park-authority/planning/>. [Accessed June 2016].

<sup>xi</sup> Scotland's Census (2011); Scotland's Census [online]. Available at <http://www.scotlandscensus.gov.uk/> [Accessed June 2015].

## 9. Geology, Soils and Groundwater

### 9.1. Introduction

- 9.1.1. This chapter presents the results of the DMRB Stage 2 Assessment of the potential impacts of the Proposed Scheme Options in relation to geology, soils and groundwater. The potential significant impacts considered are:
- loss of geodiversity sites, particularly within areas of conservation importance, where existing road cuttings are widened or new cuttings created;
  - loss or sterilisation of mineral deposits or soils, including peat, below the footprint of the Proposed Scheme Options;
  - groundwater pollution during construction due to increased generation and release of sediments and suspended solids, and increased risk of accidental spillage of pollutants such as oil, fuel and concrete associated with construction activities and site storage requirements;
  - groundwater pollution during road operation due to contaminants within routine road runoff. A broad range of potential pollutants, such as hydrocarbons i.e. fuel and lubricants, fuel additives, metal from corrosion of vehicles, de-icer and gritting material, can accumulate on road surfaces. These can subsequently be washed off the road surface during rainfall events, polluting the receiving groundwater bodies;
  - groundwater pollution during road operation due to accidental spillage. On all roads there is a risk that accidents or vehicle fires may lead to an acute pollution incident. Where commercial vehicles are involved, potential pollutants that may be spilled could range from hazardous chemicals to milk, alcoholic beverages, organic sludges and detergents. Spilled materials may drain from the road surface, polluting the receiving groundwater bodies;
  - direct loss or changes to groundwater aquifers and groundwater supported public and private water supplies, either below the footprint of the Proposed Scheme Options, or as a result of changes to groundwater flows and levels associated with the dewatering of deep cuttings and foundation excavations;
  - indirect loss or change to surface water receptors, as a result of dewatering of groundwater aquifers;
  - loss or changes to Groundwater Dependent Terrestrial Ecosystems (GWDTEs), including peatland habitats, either below the footprint of the Proposed Scheme Options, as a result of severance of habitat or as a result of changes to groundwater flows and levels associated with dewatering activities; and
  - disturbance of existing contaminated land, resulting in the establishment of potential pollutant linkages or an increase in the risk associated with existing pollutant linkages with consequential impacts on local receptors.
- 9.1.2. It should be noted that consequential impacts on sites designated for their conservation value, groundwater dependent habitats and associated fauna are discussed in Chapter 11: Ecology and Nature Conservation. Similarly the value of the soil resources for agriculture or other potential land uses are discussed in Chapter 8: Community and Private Assets. Pollution impacts on surface waters and flooding, including groundwater flooding are discussed in Chapter 10: Road Drainage and the Water Environment. Impacts relating to any water supply infrastructure of private and public water supplies are covered in the Utilities section of the Engineering Assessment.
- 9.1.3. No impacts have been scoped out prior to the DMRB Stage 2 assessment.





## Study Area

- 9.1.4. The assessment study area includes the footprint of the Proposed Scheme and a buffer of 250m. This is in recognition that the potential impacts on geology, soils and in particular groundwater and groundwater dependent terrestrial ecosystems (GWDTEs), may extend some distance from the road corridor itself. A buffer of 500m has been used for the contaminated land assessment, and a buffer of 1km has been applied in the case of properties served by private water supplies, due to the lack of information at this stage regarding the location of the water sources.

## 9.2. Approach and Methods

- 9.2.1. The assessment has been carried out in accordance with the guidance contained in the Design Manual for Roads and Bridges (DMRB), Volume 11, Section 3, Part 11 Geology and Soils<sup>i</sup> and DMRB Volume 11, Section 3, Part 10 HD 45/09 Road Drainage and the Water Environment<sup>ii</sup>. An explanation of the methods used is provided below.

### Guidance

- 9.2.2. The following guidance documents have been used to inform the assessment:
- SNH 'A Handbook on Environmental Impact Assessment'<sup>iii</sup>;
  - A9 Dualling Programme Strategic Environmental Assessment (SEA) Environmental Report<sup>iv</sup>;
  - A9 Dualling Programme SEA Environmental Report Addendum<sup>v</sup>;
  - The Scottish Government 'Scottish Soil Framework'<sup>vi</sup>;
  - The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended) A Practical Guide (Version 7.2)<sup>vii</sup>;
  - Planning Advice Notice (PAN) 33: Development of Contaminated Land<sup>viii</sup>;
  - SNIFFER WFD 95: A Functional Wetland Typology for Scotland<sup>ix</sup>;
  - SEPA Regulatory Position Statement – Developments on Peat<sup>x</sup>;
  - SEPA Regulatory Method WAT-RM-11 – Licensing Groundwater Abstractions including Dewatering<sup>xi</sup>;
  - SEPA Land Use Planning System (LUPS) Guidance Note 31 – Guidance on Assessing the Impacts of Development on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems<sup>xii</sup>;
  - Scottish Government Guidance on Developments on Peat - Site Survey<sup>xiii</sup>;
  - Scotland's Geodiversity Charter (2013)<sup>xiv</sup>;
  - British Geological Survey 'Geodiversity of the Cairngorms National Park'<sup>xv</sup>;
  - DEFRA/EA Contaminated Land Report (CLR) 11: Model Procedures for the Management of Land Contamination<sup>xvi</sup>;
  - CIRIA Contaminated Land Risk Assessment: A guide to good practice (C552)<sup>xvii</sup>; and
  - Environmental Protection Act 1990: Part IIA Contaminated Land – Statutory Guidance: Edition 2<sup>xviii</sup>.





## Baseline Data Collection

- 9.2.3. Baseline conditions have been determined through consultation, desk studies and site surveys.
- 9.2.4. The desk studies included a review of the following information:
- British Geological Survey (BGS) 1:50,000 and 1:10,000 superficial and bedrock geology mapping<sup>xxix</sup>;
  - BGS Aquifer Productivity Map of Scotland 1:100,000 scale digital version and associated user guide<sup>xxx</sup>;
  - BGS Groundwater Vulnerability Map of Scotland 1:100 000 scale, digital version and associated user guide<sup>xxxi</sup>;
  - A9 Perth to Inverness Dualling Geotechnical Preliminary Sources Study Report (PSSR) Kinveachy to Slochd (Rev 3) Jacobs<sup>xxii</sup>;
  - A9 Perth to Inverness Dualling Geotechnical Preliminary Sources Study Report (PSSR) Slochd to Moy (Rev 4) Jacobs<sup>xxiii</sup>;
  - A9 Dualling Northern Section: Dalraddy to Slochd Geotechnical Preliminary Sources Study Report<sup>xxiv</sup>;
  - Scottish Environment Protection Agency (SEPA) River Basin Management Plan (RBMP) Classification Results (<https://www.sepa.org.uk/environment/water/classification/classification-results/>);
  - SEPA RBMP Discover Data - Groundwater Interactive Mapping (<http://www.environment.scotland.gov.uk/get-interactive/data/groundwater/>);
  - SEPA Wetlands Inventory (2015);
  - Macaulay Institute for Soil Research Soil Maps of Scotland (partial coverage) at a scale of 1:250,000<sup>xxv</sup>;
  - Contaminated land data from A9 Stage 1 PSSR (Jacobs) and from the Highland Council;
  - Review of Mining Instability in Great Britain<sup>xxvi</sup>;
  - BGS 'Non Coal Mining plans' online database<sup>xxvii</sup>;
  - Coal Authority online interactive map data<sup>xxvii</sup>;
  - BGS 'Directory of Mines and Quarries'<sup>xxviii</sup>;
  - Private water supply data (The Highland Council);
  - Public water supply data (Scottish Water);
  - Ordnance Survey (OS) raster mapping on 1:10k, 1:25k, 1:50k, 1:250k scale<sup>xxix</sup>;
  - Scotland's Environment Water Framework Directive (WFD) Groundwater body status (<http://www.environment.scotland.gov.uk/get-interactive/data/groundwater/>)<sup>xxx</sup>;
  - Scottish Natural Heritage (SNH) Carbon-rich soil, deep peat and priority peatland habitat map<sup>xxxi</sup>;
  - SNH data on designated environmental and geological sites;
  - SNH NVC data for designated sites within the study area; and
  - CH2M Hill/Atkins Mouchel Joint Venture (AMJV) Phase 1 habitat mapping.





- 9.2.5. Several geotechnical site walkovers have been completed, in July 2015, December 2015 and March 2016, as part of site familiarisation and to aid in the design of the planned Ground Investigation (GI). At the time of writing a full GI in support of the Proposed Scheme has not been completed, however limited rock mapping and peat probing has been carried out as detailed below. Further GI has been proposed in support of Stage 3 assessments.
- 9.2.6. Some geotechnical mapping of rock cuts has been undertaken in September 2015, however this will not be formally reported until the associated GI data is available. Peat probing was carried out in December 2015 across seven areas where the potential for peat had been identified during the desk studies. A total of 580 probing points were measured as part of the peat probing survey. Peat probing was carried out using a Van Walt peat probe to measure total peat depth, with probing positions located using a hand held GPS.
- 9.2.7. In relation to GWDTEs, Phase 1 surveys were carried out within a 100m buffer of the existing A9 as part of the Stage 1 assessment, with additional surveys carried out in May 2016 where further data was required at proposed junction locations and along other side roads to complete the 100m buffer dataset for the Proposed Scheme footprint. Further details are provided in Chapter 11: Ecology and Nature Conservation.

## Consultation

- 9.2.8. Consultations were undertaken with those organisations listed below:
- Mineral Valuation Office to gather information on the economic mineral deposits within the study area;
  - Scottish Natural Heritage (SNH) and Cairngorms National Park Authority (CNPA) to gather information on geodiversity sites within the study area.
  - British Geological Survey (BGS) to better understand the geological setting of the Slochd Geological Conservation Review (GCR) site.
- 9.2.9. As part of the consultations a site visit to the Slochd GCR site was conducted with SNH and BGS in 2015.

## Assessment of Impacts

### *Loss of Rock Exposures*

- 9.2.10. The assessment of the potential loss of rock exposures has involved:
- identification of Geological Conservation Review (GCR) sites, Sites of Special Scientific Interest (SSSIs, including Candidate SSSIs), and Local Geodiversity Sites (LGS) designated for geological interest, identification of existing road cuttings and outcrops in the vicinity of the Proposed Scheme, and evaluation of the sensitivity/importance of the rock exposures;
  - review of the Proposed Scheme Options to determine where existing cuttings or outcrops will be modified, quantification of the length of each cutting modified, or outcrop intersected for each Proposed Scheme Option and qualitative evaluation of the potential impact on the rock exposures;
  - consideration of potential mitigation for each Proposed Scheme Option; and
  - assessment of the significance of the impacts without and with mitigation.



### *Loss of Mineral Deposits, Soils and Peat*

- 9.2.11. The loss of mineral deposits, soils and peat have been assessed through quantification of the area of each lost under the footprint of each Proposed Scheme Option.
- 9.2.12. The areas of mineral deposits were identified through review of geological mapping, searches of the Coal Authority online gazetteer<sup>xxxii</sup>, BGS Mining Plan Portal mapping, BGS Directory of Mines and Quarries<sup>xxxviii</sup>, Review of Mining Instability in Great Britain<sup>xxvi</sup> and discussions with the Mineral Valuation Office, while the variety of soil types within the study area were determined from the Soil Survey of Scotland mapping<sup>xxv</sup>.
- 9.2.13. Areas of peat and priority peatlands were identified through comparison and collation of data from the superficial geology mapping, soils mapping, the SNH document 'Carbon-rich soil, deep peat and priority peatland habitats', site walkovers and the peat probing surveys<sup>xxxix</sup>. The quantification of peat loss has been sub-divided into areas of SSSI designated peatlands, Class 1 to 5 Priority Peatland and other areas of potential peat identified from peat probing surveys.
- 9.2.14. The sensitivity or importance of the mineral deposits, soils and peat areas has been evaluated qualitatively, as has the magnitude of impact on each.

### *Construction Pollution*

- 9.2.15. The potential for pollution of groundwaters/aquifers is greatest where cuttings are proposed which would be close to, or potentially penetrate the water table, and locations where there are permeable drift deposits. In the absence of site specific groundwater level data at DMRB Stage 2, the length of cutting has been quantified for each Proposed Scheme Option.
- 9.2.16. The sensitivity of the groundwater has been evaluated based on the groundwater vulnerability classification, the magnitude of impact has been evaluated qualitatively.

### *Pollution from Routine Runoff*

- 9.2.17. A summary of the preliminary drainage design for the Proposed Scheme is provided in Chapter 7, which includes six groundwater discharges, via infiltration basins, for each Proposed Mainline Alignment Option and one infiltration basin at Black Mount Junction. DMRB Volume 11, Section 3, Part 10, HD 45/09 – Road Drainage and the Water Environment, specifies procedures for the assessment of pollution impacts from routine runoff on groundwater, known as 'Method C'<sup>iii</sup>.
- 9.2.18. The Method C assessment of potential routine runoff impacts on groundwater takes the form of a risk assessment using the Source-Pathway-Receptor (S-P-R) model utilised in contaminated land investigations. Seven parameters relating to source and pathway are considered in turn and assigned a risk category as detailed in Table 9.1.

**Table 9.1: Routine runoff groundwater assessment parameters**

SOURCE S-P-R	Weighting	Parameter	Low Risk (1)	Medium Risk (2)	High Risk (3)
SOURCE	15	Traffic density	< 50,000 AADT	50,000 to <100,000 AADT	> 100,000 AADT

S-P-R	Weighting	Parameter	Low Risk (1)	Medium Risk (2)	High Risk (3)
	15	Annual average rainfall	< 740mm rainfall	740 – 1060 mm rainfall	> 1060 mm rainfall
PATHWAY	15	Soakaway geometry	Continuous linear (e.g. ditch, grassed channel)	Single point, or shallow soakaway (e.g. lagoon) serving low road area	Single point, deep serving high road area (>5,000m <sup>2</sup> )
	20	Unsaturated zone	Depth to water table >15m and unproductive strata	Depth to water table 5-15m	Depth to water table <5m
	20	Flow type	Unconsolidated or non-fractured consolidated deposits (i.e. dominantly intergranular flow)	Consolidated deposits (i.e. mixed fracture and intergranular flow)	Heavily consolidated sedimentary deposits, igneous and metamorphic rocks (dominated by fracture porosity)
	7.5	Effective grain size	Fine sand and below	Coarse sand	Very coarse sand and above
	7.5	Lithology	>15% clay minerals	1-5% clay minerals	<1% clay minerals

Table Source: DMRB Volume 11, Section 3, Part 10, HD 45/09 – Road Drainage and the Water Environment.

9.2.19. The risk of adverse impact at each proposed groundwater discharge is determined by multiplying the risk factor attributed to each parameter by the weighting factor and adding the resultant scores to establish the overall risk score for each discharge. This has then been evaluated against the following risk ratings:

- Overall risk score < 150 – Low Risk of Impact;
- Overall risk score 150-250 – Medium Risk of Impact; and
- Overall risk score > 250 – High Risk of Impact.

9.2.20. At DMRB Stage 2 no ground investigation works have been carried out and therefore there is very limited site specific information available on the groundwater table and aquifer properties in the vicinity of the proposed groundwater discharges. Conservative assumptions have therefore been made for the Pathway parameters, based on the available mapping data for the study area and data collated from historic GI borehole logs near to the proposed discharge location and within the same superficial geological unit.

9.2.21. For each Proposed Scheme Option the results of the Method C assessment for each proposed groundwater discharge have been presented for comparison.

#### Pollution from Accidental Spillage

9.2.22. The DMRB document HA 45/09 specifies procedures for the assessment of pollution impacts from accidental spillage, known as Method D. A summary of the methodology is provided below, with full details provided in HD 45/09<sup>ii</sup>.

- 9.2.23. The assessment takes the form of a risk assessment, where the risk is expressed as the annual probability of a serious pollution incident occurring. This risk is the product of two probabilities:
- the probability that an accident will occur, resulting in a serious spillage of a polluting substance on the carriageway; and
  - the probability that, if such a spillage did occur, the polluting substance would reach the receiving groundwater body and cause a serious pollution incident.
- 9.2.24. The probability of a serious spillage occurring is dependent on a variety of factors including: traffic volumes, percentage of heavy goods vehicles in the traffic volumes, whether the road is motorway, rural or urban trunk road, the road type categories within the road drainage catchment under assessment i.e. 'no junction', 'slip road', 'cross road' or 'roundabout' and the length of each road type within the catchment.
- 9.2.25. The probability of a serious spillage subsequently causing a serious pollution incident is dependent on the receiving water body type, i.e. groundwater, and the response time of the emergency services, i.e. less than 20 minutes, less than one hour, or greater than one hour.
- 9.2.26. Typically an annual probability of 1% (i.e. a 1 in 100 chance of a serious pollution incident occurring in any one year) is considered by DMRB as an acceptable risk. However, where a road drainage outfall discharges within 1km of a sensitive receptor, such as a protected (designated) conservation site, a higher level of protection is required, such that the risk has no greater annual probability than 0.5% (i.e. a 1 in 200 chance of occurring in any one year).
- 9.2.27. The highest traffic flow associated with each option was used across all networks in that option in order to conservatively evaluate the Proposed Scheme Options, whilst also taking into account various drainage design permutations. The outcomes reported are the worst performing network in terms of return period (i.e. highest risk) for each of the individual Proposed Scheme Options. At DMRB Stage 3, updated traffic data will enable refined calculations, which may lead to a reduction in risk value.

### *Loss or Change to Groundwater Aquifers and Supported Water Supplies*

- 9.2.28. Groundwater aquifers were identified and their sensitivity evaluated through review of BGS aquifer productivity and groundwater vulnerability mapping, and review of the WFD groundwater body status.
- 9.2.29. Public and private water abstraction information was provided in October 2015 and June 2016 by SEPA, Scottish Water and The Highland Council, with a small number of owner-occupier consultations undertaken during DMRB Stage 2 (with further consultations planned for DMRB Stage 3). Data was provided from each for a minimum of 5km from the existing A9 route. The quality of the private water supply data provided was variable, with grid references and type of supply (i.e. surface water or groundwater source) missing for a number of supplies. Where the type of source is unknown it has been assumed that it is a groundwater source, for this assessment. It should be noted that in Chapter 10: Road Drainage and the Water Environment, these same supplies have been assumed to be surface water fed, thus in each chapter we assume the worst case scenario, with respect to these receptors. Where there are properties within 1km with a suspected private water supply, but no registered information has been identified, these properties have been included within the DMRB Stage 2 Assessment, with supply details to be confirmed during DMRB Stage 3. The sensitivity of the water supplies has been evaluated based on the population supplied.





- 9.2.30. For each Proposed Scheme Option the locations of the cuttings have been identified and the aquifers and water supplies within close proximity to each quantified. In the absence of site specific groundwater data at DMRB Stage 2, the magnitude of impact on each aquifer and supply has been estimated based on the proximity to the Proposed Scheme and potential cuttings in relation to areas with high groundwater productivity.

#### *Indirect Loss or Change to Surface Water Receptors*

- 9.2.31. Surface water bodies such as streams, lakes and wetlands can receive or recharge groundwater, with movement likely between the two receptors. Any changes to groundwater as a result of dewatering may indirectly impact surface water bodies and result in changes to surface water flow.
- 9.2.32. For each of the Proposed Scheme Options, the impact on surface water receptors has been assessed qualitatively. Surface water receptors have been grouped together by WFD catchment. Due to the lack of information on the depth and location of cuttings, where dewatering is likely to take place, it is assumed all receptors could be potentially impacted by cuttings.
- 9.2.33. Further baseline information on each surface waterbody, including its sensitivity, is provided in Chapter 10. As there are a number of attributes contributing to the overall sensitivity of each watercourse, the highest sensitivity has been considered for this impact.

#### *Loss or Change to Groundwater Dependent Terrestrial Ecosystems (GWDTEs)*

- 9.2.34. SEPA LUPS Guidance Note 31 sets out the method for identification of GWDTEs, based on National Vegetation Classification (NVC) communities<sup>xiii</sup>. Where NVC survey data is not available the guidance recommends using Phase 1 habitat survey data in conjunction with the SNIFFER Wetland Typology guidance to identify potential GWDTEs in the initial stages of assessment.
- 9.2.35. At the current time, there is limited NVC data available for the study area, primarily at designated site locations. Where there is no NVC data, potential GWDTEs have been identified using the alternative method discussed above. Phase 1 habitat mapping was carried out for DMRB Stage 1 along a corridor 100m wide either side of the existing A9. AMJV ecologists have subsequently reviewed this data and updated it following their own site visits. This Phase 1 habitat survey information is presented in Chapter 11: Ecology and Nature Conservation, and its associated figures. Those habitats which could include groundwater dependent NVC communities have been extracted from the mapping and used as the basis of the GWDTE mapping. The final dataset of potential GWDTEs used for the assessment is a combination of the available NVC and Phase 1 mapping.
- 9.2.36. The sensitivity of the GWDTEs have been evaluated based on the level of groundwater dependency of the likely NVC communities present.
- 9.2.37. The SEPA guidance recommends that buffers of 100m from excavations less than 1m deep, and 250m from excavations greater than 1m deep are applied to identify GWDTEs which may be at risk from associated groundwater changes. At the present time it is not known what the excavation depths will be along the Proposed Scheme Options, with the majority of Phase 1 and NVC survey data only available within 100m of the existing A9. The lack of NVC and Phase 1 survey coverage will result in an underestimate of the area of GWDTEs within 250m.





- 9.2.38. The area of GWDTEs lost under the footprint of the Proposed Scheme or within 250m of each Proposed Scheme Option has been calculated and the magnitude of this impact evaluated qualitatively.

#### *Mobilisation of Historic Contamination*

- 9.2.39. For contaminated land, the Scottish Government considers the ‘suitable for use’ approach as the most appropriate to deal with historical land contamination. A contaminated land Phase 1 Preliminary Risk Assessment has been undertaken by AMJV, and is reported as an appendix to the Geotechnical PSSR. The aims of the preliminary risk assessment are to identify sites of potential historic contamination within the Proposed Scheme study area and assess the potential risks posed to human health and the wider environment in the context of the proposed land use, in line with the requirements of PAN 33: Development of Contaminated Land<sup>viii</sup> and CLR11<sup>xvi</sup>.
- 9.2.40. The risk assessment methodology has involved the development of a Preliminary Conceptual Site Model (CSM) for the site. The CSM represents a network of relationships between potential sources of contamination and different receptors through different potential pollution pathways. The receptors can include people i.e. local residents, drivers and non-motorised users (NMUs) of the road, construction workers, the water environment, statutory designated ecological systems (SSSIs, SPAs, etc.) or buildings/structures. Potential pollutant pathways may include: direct contact with contaminated soils; ingestion/inhalation of soil, dust, vapour or gas; and the leaching and migration of contaminants, including gas through the ground. The potential receptors and pathways have been compiled based on the definitions used in Part IIA of the Environmental Protection Act 1990, as provided in the Scottish government’s Statutory Guidance<sup>xviii</sup>. Where a source, pathway and receptor combination exists this is referred to as a complete pollutant linkage, and a generic qualitative risk assessment has been undertaken in accordance with CIRIA C552, given the stage of the assessment. The risk is evaluated based on the consequence of risk being realised as shown in Table 9.2 and the probability or likelihood of risk being realised as shown in Table 9.3. The risk evaluation is then derived from the matrix shown in Table 9.4, and the Risk Classification definitions listed in Table 9.5.

**Table 9.2: Consequence of risk being realised**

Consequence	Category	Definition
Severe  Short-term (acute) risks only	Humans	Short term (acute) risk to human health likely to result in ‘significant harm’ as defined by the Environment Protection Act 1990, Part IIA and the Scottish Government Statutory Guidance 2006.
	Water Environment	Short term risk of significant pollution which meets Part IIA definition. Pollution resulting in the loss of a groundwater resource characterised by a breach relevant standards or resulting in a downgraded status as defined by the SEPA RBMP. Pollution of an industrial groundwater abstraction or irrigation supply that impairs its function. Pollution of a surface water course characterised by a breach of an EQS at a statutory monitoring location or resulting in a change in SEPA RBMP grade of river reach. Discharge of a hazardous substance to groundwater. Breach of Environmental Liabilities Regulations.
	Property	Catastrophic damage to or failure of buildings/property likely to result in ‘significant harm’ as defined by the Environment Protection Act 1990, Part IIA and the Scottish Government Statutory Guidance 2006.



Consequence	Category	Definition
		Substantial damage to a Scheduled Ancient Monument significantly impairing the historic, architectural, traditional, artistic or archaeological interest by reason of which the monument is scheduled.
	Ecological Systems	A short-term acute risk to a particular ecosystem, or organism forming part of such ecosystem.
Medium	Humans	Chronic damage to human health ('significant harm' as defined in SG Statutory Guidance 2006)
Chronic (long term) risks; 'significant harm'	Water Environment	Pollution of a groundwater resource protection zone characterised by a breach of relevant standards. Substantial pollution but insufficient to result in a change in the SEPA RBMP classification of the nearest river reach. Pollution meets Part IIA definition in SG 2006 guidance.
	Property	Substantial damage to buildings, foundations and service rendering the structures unsafe or impairing their function. Significant damage to a Scheduled Ancient Monument significantly impairing the historic, architectural, traditional, artistic or archaeological interest by reason of which the monument is scheduled.
	Ecological Systems	A significant change in a particular ecosystem.
Mild	Humans	No appreciable impact on human health based on the potential effects on the critical human health receptor.
Chronic (long term) risks: less sensitive receptors	Water Environment	Low levels of pollution of groundwater resource insufficient to result in a change in the status of the groundwater body under SEPA's RBMP. Low levels of pollution that may impact on a surface watercourse but that does not affect the classification of the river reach under SEPA's RBMP. Pollution of an unclassified surface watercourse.
	Property	Significant damage to crops, buildings, structures and services ('significant harm' as defined in SG Guidance 2006)  Damage to a Scheduled Ancient Monument but no significant impairment to the historic, architectural, traditional, artistic or archaeological interest by reason of which the monument is scheduled.
	Ecological Systems	Damage to ecological systems with no significant impairment.
Minor	Humans	Non-permanent health effects to human health (easily prevented) by means such as personal protective clothing, etc.)
Chronic (long term) risk; mild	Water Environment	No appreciable pollution, or pollution of a low sensitivity receptor or a surface water course without a quality classification
	Property	Easily repairable effects of damage to crops, buildings, structures and services
	Ecological Systems	Easily repairable effects of damage to ecological systems



**Table 9.3: Probability of risk being realised**

Likelihood	Definition
High Likelihood	There is a pollution linkage and an event that either appears very likely in the short term and almost inevitable over the long term, or there is evidence at the receptor of harm or pollution.
Likely	There is a pollution linkage and all the elements are present and in the right place, which means that it is probably that an event will occur. Circumstances are such that an event is not inevitable, but possible in the short term and likely over the long term.
Low Likelihood	There is a pollution linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a longer period such event would take place, and is less likely in the shorter term.
Unlikely	There is a pollution linkage but circumstances are such that it is improbable that an event would occur even in the very long term.

**Table 9.4: Contaminated land potential pollutant linkage risk evaluation matrix**

Consequence	Likelihood			
	Unlikely	Low	Likely	High
Severe	Moderate/Low	Moderate	High	Very High
Medium	Low	Moderate/Low	Moderate	High
Mild	Very Low	Low	Moderate/Low	Moderate
Minor	Very Low	Very Low	Low	Moderate/Low

**Table 9.5: Risk Classification Definitions**

Risk	Definition
Very High	There is a high probability that severe harm could arise to a designated receptor from an identified hazard, or, there is evidence that severe harm to a designated receptor is currently happening. This risk, if realised, is likely to result in a substantial liability. Urgent investigation (if not undertaken already) and remediation are likely to be required.
High	Harm is likely to arise to a designated receptor from an unidentified hazard. Realisation of the risk is likely to present a substantial liability. Urgent investigation (if not undertaken already) is required and remedial works may be necessary in the short term and are likely over the longer term.
Moderate	It is possible that harm could arise to a designated receptor from an identified hazard. However, it is either relatively unlikely that such harm would be severe, or if any harm were to occur it is more likely that the harm would be relatively mild. Investigation (if not already undertaken) is normally required to clarify the risk and to determine the potential liability. Some remedial works may be required in the longer term.
Low	It is possible that harm could arise to a designated receptor from an identified hazard, but it is likely that this harm, if realised, would at worst normally be mild.
Very Low	There is a low possibility that harm could arise to a receptor. In the event of such harm being realised it is not likely to be severe.

9.2.41. It should be noted that the assessment described above does not constitute a formal Environmental Impact Assessment (EIA) but is an amalgamation of the Contaminated Land and EIA assessment methods.

- 9.2.42. For the purposes of the Stage 2 Assessment comparison of the Proposed Scheme Options the number of potentially contaminated sites under the footprint, or within 500m, of each option has been quantified.

#### *Impact Assessment Criteria*

- 9.2.43. The assessment of significance of impacts in relation to geology, soils, and groundwater has been based on the guidance provided in the DMRB, Volume 11, Section 3, Part 10, HD 45/09 Road Drainage and the Water Environment<sup>ii</sup>. It should be noted that DMRB, Volume 11, Section 3, Part 11 Geology and Soils does not provide any specific guidance on the evaluation of sensitivity, magnitude and significance. Given that HD 45/09 does provide specific guidance in relation to groundwater impacts, this guidance has been used as a basis for the whole Geology, Soils and Groundwater Assessment, with sensitivity and magnitude criteria developed for the geology, and soils aspects.
- 9.2.44. It should also be noted that the contaminated land assessment has been carried out using a consequence / likelihood risk based methodology as per accepted industry practice referenced above. This approach does not easily translate into the sensitivity/magnitude significance approach of EIA and has therefore been reported separately within this chapter.

#### *Value/Sensitivity*

- 9.2.45. Application of the DMRB / EIA guidance has involved consideration of the importance/sensitivity of relevant attributes of the geology, soils, and groundwater receptors and evaluation of the magnitude of the impact. Importance/sensitivity has been evaluated taking into account quality, rarity, scale and substitutability in keeping with the DMRB guidance and using the criteria shown in Table 9.6.

**Table 9.6: Criteria used to estimate the Sensitivity of receptors.**

Sensitivity	Description
Very High	<p>Geology &amp; Geodiversity</p> <p>Areas containing geological or geomorphological features considered to be of a national interest such as Sites of Special Scientific Interest (SSSI), candidate SSSI or Geological Conservation Review (GCR) sites.</p> <p>Extensive areas of nationally important economic mineral deposits.</p> <p>Soils &amp; Peat</p> <p>Areas of very high quality/value soils including designated soils and/or Land Capability for Agriculture (LCA) Class 1 soils</p> <p>Areas of peatland designated as part of SSSIs, with national importance</p> <p>Groundwater</p> <p>Very high productivity aquifer</p> <p>Groundwater vulnerability Class 5</p> <p>Public water supply or large private water supply serving &gt;10 properties</p> <p>Designated GWDTEs, and GWDTEs located within designated areas</p>
High	<p>Geology &amp; Geodiversity</p> <p>Areas containing geological features of designated regional importance considered worthy of protection for their educational, research, historic or aesthetic importance, such as Local Geodiversity Sites (LGS)/ Regionally Important Geological Sites (RIGS) of national/ regional importance.</p> <p>Areas of regionally important economic mineral deposits.</p> <p>Soils &amp; Peat</p> <p>Areas of high quality/value soils and/or LCA Class 2 and 3 soils</p>



Sensitivity	Description
	<p>Class 1 priority peatland, carbon rich and peaty soils</p> <p>Groundwater</p> <p>WFD Good overall status groundwater body</p> <p>British Geological Survey (BGS) High productivity aquifer</p> <p>Groundwater vulnerability classes 4a and 4b</p> <p>Private water supply serving 2-10 properties</p> <p>Non designated GWDTEs with highly groundwater dependent NVC communities</p>
Medium	<p>Geology &amp; Geodiversity</p> <p>Sites and geological features not currently identified as SSSI, GCR or LGS/ RIGS but that may require protection in the future.</p> <p>Areas of locally important economic mineral deposits.</p> <p>Soils &amp; Peat</p> <p>Areas of medium quality/value soils and/or LCA Class 4 and 5 soils</p> <p>Class 2 and 3 priority peatland areas, carbon rich and peaty soils</p> <p>Groundwater</p> <p>BGS Moderate/low productivity aquifer</p> <p>Groundwater vulnerability classes 2 and 3</p> <p>Private water supply serving a single property</p> <p>Non designated GWDTEs with moderately groundwater dependent NVC communities</p>
Low	<p>Geology &amp; Geodiversity</p> <p>Geological features not currently protected and unlikely to require protection in the future.</p> <p>Absence of economic mineral deposits or minimal areas of locally important deposits.</p> <p>Soils &amp; Peat</p> <p>Area of low quality/value soils and/or LCA Class 6 and 7 soils</p> <p>Class 4 and 5 peatland areas and unclassified areas (class 0, -1 and -2)</p> <p>Groundwater</p> <p>WFD Poor overall status groundwater body</p> <p>BGS Very low productivity aquifers</p> <p>Groundwater vulnerability classes 0 and 1</p>

### *Magnitude of Impact*

- 9.2.46. Magnitude has been determined by taking into account the extent of loss and effects on integrity of an attribute in keeping with the DMRB guidance and using the criteria shown in Table 9.7.

**Table 9.7: Criteria used to estimate the Magnitude of an impact on receptors.**

Magnitude	Description
Major	<p>Geology &amp; Geodiversity</p> <p>Major or total loss of a geological site or mineral deposit, where the value of the site would be severely affected.</p> <p>Soils &amp; Peat</p> <p>Major or total loss of soils or peatland deposits (above 50%), or where the value of the site would be severely effected</p> <p>Groundwater</p>





Magnitude	Description
	<p>High risk of pollution to groundwater during construction, significant temporary or long-term change in water quality, resulting in a permanent change in WFD status or permanent loss of surface water supply</p> <p>High risk (risk score &gt;250) of pollution of groundwater from routine runoff</p> <p>Risk of pollution from accidental spillage during operation &gt; 2% annually</p> <p>Major loss of an aquifer in terms of water level or yield, with total loss of or major changes to dependent abstractions/habitats</p> <p>Major change or total loss of a GWDTE, where the value of the site would be severely affected</p>
Moderate	<p>Geology &amp; Geodiversity</p> <p>Partial loss of a geological site or mineral deposit, with major effects to the settings, or where the value of the site would be affected.</p> <p>Soils &amp; Peat</p> <p>Partial loss of soils or peatland deposits (15-50%), or where the value of the site would be affected</p> <p>Groundwater</p> <p>Moderate risk of pollution to groundwater during construction, moderate temporary change in water quality, resulting in a temporary change of WFD status or preventing attainment of overall status of 'Good', or temporary loss of water supply</p> <p>Medium risk (risk score 150-250) of pollution of groundwater from routine runoff</p> <p>Risk of pollution from accidental spillage during operation &gt; 1% annually</p> <p>Changes to an aquifer in terms of water level or yield, with small changes to nearby dependent abstractions/habitats</p> <p>Partial change or loss of a GWDTE, where the value of the site would be affected</p>
Minor	<p>Geology &amp; Geodiversity</p> <p>Small effect on a geological site or mineral deposit, such that the value of the site would not be affected.</p> <p>Soils &amp; Peat</p> <p>Small loss of soils or peatland (&lt;15%), or where soils will be disturbed but the value not impacted</p> <p>Groundwater</p> <p>Minor risk of pollution during construction to groundwater, relatively minor temporary changes in water quality such that ecology is temporarily affected. Equivalent to a temporary minor, but measurable, change within WFD status class or temporarily reduced quality of water supply</p> <p>Low risk (risk score &lt;150) of pollution of groundwater from routine runoff</p> <p>Risk of pollution from accidental spillage during operation &gt; 0.5% annually</p> <p>Small change to an aquifer in terms of water level or yield, with little discernible change to dependent abstractions/habitats</p> <p>Small change to or loss of a GWDTE, where the value of the site would not be affected</p>
Negligible	<p>Geology &amp; Geodiversity</p> <p>Minimal or no change to a geological site or mineral deposit</p> <p>Soils &amp; Peat</p> <p>Minimal or no change to soils or peatland deposits</p> <p>Groundwater</p> <p>Negligible risk of pollution to groundwater during construction, very slight temporary change in water quality with no discernible effect on watercourse ecology or water supply</p>





Magnitude	Description
	Risk of pollution from accidental spillage during operation < 0.5% annually Minimal or no change to an aquifer in terms of water level or yield, with no discernible change to dependent abstractions/habitats Minimal or no change to or loss of a GWDTE

### Impact Significance

- 9.2.47. The evaluation of significance has been derived by combining the sensitivity of the affected attributes and the magnitude of the impacts using the matrix recommended in the DMRB HD 45/09 guidance, which is replicated in Table 9.8. Where the significance is shown as being one of two alternatives, a single description is provided based on reasoned judgement.

**Table 9.8: Criteria used to estimate the Significance of potential effects**

Sensitivity	Magnitude of Impact			
	Major	Moderate	Minor	Negligible
Very High	Very Large	Large / Very Large	Moderate / Large	Neutral
High	Large / Very Large	Moderate / Large	Slight/Moderate	Neutral
Medium	Large	Moderate	Slight	Neutral
Low	Slight / Moderate	Slight	Neutral	Neutral

### Limitations of the Assessment

- 9.2.48. This assessment has relied upon the accuracy and level of detail of the documented data sources. For instance, identification of potential contaminated land and historical quarry sites have been through desk study review of historical maps. It is possible that potentially contaminating land use or quarry excavation and backfilling could have taken place between recorded years of mapping and have therefore not been identified. It is also possible given the rural nature of the Proposed Scheme that unrecorded farmers' tips may be present along the scheme.
- 9.2.49. The scale of various mapping datasets, such as groundwater vulnerability and soils mapping, is such that only broad characterisation of these attributes and high level assessment of potential impacts has been possible at this stage. Both the aquifer productivity and groundwater vulnerability data only provide a guide to aquifer conditions at a 1:100,000 scale. Further detailed site investigations and consultation will inform the DMRB Stage 3 Assessment of the Preferred Option.
- 9.2.50. To date full GI works for the Proposed Scheme have not been completed and therefore much of the assessment has relied on available historic GI data.
- 9.2.51. Due to the limited GI data available there is very limited site specific information available on the groundwater table and aquifer properties in the vicinity of the proposed groundwater discharges and road cuttings. Conservative assumptions have therefore been made, based on the available mapping data for the study area.
- 9.2.52. Historic groundwater level data, which was collected before sections of the current A9 were constructed, may refer to deposits that no longer exist, and ground levels that have since changed as a result of the construction of these sections of the current A9 route.



- 9.2.53. Full drainage designs for each of the Proposed Mainline and Junction Options were not available at the time of Stage 2 assessment, therefore a precautionary approach was taken for assessments relating to pollution from accidental spillage and routine runoff impacts, using the largest impermeable areas and highest levels of traffic within the calculations.
- 9.2.54. In relation to the peat investigations the probing surveys carried out can provide total soil depths at a specified location, but not detail the extent of different soil layers (e.g. peat, clay, gravel), which would be gained from further GI as part of the DMRB Stage 3 assessment. Any estimates of peat depths between probe locations have been extrapolated from surrounding data points and topography.
- 9.2.55. As previously discussed only partial private water supply data (including supplies for agricultural use) was available for this assessment and conservative assumptions have been made regarding some supplies. Detailed consultation with landowners will be carried out as part of the DMRB Stage 3 assessment to determine the full extent of water supplies within the study area.
- 9.2.56. Also discussed earlier, limited NVC data was available to determine the extent of GWDTEs within the study area, with most potential locations identified based on Phase 1 habitat survey data which also only extends 100m from the existing A9 in areas. This is likely to provide an underestimate for potential GWDTEs impacted. This limitation will be addressed at Stage 3 when full NVC surveys extending 250m from the Proposed Scheme will be undertaken, and the GWDTE assessment refined accordingly.
- 9.2.57. The contaminated land assessment has been based on desk study data only. Whilst the potential pollution pathway linkages have been identified and risk assessed, the presence, nature, extent and severity of any contamination cannot be confirmed at this stage. Further GI and analysis of soil and water samples will be carried out to inform the DMRB Stage 3 Assessment of the Preferred Option.
- 9.2.58. The limitations discussed above are typical of a DMRB Stage 2 Assessment, and the assessment detailed herein is considered to be robust and of an appropriate level of detail to inform the selection of a Preferred Option. As noted above further detailed investigations and assessments will be undertaken at DMRB Stage 3 to inform the design of the Preferred Option.

## 9.3. Baseline Conditions

### Geology

- 9.3.1. The information below is summarised from the Geotechnical Preliminary Sources Study Report for the Proposed Scheme, where further baseline information on geology is discussed<sup>xxii</sup>.

#### *Bedrock Geology*

- 9.3.2. As determined from available BGS maps, much of the Proposed Scheme is underlain by metamorphic bedrock geology. Igneous bedrock in the form of major and minor intrusions is also shown along the Proposed Scheme but to a lesser extent than the metamorphic deposits. The distribution of bedrock geology is shown in Figure 9.1.
- 9.3.3. Bedrock is noted to be at or near the ground surface at numerous locations in close proximity to the Proposed Scheme, typically associated with hillsides. Bedrock is anticipated to be close to or at ground level beneath the Proposed Scheme in the area

of Craigellachie Nature Reserve (Section 3a), around Kinveachy (Section 6a), and extensively in the area of Slochd (Sections 10 and 11).

- 9.3.4. Much of the Proposed Scheme is underlain by metamorphic rock types. These rocks are formed as a result of changes to original rock types due to increases in pressure or temperature. For example, a metamorphosed sandstone is known as a psammite, while a metamorphosed siltstone is known as a semipelite.
- 9.3.5. The distribution of metamorphic rocks in the area of the Proposed Scheme is shown on Figure 9.1. The name given to each group of metamorphic rock along with a brief description of its geology is given below, with the metamorphic rock types listed from oldest to youngest (as far as can be determined from available information):
- The Central Highland Migmatite Complex consists of psammite and is present beneath the Proposed Scheme in the area of Carrbridge (Sections 7 and 8).
  - The BGS mapping shows the Dava Subgroup to underlie the Proposed Scheme south of Carrbridge (NGR 2909 8177 to NGR 2904 8214, beneath Sections 6 and 7). The Dava Subgroup comprises gneissose psammite and semipelite.
  - The Slochd Psammite Formation underlies much of the area around Black Mount and Slochd (Sections 9, 10 and part of 11). A narrow band also crosses the Proposed Scheme at Slochd Summit, near the northern terminus of the scheme.
  - The Creag Buidhe Semipelite Formation consists of gneissose to migmatitic semipelite and underlies part of Section 11 at Slochd Summit.
  - The Beinn Bhreac Psammite underlies the northernmost part of the Scheme at Slochd Summit. It comprises gneissose quartzite as well as a gneissose-micaceous psammite.
  - The Loch Laggan Psammite Formation is present in the area of Loch Alvie, at the southern end of the Proposed Scheme. This formation comprises micaceous psammite as well as psammite and semipelite.
  - Psammite, semipelite, and calcsilicate rock of the Dalradian Supergroup underlies parts of the Proposed Scheme in Sections 10 and 11 at An Slochd Beag and at Slochd Summit.
  - The Grampian Group comprises psammite and is shown on Figure 9.1 to underlie the Proposed Scheme in the area of the existing and proposed junction at Granish.
  - The Pityoulish Formation underlies much of Sections 2 and 3a (in the area of the existing and proposed Aviemore South junction) and Section 5 (around Granish and Avie Lochan). This formation comprises interbanded psammites and semipelites with distinctive bands of siliceous psammite and quartzite.
  - Much of Aviemore is underlain by the Nethybridge Psammite Formation. The formation typically comprises psammite.
- 9.3.6. While most of the study area is underlain by metamorphic rocks, large areas are underlain by igneous rocks. Igneous rocks are formed as a result of the cooling and solidification of molten or partially molten material i.e. magma or lava.
- 9.3.7. The distribution of igneous rocks beneath the study area is shown on Figure 9.1. The igneous rocks encountered are listed below along with a brief description of the material:
- The Monadhliath Pluton (Phases 1 to 4) is an igneous intrusion that underlies the study area towards the south of the Proposed Scheme (Sections 1 to 4). The geology of the pluton varies slightly depending upon its “phase” as can be seen on Figure 9.1; however, it generally consists of granite or microgranite.

- The Boat of Garten Pluton underlies the Study Area in the area of Loch Vaa and Kinveachy. The Proposed Scheme is underlain by this in Section 6a. This igneous intrusion comprises tonalite and granodiorite.
- Minor intrusions belonging to the North Britain Siluro-Devonian Calc-Alkaline Dyke Suite are found beneath the Proposed Scheme at several locations as shown on Figure 9.1.

### *Structural Geology*

- 9.3.8. As well as information on the distribution of and material that constitutes the Bedrock geology, available BGS maps also include information relevant to the Proposed Scheme on the structural geology. The features discussed in the following sections are shown on Figure 9.1.
- 9.3.9. The Proposed Scheme crosses the margins of contact metamorphism aureoles twice: to the south of Avielochan (Section 5) where the contact is oriented northwest to southeast, and near the northern extent of the Scheme (Section 11) where the contact is generally oriented north to south in the area of the existing carriageway.
- 9.3.10. A number of faults are also noted to intersect the alignment of the existing carriageway and thus the Proposed Scheme as given below:
- Fault (inferred) with unknown displacement crosses the Proposed Scheme at NGR 2910 8191 (in Section 7, north of Kinveachy), trending north-northeast to south-southwest.
  - Fault (inferred) with unknown displacement crosses the Proposed Scheme at NGR 2908 8203 (Section 7, in the area of Docharn Wood), trending northeast to southwest.
  - Fault (inferred) with unknown displacement and two subsidiary faults crosses the Proposed Scheme at Slochd Beag (Section 10, NGR 2849 8239). The general trend of these faults is north-northeast to south-southwest.
- 9.3.11. There are several areas along the Proposed Scheme that the BGS geological maps identify as zones where bedrock is likely to be more disturbed as a result of faulting in the geological past. These are:
- A zone of sheared rock that crosses the Proposed Scheme to the north of Slochd village (from NGR 2846 8240 to NGR 2846 8241). This narrow zone generally trends east to west.
  - From NGR 2838 8253 to NGR 2835 8256 (near Slochd Summit) along the Proposed Scheme are a number of structures that indicate that bedrock in this area is likely to be highly deformed and disturbed. The reported features included areas of sheared rock, faults known as a “thrust” or “reverse faults”, and the trace of folds in the bedrock. The zone of deformation extends to either side of the Proposed Scheme.
  - Multiple narrow bands of sheared rock are shown to cross the Proposed Scheme from NGR 2818 8267 to NGR 2815 8269 (at the far northern extent of the scheme). These zones extend to the north and the south of the route.

### *Superficial Geology*

- 9.3.12. BGS mapping indicates the most prevalent superficial deposits underlying the study area comprise glacial deposits including Glacial Till (Devensian Till), Hummocky (Moundy) Glacial Deposits, and Glaciofluvial Sheet Deposits. Lesser deposits along the

Proposed Scheme include Peat and Alluvium. The superficial deposits are discussed in more detail below and their distribution is shown on Figure 9.2.

- 9.3.13. The findings of historical ground investigations are discussed in detail in the PSSR. It should be noted that the superficial deposits encountered in exploratory holes were typically similar in composition: the descriptions of the materials given below (based upon geological mapping) confirm that much of the deposits in the study area are likely to be of a similar composition albeit of different geological origin. It is also noted that much of the historical Ground Investigation data precedes the construction of the existing A9.
- 9.3.14. Devensian Glacial Till (Diamicton) is typically shown in the central and northern sections of the study area. Glacial Till is shown beneath the Proposed Scheme around NGR 2901 8157 (between Granish and Avielochan, Section 5) and intermittently between NGR 2908 8176 and NGR 2907 8207 (Kinveachy to Docharn Wood, Sections 6a, 6b and 7)). The Glacial Till is anticipated to be poorly sorted including clay fractions through to boulders.
- 9.3.15. Hummocky (Moundy) Glacial Deposits comprise lithologically diverse glacial deposits, typically of rock debris, clayey till, and poorly to well stratified sand and gravel. These are the prevalent superficial deposits through much of the central section of the Proposed Scheme from NGR 2907 8207 to NGR 2853 8238 (Docharn Woods to Black Mount, Sections 7 to 10). These deposits are also present in the south of the study area where they are more intermittent, due to the Proposed Scheme straddling the boundary between the Hummocky (Moundy) Glacial Deposits and the Glaciofluvial Sheet Deposits in this area.
- 9.3.16. Glaciofluvial Ice Contact Deposits are typically limited in extent within the study area. Of particular relevance to the Proposed Scheme is the deposit that extends from NGR 2910 8190 to NGR 2908 8203 (north of Kinveachy to Docharn Wood, Sections 6b and 7). These deposits typically comprise sand and gravel.
- 9.3.17. Glaciofluvial Sheet Deposits are the most widespread superficial deposit in the south of the study area. They are intermittently present beneath or to the east of the Proposed Scheme until NGR 2910 8185 (Kinveachy). Lesser deposits are encountered throughout much of the study area. This material typically comprises sand and gravel with localised lenses of silt, clay, or organic material. These materials were often deposited as large outwash plains as a result of meltwater from a glacier.
- 9.3.18. The distribution of River Terrace Deposits (undifferentiated) is related to the location of significant watercourses in the study area; namely, the River Spey and the River Dulnain. Those deposits associated with the River Spey are present in the south of the study area and underlie the Proposed Scheme from NGR 2867 8101 to NGR 2884 8106 (Ballinluig to Lynwilg, Sections 1, 2 and 3a). This material generally consists of sand and gravel with localised lenses of silt, clay, or peat.
- 9.3.19. The distribution of Alluvium throughout the study area is associated with the presence of watercourses. Of particular note to the Proposed Scheme is Alluvium associated with Allt an Fhearna (NGR 2854 8091), an unnamed watercourse near Ballinluig and Loch Alvie (NGR 2868 8101), Féith Mhór and its tributaries (NGR 2907 8208), the River Dulnain (NGR 2896 8225 to NGR 2895 8226), and Allt nan Ceatharnach (NGR 2892 8230 to NGR 2891 8231). Smaller areas of Alluvium are present within the study area as shown on Figure 9.2. The BGS description for Alluvium in the area is soft to firm silty clay that can contain layers of silt, sand, peat, and basal gravel.
- 9.3.20. In general, Peat deposits in the study area are localised in extent as shown in Figure 9.6 with the exception of a relatively extensive area of Peat which is beneath the Proposed

Scheme from NGR 2871 8240 to NGR 2860 8238 in the area of the proposed Black Mount junction. Recent peat probing (December 2015) confirmed Peat in this area to a maximum depth of 5.4m Below Ground Level.

### Designated Geological Sites

- 9.3.21. The term 'Geodiversity' refers to the variety of rocks, minerals, fossils, landforms sediments and soils in an area, together with natural processes, such as erosion and landslips that may still be active<sup>xxxiii</sup>. Sites of geodiversity interest within the study area are shown on Figure 9.3.
- 9.3.22. There are no Geological SSSIs within the study area; however, there is one Geological Conservation Review (GCR) site which SNH advises should be considered a Candidate SSSI. This has been given GCR number 3318 and is referred to as The Slochd<sup>xxxiv,xxxv</sup>.
- 9.3.23. The Slochd GCR covers an area of approximately 110 Hectares and the GCR record gives the following grid references: NGR 2836 8257, NGR 2833 8240, and NGR 2842 8240. The Proposed Scheme enters the GCR site at NGR 2838 8252 in the southeast and at NGR 2835 8255 in the northwest and the existing rock cutting adjacent to the southbound carriageway forms part of the site. The extents of the GCR are shown on Figure 9.3. It is noted that only a small proportion of the GCR is in close proximity to the existing A9 and thus to the proposed dualled A9. The GCR belongs to the "Precambrian – Dalradian" GCR block and is considered to be of national importance for the study of Precambrian metamorphism and the tectonic history of the Highlands of Scotland. A 2010 site condition survey recorded the site's condition to be "favourable". In this report, two areas within the GCR boundaries were identified as "crucial" on the basis that important features of the rocks are exposed in these localities which aid in understanding the scientific interest of the GCR. The northernmost of these areas includes the rock cutting adjacent to the southbound carriageway as well as the rock cuttings adjacent to the railway line and the northbound carriageway. It is noted that the extent of this crucial area is beyond the boundaries of the GCR. The southernmost crucial area is within the GCR but beyond the extents of the proposed dualling.
- 9.3.24. A second GCR site, Allt na Feithe Sheilich (GCR number 924) is also present within 1km of the carriageway (Figure 9.3). At its closest point it is 895m northeast of NGR 2839 8251 (south of Slochd Summit). Given its distance from the carriageway it has not been considered further as part of this assessment as the proposed online dualling will have no impact upon it.
- 9.3.25. There are no Local Geodiversity Sites (LGS) within the study area. The 2011 geodiversity audit of the Cairngorms National Park completed by BGS identified two further sites within the study area that are of geodiversity interest but which have not been designated as LGSs. These are: Boat of Garten / Tore Hill and Slocht Mor (it is noted that Slochd appears to have been misspelled and this location will be referred to as Slochd Mor herein).
- 9.3.26. Boat of Garten / Tore Hill were identified as possible geodiversity locations for their outcrops of the Boat of Garten and Tore Hill igneous intrusions. Of relevance to the proposed scheme, are the extents of the Boat of Garten Pluton which are shown on Figure 9.3. As discussed earlier in the text, the Boat of Garten Pluton underlies the Proposed Scheme from NGR 2904 8169 to NGR 2909 8177 (Section 6a) and is considered to be of potential geodiversity interest as it; along with the Tore Hill intrusions, may be the only representatives of the Argyll-Northern Highlands Subsuite in the Cairngorms National Park. A former quarry face is exposed at NGR 2906 8172 in the area shown to be underlain by the Boat of Garten Pluton otherwise bedrock





exposures along the existing A9 are limited with much of the landforms dominated by superficial deposits

- 9.3.27. The exact location and the extents of the possible geodiversity location Slochd Mor were not given in the BGS audit; however, it is understood to be in the region of NGR 2842 8249 and NGR 2838 8251 thus is of relevance to the Proposed Scheme. The approximate location is shown on Figure 9.3. This is of geodiversity interest as it is a significant meltwater channel landform associated with past glaciations in the area.
- 9.3.28. An additional feature falls within the study area that has not been designated or suggested as a geodiversity site but is known to be a feature of local interest. A rock feature near Slochd Summit (NGR 2841 8251) is locally referred to as the German Soldier and is believed to resemble a human head wearing a helmet. This feature is also known by a number of other names such as the Soldier's Head. Anecdotal reports suggest that this feature was either hand carved or formed as a result of nearby blasting during the construction of the existing A9; however, it is most likely a natural feature in the rock face.
- 9.3.29. A number of cuttings have been formed in rock to accommodate the existing A9 between Dalraddy and Slochd. The majority of these cuttings, listed below, are considered to have little geodiversity interest unless stated otherwise:
- NGR 2836 8254, southbound lane: part of The Slochd GCR;
  - NGR 2838 8253, northbound lane: part of The Slochd GCR;
  - NGR 2842 8247, southbound lane;
  - NGR 2849 8239, northbound and southbound lanes. The cutting adjacent to the southbound lane is noted to be significantly larger than the one adjacent to the northbound lane;
  - NGR 2851 8238, northbound lane;
  - NGR 2908 8204, northbound lane;
  - NGR 2895 8144, northbound lane;
  - NGR 2891 8131, northbound lane;
  - NGR 2891 8116, southbound lane;
  - NGR 2890 8111, northbound and southbound lanes. The cutting adjacent to the northbound lane is noted to be significantly longer and deeper than adjacent to the southbound lane. This feature is illuminated as a feature of interest at night; however, the geodiversity interest of this cutting is considered to be low; and,
  - NGR 2886 8107, northbound lane.
- 9.3.30. The sensitivity of most of the rock exposures and outcrops within the study area is considered to be Low with the exception of The Slochd GCR which should be treated as a Candidate SSSI and is therefore considered to be of Very High sensitivity. Additionally the Boat of Garten / Tore Hill and Slochd Mor outcrops are considered to be of Medium sensitivity due to their identified geodiversity interest.

### Economic Minerals

- 9.3.31. The bedrock geology of the study area suggests that extraction of economic minerals by mining is unlikely to have occurred. The Coal Authority Interactive Map was accessed and confirms that coal mining has not taken place within the study area. The BGS Non-coal Mining Plans portal was also accessed and confirms that mining of other economic



minerals has not occurred within the study area. As part of documentary researches for the PSSR the specialist Mineral Valuer team in the Valuation Office Agency was contacted about the Proposed Scheme. Their search revealed no records of underground mining. A search of the Review of Mining Instability in Great Britain was also undertaken and further confirms that mining of economic minerals has not been undertaken within or in close proximity to the study area: there is no risk to the Proposed Scheme from past mining activities.

- 9.3.32. The BGS Directory of Mines and Quarries<sup>xxviii</sup> and the BGS Onshore Geindex online portal indicates that there is one registered active quarry within the study area. This is Granish Quarry (NGR 2905 8153), north of Aviemore, and approximately 160m east of the existing A9. This quarry is operated by David Ritchie & Sons Ltd and the commodity is given as sand and gravel.
- 9.3.33. Historical maps that cover the length of the Proposed Scheme were reviewed as part of the PSSR. A number of historic quarries and pits were identified, a number of which have since been infilled. The quarries and pits identified in the PSSR are tabulated below.

**Table 9.9: Quarries and pits within the study area**

Location	Map description	Comments
NGR 2864 8103	Disused pit	-
NGR 2871 8103	Disused gravel pit	Stockpiled materials observed during the PSSR walkover. No evidence of current extraction.
NGR 2873 8098	Disused sand pit	-
NGR 2883 8100	Disused pit	-
NGR 2885 8108	Quarry	Former commodity – rock.
NGR 2892 8116	Disused sand pit	-
NGR 2894 8138	Quarry	-
NGR 2896 8145	Quarry	At the time of the PSSR walkover this was used as an industrial yard. No evidence of current extraction.
NGR 2906 8172	Former quarry	Former commodity – rock.
NGR 2910 8196	Disused pit	-
NGR 2911 8198	Disused pit	-
NGR 2859 8243	Gravel pit	-
NGR 2848 8238	Disused quarry	-
NGR 2848 8239	Former quarry	Rock was extracted from this location at the time of the original A9 construction.
NGR 2825 8260	Disused pit	-
NGR 2824 8261	Disused sand pit	-

Table Source: A9 Dualling Northern Section: Dalraddy to Slochd Geotechnical Preliminary Sources Study Report.

- 9.3.34. Given their location and the underlying geology it is assumed that the majority of these former pits and quarries were used for the extraction of sand and gravel. It is noted that a number of former quarries were used for the extraction of rock (igneous or metamorphic) possibly for building stone supply or for the provision of material for the construction of the existing A9.
- 9.3.35. Granish Quarry is considered a locally important source of sand and gravel and has therefore been assigned a sensitivity of Medium. The sand and gravel resource



elsewhere in the study area has been worked historically but is not currently being extracted. Given the widespread distribution of superficial deposits that consist largely of sand and gravel the sensitivity of this resource is considered to be Low. The location of Granish Quarry is shown on Figure 9.4.

- 9.3.36. Rock is not currently being quarried within the study area but has been extracted historically. Bedrock is at or near the ground surface across large sections of the study area; therefore, the sensitivity of this resource is considered to be Low.

## Soils

- 9.3.37. The soil units present on site are summarised from the 1:250,000 Soil Map of Scotland by the James Hutton Institute<sup>xxv</sup>.
- 9.3.38. The distribution of soils within the study area is dependent on the geology, topography and drainage regime of the area. The study area soils consist of various soil units belonging to the Arkaig, Corby, Countesswell, Aberlour and Dulsie Associations, derived from Moine Series metamorphic rocks, fluvioglacial sands and gravels and granites respectively. The main soil types within the study area are:
- **Gleys:** naturally poorly drained soils that develop under conditions of intermittent or permanent waterlogging. Soils are typically greyish or blue-grey with orange mottling. Peaty gleys have a peat-rich surface horizon; noncalcareous gleys have a low lime content; humic gleys include a humus-rich surface layer;
  - **Podzols:** typically free-draining acid soils developed under aerobic conditions. Podzols are generally nutrient-deficient and heavily leached in the upper horizons, with an accumulation of iron/aluminium oxides ('ironpan') or organic material at lower levels within the soil profile. Peaty podzols have a peat-rich surface horizon; humus-iron podzols have a more humus-rich surface layer and a higher concentration of iron oxides within the soil profile. In areas with low slope angles, waterlogging may occur above the ironpan; this can produce a soil intermediate between a podzol and a gley;
  - **Rankers:** predominant in mountain or hilly terrain or on glacially eroded rocky terrain with underlying solid or fragmented non-calcareous rocks within 30cm depth. An organic or organo-mineral surface horizon present but generally lacks subsoil; and
  - **Peat:** accumulations of organic material that have remained wet to the surface; often dominated by Sphagnum mosses.
- 9.3.39. Sixteen soil units are found within the study area, summarised in Table 9.10, and shown in Figure 9.5. Each soil unit consists of varying proportions of the soil types discussed above, with the proportion of each soil type within a soil unit dictated by the local climatic, topographical and drainage conditions.

**Table 9.10: Soils within the study area**

Soil Association	Soil Unit	Component Soils	Landforms	Typical Associated Vegetation	Study Area Presence Section No.
Alluvial Soils	1	Alluvial soils	Flood plains, river terraces and former lake beds	Arable and permanent pastures, rush pastures and sedge mires, broadleaved woodland	Along the valley of River Spey upstream of Loch Alvie and south of Aviemore Sections 1 to 3a



Soil Association	Soil Unit	Component Soils	Landforms	Typical Associated Vegetation	Study Area Presence Section No.
Organic Soils	3	Basin and valley peats	Basins and valleys	Blanket and flying bent bog, swamp, rush pastures and sedge mires	Large open areas both south and east of Black Mount, and north of Slochd summit Sections 10 and 11
Aberlour	9	Peaty podzols, peat, peaty gleys	Hummocky moraine with strong, non-rocky or slightly rock complex slopes.	Moist boreal heather moor and blanket bog	North of Slochd along steep rocky slopes  Section 11
	10	Peaty podzols, humus-iron podzols, peaty gleys and rankers	Hills and valley sides with strong to moderately rocky slopes	Moist and dry boreal heath moors and white bent-tussock grass grassland	East of Slochd across existing A9 route  Section 9 and 10
	15	Rankers, lithosols and some alpine soils	Mountain summits with strong to very steep and very rocky slopes	Blaeberry heath, bog whortleberry heath, alpine azalea-lichen heath and stiff sedge-fescue grasslands	Area around settlement of Slochd within valley  Sections 10 and 11
Arkaig	22	Peaty podsols, peat, some peaty gleys and humus-iron podzols	Hills and valley sides with strong slopes, non-rocky	Moist boreal heather moor, blanket and upland blanket bog, bog heather moor	Small upland area north of Slochd  Section 11
	28	Peaty podzols, humus-iron podzols; some peaty gleys and rankers	Hills and undulating lowlands with gentle and strong slopes: moderately rocky	Boreal and Atlantic heath moors, heath rush-fescue grasslands and rich bent-fescue grassland	Lower lying woodland west of Crannich and west of the Proposed Scheme  Section 7
	30	Rankers, peaty podzols; some humus-ironpodzols and peaty gleys	Rugged hills with strong and steep slopes; very rocky	Dry and moist boreal heather moor, bog heather moor, blaeberry heath	Large area west of Proposed Scheme from Aviemore to north of Kinveachy, west of Slochd summit along upper slopes Sections 5 to 7
Corby	98	Humus-iron podzols, alluvial soils	Valley floors, terraces and mounds with	Coniferous woodland, and natural oak and	Valley of River Dulnain at Carrbridge





Soil Association	Soil Unit	Component Soils	Landforms	Typical Associated Vegetation	Study Area Presence Section No.
			gentle and strong slopes	birch woodlands	Section 8
	100	Humus-iron podzols, some peaty gleys and humic gleys	Mounds and ridges with gentle to steep slopes	Atlantic and boreal heather moors, and acid bent-fescue grassland	Valley floor around Loch Alvie, and large area east of Proposed Scheme extending north from Aviemore to Kinveachy  Sections 1, 3a-7
	101	Peaty podzols, some humus-iron podzols and peat	Located on both steep sided mounds and flat areas	Moorland communities dominate peaty podzols whereas blanket bogs typify peat filled depressions	South of Slochd Mhor and west of the existing A9 route  Sections 10 and 11
Countesswells	126	Peaty podzols, humus-iron podzols, some peaty gleys and rankers	Hill and valley sides with strong to very steep, moderately rocky slopes	Boreal heath moors, flying bent grassland and boreal juniper scrub	Small area west of Ballinluig on higher slopes of Creag Ghleannain Section 1
	127	Peaty podzols, peat; some peaty podzols and peaty rankers	Hills and undulating lowlands with gentle and strong slopes: moderately rocky	Moist boreal and Atlantic heather moor, bog heather moor, blanket, lowland and upland blanket bog	Small uphill area west of Slugganranish Section 4 and 5
Dulsie	172	Humus-iron podzols; some gleys and peaty podzols	Undulating lowlands and hills with gentle and strong slopes	Scots pine, with areas of crops based on grass.	Woodland area around Crannich, south of Carrbridge Section 7
	173	Peaty podzols, peat; some peaty gleys and humus-iron podzols	Hills and valley sides with strong and steep slopes	Scots pine	Large area around Black Mount and Baddengorm Woods Sections 8 to 10
Organic Soils	606	Peat	Blanket Peat		Small area located east of Slochd summit on slopes of Carn nam Bain-tighearna Section 11

Table Source: Soils Scotland<sup>xxv</sup>.





9.3.40. Information on the potential use and quality of the soils has been derived from the Land Capability for Agriculture mapping, also produced by The James Hutton Institute<sup>xxv</sup>. The land capability classes present within the study area are shown in Figure 8.3 and listed in order of prevalence within Table 9.11 below.

**Table 9.11: Land capability for agriculture classes within the study area**

Class	Description	Study Area Presence / Section
4 <sub>2</sub>	Land capable of producing a narrow range of crops. Primarily grassland with some limited potential for other crops. Grass yields can be high but difficulties of conservation or utilisation may be severe, especially in areas of poor climate or on very wet soils.	Extensive area of Proposed Scheme from land around Loch Alvie, along existing A9 through Aviemore, Kinveachy and Carrbridge to Black Mount. Corresponds mainly to soil unit 100, but also with soil units 98 and 173. Sections 1 to 10
6 <sub>3</sub>	Land capable of use only as rough grazings. The vegetation is dominated by plant communities with low grazing values, particularly heather moor, bog heather moor and blanket bog.	Primarily along steeper slopes and higher ground west of existing A9 west of Lynwilg, Aviemore and Kinveachy, and the area around Slochd. Corresponds with a number of soil units including 3, 9, 10, 15, 30 and 126. Sections 1, 3a to 7, 10, 11
5 <sub>2</sub>	Land capable of use as improved grassland. Sward establishment presents no difficulties but moderate to low trafficability, patterned land and/or strong slopes cause maintenance problems. Growth rates are high and despite some problems of poaching satisfactory stocking rates are achievable	Woodland around Avielochan, north of Kinveachy and west of Slochd Mor. Corresponds with soil units 30, 100 and 172. Sections 6a to 8, 11
3 <sub>2</sub>	Land capable of producing a moderate range of crops. Suited to an average production but high yields of barley, oats and grass. Grass leys are common and reflect increasing growth limitations for arable crops and degree or risk involved in production.	Valley bottom along the Spey around Aviemore, and along River Dulnain west of Carrbridge. Broadly correlates with soil units 1 and 100 Sections 1 to 4, 8.
5 <sub>3</sub>	Land capable of use as improved grassland. Similar to class 5 <sub>2</sub> , sward establishment may be easy although deterioration in quality is often rapid. Patterns of soil, slope or wetness may seriously interfere with establishment, land cannot support high stock densities.	Large areas south of Black Mount and east of Slochd, with a small area west of Sluggangranish. Corresponds with soils 3, 22 and 127. Sections 4, 5, 8 to 10

Table Source: Soils Scotland<sup>xxv</sup>.

- 9.3.41. Given the distribution of the soils the vast majority of the existing A9 is underlain by land capability class 4 and 5 soils, where the soils are of medium quality and therefore of medium sensitivity.
- 9.3.42. Areas towards the south end of the scheme feature land capability class 3 soils, where the soils are of high quality and therefore considered to be of high sensitivity.
- 9.3.43. The outlying areas of the Proposed Scheme Options are generally on higher ground with poorer quality soils (land capability classes 6 and 7) where the soils are of low quality and therefore are considered to be of low sensitivity.



## Peat

- 9.3.44. Peat is a soft to very soft, highly compressible, highly porous organic material which can consist of up to 90% water by volume. Unmodified blanket peat typically has two layers, a surface layer or acrotelm which is usually 0.1 to 0.3 m thick, highly permeable and receptive to rainfall. The acrotelm layer generally has a high proportion of fibrous material and often forms a crust under dry conditions. The second layer, or catotelm, lies beneath the acrotelm and forms a stable colloidal substance which is generally impermeable. As a result, the catotelm usually remains saturated with little groundwater flow. Peat is thixotropic, meaning that its viscosity decreases under applied stress. This property may be considered less important where the peat has been modified through artificial drainage and is drier, but will be significant when the peat body is saturated.
- 9.3.45. A variety of desk study data sources provide information on the presence of peat deposits within the study area, in particular the superficial geology mapping and the soils mapping. However there are conflicts between the datasets, partly due to the different scales of mapping, but also due to differences in the definition of what constitutes peat and the criteria used in mapping it.
- 9.3.46. SNH has published national map of ‘carbon-rich soil, deep peat and priority peatland’, in July 2016<sup>xxxi</sup>. This map draws on a number of national datasets including those mentioned above to identify peat and peat soils and classify them by ‘importance’. This mapping is presented in Figure 9.6. A summary description of the Carbon and Peatland ‘importance’ classes present within the study area is provided in Table 9.12, listed in order of prevalence within the study area.

**Table 9.12: Summary of Carbon and Peatland Classes Present within Study Area**

Class	Description	Study Area Presence
Class 4	Area unlikely to be associated with peatland habitats or wet and acidic soils Area unlikely to include carbon-rich soils	East of existing A9 at Kinakyle, north of Craigellachie, west of Avielochan, north of Carrbridge, west of Slochd.
Class 0	Mineral Soils	Predominant classification, present across most of the study area
Class 3	Vegetation cover does not indicate priority peatland habitat, but associated with wet and acidic soils Most of the soils are carbon-rich soil, with some areas of deep peat	Number of small areas of peat north-west of Dalrachney Beag, west of Baddengorm Woods along A938, north of the railway at Black Mount and along the A9 at Black Mount, all in Section 10
Class 5	Vegetation cover does not indicate peatland habitat All soils are carbon-rich soil and deep peat	Extensive area in the very gently sloping valley of Allt Ruaidh located north west of Dalrachney Beag (section 9) and south of Black Mount (Section 10), and large area in the vicinity of Slochd summit, on both sides of the current A9 (Section 11)
Class 1	All vegetation cover indicates priority peatland habitats All soils are carbon-rich soils and deep peat	Extensive peatland south of Black Mount in the very gently sloping valley of the Allt Ruaidh, west of the railway at Slochd Summit (Section 9), and a very small isolated area north of Slugganranish along the Allt na Criche (north) (Section 5)

Class	Description	Study Area Presence
Class -1	Unknown soil type	None within study area
Class -2	Non-soil e.g. loch, built up area	Lochs and larger watercourses throughout the study area.

Table Source: SNHxxxi.

- 9.3.47. The SNH mapping has been supplemented with a peat probing survey to further define the extent and depth of the peat within the study area. The results of this survey are presented in Figure 9.6. The vast majority of the study area was found to have peaty soils of less than 0.5m depth, however a number of defined areas with peat or peaty soils greater than 0.5m in depth were identified, as listed below in Table 9.13.

**Table 9.13: Summary of Peat Probing results across study area**

Location	Description	Peat depth (m)
Section 7, Ch 14500 to 15000 NGR 2905 8212	South of Carrbridge along the existing A9 at Crannich	4.3
Section 9, near ch18900 NGR 2880 8240	East of Black Mount junction along A938	1.3
Section 8, Ch20600 NGR 2863 8237	West of Black Mount junction, south of Black Mount and the existing A9	5.3
Section 8, Ch20400 NGR 2865 8239	West of Black Mount junction, north of the existing A9 at Black Mount	2.8
Section 1, Ch24000 NGR 2836 8254	North of Torr Mor along existing A9	2.5

- 9.3.48. Based on the information presented above the sensitivity of the Class 1 peat is considered high, while the Class 3 peat is considered medium. The Class 4 and Class 5 areas are considered low sensitivity, with the exception of the discrete areas of deep peat found through the peat probing survey, which are considered moderate.

## Groundwater

### Hydrogeology

- 9.3.49. Most of the igneous and metasedimentary bedrock in the study area are described on the BGS Bedrock Aquifer Productivity mapping as being very low productivity aquifers<sup>xx</sup>. Within these very low permeability rocks groundwater storage and flow is limited to the near surface weathered zone and secondary features such as fractures. Sustainable yields of less than 0.1 litres per second (l/s) are typical in suitably sited boreholes. The direction of groundwater flow in the bedrock is not known.
- 9.3.50. There are two areas of the Pityoulish Formation at Kinakyle and at Granish, which feature low productivity aquifers and where groundwater storage and flow is also limited to fractures. Sustainable yields are typically around 0.1 to 1 l/s in suitably sited boreholes.
- 9.3.51. The BGS Superficial Aquifer Productivity mapping<sup>xx</sup> (Figure 9.7) indicates that the glaciofluvial sheet and ice contact deposits comprising gravel, sand and silt are considered to be high productivity intergranular flow aquifers. Typical sustainable



borehole yields are expected to be greater than 10l/s. These aquifer types are located around Lynwilg, Aviemore, Kinveachy and west of Slochd.

- 9.3.52. The river terrace and alluvial deposits within the study area are described as intergranular flow aquifers with moderate to high productivity i.e. sustainable yields of between 1 and 10l/s are typical. These aquifer types are located at Dalraddy, south of Lynwilg, along the River Dulnain at Carrbridge, along the valley of the Allt nan Ceatharnach to the west of Baddengorm Woods and along the valley bottom of the Allt Slochd Mhuic near Slochd settlement. There are small areas described as intergranular flow aquifers with low to moderate productivity and yields of 0.1 to 10 l/s, which correspond to talus deposits near Slochd Mor.
- 9.3.53. Finally the Devensian Till and Peat deposits are not considered significant aquifers, with typical sustainable yields (if any) of less than 0.1l/s. These form large areas of the scheme west of the existing A9 north of Aviemore, and along the sections of the Study Area at Baddengorm Woods and Black Mount.
- 9.3.54. Groundwater flow within the superficial deposits is expected to follow surface topography, draining towards local surface watercourses<sup>xxii</sup>.

### *Groundwater Observations*

- 9.3.55. The recorded depth to groundwater typically ranges between 0.25mbgl and 7mbgl<sup>xxii</sup>. Historic monitoring of groundwater levels during BGS Ground Investigation in the Carrbridge and Slochd areas of the A9, undertaken in spring/summer 2008, indicated water levels were shallow within granular superficial deposits, with water levels generally between 1 to 4 mbgl, with a maximum depth of 10mbgl<sup>xxii</sup>. The Jacobs PSSR also records that sub-artesian conditions were encountered at two locations, one north of Loch Alvie and one west of Aviemore.
- 9.3.56. Recent groundwater monitoring at boreholes located in the central and far northern areas of the Proposed Scheme corridor were carried out between January and April 2016. Water levels were found to be generally stable within each borehole, however the water table varied across the existing boreholes, measuring between 0.8mbgl at Black Mount (NGR 2874 8240) to 7mbgl south of Baddengorm (NGR 2888 8234). Two boreholes were also reported to be dry during monitoring, east of Black Mount and east of An Slochd Beag.
- 9.3.57. Based on the above groundwater monitoring it is anticipated that groundwater levels will be variable but generally found at shallow depths across the study area.
- 9.3.58. Based on the information presented above, both the 'moderate to high' and 'high' productivity classes are considered of high sensitivity in relation to groundwater quantity. The remaining aquifers are considered of low sensitivity.

### *Groundwater Vulnerability*

- 9.3.59. Groundwater vulnerability is defined as 'the tendency and likelihood for general contaminants to reach the water table within the uppermost aquifer after introduction at the ground surface'<sup>xxi</sup>. The groundwater vulnerability classifications are derived from datasets from a number of parameters, including the flow type, presence of clay deposits, permeability and thickness of superficial and bedrock deposits, groundwater depth and Hydrology of Soil Type (HOST) class.
- 9.3.60. The variation of groundwater vulnerability classification is important in identification of the risk posed to groundwater receptors from pollutants, and is considered when





assessing potential pollution impacts from construction activities and operational routine runoff and accidental spillages on groundwater bodies<sup>xxi</sup>.

9.3.61. Table 9.14 provides information on the groundwater vulnerability classifications.

**Table 9.14: Groundwater Vulnerability classifications**

Vulnerability Class	Description		Frequency of activity	Travel time	Site Presence		
5	Vulnerable to most pollutants, with rapid impact in many scenarios		Vulnerable to individual events	Rapid	Large area of exposed rock west of A9 at Kinakyle/Craigellachie, west of A9 at Slugganranish, around Kinveachy forest and at Slochd/Slochd summit. Generally corresponds to areas where bedrock is at or near surface.		
4	Vulnerable to those pollutants not readily absorbed or transformed	4a May have low permeability soil; less likely to have clay present in superficial deposits			Most of The Proposed Scheme footprint lies within this class, including areas around Aviemore, Kinveachy and Carrbridge.		
		4b More likely to have clay present in superficial deposits			Small areas within woodland area south of Carrbridge, open peatland west of Dalrachney Beg and across and to the south of the A9 at Black Mount. Generally corresponds to peat deposits.		
3	Vulnerable to some pollutants; many others significantly attenuated				Vulnerable only to persistent activity	Slow	Small areas around Ballinluig, woodland areas at Craigellachie, woodland west of Granish junction extending north to Avielochan. Broadly corresponds to some hummocky glacial deposits within the study area
2	Vulnerable to some pollutants; but only when they are continuously discharged/leached						Not present within study area.
1	Only vulnerable to conservative pollutants in the long term when continuously and widely discharged/leached		None within study area. Largely corresponds to areas of valley peat.				



Vulnerability Class	Description	Frequency of activity	Travel time	Site Presence
0	Not sufficient data to classify vulnerability e.g. below lochs, in urban areas where geological and/or soil data is missing, where superficial deposits are mapped but not classified; or in mined (including opencast) and quarried areas.			Areas including Loch Alvie and made ground at Slochd associated with the Highland Mainline railway and current A9, corresponding to waterbodies and built up areas.

Table Source: BGS (2016).

- 9.3.62. Groundwater vulnerability mapping<sup>xxi</sup> indicates that the majority of The Proposed Scheme area falls under Class 4a, featuring a relatively high vulnerability and low permeability soils. This mapping is presented in Figure 9.8.

#### *Water Framework Directive (WFD) Status*

- 9.3.63. The bedrock of the study area is classified under the WFD as part of the Strathnairn, Speyside and Cairngorms Groundwater Body (WFD ID 150709). The high and moderate to high productivity glacial sands and gravels and alluvium deposits of the study area are classified under the WFD as part of the Upper Spey Sand and Gravel Groundwater Body (WFD 150814)<sup>xxvi</sup>.
- 9.3.64. As of 2014 both water bodies are classified as having an overall status of Good with high confidence, with a Good status for both chemistry and quantitative factors. There are currently no pressures identified on these water bodies. Both waterbodies are also designated as Drinking Water Protected Areas (DWPA) under the Drinking Water Directive, with a current condition parameter (DWPA status) of Pass.
- 9.3.65. Based on the information presented above the groundwater bodies of the study area are considered to be of high sensitivity in relation to groundwater quality.

#### **Surface Water Receptors**

- 9.3.66. The River Spey is a designated SAC for the protection of fish, invertebrates and mammal features. This designation extends to a number of tributaries of the River Spey within the scheme area.
- 9.3.67. Further information on surface water receptors is provided in Chapter 10: Road Drainage and the Water Environment.

#### **Public Water Supplies**

- 9.3.68. Public water supply information was provided by Scottish Water. A number of assets were identified in the Aviemore and Carrbridge area. This includes the public water supply for the Aviemore area, which is a groundwater source located near Section 3a, south of Aviemore beside the River Spey (the precise location of the source is confidential). Given the location of this source, immediately adjacent to the River Spey, it is assumed that it is drawing water from the river terrace sands and gravels and is likely to have a strong hydrological connection to the river itself.
- 9.3.69. In addition there are three District Service Reservoirs (DSR's) serving the area, which are located at Aviemore, Slugganranish and Carrbridge. As these are for drinking water



storage, any impacts on public water infrastructure will be covered under the Utilities section of the Engineering Assessment.

- 9.3.70. Given the large population served by the Aviemore public water abstraction, the sensitivity of this supply is considered to be Very High.

### Private Water Supplies

- 9.3.71. Private water supplies identified to date within 1km of the study area are shown on Figure 9.8 and presented in Table 9.15 below. The sensitivity of the private water supply sources has been based on the number of properties served and assigned as shown in Table 9.15 below.
- 9.3.72. A number of rural properties were identified within 1km of the scheme area that are not included in the private water supply dataset. These are likely to be on public water supply, but may have historic private water supplies. These properties include Doune Farm, Inverdrue House, Jasmine Cottage, Honeysuckle Cottage, Kinrara Croft, The Bothy, Loch Alvie Cottage, Hillview, 1+2 Railway Cottage, Croftgowan, Tor Alvie, The Rowan Tree Hotel, The Rowan Tree Cottage, Kinloch Cottage and Ballinluig Cottage. These properties will be included as part of landowner surveys at the DMRB Stage 3 assessment.

**Table 9.15: Private water supplies located within 1km of the Proposed Scheme**

Source Name NGR Chainage Section	Data Source	Source Type	Properties Supplied /NGR	Comment	Sensitivity
PWS Rothiemurchus Estate NGR 2927 8114 Section 3a	SEPA Licenced Abstractions  The Highland Council  OS Map (suspected supplies)	Spring	Rothiemurchus Visitor Centre NGR 2896 8111 Rothiemurchus Smoke House NGR 2900 8113 Tigh an Druie NGR 2898 8112 Tennis Club NGR 2900 8113	The supply is listed both by the Highland Council and SEPA. There are a number properties on the estate are fed by a spring fed supply located at Achnahatnich approx. 3km east of these properties. The River Spey is located between the Proposed Scheme and both the supplies and properties. Given their distance and the intervening topography they will be unaffected by the Proposed Scheme.	Not applicable – supply outside of study area
PWS Wendy Unknown source location Near Chainage 7400 Section 4	The Highland Council	Unknown	7 Dalfaber Place NGR 2904 8139	The property is a residential house in Aviemore and is located approx. 0.99km east of the Proposed Scheme. The source of this supply is unconfirmed, but if groundwater fed could be impacted by the Proposed Scheme.	Medium





Source Name NGR Chainage Section	Data Source	Source Type	Properties Supplied /NGR	Comment	Sensitivity
PWS Slugganranish NGR 2898 8144 Near Chainage 7900 Section 4	The Highland Council	Unknown	Slugganranish Farm NGR 2897 8144 Slugganranish Farm Cottage NGR 2897 8144	Unknown source type which may feed the farm and domestic property at Slugganranish, 200m east of the Proposed Scheme. If groundwater fed may be impacted by the Proposed Scheme.	High
Potential PWS Unknown source location Near Chainage 17000 Section 8	SEPA OS Map	Unknown	Lynphail NGR 2891 8227 Dalrachney Beag NGR 2892 8226	Due to its rural location this property may have a private water supply. If groundwater fed it is likely to be fed from a spring source north of the properties, or a well close to the properties. Due to the close proximity of the supply to the Proposed Scheme this supply may be impacted.	High
Potential PWS Unknown source location Near Chainage 16300 Section 9	OS map	Unknown	Baddengorm NGR 2887 8242	Due to its rural location, this property may have a private water supply. The property is located 0.4km north of the Proposed Scheme. If groundwater fed it is likely to be fed from a source located above and to the north of the property. If groundwater fed may be impacted by the Proposed Scheme.	Medium
Potential PWS Unknown source location Near Chainage 19600 Section 9	OS map	Unknown	West Foregin	Aerial mapping indicates there is a property at West Foregin, located 0.96km north and upstream of the Proposed Scheme, with the railway and side road located in between. Given their distance and the intervening topography they will be unaffected by the Proposed Scheme.	Not applicable
PWS Slochd Lodge NGR 2850 8237 Near Chainage 22000	The Highland Council	Borehole	Slochd Mhor Lodge and associated outbuildings NGR 2848 8238	This supply is located 0.1m south of the Proposed Scheme, uphill with the railway and B- road between. Clarification is required at Stage 3 regarding the	High





Source Name NGR Chainage Section	Data Source	Source Type	Properties Supplied /NGR	Comment	Sensitivity
Section 10				number of sources and properties associated with each supply in the Slochd area due to conflicting data from the Highland Council PWS register and preliminary landowner interviews. However at present it is believed that this source supplies Slochd Mhor Lodge and associated outbuildings. As the supply is located near existing A9 road, it may be impacted by all route options. Given its close proximity the source may be impacted by the Proposed Scheme.	
PWS Slochd Cottages NGR 2847 8238 Near Chainage 21900 Section 10	The Highland Council	Spring or borehole	2 Slochd Railway Cottages NGR 2847 8237 3 Slochd Railway Cottages NGR 2847 8237 4 Slochd Railway Cottages NGR 2848 8237	The source is located adjacent to the railway cottages. As discussed above clarification is required at Stage 3, however at present it is believed that the source is a borehole feeding the railway cottages, and is a separate source to that supplying Slochd Mhor Lodge. Due to the close proximity of the supply to the Proposed Scheme this supply may be impacted.	High
PWS Slochd NGR 2846 8244 Chainage 22500 Section 10	The Highland Council	Spring	Slochd Cottage NGR 2845 8241 Doneen NGR 2845 8241	The well for supply is located uphill of the two properties 0.26 km east and uphill of the Proposed Scheme, with pipework crossing under the existing A9 route. Due to the close proximity of the supply to the Proposed Scheme this supply may be impacted.	High
PWS Rynaclask NGR 2845 8241 Chainage 22500 Section 10	The Highland Council	Spring	Slochd Cottage NGR 2845 8241 Doneen NGR 2845 8241	The supply is located adjacent to the two properties Slochd Cottage and Doneen, but listed as supplying a property called Rynaclask which no	High



Source Name NGR Chainage Section	Data Source	Source Type	Properties Supplied /NGR	Comment	Sensitivity
				longer exists. The supply location is to be confirmed, but due to the close proximity and downstream location is likely to be impacted by the Proposed Scheme.	

Table Source: The Highland Council (2015), SEPA (2016), OS Mapping.

- 9.3.73. As can be seen from Table 9.15, some of the private water supply sources have been eliminated from this assessment, due to their distance from the Proposed Scheme and the intervening topography. Supplies with confirmed surface water sources are dealt with within Chapter 10: Road Drainage and the Water Environment. For the remaining supplies where the source type is unknown it has been assumed for this assessment that these are groundwater fed.
- 9.3.74. The number of properties served has been estimated based on data provided by The Highland Council, SEPA, OS mapping and landowner information. Further information on all private water supplies will be collected at DMRB Stage 3.

### Groundwater Dependent Terrestrial Ecosystems (GWDTEs)

- 9.3.75. GWDTEs are types of wetland which are specifically protected under the WFD and can include: fens, springs, flushes, seepages, quaking bog, wet woodland, marshy grassland and some types of wet heath, reedbed and swamp.
- 9.3.76. There is currently insufficient data to positively identify GWDTEs for the majority of the study area where there is no NVC data available. Potential GWDTEs have been identified using Phase 1 habitat mapping as discussed in the Approach and Methods section earlier. The potential GWDTEs are shown in Figure 9.9, and the Phase 1 habitat mapping from which this data has been derived is presented in Chapter 11: Ecology and Nature Conservation.
- 9.3.77. There are several designated sites which lie partially within the 250m buffer of the proposed scheme and coincide with areas of potential GWDTE. Each of these designated sites is discussed below.
- 9.3.78. Alvie SSSI is located south of the existing A9 around Loch Alvie, and is protected for a number of features including the presence of upland oak woodland, which has a summary condition of Recovering, and its hydromorphological mire range with a summary condition of Favourable. There are several areas within the SSSI boundary on the northern shore of the loch which have been identified as potential GWDTEs
- 9.3.79. Craigellachie SSSI is located west of Aviemore, with the eastern boundary of the site immediately adjacent to the current A9. It is protected for a number of features including the presence of upland birch woodland, which has a summary condition of Favourable. Much of the eastern fringe of the SSSI site, which lies within the 250m of the Proposed Scheme, has been identified as potential GWDTE.
- 9.3.80. Loch Vaa, located to the east of the current A9 at Kinveachy, is designated as both a SSSI and SPA. The site comprises a spring and groundwater fed loch and surrounding birch and scots pine woodland, with marshy areas vegetated with fen and bog



communities. The site is notified for its breeding birds and aquatic beetles. There are several areas within the SSSI/SPA boundary on the western shore of the loch which have been identified as potential GWDTEs.

- 9.3.81. The River Spey SAC includes several tributaries which cross the Proposed Scheme study area, specifically the Allt na Criche (south) at Lynwilg and the River Dulnain at Carrbridge. Areas of potential GWDTE have been identified on the banks of these rivers, and which lie within the SAC boundary. The SAC is designated for Atlantic Salmon, Freshwater Pearl Mussel, Otter and Sea Lamprey.
- 9.3.82. Finally, two small areas of potential GWDTE have been identified within the boundary of the Slochd SAC, located at the far northern end of the Proposed Scheme. The SAC is designated for its dry heath habitat.
- 9.3.83. As can be seen there is currently only habitat identified as potential GWDTEs within a 100m buffer of the existing A9, with a small number GWDTEs between 100m and 250m where historical NVC surveys have been carried out at the designated sites listed above. It is anticipated that once a full NVC survey and associated mapping is carried out at DMRB Stage 3 this area will change.
- 9.3.84. At present there is insufficient resolution of data to differentiate between the GWDTE areas with high and moderate dependency on groundwater, therefore a precautionary approach has been taken and it is currently assumed that all areas are highly groundwater dependent. Potential GWDTE areas within designated sites are considered of very high sensitivity. Non-designated areas with potential GWDTE areas are considered of high sensitivity.

## Contaminated Land

- 9.3.85. Potentially significant sources of contamination relating to various historical features within the study area have been identified through the geotechnical desk study and associated contaminated land Phase 1 Preliminary Risk Assessment. These historical features are discussed in detail within these reports, are detailed on Figure 9.10, and are summarised in Table 9.16 below.

**Table 9.16: Contaminated land sites located within the study area**

Source Description	Chainage	Distance to Existing Carriageway (m)	Perceived Severity of Contamination
Development of A9	N/A	N/A	Generally very low to moderate, although moderate for water environment receptors.
Perth to Inverness Railway Line	N/A	Adjacent - 600	Generally low to moderate, although moderate for water environment receptors.
Quarries/Pits (not infilled)	2250, 3820, 7850, 7900, 22750	~25, 40, 6, 6, on site	Very low to low
Limekilns	8030	60	Very low to low
Fuel stations (current and obsolete)	5200, 5500, 4950	330, 415, 180	Low



Source Description	Chainage	Distance to Existing Carriageway (m)	Perceived Severity of Contamination
Unidentified farm landfills	N/A	~150	Low
Infilled land	5400, 7150, 12150, 13000	On site, on site, adjacent, on site	Generally low to moderate. Moderate for water environment receptors.
Construction of buildings	N/A	Within 100	Generally very low to moderate. Moderate for water environment receptors.
Forestry	N/A	Within 100	Very low to low
Pipeline	4970	320	Very low to low
Mill	7000	70	Very low to low
Unidentified tank	7260	70	Low to moderate
Sluices	7150	On site, 80	Very low to low
Dairy	10150	80	Very low to low
Landfill	8400	335	Low to moderate
Ford	12200	60	Very low to low
Kennel	12450	70	Very low to low
Earthworks	13200, 24300	Adjacent, 40	Generally low to moderate. Moderate for water environment receptors.
Coal yard	16300	~100	Low to moderate
Well (infilled)	20900	20	Very low to low
Depot	19720	45	Low to moderate.
Car park	20570	Adjacent	Generally very low to moderate. Moderate for water environment receptors.
Cycle path	Adjacent	Adjacent	Generally very low to moderate / low although moderate for water environment receptors.
Overhead Cables	13560	50	Very low to low

Table Source: A9 Perth to Inverness Dualling Geotechnical Preliminary Sources Study Report (PSSR) Kinveachy to Slochd (Rev 3) Jacobs<sup>xxii</sup>.

9.3.86. It should also be noted that parts of the A9 alignment are within designated Radon Affected Areas. The presence of radon is noted as a diffuse source/regional constraint to the A9 dualling corridor.

## 9.4. Potential Impacts

9.4.1. The potential impacts for each of the Proposed Scheme Options are discussed in this section, subdivided into construction and operational impacts. For the purposes of this assessment construction impacts are generally considered to be short-term impacts



which occur during the construction phase only. Operational impacts are considered to be long-term or permanent impacts affecting receptors after the construction phase is complete. It is recognised that many operational impacts are initiated by construction activities e.g. excavation of cuttings, however the full effect of the impact may only manifest itself in the long-term.

- 9.4.2. Each impact is assessed using the methods outlined in Section 9.2. The potential impacts are assessed before mitigation, with potential mitigation detailed following this assessment and a summary including residual impact
- 9.4.3. For the impact assessment, the mainline and junction options have been assessed separately based on the footprint for each option, including an assumed additional 3m of land required for all options. Impacts are grouped together where they are common to all mainline options, and common to each junction option. Where the impact is not common, these are detailed separately.

## Impacts Common to All Mainline Alignment Options

### *Construction Impacts*

#### Construction Pollution

- 9.4.4. Potential impacts on groundwater quality during construction relate to the removal of surface cover, including soils and superficial deposits, during the creation of cuttings and potential excavation close to or below the groundwater table. Spillages in these areas could introduce pollutants directly into the groundwater aquifers.
- 9.4.5. At DMRB Stage 2 there is limited information on groundwater levels in the vicinity of the proposed cuttings, although it is anticipated that groundwater levels will be shallow in the higher permeability superficial deposits. Similarly, there is little information on the depth of individual cuttings, however, it is estimated that the depth of the cuttings will generally be up to 5m on the mainline, except in the vicinity of the junctions, where cuttings may be up to 10m in depth. This would suggest that it is likely that groundwater will be intercepted in some of the cuttings which are excavated into both superficial and bedrock deposits, with a subsequent potential for introduction of pollutants.
- 9.4.6. For each of the Proposed Mainline Alignment Options the total length of cutting within each groundwater vulnerability class (shown in Figure 9.8) have been calculated to provide an indication of the risk of pollution to groundwater quality associated with each Mainline Alignment Option in Table 9.17.

**Table 9.17: Summary of impacts from cutting on aquifers by groundwater vulnerability class**

Mainline Alignment Option	Total length of cutting (m) within each groundwater vulnerability class				
	Class 1	Class 2	Class 3	Class 4	Class 5
Option 1	0	18	2281	17138	1218
Option 1A	0	18	2112	18320	1176
Option 2	0	44	2572	18106	1170

- 9.4.7. Based on the criteria in Section 9.2, the groundwater vulnerability for Class 5 areas of groundwater vulnerability is considered to be of High sensitivity. It is considered that the potential impact from construction pollution for all Mainline Alignment Options would be of Minor magnitude, with an associated significance of Moderate/Large.

- 9.4.8. For areas of Class 4 groundwater vulnerability, the impact from cuttings would be of Moderate magnitude, with an associated significance of Moderate/Large.
- 9.4.9. For areas of Classes 2 and 3 groundwater vulnerability, the impact from cuttings would be of Minor magnitude with an associated significance of Slight.

### *Operational Impacts*

#### Loss of Geodiversity Sites

- 9.4.10. Rock exposures and other geological and geomorphological features can provide an important foundation upon which ecosystems thrive and can provide an important educational and scientific resource. Road construction, in particular excavation of cuttings, can result in the loss of these features both through direct removal and from the obscuring effects of slope stabilisation methods.
- 9.4.11. Each of the Mainline Alignment Options involves the widening of the existing carriageway, either to the northbound or the southbound carriageway, which will require modification of existing cuttings and embankments. Slopes in rock cuttings are anticipated to be formed at a nominal 1V in 2H with incorporation of berms and rock traps as required. Rock slope design and construction methods will be further developed as part of Stage 3 assessments taking account of local geological conditions and geotechnical parameters determined as a result of ground investigations.
- 9.4.12. Regardless of the Proposed Scheme Option under consideration, excavation of fresh cuttings will be required in the area of The Slochd GCR site. The Slochd GCR covers an area of 111.1 Hectares and the loss of the GCR area is presented below:

**Table 9.18: Summary of GCR area loss for each Mainline Alignment option**

Mainline Option	The Slochd GCR area under footprint (ha)	% of The Slochd GCR area under footprint
Option 1	2.60	2.3
Option 1A	2.60	2.3
Option 2	2.51	2.3

- 9.4.13. In the area of The Slochd GCR all three of the Mainline Alignment Options show widening predominantly to the southbound carriageway. As shown above, there is little difference between the percentage loss of the GCR due to dualling. However, common to each of the Proposed Options is the fact that much of the loss of the GCR site will be in one of the zones that has been identified as critical to the overall setting and understanding of the location.
- 9.4.14. As discussed previously, The Slochd GCR is of Very High sensitivity because of recommendations that it be treated as a "Candidate SSSI". Given that the loss of GCR area is concentrated in a critical zone, the magnitude of the impact of the Proposed Mainline Alignment Options has been assessed as Moderate for each of the options. The impact significance is therefore Large / Very Large. However, it should also be borne in mind that the excavation of fresh cuttings may enhance the geodiversity interest at this location and provide valuable information to the scientific community.
- 9.4.15. Where the Boat of Garten Pluton underlies the Proposed Scheme, a combination of excavation of fresh cuttings and construction of embankments will be required in order to facilitate widening of the carriageway. This reflects the variable nature of the topography in this area. It is anticipated that much of the cuttings will be formed in

superficial deposits; however, there may be potential for fresh exposures of the Boat of Garten Pluton to be created. Based on the assessment in Section 9.2, the sensitivity of this geodiversity feature is considered to be Medium. The impact of mainline widening (across all three options) is considered to be Negligible as there may be the possibility to positively contribute to geodiversity along the Proposed Scheme by revealing new exposures of this geological unit. Consequently, the impact significance is assessed to be Neutral.

- 9.4.16. The Mainline Options under consideration do not have any effect on the German Soldier as a result of this feature's position on the natural rock slope. The sensitivity was assessed to be Low and the magnitude of impact is determined to be Negligible. As a result, the impact significance on this geodiversity feature is Neutral.
- 9.4.17. Assessment of the impact of the Proposed Scheme on the Slochd Mor geodiversity feature is considerably more subjective given that an exact location and/or area has not been defined. At the assumed location the Proposed Scheme requires an increase in embankment footprint with little to no variation between the Mainline Options. The sensitivity of this feature was characterised as Medium and while the lack of information on it precludes a full assessment it is considered that a magnitude of impact of Minor would be a reasonable, and conservative estimate. To that end, the impact significance is Slight.
- 9.4.18. As discussed previously, with the exception of those rock cuttings associated with the GCR site at Slochd the rock cuttings currently exposed along the scheme are of little geodiversity interest and were assigned a Low sensitivity. The total length of cutting (into superficial deposits and/or bedrock) required for each of the Mainline Options has been calculated and is presented below. For each mainline option the length of cutting on either side of the carriageway has been measured and combined to give a cumulative total. At this stage there is insufficient ground investigation data to fully assess the length along which proposed cuttings will intercept and expose bedrock.

**Table 9.19: Total length of road cutting for each Mainline Alignment Option.**

Mainline Option	Total length of road cutting (km)
Option 1	24.7
Option 1A	25.7
Option 2	25.2

- 9.4.19. The extent of exposures may change as a result of excavation of fresh cuttings; however, the quality of exposures is unlikely to. Therefore, the magnitude of impact has been assessed as Negligible for all Mainline Options and the impact significance has been rated as Neutral. It is noted that excavation of fresh bedrock exposures may increase the geodiversity interest along the Proposed Scheme.

#### [Loss of Economic Mineral Deposits](#)

- 9.4.20. Construction of the Proposed Scheme has the potential to reduce the area available for future quarrying.
- 9.4.21. Each of the Proposed Mainline Options cross areas of potential economic minerals. Where the Proposed Scheme intersects these it results in a loss of this potential resource.

**Table 9.20: Total loss of economic minerals for each Mainline Alignment Option.**

Mainline Option	Total area of Glaciofluvial sands and gravels under footprint (ha)	% within study area which are under footprint
Option 1	49.6	11.9
Option 1A	47.9	11.4
Option 2	47.9	11.4

- 9.4.22. As a result of similarity in the footprints there is minimal difference in the loss of potential economic minerals between the three Proposed Options. In general terms, it can be seen that the loss of potential economic minerals is limited given the extents of the Proposed Scheme.
- 9.4.23. As noted previously, the Sensitivity of this potential resource is Low. Based on the loss of area shown above the Magnitude of the impact of all three Proposed Options has been assessed as Minor. This gives a resultant significance of Neutral for all three Proposed Mainline Options.

#### Loss of Soils

- 9.4.24. Construction of the Proposed Scheme will result in the disturbance of soils and impact on soil quality. Although it is likely that much of the topsoil will be reused as part of the Proposed Scheme, to dress the earthworks slopes for instance, there is the potential for the quality and value of the soils to be affected if improperly handled. The area of soils within each Land Capability for Agriculture class disturbed by the Mainline Alignment Options is presented in Table 9.21 below.

**Table 9.21: Soil disturbance for Mainline Alignment Options**

Mainline Alignment Option	LCA class area under footprint (ha)						% of LCA classes within study area which are under footprint		
	3 <sub>2</sub>	4 <sub>2</sub>	5 <sub>2</sub>	5 <sub>3</sub>	6 <sub>2</sub>	6 <sub>3</sub>	3 <sub>2</sub>	4 <sub>1</sub> , 4 <sub>2</sub> , 5 <sub>2</sub> , 5 <sub>3</sub>	6 <sub>2</sub> , 6 <sub>3</sub>
Option 1	7.48	85.39	8.06	1.05	1.13	52.47	0.50	6.26	3.55
Option 1A	7.03	85.31	8.05	1.05	1.13	52.77	0.47	6.25	3.57
Option 2	6.53	90.59	6.83	1.28	1.24	66.32	0.43	6.53	4.47

- 9.4.25. Overall there is little difference between the Mainline Alignment Options, due to the similarity in their footprints. Slightly larger area of soils are lost or disturbed by Option 2 due to the larger land take but does not generate significant additional impacts.



- 9.4.26. For LCA class 3<sub>2</sub> (High sensitivity) there will be minimal disturbance of soils. Therefore the impact magnitude is considered Minor, and the significance Slight/Moderate.
- 9.4.27. There are larger areas of soil classes 4<sub>2</sub>, 5<sub>2</sub> and 5<sub>3</sub> (Medium sensitivity) present in the wider study area, with the areas disturbed by the Mainline Alignment Options being relatively small in the context of the wider area. Therefore the magnitude of impact is considered to be Minor, resulting in a significance of Slight.
- 9.4.28. For LCA classes 6<sub>2</sub> and 6<sub>3</sub> (Low sensitivity) there will be minimal disturbance of soils. Therefore the impact magnitude is considered Minor, and the significance Neutral.

#### Loss of Peat

- 9.4.29. Due to its poor engineering characteristics shallow peat present under the footprint of the Proposed Scheme is likely to be excavated out and replaced with suitable engineering fill. Where deep peat is encountered excavation may not be practical and the road may need to be piled or 'floated' across these areas. The effect that these works, as well as the introduction of pre-earthworks cut-off drainage, can have is to alter the groundwater and surface water flow paths through the peat, which can result in drying out of the peat in some areas and surcharging in others. The effects of this can sometimes be seen extending some distance from the footprint of the development. This can subsequently cause erosion and/or instability of the peat, resulting in the release of organic carbon to the atmosphere and local watercourses, or potentially catastrophic peat landslides.
- 9.4.30. Although it is likely that some peat will be reused on site, large volumes of excavated peat can present a management issue as storage can be difficult and reuse on site can be limited, due to the need to maintain the hydrological regime of the peat.
- 9.4.31. At present there is insufficient site data to quantify the volume of peat which may be excavated, or to fully delimit the adjacent areas of peat that may be affected by the Proposed Scheme. Therefore the area of peat under the footprint of each Proposed Mainline Alignment Option has been determined as shown in Table 9.22, subdivided by the SNH Priority Peatland and Carbon Soils 'importance' class as described in Section 9.2.

**Table 9.22: Summary of peat loss for each Mainline Alignment Option**

Mainline Alignment Option	Class 3 peat loss (ha)	Class 4 peat loss (ha)	Class 5 peat loss (ha)	Class 0 (mineral soil) loss (ha)	% of peat classes within study area which are under footprint	
					Class 3	Class 4 & 5
Option 1	0.07	31.05	15.21	109.25	0.004	3.06
Option 1A	0.07	30.68	15.29	109.30	0.004	3.04
Option 2	0.06	38.20	16.86	117.67	0.004	3.65

- 9.4.32. As can be seen there is no loss of Class 1 peat with any of the Proposed Mainline Options. This is due to the avoidance of peat, in particular Class 1 peat, being used as a key constraint in the development of the Proposed Mainline Alignment Options.
- 9.4.33. Overall the percentage loss of Class 3 and Class 4/5 areas of peat related to each of the Mainline Alignment Options is similar. Mainline Option 2 has a slightly larger area of peat loss, as northbound mainline widening includes the peatland area south of Black Mount junction. Although there are minor differences in the percentage losses between

the Options these differences do not amount to a material difference in impact significance.

- 9.4.34. Accordingly all Mainline Alignment Options are considered to have an impact of Minor magnitude Class 3 peat (Medium sensitivity), with a subsequent significance of Slight.
- 9.4.35. The Class 4 and Class 5 soils (Low sensitivity) are considered to have an impact of Moderate magnitude, with a significance of Slight. Class 0 soils are classified as mineral soils, therefore no impact of loss of peat.

#### Pollution from Routine Runoff

- 9.4.36. A broad range of potential pollutants, such as hydrocarbons i.e. fuel and lubricants, fuel additives, metal from corrosion of vehicles, de-icer and gritting material, can accumulate on road surfaces. These can subsequently be washed off the road during rainfall events, polluting the receiving water bodies.
- 9.4.37. Six groundwater discharges via infiltration basins are proposed for each of the Mainline Alignment Options, as shown in Figures 7.1 to 7.3. The locations, sizes and contributing network catchments for each groundwater discharge are virtually identical across all three Proposed Mainline Alignment Options, therefore the assessed routine runoff impacts are identical for all three Mainline Options. It should be noted that the number of indicative groundwater infiltration basins shown in Figures 7.1 to 7.3 is greater than the above stated six groundwater discharges. This is partly due to the figures showing some infiltration basins which drain cuttings and embankments only, and which do not require assessment for pollution impacts. Also, in several discharge locations the topography is such that a single infiltration basin could not be accommodated; in these instances several closely clustered infiltration basins are proposed, but are essentially a single discharge and have been assessed as such.
- 9.4.38. A single groundwater discharge (3A C) via several infiltration basins in close proximity to each other is proposed to the south of Aviemore, near Loch Puladdern (Section 3), with superficial geology mapping indicating that these areas are underlain by Glaciofluvial Sheet Deposits, comprising gravel, sand and silt. Using historic borehole and recent groundwater monitoring data it has been assumed that the water table is close to the ground surface, flow type is dominantly intergranular, the effective grain size as fine sand and below and the lithology comprises < 1% clay minerals.
- 9.4.39. A single infiltration basin (5C) is proposed west of the existing Granish junction (Section 5) with superficial geology mapping indicating that these areas are underlain by Hummocky (moundy) glacial deposits, comprising diamicton, gravel and sand. Using historic borehole and recent groundwater monitoring data it has been assumed that the water table is close to the ground surface, flow type is dominantly intergranular, the effective grain size as very coarse sand and above and the lithology comprises of 1-5% clay minerals.
- 9.4.40. There are three infiltration basins (6A A, 6A C and 6A E) proposed to the south of Kinveachy, near Loch Vaa (Section 6a) and an additional infiltration basin (6B A) east of Kinveachy Lodge (Section 6b). The superficial geology mapping indicates that these areas are underlain by Glaciofluvial Sheet Deposits, comprising gravel, sand and silt. Using historic borehole and recent groundwater monitoring data it has been assumed that for 6A C, 6A E and 6B A the water table is close to the ground surface, flow type is dominantly intergranular, the effective grain size as very coarse sand and above and the lithology comprises < 1% clay minerals. For infiltration basin 6A A, the superficial geology conditions are the same except for lithology, with a clay content between 1-5%.



9.4.41. On this basis the assessment of routine runoff impacts on groundwater at this location is as shown in Table 9.23.

**Table 9.23: Routine runoff groundwater assessment results**

Outfall ID	NGR	Traffic Density (AADT)	SAAR (mm)	Soakaway geometry	Depth to water table (m)	Flow Type	Effective grain size	Lithology	Overall Risk Score	Risk Category
3A C	289126 811964	<50k	740 - 1060	Single point, or shallow soakaway (e.g. lagoon) serving low road area	Depth to water table <5m	Unconsolidated or non-fractured consolidated deposits (i.e. dominantly intergranular flow)	Fine Sand and Below	<1% Clay	185.00	Med
5C	289936 815338	<50k	740- 1060	Single point, or shallow soakaway (e.g. lagoon) serving low road area	Depth to water table <5m	Unconsolidated or non-fractured consolidated deposits (i.e. dominantly intergranular flow)	Very Coarse Sand and Above	<5% to >1% Clay	192.50	Med
6A A	290720 817092	<50k	740- 1060	Single point, or shallow soakaway (e.g. lagoon) serving low road area	Depth to water table <5m	Unconsolidated or non-fractured consolidated deposits (i.e. dominantly intergranular flow)	Coarse Sand	<5% to >1% Clay	185.00	Med
6A C	290929 817512	<50k	740- 1060	Single point, or shallow soakaway (e.g. lagoon) serving low road area	Depth to water table <5m	Unconsolidated or non-fractured consolidated deposits (i.e. dominantly intergranular flow)	Coarse Sand	<1% Clay	192.50	Med
6A E	290968 817724	<50k	740- 1060	Single point, or shallow soakaway (e.g. lagoon) serving low road area	Depth to water table <5m	Unconsolidated or non-fractured consolidated deposits (i.e. dominantly intergranular flow)	Coarse Sand	<1% Clay	192.50	Med
6B A	2909738 17826	<50k	740- 1060	Single point, or	Depth to	Unconsolidated or non-fractured	Coarse Sand	<1% Clay	192.50	Med



Outfall ID	NGR	Traffic Density (AADT)	SAAR (mm)	Soakaway geometry	Depth to water table (m)	Flow Type	Effective grain size	Lithology	Overall Risk Score	Risk Category
				shallow soakaway (e.g. lagoon) serving low road area	water table <5m	consolidated deposits (i.e. dominantly intergranular flow)				

9.4.42. As can be seen in Table 9.23, the overall risk score generated places the groundwater discharge outfalls in the 'Medium Risk of Impact' category. On this basis, the magnitude of the impact on the receiving groundwaters (High sensitivity) is considered to be Moderate, with a resulting significance of Moderate/Large.

#### Pollution from Accidental Spillage

9.4.43. On all roads there is a risk that road traffic accidents or vehicle fires may result in accidental spillage of potential pollutants on the road surface. These may then enter the road drainage network and subsequently be discharged to the water environment, causing an acute pollution event.

9.4.44. The result of the calculations (Appendix 10.3) relating to operational accidental spillage demonstrate that, whilst applying conservatively high traffic data for each Proposed Mainline Alignment Option, the 6 network discharges to groundwater via infiltration basins will meet the minimum DMRB standard of a 1 in 200 year return period, with the worst calculated annual probability being 1 in 10,789 years. This outcome indicates that no further mitigation would be required.

9.4.45. It has accordingly been concluded that the magnitude of potential impact of each Mainline Alignment Option on the receiving groundwaters (High sensitivity) would be of Negligible magnitude, with the associated significance being Neutral.

#### Loss or Change to Groundwater Aquifers

9.4.46. Road cuttings excavated to below the groundwater table, and associated drainage, have the potential to permanently lower groundwater levels in the aquifer adjacent to the cutting and alter groundwater flowpaths. This could also potentially affect nearby groundwater dependent receptors, such as wetlands, surface water bodies or groundwater abstractions.

9.4.47. During construction there may also be groundwater impacts as a result of the temporary dewatering of deep foundation excavations related to the larger bridge structures. The effect on groundwater levels at these locations is likely to be temporary and the long-term effects on groundwater flowpaths highly localised.

9.4.48. There is currently limited detailed information available on cuttings and foundation excavations, however the estimated depth of the cuttings will generally be up to 5m on the mainline, except in the vicinity of the junctions, where cuttings may be up to 10m in depth. The aquifers that these will intersect are based on the BGS superficial aquifer productivity mapping. The bedrock aquifer productivity within The Proposed Scheme area has been defined as either low or very low productivity, and is therefore not included in the impact assessment.

- 9.4.49. Table 9.24 below provides for each Mainline Alignment Option a breakdown of the total length of cuttings located within the superficial aquifers of the Mainline Alignment Options study area.

**Table 9.24: Summary of superficial aquifer impacts from cuttings**

Mainline Alignment Option	Total cutting length within high productivity aquifers (m)	Total cutting length within moderate to high productivity aquifers (m)	Total cutting length within non-significant aquifers (m)
Option 1	7748.70	1938.48	9472.30
Option 1A	7859.29	2391.96	9910.43
Option 2	7588.91	1792.92	11,070.62

- 9.4.50. At present there is no information on groundwater levels or likely drawdown in the vicinity of the cuttings however it is expected that the alluvium and sand and gravel aquifers (High sensitivity) with a high productivity will be at most risk.
- 9.4.51. The magnitude of impact on the high productivity aquifers (High sensitivity) is anticipated to be Moderate, with a subsequent significance of Moderate/Large.
- 9.4.52. The magnitude of impact on the moderate to low productivity aquifers (Medium sensitivity) is anticipated to be Minor, with a subsequent significance of Slight.
- 9.4.53. The magnitude of impact on non-significant aquifers featuring low permeability glacial till and bedrock is anticipated to be Minor, with a subsequent significance of Neutral.

#### Loss or Change to Water Supplies

- 9.4.54. As discussed above, impacts on the groundwater aquifers of the study area could also impact on groundwater dependent abstractions, resulting in a loss of yield and failure of the supply.
- 9.4.55. The Aviemore public water supply is a groundwater source located in the vicinity of Section 3a of the Proposed Scheme. The footprint of each Mainline Alignment Option lies 80m uphill of the source, at their nearest point. Each option requires cutting into the uphill hillside, with the nearest point of cutting lying 130m uphill of the source. For each option the maximum cutting height/depth in this area is estimated to be approximately 9m. No information is available at present regarding the groundwater depth and permeability of the aquifer in this area and therefore no calculation of the zone of influence is possible at this stage. However on the basis of the proximity of the supply and the potential depth of cutting the impact magnitude is anticipated to be Moderate. Given the Very high sensitivity of the public supply the corresponding impact significance will be Large/Very Large.
- 9.4.56. Given the similarities in the footprints of the Mainline Alignment options in the vicinity of the public supply source no material difference in impact is expected between the Proposed Mainline Alignment Options.
- 9.4.57. To date 10 private water supplies have been identified in the vicinity of the Proposed Mainline Alignment Options. Of these supplies, two have been eliminated from further assessment due to their lack of hydrogeological connection to the Proposed Scheme, as discussed in paragraph 9.3.73. The impact on these supplies has been determined based on their proximity to the Proposed Mainline Alignment Options. The sensitivity of the remaining private water supply sources has been based on the number of properties served and assigned as follows.



- 9.4.58. Of the private water supplies identified to date, the supply at PWS Wendy, which is considered to be of medium sensitivity, may have a groundwater supply. Located 0.99km downstream of the Mainline Alignment options, it is anticipated that the impact on this source will be of Minor magnitude, resulting in a significance of Slight.
- 9.4.59. The supply at Slugganranish, which is considered to be of medium sensitivity, may have a groundwater supply. The property is located approximately 200m east and downhill of the Mainline Alignment options and it is anticipated that the impact on this source will be of Minor magnitude, resulting in a significance of Slight.
- 9.4.60. The properties at Dalrachney Beag and Lynphail, located 0.17km and 0.21km west of the Mainline Alignment options respectively and which potentially have a groundwater supply. Any supply (High sensitivity) may be impacted due to the close proximity of the properties to the Mainline Alignment options. It is anticipated that the impact on this source will be of Minor magnitude, resulting in a significance of Slight.
- 9.4.61. A potential groundwater supply at the property at Baddengorm (Medium sensitivity) is suspected to be located adjacent to or uphill of the property, approximately 0.4km north of the Mainline Alignment options. It is anticipated that the impact on this source will be of Minor magnitude, resulting in a significance of Slight.
- 9.4.62. A potential groundwater supply at the property at West Foregin (Medium sensitivity) is suspected to be located adjacent or uphill of the property, approximately 0.4km north of the Mainline Alignment options. It is anticipated that the impact will be of Minor magnitude, resulting in a significance of Slight.
- 9.4.63. The supplies for both PWS Slochd Lodge and PWS Slochd Cottages (both of High sensitivity) are both suspected to be located on the hillslopes south and uphill of the proposed scheme. Due to the close proximity of the supplies to the Mainline Alignment options, this supply may be impacted from the construction of the scheme. It is anticipated the impact on this source will be of Minor magnitude, resulting in a significance of Slight/Moderate and Slight respectively.
- 9.4.64. The supply at PWS Slochd (considered to be of High sensitivity) has been positively identified as a groundwater source 0.26km north and uphill from the Mainline Alignment options. Due to its close proximity to the scheme it is anticipated the impact on this source will be of Moderate magnitude, resulting in a significance of Moderate/Large.
- 9.4.65. The supply PWS Rynaclask (High sensitivity) is likely to be a historic supply near the properties Slochd and Doneen, and if the supply is still used it will be impacted by the scheme due to its close proximity and downstream location. It is anticipated the impact on this source will be of Moderate magnitude, resulting in a significance of Moderate.
- 9.4.66. Given the similarities in the footprints of the Mainline Alignment options, particularly in the vicinity of the private water supplies, no material difference in impact is expected between the Proposed Mainline Alignment Options.

#### Indirect Loss or Change to Surface Water Receptors

- 9.4.67. There are a large number of surface water features within the study area which may rely to a greater or lesser degree on groundwater, i.e. base flow in the rivers and groundwater inflows to standing waters. Groundwater drawdown in cuttings located close to these surface water features may result in a loss of groundwater inputs to these surface waters, causing indirect loss or change of the surface waters.
- 9.4.68. Details of the surface waters within the study area are provided in Chapter 10: Road Drainage and the Water Environment. The sensitivity of the surface waters ranges from



very high for the River Spey and the Allt na Criche (Lynwilg), due to their SAC designation, to low sensitivity for numerous small drains and ponds.

- 9.4.69. The high productivity superficial deposits such as the Glaciofluvial Sands and Gravels, which underlie the majority of the Proposed Scheme, are likely to have a strong hydraulic connectivity between the surface and groundwater systems. It is anticipated that where cuttings are excavated within these deposits groundwater drawdown effects may have an indirect impact of moderate magnitude on nearby surface waters. Where cuttings are excavated in lower permeability/lower productivity deposits, such as the Glacial Till, the hydraulic connectivity between groundwater and surface water will be less. In these instances the indirect impact on nearby surface waters is anticipated to be of minor magnitude.
- 9.4.70. Given the range of sensitivities and anticipated impact magnitudes, the impact significance may range from Neutral to Large/Very Large for all Mainline Alignment Options. Whilst Mainline Alignment Option 2 features a slightly higher length of cutting along the route, the level of dewatering is anticipated to be of a similar magnitude for both northbound and southbound widening, and results in no material difference in impact significance.
- 9.4.71. It should be noted that more detailed assessment of indirect losses on surface waters will be undertaken at Stage 3, when sufficient detail on the individual cuttings is available to assess fully the impacts on nearby surface waters.

#### Loss or Change to GWDTEs

- 9.4.72. GWDTEs within the study area may be impacted through direct loss of habitat under the footprint of the Mainline Alignment options, through severance of habitat and through changes to the groundwater regime supporting the habitat. This could result in altered vegetation in corridors close to infrastructure.
- 9.4.73. For each of the Mainline Alignment Options the area of GWDTEs lost under the footprint and within 250m (where Phase 1 habitat and NVC data were available) of the proposed works has been quantified as shown in Table 9.25.

**Table 9.25: Impact on potential GWDTEs from each route option**

Mainline Alignment Option	Area of GWDTEs lost under the footprint (ha)	% of GWDTEs within the study area that are lost under the footprint	Area of GWDTEs within 250m of the options (ha)	% of GWDTEs within the study area that are within 250m of the options	Area of GWDTEs within designated sites lost under the footprint (ha)	% of designated GWDTEs within the study area that are within 250m of the options
Option 1	31.40	10.93	284.62	99.14	11.12	3.87
Option 1A	31.37	10.92	284.41	99.08	11.10	3.87
Option 2	36.58	12.74	285.92	99.60	13.43	4.67

- 9.4.74. As previously outlined the study area has been defined as a 250m buffer around the combined footprint of all the Proposed Mainline Alignment Options. Due to the lack of Phase 1 habitat and NVC data, the results are an underestimate of the potential GWDTE area lost or impacted within 250m.

- 9.4.75. For all Mainline Alignment Options a proportion of GWDTEs will be lost under the option footprint within designated sites, including the River Spey SAC, Alvie SSSI and Craiggellachie SSSI. Potential GWDTEs within the boundary of Loch Vaa SPA also lie within 250m of the options.
- 9.4.76. The area of GWDTEs within the study area and the area of those within 250m of each Mainline Alignment Option are virtually identical, resulting in similar and very high percentages of GWDTEs within the study area which could be affected.
- 9.4.77. The area of potential GWDTEs within the 250m buffer of the Proposed Scheme is significant for all Mainline Alignment Options, due to the high level delineation of potential GWDTE areas. As the groundwater drawdown effect will reduce with distance from the Proposed Scheme it is anticipated that the overall changes to GWDTEs within the 250m buffer will be small.
- 9.4.78. It is highly likely that the area of GWDTEs within the 250m buffer will significantly reduce at DMRB Stage 3 with more detailed delineation of these habitats. In addition it is likely that some of the GWDTEs that are present will be found to have no hydrological/hydrogeological link to the Proposed Scheme and can be eliminated from the DMRB Stage 3 assessment.
- 9.4.79. Based on the currently available information, and due to the combined effects of direct loss under the footprint and indirect changes within 250m of the Mainline Options, the potential magnitude of the impact on potential GWDTEs (High sensitivity) is considered to be Minor, with a resulting significance of Slight/Moderate.
- 9.4.80. The potential magnitude of the impact on GWDTEs within designated areas (Very High sensitivity) due to direct loss under the footprint of the Mainline Options, is considered to be Moderate, with a resulting significance of Large.

#### Mobilisation of Historic Contamination

- 9.4.81. Full details of the contaminated land assessment are provided in the Geotechnical PSSR. The findings of that assessment, relevant to the identified potential receptors that might be affected by contamination sources is summarised within this section.
- 9.4.82. The contaminated land Phase 1 Preliminary Risk Assessment included in the PSSR involved the development of a Preliminary Conceptual Site model (CSM), comprising a summary of the ground model, potential sources, pathways and receptors and plausible pollutant linkages, and a risk evaluation as discussed below.

#### Ground Model

- 9.4.83. Land use within the study area is largely agricultural / forestry land, with the exception of the settlements at Aviemore and Carrbridge.
- 9.4.84. Historical features which represent potentially contaminated ground have been identified as discussed above and in Table 9.16 and Figure 9.10. Made Ground is likely to be present in these areas as well as being associated with the existing A9. The Made Ground has the potential to contain contaminants as well as to generate ground gas / vapours. In addition, spills and leaks may have occurred at several of the areas and these may have introduced contaminants to the ground.
- 9.4.85. A large proportion of the superficial deposits within the study area have been classified as highly productive aquifers and is therefore considered to be a potential receptor. The bedrock is considered to be low productivity, and has therefore been ruled out of any further assessment.

- 9.4.86. There are several surface water bodies within the study area, with a number of watercourses crossing beneath the existing A9, or flowing in the general vicinity of the road. These water bodies include the larger watercourses of the River Spey, Allt na Criche Burn (south), Aviemore Burn, Feith Mhor, River Dulnain, Allt nan Ceatharnach, and Allt Slochd Mhuic. Water quality information is not available for the majority of these waterbodies although some of the surface water features within the study area have been designated under the Water Framework Directive (WFD) and these include the Feith Mhor, which crosses the study area, designated as 'poor', and further waterbodies more than 200m from the study area which are designated as 'moderate' and 'good'. Loch Alvie which is located approximately 150m south of chainages 900 to 2400 and is indicated to be designated as 'good' quality.
- 9.4.87. The following designated ecosystems have been identified within, or immediately adjacent to the study area:
- Cairngorms National Park;
  - Cairngorm Straths Environmentally Sensitive Area;
  - Cairngorms National Scenic Area;
  - Cairngorm Mountains National Scenic Area;
  - Alvie Site of Special Scientific Interest (SSSI);
  - River Spey Special Area of Conservation (SAC) and SSSI;
  - Craigellachie National Nature Reserve and SSSI; and,
  - Slochd SAC.
- 9.4.88. There is one Scheduled Monument identified within 50m of the Proposed Scheme options – Tor Beag SM located south of Kinveachy and west of the existing A9 carriageway.
- 9.4.89. Residential properties are concentrated in the settlements of Aviemore and Carrbridge although there are also individual properties scattered throughout the study area. There are also several agricultural properties located within the study area. Farming within the study area is largely limited to livestock (sheep) farming, with very limited arable farming.
- 9.4.90. Parts of the A9 Northern Section are located within an area affected by radon.

#### Potential Pollutant Linkages

- 9.4.91. Potential sources of contamination within the study area were identified in Table 9.16 of the Baseline. Table 9.26, below, provides details of the likely contaminants and their expected distribution.

**Table 9.26: Sources of contamination**

Ref	Primary Source	Expected Distribution	Likely Contaminants
S1	Potentially Contaminated Ground	Across all areas where potentially contaminative uses have been identified	Heavy metals, asbestos, polycyclic aromatic hydrocarbons (PAHs), total petroleum hydrocarbons (TPH), acidic / alkali pH.
		Additional contaminants associated with farms	Pesticides, herbicides, insecticides, phenols



Ref	Primary Source	Expected Distribution	Likely Contaminants
		Additional contaminants associated with railways	Herbicides, polychlorinated biphenyls (PCBs)
		Additional contaminants associated with infilled quarries / pits	Phenols, semi-volatile organic compounds (SVOCs), volatile organic compounds (VOCs)

9.4.92. The identified receptors are detailed in Table 9.27 below.

**Table 9.27: Potential Receptors**

Ref	Receptor	Description
R1	Aquifer – Superficial Deposits	The underlying superficial deposits are classified as high productivity aquifers and are likely to be in hydraulic continuity with the surrounding burns and rivers
R2	Surface Water – Loch Puladdern, Loch Alvie, rivers, burns	In general, the waterbodies located within the study area were not designated under WFD. Loch Alvie, located 150m south of the Proposed Scheme is classified as having 'good' status. Feith Mhor which crosses the alignment at Chainage 14300 is indicated to have a 'poor' water quality. River Spey located 200m south-east and River Dulnain located 280m north-west are designated as 'moderate' and 'good' respectively
R3	Drivers & NMUs	Drivers of vehicles using the existing/proposed route, pedestrians and cyclists using footpaths and cyclepaths
R4	Local Residents	Residents located in properties present at off-site locations along the route corridor. These are concentrated in the settlements of Aviemore and Carrbridge although further more isolated properties are also present
R5	Ecosystems	Designated ecosystems located on or adjacent to the study area include Cairngorms National Park; Cairngorm Straths Environmentally Sensitive Area; Cairngorms National Scenic Area; Cairngorm Mountains National Scenic Area; Alvie Site of Special Scientific Interest (SSSI); River Spey Special Area of Conservation (SAC) and SSSI; Craigellachie National Nature Reserve and SSSI; and Slochd SAC
R6	Property (buildings and crops)	There are several residential properties and agricultural buildings and limited agricultural fields for arable farming present at isolated locations within the study area
R7	Property (livestock, pets, wildlife)	Livestock farming is prevalent throughout the study area. There are likely to be pets associated within various residential properties and wildlife subject to shooting and fishing rights in the study area
R8	Site Infrastructure	There will be buried services, culverts and structure foundations associated with the Proposed Scheme

9.4.93. Construction and maintenance workers are potential receptors to contamination but are not considered in this preliminary CSM. The UK framework for contaminated land assessment is based on potential adverse health effects resulting from long-term exposure to soil contamination. This is because, in the majority of cases, chronic exposure to contamination is more significant than acute exposure, and because the



occupational risks are already required to be addressed by the Health and Safety at Work Act 1974 and related legislation.

- 9.4.94. The potential pathways which could expose the receptors to the potential sources of contamination are summarised in Table 9.28 below.

**Table 9.28: Summary of potential pathways**

Reference	Pathway	Description
P1	Direct contact with soil	Soil contaminants could come into direct contact with the skin of site users, buried services, culverts or structure foundations, ecosystems, crops, pets, livestock and also the underlying groundwater.
P2	Ingestion of soil / soil dust	Soil derived contaminants could be ingested by site users.
P3	Inhalation of fugitive soil dust	During dry, dusty conditions, contaminated soil dust could be inhaled by site users
P4	Inhalation of vapour / soil gas	Site users may inhale vapours and / or soil gas that may be present.
P5	Leaching and vertical / lateral migration of contaminants	Contaminants could leach and migrate into the underlying superficial aquifer and adjacent watercourses / bodies, affecting dependant water supplies, ecosystems and livestock. Contaminated groundwater/surface could come into contact with property foundations and site infrastructure
P6	Vertical and lateral migration of soil gas	There is the potential that made ground present in the study area could generate soil gas. This gas could potentially migrate into buildings and site infrastructure.

### Risk Evaluation

- 9.4.95. Each plausible pollutant linkage is identified in the table below. An evaluation of the risk that each pollutant linkage poses to the project has been undertaken in general accordance with CIRIA guidance document C552, 2001. Risk classification matrices are presented in Section 9.2. The levels of risk estimation and evaluation detailed in Table 9.29 are considered to be common to all mainline options.
- 9.4.96. The evaluations for each of the mainline options are based on the available information presented within this report.

**Table 9.29: Risk Evaluation of Plausible Pollutant Linkages**

Hazard identification	Hazard assessment		Risk estimation		Risk evaluation	Managing the risk
	Pathway	Receptor	Maximum Consequence of risk being realised	Probability of risk being realised	Classification	Discussion / action required
S1 Potentially contaminated made ground	P1 – Direct contact	R1 - Upper Spey Valley Sand and Gravel Aquifer	Medium	Likely	Moderate	Intrusive investigation and chemical



Hazard identification	Hazard assessment		Risk estimation		Risk evaluation	Managing the risk
Contaminant source	Pathway	Receptor	Maximum Consequence of risk being realised	Probability of risk being realised	Classification	Discussion / action required
		R2 – Surface Water	Medium	Likely	Moderate	testing of soils is required to quantify the contamination status of the site and to assess the presence or absence of the identified potential pollutant linkages
		R3 - Drivers & NMUs	Medium	Unlikely	Low	
		R4 – Local Residents	Medium	Unlikely	Low	
		R5 - Ecosystems	Medium	Low Likelihood	Moderate / Low	
		R6 – Buildings & Crops	Mild	Low Likelihood	Low	
		R7 – Livestock, Pets & Wildlife	Medium	Unlikely	Low	
		R8 – Site Infrastructure	Mild	Low Likelihood	Low	
		P2 - Ingestion	R3 - Drivers & NMUs	Medium	Unlikely	
		R4 - Local Residents	Medium	Unlikely	Low	
		R5 – Ecosystems (fauna)	Medium	Unlikely	Low	
		R7 - Livestock, Pets & Wildlife	Medium	Unlikely	Low	
	P3 – Inhalation of dust	R3 - Drivers & NMUs	Medium	Unlikely	Low	
		R4 - Local Residents	Medium	Unlikely	Low	
		R5 - Ecosystems (fauna)	Medium	Unlikely	Low	
		R7 - Livestock, Pets & Wildlife	Medium	Unlikely	Low	
	P4 – Inhalation of vapours / soil gas	R3 - Drivers & NMUs	Medium	Unlikely	Low	
		R4 - Residents	Medium	Unlikely	Low	
		R5 – Ecosystems (fauna)	Medium	Unlikely	Low	





Hazard identification	Hazard assessment		Risk estimation		Risk evaluation	Managing the risk
Contaminant source	Pathway	Receptor	Maximum Consequence of risk being realised	Probability of risk being realised	Classification	Discussion / action required
	P5 – Leaching and migration	R7 - Livestock, Pets & Wildlife	Medium	Unlikely	Low	
		R1 - Aquifer	Medium	Likely	Moderate	
		R2 – Surface Water	Medium	Likely	Moderate	
		R5 – Ecosystems (flora)	Medium	Low Likelihood	Moderate / Low	
		R6 – Buildings & Crops	Mild	Unlikely	Very Low	
		R6 - Property	Mild	Unlikely	Very Low	
		R8 – Site Infrastructure	Mild	Low Likelihood	Very Low	
	P6 – Vertical and lateral migration of soil gas	R4 – Local Residents	Severe	Unlikely	Moderate / Low	
		R6 - Property	Severe	Unlikely	Moderate / Low	
		R8 – Site Infrastructure	Severe	Unlikely	Moderate / Low	

9.4.97. The potential environmental liabilities relating to the possible presence of contamination and its likely impact on the environment are considered to be moderate / low in accordance with CIRIA C552.

9.4.98. In relation to the SAR 2 comparison of the Proposed Mainline Options the number of potential contamination sources within the footprint of each option is presented in Table 9.30 below.

**Table 9.30: Number of contamination sources under each mainline option**

Mainline Alignment Option	No. of contamination sources under the footprint	No of contamination sources within 250m of the footprint
Option 1	3	25
Option 1A	3	25
Option 2	3	25

9.4.99. There is no difference between the different mainline options and the different options for each junction with regards to the relative location of potential contamination sources.

## Impacts Specific to Mainline Alignment Options

9.4.100. There are no impacts specific to any of the Mainline Alignment Options.

## Impacts Common to Aviemore South Junction Options

### *Construction Impacts*

9.4.101. There are no construction impacts common to all Aviemore South Junction Options – these are covered under the section relating to specific impacts for each junction option.

### *Operational Impacts*

#### Loss of Geodiversity Sites

9.4.102. Each of the Aviemore South Junction options will require the excavation of new or modification to existing cuttings. The extent to which these cuttings will result in the exposure of fresh bedrock outcrop is, at this stage, unknown. The total length of cuttings required to form the proposed Aviemore South Junction options are given below.

**Table 9.31: Summary of cutting length for each Aviemore South Junction Option**

Junction Option	Total length of cutting (km)
A02	1.38
A09	1.22
A18	2.99

9.4.103. Bedrock in this area has been identified as being of little geodiversity interest and is therefore of Low Sensitivity. The extent of exposures may change as a result of excavation of fresh cuttings; however, the quality of exposures is unlikely to.

9.4.104. Therefore, the magnitude of impact for Junction Options A02 and A09 has been assessed as Negligible and the impact significance has been rated as Neutral.

9.4.105. The magnitude of impact for Junction Option A18 has been rated as Minor with a resultant impact significance of Neutral.

9.4.106. It is noted that excavation of fresh bedrock exposures may increase the geodiversity interest in the area of Aviemore South Junction.

#### Loss of Economic Mineral Deposits

9.4.107. The areal loss of potential economic minerals as a result of the three Aviemore South Junction Options is presented below.

**Table 9.32: Summary of loss of economic materials for Aviemore South Junction Option**

Aviemore South Junction Option	Total area loss (ha)	% within study area under footprint
A02	0.03	0.1
A09	0.00	0.0
A18	0.0009	0.0

- 9.4.108. The loss of potential economic minerals (Low Sensitivity) as a result of the Aviemore South Junction Options is minimal. The impact has been assessed as Low, the magnitude of impact is Negligible, resulting in a significance of Neutral.

#### Loss of Soils

- 9.4.109. The area of soils within each Land Capability for Agriculture class disturbed by the Aviemore South Junction options is presented in Table 9.33 below.

**Table 9.33: Soil disturbance at Aviemore South Junction**

Aviemore South Junction Option	LCA class 3 <sub>2</sub> area under footprint (ha)	LCA class 4 <sub>2</sub> area under footprint (ha)	% of LCA class 3 <sub>2</sub> within study area under footprint	% of LCA class 4 <sub>2</sub> within study area under footprint
A02	2.64	4.51	1.91	3.26
A09	1.75	7.83	1.27	5.34
A18	4.56	8.16	3.31	5.91

- 9.4.110. For LCA class 3<sub>2</sub> (High sensitivity), there will be a small disturbance of soils. Therefore the impact magnitude is considered Minor and the significance Slight/Moderate. For LCA class 4<sub>2</sub> (Medium sensitivity), the impact magnitude is considered Minor and the significance Slight.

#### Loss of Peat

- 9.4.111. The area of peat loss is at Aviemore South Junction shown in Table 9.34 below.

**Table 9.34: Loss of peat at Aviemore South Junctions**

Aviemore South Junction Option	Class 0 loss (ha)	% of Class 0 within study area under footprint
A02	7.15	5.17
A09	9.13	6.61
A18	12.74	9.22

- 9.4.112. Accordingly all Aviemore South junction Options are Class 0 (mineral soils) therefore no impact is anticipated for loss of peat.

#### Loss or Change to Water Supplies

- 9.4.113. From the private water supply locations detailed within the Baseline Assessment section, there are no supplies or properties located within a 1km buffer of all of the Aviemore South Junction Options, therefore no impact as a result of these options.

#### Indirect Loss or Change to Surface Water Receptors

- 9.4.114. The cuttings associated with all Aviemore South Junction options are located within river terrace deposits (moderate to high productivity aquifers), which are likely to have a strong hydraulic connectivity between the surface and groundwater systems. Whilst the length of cuttings varies with each junction option, the impact of dewatering is likely to be similar. The main surface water receptors at this junction include Loch Alvie (High sensitivity) to the west and Allt na Criche (Very High sensitivity) to the east, both within the River Spey catchment. The impact of indirect loss to surface waters as a result of

dewatering is anticipated to be of Moderate magnitude, resulting in a significance of Large.

#### Loss or Change to GWDTEs

- 9.4.115. For each of the Aviemore South Junction Options the area of GWDTEs lost under the footprint and within 250m (where Phase 1 habitat data was available) of the proposed works has been quantified as shown in Table 9.35.

**Table 9.35: Impact on potential GWDTEs from each route option**

Aviemore South Junction Option	Area of GWDTEs lost under the footprint (ha)	% of GWDTEs within the study area that are lost under the footprint	Area of GWDTEs within 250m of the options (ha)	% of GWDTEs within the study area that are within 250m of the options	Area of GWDTEs within designated sites (ha)
A02	0.78	3.75	16.31	78.83	0
A09	0.15	0.70	18.29	88.37	0
A18	1.24	0.06	20.69	100.00	0.09

- 9.4.116. Based on the currently available information, and due to the combined effects of direct loss under the footprint and alteration of GWDTEs within the 250m buffer, the potential magnitude of the impact on potential GWDTEs (High sensitivity) is considered to be Minor, with a resulting significance of Slight/Moderate.

#### Mobilisation of Historic Contamination

- 9.4.117. No contamination sources were identified on-site at the Aviemore South junction and as no source is present it is considered that no pollutant linkages, and therefore no risk from contaminated land, will be present with regards to on-site sources at this location. Given the distance and nature of the nearby potentially contaminative land uses and the proposals at each junction it is also considered unlikely that the development would create a pollutant linkage, therefore no impact is expected.

**Table 9.36: Number of contamination sources under each route option**

Aviemore South Junction Option	No. of contamination sources under the footprint	No of contamination sources within 500m of the footprint
A02	0	3
A09	0	3
A18	0	3

## Impacts Specific to Aviemore South Junction Options

### *Impacts Specific to Junction Option A02*

#### *Construction Impacts*

#### Construction Pollution

- 9.4.118. For each of the Proposed Aviemore South Options the total length of cutting within each groundwater vulnerability class (shown in Figure 9.8) have been calculated to provide an indication of the risk of pollution to groundwater quality, as shown in Table 9.37.

**Table 9.37: Summary of impacts from cutting on aquifers by groundwater vulnerability class at Aviemore South Junction**

Aviemore South Junction Option	Total length of cutting (m) within groundwater vulnerability Class 4a
A02	1382.50
A09	1217.51
A18	2990.41

- 9.4.119. The cuttings associated with all Aviemore South Junction options are located with Class 4A where groundwater is vulnerable to pollutants not readily absorbed, with Option A18 featuring a much higher length of cutting.
- 9.4.120. Based on the results in Table 9.37 and criteria for magnitude provided in Section 9.2, it is considered that the potential impact from construction pollution for the Junction A02 would be of Minor magnitude with an associated significance of Slight/Moderate.

### *Operational Impacts*

#### Loss or Change to Groundwater Aquifers

- 9.4.121. Table 9.38 provides detail on the length of cutting associated with each Aviemore South Junction option.

**Table 9.38: Summary of superficial aquifer impacts at Aviemore South**

Aviemore South Junction Option	Total cutting length within moderate to high productivity aquifers (m)
A02	1382.50
A09	1217.51
A18	2990.41

- 9.4.122. The cuttings associated with all Aviemore South Junction options are located within river terrace deposits (moderate to high productivity aquifers), with Option A18 featuring the highest length of cutting.
- 9.4.123. The magnitude of impact of Option A02 on the superficial aquifers (High sensitivity) is anticipated to be Minor, with a significance of Slight/Moderate.

### *Impacts Specific to Junction Option A09*

#### *Construction Impacts*

##### Construction Pollution

- 9.4.124. Based on the results in Table 9.30 and criteria for magnitude provided in Section 9.2, it is considered that the potential impact from construction pollution for Option A09 would be of minor magnitude, with an associated significance of Slight/Moderate.

#### *Operational Impacts*

##### Loss or Change to Groundwater Aquifers

- 9.4.125. The magnitude of impact of Option A09 on the superficial aquifers (High sensitivity) is anticipated to be Minor, with a significance of Slight/Moderate.

### *Impacts Specific to Junction Option A18*

#### *Construction Impacts*

##### Construction Pollution

- 9.4.126. Based on the results in Table 9.30 and criteria for magnitude provided in Section 9.2, it is considered that the potential impact from construction pollution for the Junction A18, given the higher length of cutting associated with this junction, would be of Moderate magnitude with an associated significance of Moderate/Large.

#### *Operational Impacts*

##### Loss or Change to Groundwater Aquifers

- 9.4.127. Given the relatively higher length of cutting associated with Junction Option A18, the magnitude of impact on the superficial aquifers (High sensitivity) is anticipated to be Minor, with a significance of Moderate/Large.

##### Loss or Change to GWDTEs

- 9.4.128. Option A18 features a small area (0.09Ha) of direct loss of potential GWDTEs within the Loch Alvie SSSI boundary. Therefore the potential magnitude of the impact on potential GWDTEs within designated sites (Very High sensitivity) is considered to be Minor, with a resulting significance of Moderate/Large.

### **Impacts Common to Granish Junction Options**

#### *Construction Impacts*

- 9.4.129. There are no construction impacts common to all Granish Junction Options.

#### *Operational Impacts*

##### Loss of Geodiversity Sites

- 9.4.130. Each of the Granish Junction options will require the excavation of or modification to existing cuttings. The extent to which these cuttings will result in the exposure of fresh bedrock outcrop is, at this stage, unknown. The total length of cuttings required to form the proposed Granish Junction options are listed in Table 9.39 below.



**Table 9.39: Length of cutting for each Granish Junction Option**

Granish Junction Option	Total length of cutting (km)
C18	2.84
C21	2.03
C31	1.98
C34	1.71

- 9.4.131. Bedrock in this area has been identified as being of little geodiversity interest and is therefore of Low Sensitivity. The extent of exposures may change as a result of excavation of fresh cuttings; however, the quality of exposures is unlikely to.
- 9.4.132. For Junction Options C21, C31, and C34 the magnitude of impact has been assessed as Negligible giving a significance of Neutral.
- 9.4.133. For Junction Option C18 the magnitude of impact has been rated as Minor giving a significance of Neutral.
- 9.4.134. It is noted that excavation of fresh bedrock exposures may increase the geodiversity interest in the area of Granish Junction.

#### Loss of Economic Mineral Deposits.

- 9.4.135. The loss of potential economic minerals due to the four Junction Options at Granish is assessed below by considering the areal loss of this potential resource.

**Table 9.40: Summary of loss of economic materials for Granish Junction Option**

Granish Junction Option	Total area loss (ha)	% within study area under footprint
C18	5.10	8.9
C21	4.79	8.3
C31	4.99	8.7
C34	4.27	7.4

- 9.4.136. The loss of potential economic minerals as a result of the Granish Junction Options is reasonably consistent across the four. The sensitivity has been assessed as Low, the magnitude of impact for all four junction options is Minor, giving a Significance of Neutral for them all.

#### Loss of Soils

- 9.4.137. The area of soils within each Land Capability for Agriculture class disturbed by the Granish Junction options is presented in Table 9.41 below.

**Table 9.41: Soil disturbance at Granish Junction**

Granish Junction Option	LCA class 4 <sub>2</sub> area under footprint (ha)	LCA class 6 <sub>3</sub> area under footprint (ha)	% of LCA class 4 <sub>2</sub> within study area under footprint	% of LCA class 6 <sub>3</sub> within study area under footprint
C18	9.01	0.61	7.67	0.52
C21	7.66	1.12	6.52	0.96

Granish Junction Option	LCA class 4 <sub>2</sub> area under footprint (ha)	LCA class 6 <sub>3</sub> area under footprint (ha)	% of LCA class 4 <sub>2</sub> within study area under footprint	% of LCA class 6 <sub>3</sub> within study area under footprint
C31	9.45	0.23	8.04	0.22
C34	7.41	0.71	6.31	0.60

- 9.4.138. For LCA class 4<sub>2</sub> (Medium sensitivity), there will be a small disturbance of soils. Therefore the impact magnitude is considered Minor and the significance Slight. For LCA class 6<sub>2</sub> (Low sensitivity), there will be some disturbance of soils. Therefore the impact magnitude is considered Minor and the significance Neutral for all options.

#### Loss of Peat

- 9.4.139. The area of peat loss is at Granish Junction shown in Table 9.42 below.

**Table 9.42: Loss of peat at Granish Junction**

Granish Junction Option	Class 0 loss (ha)	% of Class 0 within study area which are under footprint
C18	9.60	6.96
C21	8.78	6.35
C31	9.68	7.01
C34	8.12	5.88

- 9.4.140. Accordingly all Granish Junction Options are Class 0 (mineral soils) therefore no impact is anticipated for loss of peat.

#### Loss or Change to Water Supplies

- 9.4.141. There is one supply located within a 1km buffer of the Granish Junction. As outlined in the Mainline Alignment impact section, the supply at Slugganranish (high sensitivity) may have a groundwater supply, with the property approximately 450m south and downhill of the nearest junction option, and a maximum distance of 470m south. It is anticipated that the impact on this source from all the junction options will be of Minor magnitude, resulting in a significance of Slight/Moderate.

#### Indirect Loss or Change to Surface Water Receptors

- 9.4.142. At the Granish junction, all of the options require cutting as the minor road passes beneath the Mainline Option. Cutting depths are anticipated to be up to 10m. Any dewatering at this location will potentially impact the Allt na Criche (High sensitivity) which flows northeast and runs parallel to the junction, the northern bifurcation of the Allt na Criche located south of the Granish junction, as well as an unnamed pond northeast of the junction at NGR 2901 8155. The impact of indirect loss to surface waters as a result of dewatering is anticipated to be of Major magnitude, resulting in a significance of Large/Very large.

#### Loss or Change to GWDTEs

- 9.4.143. For each of the Granish Junction Options the area of GWDTEs lost under the footprint and within 250m (where data was available) of the proposed works has been quantified as shown in Table 9.43. There are no designated sites within 250m of any of these junction options.

**Table 9.43: Impact on potential GWDTEs from each route option**

Junction Option	Area of GWDTEs lost under the footprint (ha)	% of GWDTEs within the study area that are lost under the footprint	Area of GWDTEs within 250m of the options (ha)	% of GWDTEs within the study area that are within 250m of the options
C18	7.25	23.41	31.27	99.86
C21	6.40	20.45	31.03	99.58
C31	7.33	23.42	31.19	99.58
C34	6.16	19.66	31.21	99.65

- 9.4.144. The impact on GWDTEs is of a similar scale for each of the Granish Junction options. There are no designated sites within 250m of the footprint, therefore no impact on designated GWDTEs is expected.
- 9.4.145. Based on the currently available information, and due to the combined effects of direct loss under the footprint and alteration of GWDTEs within the 250m buffer, the potential magnitude of the impact on potential GWDTEs (high sensitivity) is considered to be Moderate, with a resulting significance of Moderate/Large.

#### Mobilisation of Historic Contamination

- 9.4.146. No contamination sources were identified on-site at the Granish junction and as no source is present it is considered that no pollutant linkages, and therefore no risk from contaminated land, will be present with regards to on-site sources at this location. Given the distance and nature of the nearby potentially contaminative land uses and the proposals at each junction it is also considered unlikely that the development would create a pollutant linkage and therefore no impact is expected.

**Table 9.44: Number of contamination sources under each route option**

Granish Junction Option	No. of contamination sources under the footprint	No of contamination sources within 250m of the footprint
C18	0	2
C21	0	2
C31	0	2
C34	0	2

## Impacts Specific to Granish Junction Options

### *Impacts Specific to Junction Option C18*

#### *Construction Impacts*

#### Construction Pollution

- 9.4.147. For each junction option the total length of cutting within each groundwater vulnerability class (shown in Figure 9.8) have been calculated to provide an indication of the risk of pollution to groundwater quality, shown in Table 9.45.

**Table 9.45: Summary of impacts from cutting on aquifers by groundwater vulnerability class at Granish Junction**

Granish Junction Option	Total length of cutting (m) within each groundwater vulnerability class	
	Class 3	Class 4a
C18	1312.62	1524.90
C21	637.70	1392.31
C31	1257.96	721.67
C34	596.45	1116.45

- 9.4.148. Junction Options C18 and C21 feature higher lengths of cutting within Class 4a areas (vulnerable to pollutants not readily absorbed or transformed) of groundwater vulnerability, with junction C31 featuring the smallest length of cutting within Class 4a area.
- 9.4.149. Based on the criteria for magnitude provided in Section 9.2, it is considered that the potential impact for Class 4a areas (High sensitivity) from construction pollution for Option C18 would be of Moderate magnitude with an associated significance of Moderate/Large.
- 9.4.150. For Class 3 areas (Medium sensitivity) where aquifers are vulnerable to some pollutants, a Moderate magnitude of impact is anticipated for Option C18, resulting in a significance of Moderate.

### *Operational Impacts*

#### Loss or Change to Groundwater Aquifers

- 9.4.151. Table 9.46 below provides for each Option a breakdown of the total length of cuttings located within the superficial aquifers of the Granish Junction Options study area.

**Table 9.46: Summary of superficial aquifer impacts from cuttings**

Granish Junction Option	Total cutting length within high productivity aquifers (m)	Total cutting length within non-significant aquifers (m)
C18	770.70	1469.51
C21	568.49	1036.72
C31	467.11	989.63
C34	486.05	878.66

- 9.4.152. The area east of the existing A9 at the Granish junction features high productivity aquifers within glaciofluvial sheet deposits. The non-significant aquifers to the west comprise of hummocky (moundy) glacial deposits and till. Junction C18 features the highest length of cutting within higher productivity aquifers, with C31 featuring the lowest length.
- 9.4.153. The magnitude of impact on the high productivity (High sensitivity) aquifers is anticipated to be Moderate, with a subsequent significance of Moderate/Large.
- 9.4.154. The magnitude of impact on non-significant aquifers (Low sensitivity) is anticipated to be Negligible, with a subsequent significance of Neutral.

### *Impacts Specific to Junction Option C21*

#### *Construction Impacts*

##### Construction Pollution

- 9.4.155. The potential impact for Class 4a areas (High sensitivity) from construction pollution would be of Moderate magnitude with an associated significance of Moderate/Large.
- 9.4.156. For Class 3 areas (Medium sensitivity), a Minor magnitude of impact is anticipated resulting in a significance of Slight.

#### *Operational Impacts*

##### Loss or Change to Groundwater Aquifers

- 9.4.157. The magnitude of impact of Option C21 on the high productivity (High sensitivity) aquifers is anticipated to be Moderate, with a subsequent significance of Moderate/Large.
- 9.4.158. The magnitude of impact of Option C21 on non-significant aquifers (Low sensitivity) is anticipated to be Minor, with a subsequent significance of Neutral.

### *Impacts Specific to Junction Option C31*

#### *Construction Impacts*

##### Construction Pollution

- 9.4.159. The potential impact of Option C31 for Class 4a areas (High sensitivity) from construction pollution would be of Moderate magnitude, with an associated significance of Moderate/Large.
- 9.4.160. For Class 3 areas (Medium sensitivity), a minor magnitude of impact is anticipated resulting in a significance of Moderate.

#### *Operational Impacts*

##### Loss or Change to Groundwater Aquifers

- 9.4.161. The magnitude of impact of Option C31 on the high productivity (High sensitivity) aquifers is anticipated to be Minor, with a subsequent significance of Slight/Moderate.
- 9.4.162. The magnitude of impact of Option C31 on non-significant aquifers (Low sensitivity) is anticipated to be Minor, with a subsequent significance of Neutral.

### *Impacts Specific to Junction Option C34*

#### *Construction Impacts*

##### Construction Pollution

- 9.4.163. The potential impact of Option C34 for Class 4a areas (High sensitivity) from construction pollution would be of Minor magnitude, with an associated significance of Slight/Moderate
- 9.4.164. For Class 3 areas (Medium sensitivity), a Minor magnitude of impact is anticipated resulting in a significance of Slight.

### *Operational Impacts*

#### Loss or Change to Groundwater Aquifers

- 9.4.165. The magnitude of impact of Option C34 on the high productivity (High sensitivity) aquifers is anticipated to be Minor, with a subsequent significance of Slight/Moderate.
- 9.4.166. The magnitude of impact of Option C34 on non-significant aquifers (Low sensitivity) is anticipated to be Minor, with a subsequent significance of Neutral.

### **Impacts Common to Black Mount Junction Options**

#### *Construction Impacts*

- 9.4.167. There are no construction impacts common to all Black Mount Junction Options.

#### *Operational Impacts*

#### Loss of Geodiversity Sites

- 9.4.168. Each of the Black Mount Junction options will require the excavation of or modification to existing cuttings. The extent to which these cuttings will result in the exposure of fresh bedrock outcrop is, at this stage, unknown. The total length of cuttings required to form the proposed Black Mount Junction options are given below.

**Table 9.47: Length of cutting for Black Mount Junction Options**

Junction Option	Total length of cutting (km)
D02	1.98
D03	0.69
D07	3.42
D12	1.72
D13	1.12
D51	2.97

- 9.4.169. Bedrock in this area has been identified as being of little geodiversity interest and is therefore of Low Sensitivity. The extent of exposures may change as a result of excavation of fresh cuttings; however, the quality of exposures is unlikely to.
- 9.4.170. The magnitude of impact for Junction Options D02, D03, D12, and D13 has been assessed as Negligible and the impact significance has been rated as Neutral.
- 9.4.171. The magnitude of impact for Junction Options D07 and D51 has been rated as Minor with a resultant significance of Neutral.
- 9.4.172. It is noted that excavation of fresh bedrock exposures may increase the geodiversity interest in the area of Black Mount Junction.

#### Loss of Soils

- 9.4.173. The area of soils within each Land Capability for Agriculture class disturbed by the Black Mount Junction options is presented in Table 9.48 below.



**Table 9.48: Soil disturbance at Black Mount Junction**

Black Mount Junction Option	LCA class 4 <sub>2</sub> area under footprint (ha)	LCA class 5 <sub>3</sub> area under footprint (ha)	% of LCA class 4 <sub>2</sub> and 5 <sub>3</sub> within study area under footprint
D02	10.34	0	8.65
D03	5.35	0	4.48
D07	10.30	0.18	8.76
D12	10.67	0	8.92
D13	5.05	0	4.22
D51	11.86	0.09	9.98

- 9.4.174. For both LCA class 4<sub>2</sub> and 5<sub>2</sub> (Medium sensitivity) there will be a small disturbance of soils. Therefore the impact magnitude is considered Minor and the significance Slight.

#### Loss of Peat

- 9.4.175. Deeper areas of peat and peaty soil were identified at the Black Mount Junction based on superficial geology mapping, Class 4 and 5 areas of SNH Priority Peatland mapping and confirmed by peat probing surveys. The area of peat loss is shown in Table 9.49 below.

**Table 9.49: Loss of peat at Black Mount Junction**

Black Mount Junction Option	Class 4 peat loss (ha)	Class 5 peat loss (ha)	% of peat classes 4 and 5 within study area which are under footprint
D02	9.96	0.38	8.85
D03	5.35	0	4.48
D07	9.27	1.21	8.76
D12	10.39	0.28	8.92
D13	5.05	0	4.22
D51	10.91	1.03	9.99

- 9.4.176. Junction Options D03 and D13 have smaller land takes, with a smaller loss of Class 4 and 5 peat. Junction Option D51 in contrast has a much larger land take, with the largest loss of Class 4 and 5 peat. Although there is a difference in the loss of peat between the junction options, these differences make no material difference to the overall impact.
- 9.4.177. Accordingly all Black Mount junction Options are considered to have an impact of Minor magnitude on Class 4 peat (Low sensitivity), with a subsequent significance of Slight.

#### Pollution from Routine Runoff

- 9.4.178. A single discharge at Black Mount drains an area of the Junction and is considered to be virtually identical across all six junction options at this location.
- 9.4.179. A single infiltration basin is proposed north west of the existing Black Mount junction (Section 9), adjacent to an existing unclassified link road. Superficial geology mapping indicating that these areas are underlain by Hummocky (moundy) glacial deposits, comprising diamicton, gravel and sand. Small deposits of peat are present in the area adjacent to the northbound carriageway. Using historic borehole and recent groundwater monitoring data it has been assumed that the water table is close to the ground surface,

flow type is dominantly intergranular, the effective grain size as very coarse sand and above and the lithology comprises of 1-5% clay minerals.

- 9.4.180. On this basis the assessment of routine runoff impacts on groundwater at this location is as shown in Table 9.50.

**Table 9.50: Routine runoff groundwater assessment results**

Outfall ID	NGR	Traffic Density (AADT)	SAAR (mm)	Soakaway geometry	Depth to water table (m)	Flow Type	Effective grain size	Lithology	Overall Risk Score	Risk Category
9 B2	286897 824135	<50k	740-1060	Single point, or shallow soakaway (e.g. (lagoon) serving low road area	Depth to water table <5m	Unconsolidated or non-fractured consolidated deposits (i.e. dominantly intergranular flow)	Coarse Sand	<5% to >1% Clay	185.00	Medium

- 9.4.181. As can be seen in Table 9.50, the overall risk score generated places the groundwater discharge outfalls in the 'Medium Risk of Impact' category. On this basis, the magnitude of the impact on the receiving groundwaters (High sensitivity) is considered to be Moderate, with a resulting significance of Moderate/Large.

#### Pollution from Accidental Spillage

- 9.4.182. The result of the calculations relating to operational accidental spillage demonstrate that, whilst applying conservatively high traffic data for each Black Mount Option, one network discharge to groundwater via an infiltration basin will meet the minimum DMRB standard of a 1 in 200 year return period, with the worst calculated annual probability being 1 in 17,827 years. This outcome indicates that no further mitigation would be required.
- 9.4.183. It has accordingly been concluded that the magnitude of potential impact of each Black Mount Junction Option on the receiving groundwaters (High sensitivity) would be of Negligible magnitude, with the associated significance being Neutral.

#### Loss or Change to Water Supplies

- 9.4.184. As part of the Baseline Assessment, the property at Black Mount (Medium sensitivity) was identified within a 1km distance of the Black Mount junction options. The property is 750m north-east and located topographically at a similar height to all Black Mount Junction options. It is anticipated that the impact on this source from all the junction options will be of Minor magnitude, resulting in a significance of Slight.

#### Indirect Loss or Change to Surface Water Receptors

- 9.4.185. At the Black Mount junction, the main surface water receptors include the Bogbain Burn (High sensitivity), downstream and north-east of the proposed junction options. The impact of indirect loss to surface waters as a result of dewatering is anticipated to be of Minor magnitude, resulting in a significance of Slight/Moderate.

### Loss or Change to GWDTEs

- 9.4.186. For each of the Black Mount Junction Options the area of GWDTEs lost under the footprint and within 250m (where Phase 1 habitat data was available) of the proposed works has been quantified as shown in Table 9.51. There are no designated sites within the footprint of the junction options.

**Table 9.51: Impact on potential GWDTEs from the Black Mount Junction options**

Black Mount Junction Option	Area of GWDTEs lost under the footprint (ha)	% of GWDTEs within the study area that are lost under the footprint	Area of GWDTEs within 250m of the options (ha)	% of GWDTEs within the study area that are within 250m of the options
D02	3.63	15.12	23.58	98.10
D03	1.13	4.71	20.88	86.86
D07	3.62	15.06	23.53	97.90
D12	2.92	12.14	45.33	99.60
D13	1.69	7.03	21.39	88.97
D51	3.26	13.59	23.31	97.00

- 9.4.187. Based on the currently available information, and due to the combined effects of direct loss under the footprint and alteration of GWDTEs within the 250m buffer, the potential magnitude of the impact on potential GWDTEs (High sensitivity) is considered to be Moderate, with a resulting significance of Moderate/Large.

### Mobilisation of Historic Contamination

- 9.4.188. No contamination sources were identified on-site at the Black Mount junction and as no source is present it is considered that no pollutant linkages, and therefore no risk from contaminated land, will be present with regards to on-site sources at this location. Given the distance and nature of the nearby potentially contaminative land uses and the proposals at each junction it is also considered unlikely that the development would create a pollutant linkage.

**Table 9.52: Number of contamination sources under each route option**

Black Mount Junction Option	No. of contamination sources under the footprint	No of contamination sources within 250m of the footprint
Option D02	0	4
Option D03	0	4
Option D07	0	4
Option D13	0	4
Option D51	0	4

## Impacts Specific to Black Mount Junction Options

### Impacts Specific to Junction Option D02

#### Construction Impacts

##### Construction Pollution

- 9.4.189. For each of the Proposed Black Mount Junction Options the total length of cutting within each groundwater vulnerability class (shown in Figure 9.8) has been calculated to provide an indication of the risk of pollution to groundwater quality associated with each Black Mount Junction Option, as and Table 9.53.

**Table 9.53: Summary of impacts from cutting on aquifers by groundwater vulnerability class at Black Mount Junction**

Black Mount Junction Option	Total length of cutting (m) within each groundwater vulnerability class	
	Class 4a	Class 4b
D02	1431.13	553.53
D03	546.69	143.29
D07	2750.79	672.88
D12	1142.18	581.74
D13	701.49	414.31
D51	2632.05	341.30

- 9.4.190. Whilst there is a small difference in length of cutting within areas of Class 4b groundwater vulnerability, there is a much larger difference in length within areas of Class 4a, with junctions D07 and D51 featuring the largest length of cutting.
- 9.4.191. Based on the criteria for magnitude provided in Section 9.2, it is considered that the potential impact from construction pollution for the Option D02 would be of Minor magnitude, with an associated significance of Slight/Moderate.

#### Operational Impacts

##### Loss of Economic Mineral Deposits

- 9.4.192. The loss of potential economic minerals due to the six Junction Options at Black Mount is assessed below by considering the areal loss of this potential resource.

**Table 9.54: Summary of loss of economic materials for Black Mount Junction Option**

Junction Option	Total area loss (ha)	% within study area under footprint
D02	0.21	12.2
D03	0.17	10.1
D07	0.28	16.5
D12	0.20	11.8
D13	0.07	4.1
D51	0.43	25.5

- 9.4.193. The sensitivity of these potential economic minerals has been assessed as Low. The magnitude of impact for Junction Options D02 is Minor giving a significance of Neutral.

#### Loss or Change to Groundwater Aquifers

- 9.4.194. Table 9.55 below provides for each Proposed Junction Option a breakdown of the total length of cuttings located within the superficial aquifers of the Black Mount Junction Options study area.

**Table 9.55: Summary of superficial aquifer impacts from cuttings**

Black Mount Junction Option	Total cutting length within high productivity aquifers (m)	Total cutting length within non-significant aquifers (m)
D02	126.05	1858.61
D03	0	689.99
D07	177.96	3245.72
D12	0	1723.92
D13	0	1115.80
D51	189.82	2783.52

- 9.4.195. Most of the cuttings at Black Mount are located within non-significant superficial aquifers, and a small area to the north-east located within high productivity glaciofluvial ice contact deposits.
- 9.4.196. Options D02, D07 and D51 involve cutting within high productivity aquifers. All options involve cuttings within non-significant aquifers, with options D03, D12 and D13 featuring a relatively smaller cutting length. Junction Options D02, D07 and D51 feature much higher levels of cutting.
- 9.4.197. The magnitude of impact of Option D02 on the higher permeability glaciofluvial ice contact deposits (High sensitivity) is anticipated to be Minor, with a subsequent significance of Slight/Moderate.
- 9.4.198. The magnitude of impact of Option D02 on the lower permeability glacial deposits and bedrock aquifers (Low sensitivity) is anticipated to be Minor, with a subsequent significance of Neutral.

#### *Impacts Specific to Junction Option D03*

##### *Construction Impacts*

##### Construction Pollution

- 9.4.199. It is considered that the potential impact from construction pollution for the Option D03 would be of Minor magnitude, with an associated significance of Slight/Moderate.

##### *Operational Impacts*

##### Loss of Economic Mineral Deposits

- 9.4.200. The sensitivity of these potential economic minerals has been assessed as Low. The magnitude of impact for Junction Option D03 is Minor giving a significance of Neutral.



#### Loss or Change to Groundwater aquifers

- 9.4.201. The magnitude of impact of Option D03 on the lower permeability glacial deposits and bedrock aquifers (Low sensitivity) is anticipated to be Minor, with a subsequent significance of Neutral.

#### *Impacts Specific to Junction Option D07*

##### *Construction Impacts*

#### Construction Pollution

- 9.4.202. It is considered that the potential impact from construction pollution for the Option D07 would be of Moderate magnitude, with an associated significance of Moderate/Large.

##### *Operational Impacts*

#### Loss of Economic Mineral Deposits

- 9.4.203. The sensitivity of these potential economic minerals has been assessed as Low. The magnitude of impact for Junction Option D07 is Minor giving a significance of Neutral.

#### Loss or Change to Groundwater Aquifers

- 9.4.204. The magnitude of impact of Option D07 on the higher permeability glaciofluvial ice contact deposits (High sensitivity) is anticipated to be Minor, with a subsequent significance of Slight/Moderate.

- 9.4.205. The magnitude of impact of Option D07 on the lower permeability glacial deposits and bedrock aquifers (Low sensitivity) is anticipated to be Moderate, with a subsequent significance of Slight.

#### *Impacts Specific to Junction Option D12*

##### *Construction Impacts*

#### Construction Pollution

- 9.4.206. It is considered that the potential impact from construction pollution for the Option D12 would be of Minor magnitude, with an associated significance of Slight/Moderate.

##### *Operational Impacts*

#### Loss of Economic Mineral Deposits

- 9.4.207. The sensitivity of these potential economic minerals has been assessed as Low. The magnitude of impact for Junction Option D12 is Minor giving a significance of Neutral.

#### Loss or Change to Groundwater Aquifers

- 9.4.208. The magnitude of impact of Option D12 on the lower permeability glacial deposits and bedrock aquifers (Low sensitivity) is anticipated to be Minor, with a subsequent significance of Neutral.





### *Impacts Specific to Junction Option D13*

#### *Construction Impacts*

##### Construction Pollution

- 9.4.209. It is considered that the potential impact from construction pollution for the Option D13 would be of Minor magnitude, with an associated significance of Slight/Moderate.

#### *Operational Impacts*

##### Loss of Economic Mineral Deposits

- 9.4.210. The sensitivity of these potential economic minerals has been assessed as Low. The magnitude of impact for Junction Option D13 is Minor giving a significance of Neutral.

##### Loss or Change to Groundwater Aquifers

- 9.4.211. The magnitude of impact of Option D13 on the lower permeability glacial deposits and bedrock aquifers (Low sensitivity) is anticipated to be Minor, with a subsequent significance of Neutral.

### *Impacts Specific to Junction Option D51*

#### *Construction Impacts*

##### Construction Pollution

- 9.4.212. It is considered that the potential impact from construction pollution for the Option D51 would be of Minor magnitude, with an associated significance of Moderate/Large

#### *Operational Impacts*

##### Loss of Economic Mineral Deposits

- 9.4.213. The magnitude of impact for Junction Option D51 has been assessed as Moderate thus giving a significance of Slight.

##### Loss or Change to Groundwater Aquifers

- 9.4.214. The magnitude of impact of Option D51 on the higher permeability glaciofluvial ice contact deposits (High sensitivity) is anticipated to be Minor, with a subsequent significance of Slight/Moderate.
- 9.4.215. The magnitude of impact of Option D51 on the lower permeability glacial deposits and bedrock aquifers (Low sensitivity) is anticipated to be Moderate, with a subsequent significance of Slight.

## **9.5. Potential Mitigation**

- 9.5.1. At DMRB Stage 2 the design of the Proposed Scheme has not been sufficiently developed to allow detailed mitigation to be specified for each of the Proposed Scheme Options. However potential generic mitigation, based on current legislation, guidance and good practice, has been outlined below. As part of DMRB Stage 3 the design of the Preferred Option and the potential mitigation measures will be developed and refined to minimise the impacts on geology, soils and groundwater wherever possible.



## Mitigation during Construction

- 9.5.2. The Preferred Scheme Option will be developed at DMRB Stage 3 to avoid and minimise cuttings in areas of identified geodiversity interest where practicable. Where unavoidable the design team will consult with SNH and other key stakeholders to agree appropriate slope angles and cutting methods, with the aim of creating new natural looking exposures. The use of rock mesh and planting of vegetation on important exposures will be avoided wherever possible. However, the potential need to implement rockfall protection measures, including the use of mesh, cannot be eliminated at this time. Unfavourable rock slope geometry or poor rock mass condition may necessitate the use of rockfall protection measures in order to reduce the likelihood of rockfall that may interrupt highway operations and / or cause serious harm or death to road users. Where existing accesses to geodiversity sites are affected by the Preferred Scheme Option alternative accesses will be provided, where practicable.
- 9.5.3. In relation to soils, development of the DMRB Stage 3 design will seek to minimise impacts on high value soils and peat where practicable, including localised realignment to avoid areas of deep peat and optimising the cut and fill balance. Reuse of soils and peat within the Preferred Scheme Option will be considered wherever possible e.g. for dressing earthworks slopes and landscaping of Sustainable Drainage System (SuDS) features. Good practice methods of excavation and storage of soils and peat will be used, including: minimising the time they are stored for, removing vegetated turves and storing them so that they remain in good condition (this may include watering when dry weather could lead to desiccation) and storing top soil and sub soil separately. Soils and peat outwith the footprint of the Preferred Scheme Option will be protected from compaction by restricting vehicle movements to clearly demarcated construction areas and access tracks. If there is a significant excess of excavated soils and peat, consideration will be given to use off-site, e.g. excavated peat could be used in the restoration of nearby degraded peatland habitats, in consultation with SNH, SEPA and affected landowners.
- 9.5.4. In relation to construction pollution there are a number of Pollution Prevention Guidelines (PPGs) good practice guidance documents available from the SEPA website and by organisations such as CIRIA for site environmental management<sup>xxxvii</sup>. From such documents there are a number of mitigation measures which would be applied in all cases and some which are specific to particular design features and locations. These mitigation measures would be anticipated to be collated within the Construction Environmental Management Plan for the Proposed Scheme.
- 9.5.5. The impacts on groundwater aquifers due to the dewatering of cuttings and deep excavations during construction could be minimised through sensitive design of the dewatering operations or permanent drainage. Groundwater seeping into cuttings would be contained, channelled and directed to the down gradient side of the cutting, allowing the discharge to infiltrate to groundwater. Groundwater monitoring will be carried out at DMRB Stage 3 to inform the design of the cuttings and refine the assessment of impact.
- 9.5.6. The above measures will contribute to the protection of groundwater supported surface waters. Assessment of dewatering impacts on surface waters will be refined at Stage 3 and where applicable recommendations for monitoring will be made.
- 9.5.7. Public and private water supplies identified as being at risk at DMRB Stage 3 will have detailed surveys and groundwater monitoring carried out to establish the magnitude of the potential impact on yields. Depending on the potential level of impact anticipated mitigation may include monitoring throughout the construction phase and/or provision of a permanent alternative supply.



- 9.5.8. In relation to GWDTEs, following the detailed DMRB Stage 3 assessments those GWDTEs considered to be at risk of impact may be monitored prior, during and after construction to determine the level of impact. Monitoring may involve both groundwater readings and repeated NVC surveys. Where road embankments may result in severance of a GDWTE, consideration will be given to the use of permeable fill in the embankment construction to maintain groundwater flows. As discussed above, groundwater entering cuttings will be directed to the down gradient side and allowed to infiltrate. Where possible the location and frequency of these discharges will be designed to replicate the natural groundwater flow as closely as possible.
- 9.5.9. Further ground investigations, contaminated land sampling and testing, and full contaminated land risk assessment will be carried out at DMRB Stage 3. Where significant contamination is confirmed mitigation measures may include removal of contaminated soils from site, consolidation for treatment offsite and/or onsite or where a source-pathway-receptor linkage is unlikely to develop.
- 9.5.10. The potential risk from contaminated land on construction workers will be mitigated through the provision of appropriate training and personal protective equipment (PPE) and adherence to standard health and safety practices.

### Mitigation during Operation

- 9.5.11. It should be noted that most mitigation measures are covered under Construction Mitigation, as impacts will first occur during the construction of the scheme. However, there may be changes to groundwater levels which may require continued monitoring post construction to determine any impacts on GWDTEs and groundwater levels and only impact months after construction has ended.
- 9.5.12. The preliminary groundwater risk assessment has indicated that there is a medium risk of impact on groundwaters due to routine runoff from the seven proposed groundwater discharges, planned to be treated via filter drains and discharging via infiltration basin at each location. In this instance further detailed assessment will be required at DMRB Stage 3 to better define the level of risk. If the risk remains moderate consideration may be given to additional treatment via additional sustainable drainage prior to discharge to groundwater. Alternatively re-design may be considered to convert the outfall to a surface water discharge.
- 9.5.13. Although all networks have been assessed and pass the accidental spillage criteria without requirement for mitigation, it is considered good practice to install pollution control valves immediately upstream of the discharge location in all drainage networks. These shall facilitate isolation of the drainage network from the receiving waterbody, following a spillage incident, and pending completion of appropriate clean-up procedures. Ponds and other sustainable drainage techniques in each drainage network would also provide containment and treatment following an accidental spillage incident.

## 9.6. Summary of Route Option Impacts

- 9.6.1. A summary of the impact assessment for each Proposed Scheme Options is provided in Table 9.56 below. It should be noted that the impact significance stated in the table represents the residual impact, taking into account the mitigation discussed above. As such there may be differences in the significance ratings listed compared with those discussed in the Section 9.4: Potential Impacts.



**Table 9.56: Summary of Impacts – Mainline Alignment Options**

Sub-topic	Receptor	Potential Impact	Impact Significance (Residual Impacts)			Comparative Appraisal
			Mainline Alignment Options			
			Option 1	Option 1A	Option 2	
<b>Construction Phase Impacts</b>						
Construction Pollution	Class 5 vulnerability	Reduction in water quality	Slight/Moderate			
	Class 4 vulnerability		Slight/Moderate			
	Classes 2 & 3 vulnerability		Neutral			
<b>Operational Phase Impacts</b>						
Geodiversity	Geological deposits (general)	Loss of geodiversity sites	Neutral			
	The Slochd GCR	Loss of GCR site	Large / Very Large			
	Boat of Garten / Tore Hill outcrops	Loss of undesignated areas of geodiversity interest	Neutral			
	Slochd Mor outcrop	Loss of undesignated areas of geodiversity interest	Slight			
Economic minerals	Superficial deposits	Loss of economic minerals	Neutral			
Soils	LCA Class 3	Loss of soils	Slight/Moderate			
	LCA Class 4 & 5		Slight			
	LCA Class 6		Neutral			
	Peat Class 3	Loss of peat	Slight			
	Peat Class 4 & 5		Slight			
Groundwater	Superficial aquifer	Pollution from routine run-off	Moderate/Large			
		Pollution from accidental spillage	Neutral			





Sub-topic	Receptor	Potential Impact	Impact Significance (Residual Impacts)			Comparative Appraisal
			Mainline Alignment Options			
			Option 1	Option 1A	Option 2	
	High productivity aquifer	Loss or change to aquifer	Slight/Moderate			
	Low / Non significant aquifer		Neutral			
	Aviemore Public Supply	Loss of supply	Large/Very Large			
	PWS Wendy		Slight			
	PWS Slugganranish		Slight			
	Lynphail/ Dalrachney Beag		Slight			
	Baddengorm		Slight			
	West Foregin		Slight			
	PWS Slochd		Slight			
	PWS Slochd Cottage		Slight			
	PWS Slochd Lodge		Slight/Moderate			
	PWS Rynaclask		Slight			
	Surface water		Loss or change to aquifer	Moderate		
	GWDTEs	Potential GWDTEs	Direct loss or change to potential GWDTEs	Slight/Moderate		
Indirect loss of potential GWDTEs			Slight/Moderate			
Potential GWDTEs within designated sites		Direct loss or change to potential GWDTEs	Large			
Mobilisation of historic contamination	Groundwater	Mobilisation of pollutants into groundwater	Moderate/Low (impact provided is contaminated)			





Sub-topic	Receptor	Potential Impact	Impact Significance (Residual Impacts)			Comparative Appraisal
			Mainline Alignment Options			
			Option 1	Option 1A	Option 2	
			land risk classification)			

**Table 9.57: Summary of Impacts – Aviemore South Junction Options**

Sub-topic	Receptor	Potential Impact	Impact Significance (Residual Impacts)			Comparative Appraisal
			Aviemore South Junction Options (Route Sections 1 & 2)			
			Option A02	Option A09	Option A18	
<b>Construction Phase Impacts</b>						
Construction Pollution	Class 4 Groundwater Vulnerability	Reduction in water quality	Neutral	Moderate / Large	A18 features higher length of cutting.	
<b>Operational Phase Impacts</b>						
Geodiversity	Geological deposits	Loss of geodiversity sites	Neutral			
Economic minerals	Superficial deposits	Loss of economic minerals	Neutral			
Soils	LCA Class 3	Loss of soil	Slight/ Moderate			
	LCA Class 4		Slight			
Groundwater	Groundwater	Loss or change to aquifer	Slight/ Moderate	Moderate / Large	A18 features higher length of cutting.	
Groundwater aquifer	Surface water	Loss or change to aquifer	Moderate			
GWDEs		Direct loss or change to	Slight/Moderate			







	Potential GWDTEs	potential GWDTEs		
		Indirect loss of potential GWDTEs	Slight/Moderate	
	Potential GWDTEs within designated sites	Direct loss or change to potential GWDTEs	Moderate/Large	

**Table 9.58: Summary of Impacts – Granish Junction Options**

Sub-topic	Receptor	Potential Impact	Impact Significance (Residual Impacts)				Comparative Appraisal
			Granish Junction Options (Route Section 5)				
			Option C18	Option C21	Option C31	Option C34	
<b>Construction Phase Impacts</b>							
Construction Pollution	Groundwater vulnerability Class 4	Reduction in water quality	Slight/Moderate		Neutral		Options C18 and C21 feature higher length of cutting within Class 4 areas.
	Groundwater vulnerability Class 3		Slight	Neutral	Slight	Neutral	
<b>Operational Phase Impacts</b>							
Geodiversity	Geological deposits	Loss of geodiversity sites	Neutral				
Economic minerals	Superficial deposits	Loss of economic minerals	Neutral				
Soils	LCA Class 4	Loss of soil	Slight				
	LCA Class 6		Neutral				
Groundwater	High Productivity aquifer	Loss or change to aquifer	Slight/Moderate		Neutral		Options C18 and C31 feature higher





Sub-topic	Receptor	Potential Impact	Impact Significance (Residual Impacts)				Comparative Appraisal
			Granish Junction Options (Route Section 5)				
			Option C18	Option C21	Option C31	Option C34	
						length of cutting.	
	Non-significant aquifer		Neutral				
	PWS Sluggangranish	Loss of supply	Slight				
	Surface water	Loss or change to aquifer	Moderate/Large				
GWDTEs	Potential GWDTEs	Direct loss or change to potential GWDTEs	Moderate/Large				
		Indirect loss of potential GWDTEs	Slight/Moderate				

**Table 9.59: Summary of Impacts – Black Mount Junction Options**

Sub-topic	Receptor	Potential Impact	Impact Significance (Residual Impacts)						Comparative Appraisal	
			Black Mount Junction Options							
			Option D02	Option D03	Option D07	Option D12	Option D13	Option D51		
<b>Construction Phase Impacts</b>										
Construction Pollution	Class 4a/4b	Reduction in water quality	Neutral		Slight/Moderate		Neutral		Slight/Moderate	Options D07 and D51 feature higher length of cutting.
<b>Operational Phase Impacts</b>										





Sub-topic	Receptor	Potential Impact	Impact Significance (Residual Impacts)						Comparative Appraisal
			Black Mount Junction Options						
			Option D02	Option D03	Option D07	Option D12	Option D13	Option D51	
Geodiversity	Geological deposits	Loss of geodiversity sites	Neutral						
Economic minerals	Superficial deposits	Loss of economic minerals	Neutral						Slight Option D51 features largest area loss of superficial deposit.
Soils	Class 4 & 5	Loss of soils	Slight						
	Class 4 & 5	Loss of peat	Slight						
Groundwater	Superficial aquifer	Pollution from routine run-off	Moderate/Large						
	Superficial aquifer	Pollution from accidental spillage	Neutral						
	High Productivity Aquifer	Loss or change to aquifer	Slight	n/a	Slight	n/a	Slight	Options D02, D07 and D51 feature cuttings within high productivity aquifers.	
	Non-significant aquifer		Neutral						
Black Mount		Loss of supply	Slight						



Sub-topic	Receptor	Potential Impact	Impact Significance (Residual Impacts)						Comparative Appraisal
			Black Mount Junction Options						
			Option D02	Option D03	Option D07	Option D12	Option D13	Option D51	
	Surface water	Loss or change to aquifer	Slight/ Moderate						
GWDTEs	Potential GWDTEs	Direct loss or change to potential GWDTEs	Moderate/Large						
		Indirect loss of potential GWDTEs	Slight/ Moderate						

- 9.6.2. As can be seen there is no difference in overall impacts associated between the Mainline Alignment Options 1/1A, and Option 2. Option 2 features a slightly higher cutting length and land take associated with northbound widening. Metrics have been provided for each impact, to assist in the comparison of the Proposed Mainline and Junction Options.
- 9.6.3. For the Aviemore South Junction options, Option A18 features a much higher length of cutting resulting in larger impacts in terms of risk of construction pollution and changes to groundwater aquifers. There are no impacts to private water supplies, accidental spillage, routine run-off or from contaminated land issues.
- 9.6.4. For the Granish Junction options, the main difference in cutting lengths for each junction overlying two different superficial geology types leads to differences in impacts of construction pollution risks, changes to aquifers and loss of economic minerals. There are no impacts predicted for accidental spillage, routine run-off or from contaminated land issues.
- 9.6.5. For the Black Mount Junction options, the main difference in cutting length between two different superficial geology types leads to differences in impacts of construction pollution risks, changes to aquifers and loss of economic minerals. Junction options D07 and D51 have a larger adverse impact as a result of cuttings. There is a small difference in peat loss primarily associated with peatland south of the Black Mount junction, however, no difference in overall impact. There are no impacts for contaminated land issues.
- 9.6.6. As has been noted previously the contaminated land assessment has been reported outwith the EIA assessment methodology and therefore sensitivity, magnitude and significance evaluations are not reported in the table above. The contaminated land assessment found that for the Proposed Scheme the potential environmental liabilities relating to the possible presence of contamination and its likely impact on the

environment are considered to be moderate/low in accordance with CIRIA C552. This evaluation applies to all Mainline Alignment and Junction options.

## 9.7. Scope of DMRB Stage 3 Assessment

- 9.7.1. Further detailed assessment of the Preferred Option will be carried out at DMRB Stage 3 to refine the assessment of the impacts discussed within this chapter. The studies and investigations required are discussed below.

### Geodiversity

- 9.7.2. A range of geotechnical investigative techniques will be adopted in order to better understand the impact of the Proposed Scheme on Geodiversity. These will include excavation of exploratory holes in order to confirm anticipated ground conditions (including the depth to sound rock in the area of cuttings), geotechnical mapping of rock outcrops where it is safe and practical to do so, downhole geophysics in boreholes to obtain information on discontinuity sets in rock, as well as groundwater monitoring.
- 9.7.3. The results of these investigations will feed into the overall geotechnical assessment including stability analyses for widened rock cuts in order to inform cutting design. Due consideration will be given to the aesthetics of the resulting exposures.
- 9.7.4. Consideration will be given to the utilisation of additional techniques in order to better understand ground conditions in the area of The Slochd GCR site where the impact significance of the Proposed Scheme has been assessed as "Large / Very Large". The likely impact on this Geodiversity feature will be further considered as the scheme progresses.
- 9.7.5. The assessment of the quality and value of general rock exposures along the Proposed Scheme will be re-visited following the investigations discussed, and the likely impact on these considered further.

### Soils

- 9.7.6. Further survey work will be carried out to refine the characterisation of the soils within the study area. As the design of the Preferred Option is developed a more refined analysis of the area of soils lost to hardstanding will be undertaken. More detailed GI will be carried out to help determine the volumes of soils to be excavated. Measures to minimise soil losses will be investigated and estimates made of the volumes of excavated soil that can be reused on site.

### Peat

- 9.7.7. Detailed peat surveys will be carried out for the Preferred Option, including probing, coring and testing in line with the Scottish Government guidance on peat surveys. This data will be used to refine the design of the Preferred Option to, wherever possible, avoid peatland areas. The data will also be used to estimate the volume of peat (both acrotelmic and catotelmic) which will require excavation, and assess peat stability within the study area.
- 9.7.8. An assessment of the indirect impact on the peat due to changes in the hydrological and hydrogeological regime will be carried out, taking into consideration the effect of drainage, and cut and fill proposals.

- 9.7.9. Peat management and restoration plans will be developed in consultation with SEPA and SNH, which will include estimates of the volumes of peat which can be re-used on site.
- 9.7.10. A peat stability risk assessment will be carried out in line with Scottish Government Peat Landslide and Risk Assessment guidance, to identify if there is likely to be a risk of peat slides along the Proposed Scheme.

### Pollution from Routine Runoff

- 9.7.11. Further detailed groundwater assessment will be carried out for any groundwater discharges. This will include review and analysis of the Stage 3 GI findings and groundwater monitoring and undertaking a refined Method C assessment with updated data for each specific groundwater discharge location. If risk level remains medium, further hydrogeological investigations shall be undertaken to establish site-specific permeability factors and potentially pre-treatment measures adopted prior to groundwater discharge.

### Groundwater

- 9.7.12. Data from the DMRB Stage 3 GI works, and subsequent groundwater monitoring will be used to determine groundwater levels and aquifer properties in the vicinity of proposed cuttings and deep excavations. Using this information the drawdown and zone of influence of dewatering will be estimated, and an assessment of the magnitude of impact on the aquifers themselves carried out.

### Water Supplies

- 9.7.13. A detailed assessment of the public and private water supplies identified as potentially at risk of impact will be carried out. Consultation will be carried out with Scottish Water regarding the Aviemore public supply, and surveys will be carried out with landowners who have private water supplies within the scheme area, as well as any other properties which are suspected to have supplies. The assessment of supplies will involve the results of any water supply survey carried out where required, available GI data including groundwater monitoring, and details of the engineering design of the Preferred Scheme Option in the vicinity of the abstractions.
- 9.7.14. Using this data an assessment will be undertaken of the effect any groundwater drawdown, due to the Proposed Scheme, will have on the supplies. Based on the findings of the assessment monitoring and/or alternative supplies will be considered.

### GWDTES

- 9.7.15. Further survey work is required to positively identify all GWDTES within the study area. NVC surveys will be undertaken within at least a 250m buffer of the Preferred Option. An assessment of the likely impacts on GWDTES will be carried out in accordance with the SEPA guidance provided in LUPS-GU31.
- 9.7.16. The area of GWDTES lost under the footprint of the Preferred Option will be quantified. Additionally GWDTES within 100m of shallow excavations (<1m) and those within 250m of deep excavations (>1m) will be identified. In these instances detailed study/assessment will determine the indirect impact that changes to the hydrological regime caused by the Proposed Scheme will have. Where necessary monitoring and GWDTES management plans will be agreed with SEPA and SNH.



## Contaminated Land

9.7.17. In order to further assess the contamination status of the site and to inform the earthworks design, intrusive sampling, chemical testing and interpretative reporting is required. This will include:

- sampling and chemical testing of soils and groundwater along the route for general coverage as well as focusing on any areas of potential contamination;
- sampling from watercourses upstream and downstream of where they intersect the A9;
- assessment of the chemical analysis against the relevant guidelines / standards in order to assess the risk to human health, property, site infrastructure and the water environment; and
- reporting of findings from the chemical assessment along with recommendations for any remedial works where necessary.

<sup>i</sup> The Highways Agency, Scottish Executive, Welsh Assembly Government and The Department Regional Development Northern Ireland. (1993). Design Manual for Roads and Bridges, Volume 11, Section 3, Part 11, Geology and Soils.

<sup>ii</sup> The Highways Agency, Scottish Executive, Welsh Assembly Government and The Department Regional Development Northern Ireland. (2008). Design Manual for Roads and Bridges, Volume 11, Section 2, Part 5, Assessment and Management of Environmental Effects.

<sup>iii</sup> Scottish Natural Heritage (2013). A Handbook on Environmental Impact Assessment Guidance for Competent Authorities, Consultees and others involved in the Environmental Impact Assessment Process in Scotland. 4th Edition.

<sup>iv</sup> Transport Scotland. (2013). A9 Dualling Programme Strategic Environmental Assessment (SEA).

<sup>v</sup> Transport Scotland. (2014). A9 Dualling Programme Strategic Environmental Assessment (SEA) Environmental Report Addendum. Document TSSEA9/ER/02.

<sup>vi</sup> The Scottish Government. (2009). The Scottish Soil Framework.

<sup>vii</sup> SEPA. (2015). The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended) - A Practical Guide Version (7.2).

<sup>viii</sup> The Scottish Government. (2003). Planning Advice Notice (PAN) 33: Development of Contaminated Land.

<sup>ix</sup> Scotland and Northern Ireland Forum for Environmental Research (SNIFFER). (2009). WFD 95: A Functional Wetland Typology for Scotland.

<sup>x</sup> SEPA. (2010). Regulatory Position Statement 'Developments on Peat'

<sup>xi</sup> SEPA (2013). Regulatory Method (WAT-RM-11) Licencing Groundwater Abstractions including Dewatering. Version 5.

<sup>xii</sup> SEPA. (2015). Guidance on Assessing the Impacts of Windfarm Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems, Land use planning system, SEPA Guidance Note 31.

<sup>xiii</sup> Scottish Government. (2014). Guidance on Developments on Peat - Site Survey.

<sup>xiv</sup> Scottish Geodiversity Forum. (2013). Scotland's Geodiversity Charter.

<sup>xv</sup> H F Barron, M R Gillespie and J W Merritt. (2011). Geodiversity of the Cairngorms National Park. British Geological Survey. Open Report OR/10/019.

<sup>xvi</sup> Department for Environment, Food and Rural Affairs (DEFRA)/Environment Agency (EA). (2004). Contaminated Land Report (CLR) 11: Model Procedures for the Management of Land Contamination.

<sup>xvii</sup> CIRIA. (2001). Contaminated Land Risk Assessment: A guide to good practice (C552).

<sup>xviii</sup> Scottish Executive. (2006) Environmental Protection Act 1990: Part IIA Contaminated Land. Statutory Guidance: Edition 2. Paper SE/2006/44.

<sup>xix</sup> British Geological Survey (BGS). (2015). Superficial and Bedrock Geology mapping 1:50,000

<sup>xx</sup> Ó Dochartaigh B É, Doce D D, Rutter H K and Macdonald AM. (2015). User Guide: Aquifer Productivity (Scotland) GIS datasets, Version 2. Revised Report. British Geological Survey Open Report, OR/15/003.

<sup>xxi</sup> Ó Dochartaigh B É, Doce D D, Rutter H K and Macdonald AM. (2015). User Guide: Groundwater Vulnerability (Scotland) GIS dataset, Version 2. Revised Report. British Geological Survey Open Report, OR/15/002.



- <sup>xxii</sup> Jacobs. (2013). A9 Dualling: Preliminary Engineering Support Services Appendix E PSSR 10 Kinveachy to Slochd. Transport Scotland.
- <sup>xxiii</sup> Jacobs. (2014). A9 Dualling: Preliminary Engineering Support Services Appendix E PSSR 11 Slochd to Moy. Transport Scotland.
- <sup>xxiv</sup> Atkins Mouchel Joint Venture (AMJV). (2016). A9 Dualling Northern Section: Dalraddy to Slochd Geotechnical Preliminary Sources Study Report.
- <sup>xxv</sup> Soil Survey of Scotland Staff. (1970-1987). Soil maps of Scotland (partial coverage) at a scale of 1:25 000. Macaulay Institute for Soil Research, Aberdeen. Available at <http://www.soils-scotland.gov.uk/data/soil-survey> (accessed 1st December 2015).
- <sup>xxvi</sup> Arup Geotechnics. (1991). Review of mining instability in Great Britain. Report to Department of the Environment, Newcastle-upon-Tyne, 25 vols.
- <sup>xxvii</sup> British Geological Survey (BGS). (2015). Non Coal Mining Plans online database. Available at <http://www.bgs.ac.uk/data/miningplans/> (accessed 3rd December 2015).
- <sup>xxviii</sup> British Geological Survey (BGS). (2014). Directory of Mines and Quarries, Tenth Addition. Compiled by D G Cameron, T Bide, S F Parry, A S Parker and J M Mankelow.
- <sup>xxix</sup> Ordnance Survey (OS). (2015). Raster mapping on 1:10k, 1:25k, 1:50k, 1:250k scale.
- <sup>xxx</sup> SEPA (2013). Scotland's Environment Water Framework Directive (WFD) Groundwater Body Status. Available at <http://www.environment.scotland.gov.uk/> (accessed 1st December 2015)
- <sup>xxxi</sup> Scottish Natural Heritage (SNH). (2016). Carbon-rich soil, deep peat and priority peatland habitat map.
- <sup>xxxii</sup> The Coal Authority (2015) online interactive map. Available at <http://mapapps2.bgs.ac.uk/coalauthority/home.html> (accessed 1st December 2015).
- <sup>xxxiii</sup> SNH (2015). 'What is Geodiversity?' web article. Available at <http://www.snh.gov.uk/about-scotlands-nature/rocks-soils-and-landforms/geodiversity/> (accessed 15th December 2015).
- <sup>xxxiv</sup> A.G. Leslie et al (2013) The Dalradian rocks of the northern Grampian Highlands of Scotland. Proceedings of the Geologists' Association, Volume 124. P 263-317.
- <sup>xxxv</sup> Border Geoscience (2011). Earth Science Site Documentation Project (Contract number 28758). The Slochd GCR site, Badenoch and Strathspey, Highland Region.
- <sup>xxxvi</sup> SEPA (2013). Scotland's Environment Water Framework Directive (WFD) Groundwater Body Status. Available at <http://www.environment.scotland.gov.uk/> (accessed 1st December 2015).
- <sup>xxxvii</sup> CIRIA (2015). The SuDS Manual (C753).



## 10. Road Drainage and the Water Environment

### 10.1. Introduction

- 10.1.1. This chapter presents the results of the DMRB Stage 2 Assessment of the potential impacts of the Proposed Scheme Options on the water environment. The assessments have focussed on surface water and floodplains. The potential significant impacts considered are:
- Pollution during construction due to increased generation and release of sediments and suspended solids, and increased risk of accidental spillage of pollutants such as oil, fuel and concrete associated with construction activities and site storage requirements;
  - Pollution during road operation due to contaminants within routine road runoff. A broad range of potential pollutants, such as hydrocarbons i.e. fuel and lubricants, fuel additives, metal from corrosion of vehicles, de-icer and gritting material, can accumulate on road surfaces. These can subsequently be washed off the road surface during rainfall events, polluting the receiving surface water bodies;
  - Pollution during road operation due to accidental spillage. On all roads there is a risk that accidents or vehicle fires may lead to an acute pollution incident. Where commercial vehicles are involved, potential pollutants that may be spilled could range from hazardous chemicals to milk, alcoholic beverages, organic sludges and detergents. Spilled materials may drain from the road surface, polluting the receiving surface water bodies;
  - Alterations to the hydromorphology (fluvial geomorphological) regime, such as increased erosion, deposition and channel migration processes. These changes can occur as a result of channel modification associated with increased road surface drainage, new crossing structures, culverting, watercourse diversions and outfalls. A reduction in hydromorphological diversity can subsequently impact on water quality and biodiversity;
  - Increase in flood risk caused by the development, both within the vicinity of the Proposed Scheme and also elsewhere in the catchment. This can involve a number of inter-related factors including:
    - Increases in upstream water level caused by any restriction in flow (afflux) and conversely increases in downstream water levels where existing restrictions are removed;
    - Loss of floodplain storage due to road infrastructure occupying areas which were previously available for flood storage or flows;
    - Impediment of water flow caused by road infrastructure crossing existing drainage channels, causing potential blockage and altering local catchment area boundaries.
  - Loss of standing waters where the Proposed Scheme would be constructed through existing ponds; and
  - Loss or change to water supplies due to degradation of water quality or changes in drainage patterns as a result of the Proposed Scheme.
- 10.1.2. This chapter is supported by the following technical appendices:
- Appendix A10.1 - A9 Dualling, Dalraddy to Slochd: Hydromorphology Assessment (August 2016)

- Appendix A10.2 - A9 Dualling, Dalraddy to Slochd: Preliminary Flood Risk Assessment (August 2016)
- Appendix A10.3 - A9 Dualling, Dalraddy to Slochd: Road Drainage Water Quality Calculations (August 2016).

10.1.3. It should be noted that this chapter deals with impacts on surface water only. Groundwater impacts are discussed in Chapter 9: Geology, Soils and Groundwater.

10.1.4. Consequential impacts on locations with nature conservation value, aquatic and marginal habitats and associated fauna are discussed in Chapter 11: Ecology and Nature Conservation.

10.1.5. Planning policy documents are summarised in Chapter 19: Policies and Plans.

### Study Area

10.1.6. The study area generally refers to a broad 5km buffer surrounding the extent of all the Proposed Scheme Options. Watercourse reaches which extend downstream of this corridor are also considered part of the study area due to hydrological connectivity.

10.1.7. In relation to the Flood Risk Assessment (FRA) the study area is based on the River Spey catchment as the FRA is required to assess the impacts on downstream sensitive receptors as well as in the immediate vicinity of the Proposed Scheme.

10.1.8. Specific baseline datasets are more limited in extent, to focus attention closer to the Proposed Scheme, for example water supplies have been identified within 1km of the Proposed Scheme, extending to 5km downstream.

## 10.2. Approach and Methods

10.2.1. The assessment has been carried out in accordance with the guidance contained in the Design Manual for Roads and Bridges (DMRB), Volume 11, Section 3, Part 10 Road Drainage and the Water Environment (HD 45/09)<sup>i</sup>. An explanation of the methods used is provided below.

### Guidance

10.2.2. The following guidance documents have been used to inform the assessment:

- A9 Dualling Programme Strategic Environmental Assessment (SEA)<sup>ii</sup>;
- A9 Dualling Programme Strategic Flood Risk Assessment (SFRA)<sup>iii</sup>;
- Scottish Planning Policy (SPP) (paragraphs 254 – 268)<sup>iv</sup>;
- Highways Agency, Design Manual for Roads and Bridges (DMRB):
  - Volume 11, Section 3, Part 10 HD 45/09 – Road Drainage and the Water Environment<sup>i</sup>;
  - Volume 11, Section 4, Part 1 HD 44/09 – Assessment of Implications (of Highways and/or Road Projects) on European Sites (Including Appropriate Assessment)<sup>v</sup>;
  - DMRB Part 7 HA 107\_04 Design of Outfall and Culvert Details<sup>vi</sup>; and
  - DMRB Volume 4, Section 2, Part 3 HD 33/16 Design of Highway Drainage Systems<sup>vii</sup>.
- The Highland Council - Flood Risk and Drainage Impact Assessment Supplementary Guidance<sup>viii</sup>;



- Scottish Environment Protection Agency (SEPA) publications:
  - The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended) - A Practical Guide (March 2015)<sup>ix</sup>;
  - Good Practice - River Crossings (Nov 2010)<sup>x</sup>;
  - Good Practice – Inlets and Outfalls (Oct 2008)<sup>xi</sup>;
  - SEPA Position Statement – Culverts (Jun 2015)<sup>xii</sup>;
  - Technical Flood Risk Guidance for stakeholders V8 – Feb 2015)<sup>xiii</sup>;
  - WAT-RM-02 Regulation of Licence-level Engineering Activities<sup>xiv</sup>; and
  - WAT-RM-08 Sustainable Urban Drainage Systems (SUDS or SUD Systems)<sup>xv</sup>.
- Construction Industry Research and Information Association (CIRIA) publications:
  - C648 – Control of Water Pollution from Linear Construction Sites. Technical Manual.<sup>xvi</sup>
  - C689 - Culvert design and operation guide<sup>xvii</sup>; and
  - C720 - Culvert design and operation guide supplementary technical note on understanding blockage risks<sup>xviii</sup>.
  - C753 - The SuDS Manual 2016<sup>xix</sup>
- SNIFFER - WFD45 A functional wetland typology for Scotland<sup>xx</sup>; and
- Scottish Government - River Crossings and Migratory Fish: Design Guidance<sup>xxi</sup>.

## Baseline Data Collection

10.2.3. Baseline studies focussed on the following activities for the study area:

- Identification of international / nationally designated conservation sites with citations related to the water environment;
- Identification of surface water bodies; rivers, lochs, streams, ditches, ponds etc.;
- Identification of current and historic flood risk;
- Collation of surface water body characteristics and Water Framework Directive (WFD) classification;
- Identification of surface water abstractions for local public and private water supplies; and
- Identification of existing A9 water-related infrastructure i.e. culverts, bridges, outfalls and watercourse diversions.

10.2.4. Baseline conditions have been determined through desk studies and site survey. The desk studies included review of the following information:

- The Proposed Scheme Options;
- Ordnance Survey (OS) raster mapping on 1:10,000, 1:25,000 1:50,000, 1:250,000 scale<sup>xxii</sup>;
- Topographical Survey (including aerial imagery) for the A9 Dualling Corridor (Blom);
- 1:2,500 aerial photography and grid Digital Terrain Model (DTM);
- High precision 1:500 survey of the carriageway envelopes;
- NextMap DTM;



- Road Drainage Record Drawings from Transport Scotland;
- 3D models, including elevations and information of spans, headroom and clearance for each watercourse crossing and road structure;
- National Library of Scotland historical mapping<sup>xxiii</sup>;
- Old Maps historical mapping<sup>xxiv</sup>;
- Department for Environment, Food and Rural Affairs (DEFRA) / Environment Agency R&D Report FD1914 Guide Book of Fluvial Geomorphology<sup>xxv</sup>;
- Scottish Environment Protection Agency (SEPA) WFD Classification Results Webpage<sup>xxvi</sup>;
- Public water supply data (Scottish Water);
- Private water supply data (The Highland Council);
- SEPA Indicative Flood Maps<sup>xxvii</sup>;
- The National Flood Risk Assessment<sup>xxviii</sup>;
- SEPA Technical Flood Risk Guidance for Stakeholders<sup>xxix</sup>;
- Flood Estimation Handbook (FEH) CD ROM (V3)<sup>xxx</sup>;
- Macaulay Institute for Soil Research Soil maps of Scotland (partial coverage) at a scale of 1:250,000<sup>xxxi</sup> and 1:25,000<sup>xxxii</sup>; and
- Scottish Natural Heritage (SNH) Carbon-rich soil, deep peat and priority peatlands habitats consultation map<sup>xxxiii</sup>.

10.2.5. Hydrological walkover surveys were undertaken in 2015 from the 9<sup>th</sup> to the 13<sup>th</sup> November; and in 2016 from the 12<sup>th</sup> to the 15<sup>th</sup> January, and the 26<sup>th</sup> to the 28<sup>th</sup> April. This included review of existing A9 water-related infrastructure and characterising local water features with potential scheme interactions in order to establish the sensitivity of receptors and to identify any potential water quality monitoring locations in advance of DMRB Stage 3. A hydromorphological walkover was undertaken from the 30<sup>th</sup> November to the 4<sup>th</sup> December 2015, this supplemented data collected during the hydrological walkover surveys and provided further evidence to support the sensitivity and impact assessments.

10.2.6. Further walkover surveys were undertaken on the 22<sup>nd</sup> and 23<sup>rd</sup> March 2016 focussing on existing culverts and floodplains. A prior review of SEPA flood maps and OS mapping was conducted in order to establish areas indicative of potential flooding issues, and to identify floodplain areas requiring further detail to be obtained during the site visit. These locations included the Allt na Criche (Lynwilg), Aviemore Burn, Allt na Criche (Granish), Feith Mhor, and River Dulnain.

10.2.7. Prior to the site visit, the topographical survey data was analysed in order to determine if all the relevant data, needed to build the 1D hydraulic models, was present. Any gaps or inconsistencies in the data was then recorded or verified where possible at the relevant locations.

## Consultation

10.2.8. General consultation on the water environment has been carried out with the key stakeholders through the Environmental Steering Group, however to date no specific consultation in relation to the Dalraddy-Slochd scheme has been undertaken.



- 10.2.9. A limited number of ad hoc consultations with private water supply owners/users has been conducted, however a comprehensive survey/consultation is planned for Stage 3.

### Assessment of Impacts

- 10.2.10. The approach has focused upon the characteristics and subsequent Proposed Scheme impacts upon surface water hydrological catchments with reference to water bodies characterised by SEPA under the WFD. This hydrological catchment-based approach enables due consideration to be given to both individual locations and the wider cumulative impacts within larger surface water body areas.

#### Construction Pollution

- 10.2.11. Evaluation of the potential for pollution of surface waters as a result of spillage and of the release of sediments into watercourses or water bodies has involved a review of areas where construction would be required within or in close proximity (i.e. within 50m) to watercourses and water bodies. The approximate length of road which lies within 50m of surface water features, the number of proposed permanent road drainage discharge structures and the number of watercourse crossings has been quantified for each Proposed Scheme Option.
- 10.2.12. The sensitivity or importance of the surface waters has been evaluated qualitatively, as has the magnitude of impact of the Proposed Scheme Options on each (as set out further below).

#### Pollution from Routine Runoff

- 10.2.13. DMRB HD 45/09 specifies procedures for the assessment of pollution impacts from routine runoff on surface waters, known as 'Method A'<sup>i</sup>.
- 10.2.14. The Method A assessment comprises two separate elements:
- HAWRAT Assessment: the Highways Agency Water Risk Assessment Tool (HAWRAT) is a Microsoft Excel application designed to assess the short-term risks related to the intermittent nature of road runoff. It assesses the acute and chronic pollution impacts on aquatic ecology associated with soluble and sediment bound pollutants, respectively; and
  - EQS Assessment: Environmental Quality Standards (EQS) are the maximum permissible annual average concentrations of potentially hazardous chemicals, as defined under the WFD. The long-term risks over the period of one year are assessed through comparison of the annual average concentration of pollutants discharged with the published EQS for those pollutants.
- 10.2.15. To carry out these assessments a variety of baseline and drainage design information is required including: traffic volumes, areas of impermeable and permeable road surfaces to be drained, proposed treatment train, receiving watercourse dimensions and flow data, water hardness, presence of sensitive sites (considered as international / national designated conservation sites) and in-stream structures or features which may influence the flow.
- 10.2.16. In relation to the treatment train, preliminary road drainage design proposals which include sustainable drainage systems have been considered as embedded design (refer to Figures 7.1 – 7.3), rather than as specific mitigation measures, and have been assessed accordingly. Reference values for effectiveness of the various systems at removing various pollutants are based on figures recently published in DMRB HD33/16<sup>xxxiv</sup>.



- 10.2.17. The HAWRAT and EQS assessments have been carried out for each road drainage outfall within each Proposed Mainline Option and Proposed Junction Option. For each Proposed Scheme Option the number of outfalls passing/failing the HAWRAT and EQS assessments has been presented.
- 10.2.18. At DMRB Stage 2 there is no information available on the proposed drainage design for side roads and accommodation tracks, therefore no assessment of routine runoff impacts has been carried out at this stage. Assessment of side road and accommodation track drainage proposals will be carried out at Stage 3.

#### *Pollution from Accidental Spillage*

- 10.2.19. The DMRB document HD 45/09 specifies procedures for the assessment of pollution impacts from accidental spillage, known as Method D<sup>1</sup>. A summary of the methodology is provided below, with full details provided in HD 45/09.
- 10.2.20. The assessment takes the form of a risk assessment, where the risk is expressed as the annual probability of a serious pollution incident occurring. This risk is the product of two probabilities:
- The probability that an accident will occur, resulting in a serious spillage of a polluting substance on the carriageway; and
  - The probability that, if such a spillage did occur, the polluting substance would reach the receiving water body and cause a serious pollution incident.
- 10.2.21. The probability of a serious spillage occurring is dependent on a variety of factors; traffic volumes, percentage of heavy goods vehicles in the traffic volumes, whether the road is motorway, rural or urban trunk road, the road type categories within the road drainage catchment under assessment i.e. 'no junction', 'slip road', 'cross road' or 'roundabout' and the length of each road type within the catchment.
- 10.2.22. The probability of a serious spillage subsequently causing a serious pollution incident is dependent on the receiving surface water body and the response time of the emergency services, i.e. less than 20 minutes, less than one hour, or greater than one hour.
- 10.2.23. Typically an annual probability of 1% (i.e. a 1 in 100 chance of a serious pollution incident occurring in any one year) is considered by DMRB as an acceptable risk. However, where a road drainage outfall discharges within 1km of a sensitive receptor, (such as a nationally designated conservation site), a higher level of protection is required, such that the risk has no greater annual probability than 0.5% (i.e. a 1 in 200 chance of occurring in any one year).
- 10.2.24. At Stage 2 the scenario and road section with highest traffic flow was used across all networks in order to conservatively evaluate all Proposed Scheme Options, whilst also taking into account various drainage design permutations. The outcomes reported are the worst performing network in terms of return period (i.e. highest risk) for each of the individual Proposed Scheme Options. At DMRB Stage 3, updated traffic data will enable refined calculations, which may lead to an alteration in risk value.

#### *Alterations to Hydromorphological Regime*

- 10.2.25. The hydromorphology assessment has involved a desk study and preliminary screening exercise to identify sensitive watercourses and locations where impacts from the Proposed Scheme were most likely. Subsequently a hydromorphological walkover survey was carried out between 30th November to 4th December 2015 to determine the specific character of the geomorphological forms and processes in each of these



watercourses. Further details on the desk study, screening process and walkover survey are provided in Appendix A10.1 Hydromorphology Assessment.

- 10.2.26. The above information, in conjunction with data on the WFD status of the relevant water bodies, has been used in the evaluation of the sensitivity of the watercourses.
- 10.2.27. For each Proposed Scheme Option the location of proposed bridges, culverts, watercourse diversions and outfalls has been reviewed. The magnitude of potential impacts on channel form and gradient, flow volumes and rates, and erosion and sedimentation processes was evaluated qualitatively.
- 10.2.28. As part of the Proposed Scheme, it has been anticipated that the design of structures and any diverted channels will incorporate standard good practice measures, considered as embedded design for this assessment.
- 10.2.29. It should be noted that the DMRB does not outline a specific methodology or guidance on the evaluation of hydromorphological impacts. Therefore, hydromorphological sensitivity and impact magnitude criteria have been developed based on guidance provided in the DEFRA/EA R&D Report FD1914 Guide Book of Fluvial Geomorphology<sup>xxxv</sup>.

### *Increased Flood Risk*

- 10.2.30. At DMRB Stage 2 the PFRA is primarily a desk based assessment which reviews all available datasets to identify the sources and receptors of flood risk, along the existing A9 and the Proposed Scheme. The appraisal of flood risk impacts associated with each of the Proposed Scheme Options has considered:
- Changes to the surface water flow regime where proposed changes to existing culverts may result in increased flow capacity; and
  - Changes to floodplains due to disconnection of the floodplains by the Proposed Scheme Options and floodplain loss through encroachment by proposed road embankments.
- 10.2.31. The assessment of the floodplain impacts has been based on the 200 year return period flood event (which is equivalent to a 0.5% Annual Exceedance Probability (AEP)). Mitigation options are considered in detail at Stage 3 when the sensitivity to climate change is also considered.
- 10.2.32. The assessment of the culvert capacity incorporates consideration of long term sustainability and resilience (i.e. including allowances for climate change and appropriate freeboard). This has been agreed with SEPA and The Highland Council.
- 10.2.33. Existing watercourse crossings were identified from OS Mastermap data, Transport Scotland's structures database and confirmed from site visit. Peak flows were derived for each watercourse crossing catchment using the methodologies outlined in the Flood Estimation Handbook<sup>xxx</sup>. The precautionary approach has been applied at this stage. The existing capacities of each crossing have been calculated using simple 1 dimensional hydraulic models, and compared with agreed flood risk design standards to determine whether upsizing may be required. For each culvert identified as potentially requiring upsizing, the downstream receptors have been identified and a qualitative assessment of the increased flood risk made.
- 10.2.34. To improve the floodplain definition, a hydrological model and 1D/2D linked hydraulic model were required for the following locations:
- Allt an Fhearna

- Loch Alvie
- Allt na Criche (Lynwilg)
- Aviemore Burn
- The Shieling / Easter Aviemore Burn
- Allt na Criche (Granish)
- Feith Mhor
- River Dulnain

- 10.2.35. Peak flows were generated for each model reach using the standard FEH methodologies, with hydrographs generated from the Rainfall Runoff method.
- 10.2.36. With the exception of the Allt an Fhearna, and Loch Alvie all the 1D/2D linked hydraulic models were constructed using ISIS TuFlow. The hydraulic modelling was carried out in accordance with SEPA's Technical Guidance for Stakeholders<sup>xiii</sup>.
- 10.2.37. For the DMRB Stage 2 assessment, the AMJV flood map has been used to identify areas where: the Proposed Scheme Options may cause full or partial disconnection of the floodplain, and/or there may be loss of floodplain through encroachment of the Proposed Scheme Option embankments.
- 10.2.38. Using the AMJV 0.5% AEP the potential floodplain losses have been calculated based on the maximum flood level and earthworks footprint for each of the Proposed Scheme Options.
- 10.2.39. Where the impact of changes to the existing floodplain are considered to be significant as a result of the Proposed Scheme, mitigation measures are required to offset the impact. The strategy will be to use a sequential test for storage compensation. The strategy aligns with SEPA's guidance to stakeholders. The DMRB Stage 2 assessment applies Test 1 and 2 of the sequential test. Test 1 addresses whether the floodplain can be avoided and Test 2 addresses the need for the development within the floodplain. Floodplains failing Test 2 will be brought forward to Stage 3, where further assessment will be undertaken and mitigation developed as necessary. Test 3 of the sequential test, which addresses whether direct or indirect full replacement of floodplain volume can be provided, will be applied at Stage 3
- 10.2.40. Further details of the technical approach, parameters, modelling and further proposed modelling can be found in Appendix A10.2 Preliminary Flood Risk Assessment.
- 10.2.41. The DMRB sets out criteria with regard to assessing importance of receptors and magnitude of impact, providing examples in relation to flood risk. The DMRB criteria for estimating magnitude of floodplain impacts relates to changes in flood levels for the 1% AEP. At Stage 2 a precautionary approach has been adopted and the criteria has been applied to the 0.5% AEP, rather than the 1% set in the DMRB.
- 10.2.42. Additional magnitude criteria, as shown in Table 10.2, have been developed to assess potential impacts on the flow regime as a result of proposed changes to the flow capacity of existing watercourse crossings.

### *Loss of Standing Water*

- 10.2.43. Where standing water bodies will be partially or totally lost under the footprint, the area of loss has been calculated. In the instance of the larger lochs, particularly those that are designated, the actual area and the percentage of area lost from each has been

calculated for each loch individually. For smaller ponds, the number of ponds lost and the aggregate area loss has been calculated, for all ponds within 250m of the Proposed Scheme.

- 10.2.44. Activities occurring close to standing water bodies can also cause indirect effects, interrupting surface and groundwater flows feeding the local water body and potentially resulting in total or partial drying up of the water body. The distance to each standing water body from the nearest point of the Proposed Scheme Options has been measured using OS 1:10,000 mapping. Using this data the magnitude of impact on water bodies within 250m of the Proposed Scheme has been evaluated qualitatively.
- 10.2.45. Impacts related to the interruption of groundwater flows are assessed in Chapter 9: Geology, Soils and Groundwater.

### *Loss or Change to Water Supplies*

- 10.2.46. Public and private water abstraction information was provided in October 2015 and June 2016 by SEPA, Scottish Water and The Highland Council, with a small number of owner-occupier consultations undertaken during DMRB Stage 2 (with further consultations planned for DMRB Stage 3). Data was provided from each for a minimum of 5km from the existing A9 route.
- 10.2.47. The quality of the private water supply data provided was variable, with grid references and type of supply (i.e. surface water or groundwater source) missing for a number of supplies. Where the type of source is unknown it has been assumed that it is a surface water source, for this assessment. It should be noted that in Chapter 9: Geology, Soils and Groundwater, these same supplies have been assumed to be groundwater fed, thus in each chapter we assume the worst case scenario, with respect to these receptors.
- 10.2.48. Where there are properties within 1km with a suspected private water supply, but no registered information has been identified, these properties have been included within the DMRB Stage 2 Assessment, with supply details to be confirmed during DMRB Stage 3.
- 10.2.49. Potential impacts on water supplies have been evaluated qualitatively based on the potential hydrological linkage and distance between the construction areas of each of the Proposed Scheme Options and the water supply sources.

### **Impact Assessment Criteria**

- 10.2.50. The predicted significance of impacts on surface waters and floodplains have been based on an evaluation of the feature and the potential impact from the Proposed Scheme Options, as recommended in HD 45/09.

### *Sensitivity*

- 10.2.51. The sensitivity of the water bodies have been evaluated taking into account their quality, rarity, scale and substitutability. The criteria used in determining the sensitivity of each water body are detailed in Table 10.1, these are in accordance with the guidance and examples provided in HD 45/09.





**Table 10.1: Criteria Used to Estimate the Sensitivity of Receptors**

Sensitivity	Criteria
Very High	<p>Surface Water Quality and Biodiversity</p> <p>'High' WFD Overall Status surface water body. None or a negligible number of anthropogenic pressures and/or pollutant sources affecting the water feature WFD status</p> <p>Sites protected under EU wildlife legislation (Special Area of conservation (SAC), Special Protection Areas (SPA) and Ramsar)</p> <p>Watercourses supporting a wide range of significant species and habitats sensitive to changes in suspended sediment concentrations and turbidity such as salmon or freshwater pearl mussels</p> <p>Water dependent ecosystems of international/national biodiversity value</p> <p>Hydromorphology</p> <p>A watercourse exhibiting a range of natural morphological features such as pools and riffles, active gravel bars and varied river bank types, such morphological variability is a primary determinant of ecological diversity. Minimal modification.</p> <p>Hydrology &amp; Flood Risk</p> <p>Watercourses or floodplains, with direct or indirect flood risk to adjacent populated areas and/or presence of essential infrastructure such as schools and hospitals etc., which are highly sensitive to increased flood risk by the possible increase in water levels</p> <p>Water Supplies</p> <p>Watercourse supporting major/critical public water supplies</p> <p>Public water supply or large private water supply serving &gt;10 properties</p>
High	<p>Surface Water Quality and Biodiversity</p> <p>'Good' WFD Overall Status surface water body. A small number of anthropogenic pressures and/or pollutant sources that do not significantly affect the water feature WFD status</p> <p>Sites protected under UK wildlife legislation (Sites of Special Scientific Interest (SSSI) and National Nature Reserves (NNR))</p> <p>Water dependent ecosystems of regional/county biodiversity value</p> <p>Watercourses supporting some species and habitats sensitive to changes in suspended sediment concentrations and turbidity</p> <p>Hydromorphology</p> <p>A watercourse exhibiting a range of morphological features with very little modification.</p> <p>Hydrology &amp; Flood Risk</p> <p>Watercourses or floodplains, with a possibility of direct or indirect flood risk to less populated areas without essential infrastructure, which are sensitive to increased flood risk by the possible increase in water levels</p> <p>Water Supplies</p> <p>Watercourses supporting minor/non-critical public drinking water supplies</p> <p>Private water supply serving 2-10 properties</p>
Medium	<p>Surface Water Quality and Biodiversity</p> <p>'Moderate' WFD Overall Status surface water body, or not classified by SEPA. Likely to have deteriorated in water quality as a result of anthropogenic pressures and/or pollutant sources</p> <p>Water dependent ecosystems of county/district biodiversity value</p> <p>Watercourses supporting limited species and habitats sensitive to changes in suspended sediment concentrations and turbidity</p> <p>Hydromorphology</p>







Sensitivity	Criteria
	<p>A watercourse exhibiting some signs of modifications and recovering to a natural equilibrium. Limited morphological features and a limited range of fluvial processes.</p> <p>Hydrology &amp; Flood Risk</p> <p>Watercourses or floodplains, with direct or indirect flood risk to agricultural or recreational land and/or affecting &lt;10 industrial premises and high value agriculture (e.g. arable pastures, complex cultivation patterns and agro- forestry), which are sensitive to increased flood risk by the possible increase in water levels</p> <p>Water Supplies</p> <p>Watercourses supporting private drinking water supplies or for agricultural/industrial use</p> <p>Private water supply serving a single property</p>
Low	<p>Surface Water Quality and Biodiversity</p> <p>'Poor'/'Bad' WFD Overall Status surface water body, or not classified by SEPA. Highly likely to be affected by anthropogenic pressures and/or pollutant sources and/or heavily engineered or artificially modified features (e.g. road and field drains, and ephemeral features)</p> <p>Water dependent ecosystems of local/less than local biodiversity value</p> <p>Watercourses which do not support any significant species and habitats sensitive to changes in suspended sediment concentrations and turbidity</p> <p>Hydromorphology</p> <p>A watercourse exhibiting no morphological diversity; flow is uniform, gravel bars absent and bank type's uniform and stable, with no evidence of active fluvial processes. Such watercourses may have been subject to past modification such as straightening, bank protection and culverting, or other anthropogenic pressures.</p> <p>Hydrology &amp; Flood Risk</p> <p>Watercourses or floodplains with a possibility of direct or indirect flood risk to low value agricultural areas, such as rough grazing, which are less sensitive to increased flood risk by the possible increase in water levels</p> <p>Water Supplies</p> <p>Watercourses not supporting water abstractions</p>

### Magnitude of Impact

- 10.2.52. The magnitude of the various impacts is evaluated taking into account the extent of loss and effects on integrity of the relevant water body attributes. The criteria used in determining the magnitude of impact are detailed in Table 10.2, below, and are in keeping with the guidance and examples provided in HD 45/09.

**Table 10.2: Criteria Used to Estimate the Magnitude of an Impact on Receptors**

Magnitude	Criteria
Major Adverse	<p>Surface Water Quality and Biodiversity</p> <p>High risk of pollution to surface water during construction, significant temporary or long-term change in water quality, resulting in a permanent change in WFD status</p> <p>Failure of both soluble and sediment bound pollutants in HAWRAT and EQS routine runoff compliance failure</p> <p>Risk of pollution from accidental spillage during operation &gt; 2% annually</p> <p>Hydromorphology</p>





Magnitude	Criteria
	<p>Results in loss of feature(s) and failure of hydromorphological elements (morphology, quantity and dynamics of flow) resulting from the works. Loss or damage to existing habitats. Significant/extensive alteration to channel planform and/or cross section, including modification to bank profiles or the replacement of a natural bed.</p> <p>Hydrology &amp; Flood Risk</p> <p>Loss of &gt;50% of any individual large loch</p> <p>Loss of &gt;50% of aggregated small pond area, or &gt;50% loss of total number of small ponds within study area</p> <p>Changes to existing culvert hydraulic capacity where the 0.5% AEP flow is &gt; 5m<sup>3</sup>/s and the existing hydraulic capacity is less than the 10% AEP; or the 0.5% AEP flow is &gt; 25m<sup>3</sup>/s and the existing hydraulic capacity is between the 10% and 1% AEP.</p> <p>Floodplain impacts which result in an increase in peak flood level (0.5% AEP) &gt;100mm</p> <p>Water Supplies</p> <p>Permanent loss of surface water supply</p>
Moderate Adverse	<p>Surface Water Quality and Biodiversity</p> <p>Moderate risk of pollution to surface water during construction, moderate temporary change in water quality, resulting in a temporary change of WFD status or preventing attainment of target overall status of 'Good'</p> <p>Failure of both soluble and sediment bound pollutants in HAWRAT routine runoff but compliance with EQS limits</p> <p>Risk of pollution from accidental spillage during operation &gt; 1% annually</p> <p>Hydromorphology</p> <p>Results in adverse impact on integrity of feature(s) or loss of part of feature / moderate shift away from baseline conditions. Failure of one or more hydromorphological elements (morphology, quantity and dynamics of flow) resulting from the works. Some damage or loss to habitat due to the modifications. Some alteration to channel planform and/or cross section, including modification to bank profiles or the replacement of a natural bed.</p> <p>Hydrology &amp; Flood Risk</p> <p>Loss of 25-50% of any individual large loch</p> <p>Loss of 25-50% of aggregated small pond area, or 25-50% loss of total number of small ponds within study area</p> <p>Changes to existing culvert hydraulic capacity where the 0.5% AEP flow is 1-5 m<sup>3</sup>/s and the existing capacity is less than the 1% AEP; or the 0.5% AEP flow is 5-25 m<sup>3</sup>/s and the existing hydraulic capacity is between the 10% AEP and 0.5% AEP.</p> <p>Floodplain impacts which result in an increase in peak flood level (0.5% AEP) &gt;50mm</p> <p>Water Supplies</p> <p>Temporary loss of water supply</p>
Minor Adverse	<p>Surface Water Quality and Biodiversity</p> <p>Minor risk of pollution during construction to surface water, relatively minor temporary changes in water quality such that ecology is temporarily affected. Equivalent to a temporary minor, but measurable, change within WFD status class</p> <p>Failure of either soluble or sediment bound pollutants in HAWRAT routine runoff but compliance with EQS limits</p> <p>Risk of pollution from accidental spillage during operation &gt; 0.5% annually</p> <p>Hydromorphology</p>



Magnitude	Criteria
	<p>Potential failure in one of hydromorphological elements (morphology, quantity and dynamics of flow) resulting from the works. Results in minor adverse impact on feature / minimal shift away from baseline conditions or partial loss or damage to habitat due to modifications</p> <p>Hydrology &amp; Flood Risk</p> <p>Loss of &lt;25% of any individual large loch, or any loch located within 250m of the Proposed Scheme</p> <p>Loss of &lt;25% of aggregated small pond area, or &lt;25% loss of total number of small ponds within study area, or any small pond within 250m of the Proposed Scheme</p> <p>Changes to existing culvert hydraulic capacity where the 0.5% AEP is &lt; 1m<sup>3</sup>/s and the existing hydraulic capacity is less than the 1% AEP; or the 0.5% AEP is 1-5 m<sup>3</sup>/s and the existing hydraulic capacity is between the 1% and 0.5% AEP.</p> <p>Floodplain impacts which result in an increase in peak flood level (0.5% AEP) &gt;10mm</p> <p>Water Supplies</p> <p>Temporarily reduced quality of water supply</p>
Negligible	<p>Surface Water Quality and Biodiversity</p> <p>Negligible risk of pollution to surface water during construction, very slight temporary change in water quality with no discernible effect on watercourse ecology or water supply</p> <p>All elements of HAWRAT and EQS routine runoff assessments passed</p> <p>Risk of pollution from accidental spillage during operation &lt; 0.5% annually</p> <p>Hydromorphology</p> <p>No alteration to hydromorphological elements. Some impact on feature(s), but of insufficient magnitude to affect the use / integrity, approximating to a 'no change' situation</p> <p>Hydrology &amp; Flood Risk</p> <p>Over 250m from nearest surface water body</p> <p>Changes to existing culvert hydraulic capacity where the existing capacity is greater than the 0.5% AEP or where the 0.5% AEP is &lt; 1m<sup>3</sup>/s and the existing hydraulic capacity is greater than the 0.5% AEP.</p> <p>Floodplain impacts which result in a change in peak flood level (0.5% AEP) &lt;10mm</p> <p>Water Supplies</p> <p>No anticipated effect on water supply</p>

### Impact Significance

- 10.2.53. The estimation of the impact significance has been arrived at by combining the estimated sensitivity of the affected water bodies and the magnitude of the impacts as indicated in Table 10.3, prior to consideration of any potential mitigation, and the guidance provided in HD 45/09. Where the significance is shown as being one of two alternatives a single description is provided based upon reasoned judgement.

**Table 10.3: Criteria Used to Estimate the Significance of Potential Effects**

Sensitivity	Magnitude of Impact			
	Major	Moderate	Minor	Negligible
Very High	Very Large	Large / Very Large	Moderate / Large	Neutral
High	Large / Very Large	Moderate / Large	Slight / Moderate	Neutral

Sensitivity	Magnitude of Impact			
	Major	Moderate	Minor	Negligible
Medium	Large	Moderate	Slight	Neutral
Low	Slight / Moderate	Slight	Neutral	Neutral

## Limitations of the Assessment

- 10.2.54. This assessment has relied upon the accuracy and level of detail of the documented data sources. For instance, the identification of water bodies and current characteristics has involved reference to Scotland's Environment and SEPA websites for RBMPs and associated WFD water body information sheets. The datasets are updated annually and the latest available information (2014) has been included, to be revised as updated information becomes available during DMRB Stage 3. It is possible that in the intervening period conditions within the water bodies may have changed.
- 10.2.55. Detailed topographic survey data is not currently available for the watercourses where outfalls are proposed, and therefore the routine runoff and accidental spillage assessments have been undertaken using some reasonable assumptions for a number of the input parameters. Additional data to update the assessments will be obtained during DMRB Stage 3.
- 10.2.56. The results of the hydromorphology walkover are based on a fluvial geomorphological walkover rather than a full fluvial audit approach, supplemented by desk study information and aerial imagery. The findings of the walkover are focused around the immediate vicinity of the Proposed Scheme crossings and are not broken into reaches, except for those sections upstream and downstream of the existing A9 crossing locations. Where possible a minimum of 250m upstream and downstream was surveyed; however, where this was not possible due to access restrictions, spot checks were taken at accessible locations upstream and downstream in order to establish a sufficient understanding of the watercourse processes and sensitivity.
- 10.2.57. Site access was limited by the relevant permissions and safe access. Where access was not possible, spot checks were undertaken at existing crossings or via public footpaths. The watercourse features and processes observed may vary over time/seasons and high flow events. Site surveys were undertaken under relatively dry conditions, and the overall watercourse function and stability was inferred through professional judgement and the interpretation of features on site. The Proposed Scheme Options are currently subject to ongoing design development and the precise nature of the impacts on the watercourses are uncertain. In all cases the worst case scenario has been considered and assessed as a precautionary approach at DMRB Stage 2.
- 10.2.58. The SEPA Flood Maps are indicative and provide a strategic national overview of areas estimated to be at risk of flooding from river and/or sea. It is noted that the maps have limitations, as these are based on broad scale hydrological and hydraulic modelling techniques along with digital terrain models. They also do not take account of hydraulic structures or flood prevention schemes. However, the flood maps are a valuable tool when screening and identifying flood sources and potential flood extents.
- 10.2.59. It should be noted that in relation to flood risk impacts, increases in water levels which under the DMRB criteria discussed above would be deemed not significant, could be unacceptable in the context of the Scottish Planning Policy (SPP) which does not specify minimum acceptable changes in water level. The Flood Risk Assessment has taken into consideration the requirements of both the DMRB and the SPP, and changes

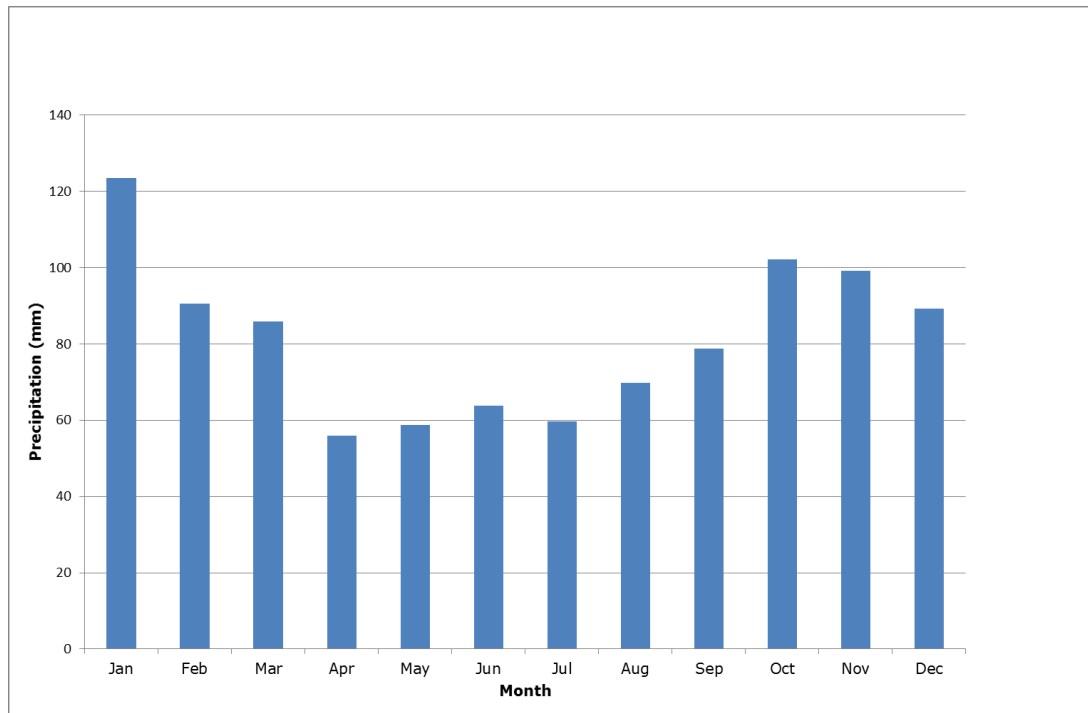
in water levels have been assessed case by case to ensure that the principles set out in SPP are adhered to.

- 10.2.60. The model used to assess the flood risk impact of the proposed alignment and junctions on the 0.5% AEP floodplain of the Allt na Criche (Granish) is indicative at this time as all options would impact on floodplain topography and replace existing culvert crossings. Precautionary assumptions have been made which are sufficient to assess the potential impact and the need for more detailed assessment of mitigation at Stage 3.
- 10.2.61. Information on public and private water supplies has been provided by Scottish Water and The Highland Council, respectively. It is recognised that private water supply data may not have been accurately registered for all local properties, with limited information provided relating to current use, source type and source locations. Where supply locations are unknown, supplies are assumed to be located within the most likely hydrological catchment associated with the Study Area. Limited ad hoc consultation with a small number of owner-occupiers has been carried out to confirm location and use of water supplies within the scheme area, including those potentially not registered with The Highland Council. A comprehensive survey/consultation of all potential private water supplies within 1km of the Proposed Scheme is planned as part of the Stage 3 assessment.
- 10.2.62. The limitations discussed above are typical of a DMRB Stage 2 Assessment, and the assessment detailed herein is considered to be robust and of an appropriate level of detail to inform the selection of a Preferred Option. As noted above further detailed investigations and assessments will be undertaken at DMRB Stage 3 to inform the design of the Preferred Option.

### 10.3. Baseline Conditions

#### Rainfall

- 10.3.1. The Meteorological (Met.) Office regional climate information locates the Proposed Scheme within the Northern Scotland regional climatic area<sup>xxxvi</sup>. Rainfall across this region varies from over 4000mm per annum near Fort William to less than 700mm per annum along the Moray Firth coast.
- 10.3.2. Data from the Met. Office monitoring station at Aviemore for the 1981–2010 period is provided as Chart 10.1, providing monthly rainfall data. The Aviemore station is located at NGR 2897 8143, at an altitude of 228m AOD, and has a standard annual average rainfall (SAAR) of 977mm.
- 10.3.3. The SAAR at Dalraddy and Slochd Summit has been derived from the Flood Estimation Handbook (FEH). Dalraddy, located approximately 6km to the southwest of the Aviemore weather station, is located at an altitude of 220m AOD and has a SAAR of approximately 850mm. Slochd Summit, located approximately 12km to the northwest of the Aviemore station, is located at an altitude of 405 mAOD and has a SAAR of 1001mm.

**Chart 10.1: Average Monthly Rainfall Data (mm) for Aviemore Met Office Monitoring Station, 1981-2010**

- 10.3.4. The greater rainfall value derived for the Slochd Summit is a reflection of the higher elevation, with prevailing winds from the southwest delivering more precipitation across this higher ground. Monthly rainfall trends across the Study Area would be expected to be similar to that recorded at Aviemore.
- 10.3.5. The UK Climate Projections Report<sup>xxxvii</sup> provides an indication of regional climate trends across the UK taking account of climate change. Within this document probabilistic projections of climate change suggest that Northern Scotland will experience slightly increased temperatures in both summer and winter. This may result in a reduction in summer precipitation and an increase during winter.
- 10.3.6. If climate change leads to drier summers, low flows and water shortages may occur in prolonged periods of dry weather. Increase in winter precipitation could increase the risk of and extent of flooding. Climate change rainfall factors are accordingly included within peak flows and the flood risk assessment.

### Designated Sites

- 10.3.7. In line with DMRB Guidance document 44/09 'Assessment of Implications of European Sites', internationally and nationally designated sites have been identified within 5km of the Proposed Scheme and are summarised in Table 10.4. Several have been screened out due to being not relevant to the water environment assessment, not hydrologically connected to the site, or being sufficiently far upstream as to be unaffected by the Proposed Scheme. Those identified as being hydrologically relevant and connected with the Proposed Scheme have been summarised with reference to SNH Key Site Documents via the SNH Gateway website<sup>xxxviii</sup>.





**Table 10.4: Relevant International and National Designations within 5km of the Proposed Scheme.**

Site Name	Site Description	Scheme Section
Alvie SSSI	<p>Alvie SSSI is located adjacent to the southern end of the Proposed Scheme and its boundary is aligned immediately adjacent to the existing A9 southbound carriageway in several locations. It is 3km southwest of Aviemore at NGR 2858 8094, occupying an area of 339ha and comprises a large area of native woodland, loch and wetland habitats. The Proposed Scheme encroaches upon the designated area in several locations between the southern end of the Proposed Scheme and Lynwilg Farm.</p> <p>There are three lochs within the designated area, with Loch Alvie being the largest. All three lochs are surrounded by inter-connected wetland habitats including a range of diverse fen and mire communities. The notified features of this SSSI includes the hydromorphological mire range and its importance as a breeding area for goldeneye<sup>xxxviii</sup>.</p>	1
River Spey SAC & SSSI	<p>The River Spey is designated as both a SAC and a SSSI with the designated boundaries extending along the majority of the full length of the river. The River Spey flows roughly parallel to and downstream of the Proposed Scheme for approximately 20km. The majority of watercourses crossed by the Proposed Scheme flow directly into this SAC and SSSI.</p> <p>The SAC designated area also extends up several tributaries of the River Spey within the study area and is crossed by the existing A9 at the Allt-na-Criche (Lynwilg) tributary at NGR 2897 8226, the River Dulnain at Carrbridge (NGR 2896 2885) and the Allt Ceatharnach at NGR 2891 8231</p> <p>The River Spey is considered to have very good water quality and supports a variety of freshwater and riparian habitats including beds of shingle, gravel, sand and silt, islands, fringing woodlands and marshes. The SAC qualifying interests for which the site is designated includes its support of populations of otter, freshwater pearl mussel, sea lamprey, and Atlantic Salmon<sup>xxxviii</sup>; which are, likewise, the notified features of the SSSI designation.</p>	2, 3a, 8
Craigellachie SSSI & NNR	<p>Craigellachie is designated as both a SSSI and a NNR and is located immediately adjacent to the existing A9 northbound carriageway at Aviemore for approximately 3km. The designated area is centred on NGR 2882 8121 and occupies 377.7ha.</p> <p>The site is notified for upland birch woodland and for its invertebrate interest, specifically moths. The site also comprises two small lochs, including Loch Puladdern, which is noted as part of the site's intricate mixture of habitats<sup>xxxviii</sup>.</p> <p>The Proposed Scheme encroaches upon much of the designated area's eastern boundary, where Loch Puladdern is located.</p>	3a, 3b
Loch Vaa SPA & SSSI	<p>Loch Vaa is designated as both a SPA and a SSSI which share the same designation boundary. This boundary is aligned immediately adjacent to the southbound side of the A95 road and is within 100m of the Proposed Scheme, separated by the Highland Mainline Railway. It is located</p>	6a





Site Name	Site Description	Scheme Section
	<p>approximately 4km northeast of Aviemore at NGR 2914 8176, occupying an area of 44.6ha.</p> <p>The designated areas surround a small, nutrient poor (oligotrophic) spring-fed loch. The Loch Vaa SPA qualifies by supporting breeding populations of slavian grebe and goldeneye<sup>xxxviii</sup>; which are, likewise, the notified features of the SSSI. The Loch Vaa designated site also features a series of small species-rich bays along the indented shoreline.</p>	

## Surface Water Catchment and Channel Descriptions

- 10.3.8. The Proposed Scheme is located almost entirely within the River Spey hydrological catchment with its northernmost extent just encroaching upon the River Findhorn catchment. The Proposed Scheme crosses several larger tributaries of the River Spey including the River Dulnain and its tributary Allt Ruighe Magaig, the Allt an Fhearna and Allt-na-Criche; in addition to numerous minor burns and ditches which flow directly into the Spey.
- 10.3.9. The interaction and proximity between the Proposed Scheme and these watercourses is illustrated in Figure 10.1 Surface Water.
- 10.3.10. Individual watercourses are discussed below, including summary hydromorphology baseline descriptions; further hydromorphology details are available in Appendix A.10.1 Hydromorphology Assessment.





Scheme Section	River Description	Photograph
2, 3a, 8	<p><b>River Spey</b></p> <p>The River Spey is the longest river in Scotland, rising 2km northwest of Loch Spey in the Monadhliath Mountains at 500m AOD (above Ordnance Datum) and flowing northeast to discharge into the Moray Firth at Spey Bay,). The river drains a total area of 2948km<sup>2</sup>. The river is characteristic of an alpine watercourse with high flow levels often attributed to snow melt. Its upper reaches drain upland landscapes such as open moorland and conifer plantation forestry, with arable agricultural land in lower valley floors. The upper and lower reaches of the watercourse are of a steep gradient and fast flowing with the middle reaches having a gentle gradient with a slower flow.</p> <p>The Proposed Scheme does not cross the River Spey, but is orientated roughly parallel with the river in the vicinity of Aviemore, with the nearest point located 200m southeast of the existing A9 carriageway at NGR 2885 8104. In this area, the river exhibits a gentle channel gradient with a moderate flow and a meandering course. Bed and bank sediments mainly comprise cobbles and gravel with deposition visible on inside channel meanders.</p>	
1	<p><b>Allt an Fhearna</b></p> <p>The Allt an Fhearna has a catchment area of approximately 22.4km<sup>2</sup>, with its headwaters rising on the steep mountainous slopes between An Suidhe, Carn Coire Dhugain and Garbh-mheall which rise to an altitude of 590m AOD. It flows east, across a steep gradient course and is crossed by the existing A9 carriageway at NGR 2854 8092, approximately 700m upstream of its confluence with Loch Alvie at NGR 2859 8095. Loch Alvie drains to the east via the Allt Dibheach, which discharges to the River Spey at NGR 2884 8100.</p> <p>The channel has been historically modified (straightened), but does possess a diverse range of sedimentary features and processes, including mid-channel and marginal gravel bars, riffles and large woody debris. The channel suggests some lateral adjustment and incision occurring upstream of the existing A9 crossing and is considered a sediment exchange system. Downstream the channel is considered a stable transfer system.</p>	









Scheme Section	River Description	Photograph
1	<p><b>Allt Chrìochaidh</b></p> <p>The Allt Chrìochaidh is a small mountainous watercourse rising between the peaks of An Sguabach, Geal-charn Mor and Creag Ghleannain, which reach an altitude of 700m AOD. The catchment is approximately 2.9km<sup>2</sup> draining steep moorland slopes via an incised channel before discharging into Loch Alvie at NGR 2859 8096. Upstream of this confluence the watercourse is crossed by the existing A9 carriageway at NGR 2857 8095.</p> <p>The channel upstream of the crossing has formed a step-pool sequence indicating a reasonable amount of stream power potential but with no evidence of erosion or deposition suggesting a stable transfer system. The channel is significantly modified around the existing crossing (see photo). Downstream of the crossing, there is some evidence of lateral adjustment with some bank erosion, and some incision around the culvert outlet; here the channel is considered to be a stable sediment exchange system.</p>	
1	<p><b>Caochan Ruadh</b></p> <p>The Caochan Ruadh is a small upland watercourse and has a catchment area of approximately 1.83km<sup>2</sup>. It initially drains open moorland, flowing predominantly southeast via a steep, narrow channel prior to flowing through modified field drains and a small network of ponds, before being joined by a smaller tributary stream approximately 35m upstream of the existing A9 crossing at NGR 2866 8101. The burn subsequently discharges to Loch Alvie at NGR 2866 8099.</p> <p>At the existing crossing location the channel is narrow, approximately 1m wide with a shallow channel gradient. Approximately 40m upstream of the existing A9 crossing, a track with a small bridge crosses the watercourse at NGR 2866 8101 (see photo for upstream view). Flows were highly energetic upstream of the crossing location at the time of survey, with a number of chutes and cascades of step features, with some areas of rippled flow. Erosion and bank slips were common along the steeper parts upstream of the channel and there were occasional gravel bars suggesting some lateral adjustment was occurring, but overall the channel was relatively stable. Downstream of the crossing, there were no visible signs of erosion, although there were some large woody material present. At this location the channel is considered to be a stable sediment transfer system.</p>	







Scheme Section	River Description	Photograph
1	<p><b>Ballinluig Burn</b></p> <p>An unnamed tributary of Loch Alvie rises on the south eastern slopes of Creag Ghleannain at 320m AOD and has a catchment area of 1.05km<sup>2</sup>. The watercourse flows predominantly south and is crossed by the existing A9 carriageway at NGR 2869 8102, near Ballinluig, continuing south to discharge to Loch Alvie at NGR 2870 8099. While unnamed on the OS maps this stream is referred to as the Ballinluig Burn throughout this chapter for ease of reference.</p> <p>The channel has been historically straightened and crossed several times by numerous access roads and the A9. Rippled flows were observed upstream of the crossing, with some cascades over infrequent steps, but there was little sign of any fluvial activity, with few areas of erosion and no deposition features. There were few signs of instability and flows were slightly less energetic downstream of the crossing. Overall, the channel is considered to be a stable sediment transfer system.</p>	
2	<p><b>Allt-na-Criche (Lynwilg)</b></p> <p>The Allt-na-Criche has a catchment area of 6.28km<sup>2</sup> and drains headwaters that rise at approximately 630m AOD between the steep slopes of Cairn Creag Ghleannain and Carn Dearg Mor. From its source, the watercourse flows southeast and is crossed by the existing A9 carriageway at NGR 2884 8106. At this crossing the watercourse is heavily modified with a straightened channel and bank modifications. The B9152 and Highland Mainline railway cross the watercourse 50m and 90m downstream of the existing A9 crossing location, respectively, before its confluence with the River Spey at NGR 2885 8104.</p> <p>Upstream of the crossing, there were a number of step-pools and large gravel bars. The channel overall was primarily a sediment transfer system, and largely stable except for some isolated areas of bank failure. Downstream of the crossing, there were few signs of fluvial erosion; however, there were a number of side bars underneath the crossings. The channel appears to be narrowing through the preferential deposition of coarse material, however this may be localised underneath these crossings.</p>	









Scheme Section	River Description	Photograph
4	<p>Aviemore Burn (Steallan Dubh/Milton Burn)</p> <p>The Aviemore Burn has a catchment area of 7.45km<sup>2</sup> and predominantly drains forestry via several smaller tributaries, including the Steallan Dubh and Milton Burn, on the northbound side of the existing A9 carriageway. These tributaries converge upstream of the existing A9 before flowing east to the existing A9 crossing location at NGR 2893 8139. The watercourse then flows south via a straightened and realigned channel that has been diverted to accommodate properties on the western fringe of Aviemore, before flowing southeast through the town to discharge to the River Spey at NGR 2898 8125.</p> <p>There were a range of energetic flows observed, including chute flow over and around boulders, cascades, rippled flow, and some ponding. There were few obvious signs of erosion, and only localised deposits. Overall, the channel is considered primarily to be a stable sediment transfer system.</p>	
4	<p>The Shieling / Easter Aviemore Burn</p> <p>An unnamed tributary of the River Spey with a catchment area of 1.4km<sup>2</sup> drains forest and grassland on the northbound side of the existing A9 carriageway. It flows predominantly southeast towards the crossing location at NGR 2894 8142. From this location the watercourse flows generally east, skirting the Shieling, Easter Aviemore and the northern fringe of Aviemore, before discharging to the River Spey at NGR 2907 8140. While unnamed on the OS maps this stream is referred to as the Shieling / Easter Aviemore throughout this chapter for ease of reference.</p> <p>Step-pools were noted, helping to create chute flow, cascades and rippled flows and overall there was little erosion or deposition to indicate instability. The channel is considered to be functioning as a stable sediment transfer system.</p>	









Scheme Section	River Description	Photograph
5	<p>Allt na Criche (Granish)</p> <p>Allt na Criche rises on the southern slopes of Carn Avie and has a catchment area of approximately 2.94km<sup>2</sup>. The watercourse flows southeast towards Slugganganish, before turning northeast to flow parallel with the northbound carriageway of the existing A9 for approximately 1.2km. Within this reach two separate bifurcating channels branch off from the main stem and flow towards the existing A9, in the vicinity of Slugganganish and Granish respectively. The main stem of the watercourse continues to flow northeast, draining forestry on the south eastern slopes of Carn Avie before the existing A9 crossing at NGR 2901 8157 (photo 1). From this location, the watercourse flows east to drain to Loch nan Carraigan at NGR 2907 8156.</p> <p>Flows in the main channel, in the vicinity of the existing crossing, ranged from rippled to chute flow, and unbroken standing waves were noted in some locations, as well as some ponded flows behind the boulders. There were some areas of erosion noted and some fine sediment deposition along the bed. Overall the channel is considered to be functioning primarily as a stable transfer system.</p> <p>The bifurcated channel near Slugganganish flows southeast away from the main channel, initially in culvert but emerging immediately to the west of the existing A9. It passes under the A9 at NGR 2897 8147, at the same location as an access underpass, before flowing southeast to join the previously discussed unnamed Spey tributary on the northern edge of Aviemore.</p> <p>The bifurcated channel near Granish flows southeast away from the main stem in a banded channel, and passes under the existing A9 carriageway at NGR 2898 8150 in a long culvert. It should be noted that during a visit in April 2016 the channel bunds had been damaged by cattle trampling such that no flow was reaching the A9 culvert, but was ponding in low lying ground in the adjacent field. Although no flow was observed entering the culvert a significant amount of running water could be heard within the culvert, suggesting a possible inflow from the existing A9 drainage. The channel reappears at NGR 2899 8150 flowing via a manmade concrete channel (photo 2) for approximately 6m before being crossed by a track. It then continues to flow southeast and is crossed by the B9152 road at NGR 2900 8149. No channel is shown on OS mapping downstream of this location, however, it is likely that this branch discharges to a small cluster of standing waterbodies, the largest being Lochan Ban, centred on NGR 2902 8150 at Granish.</p>	 







Scheme Section	River Description	Photograph
5	<p><b>Southern Avie Lochan Burn</b></p> <p>An unnamed tributary of Avie Lochan with a catchment area of 1.5km<sup>2</sup> drains forestry on the northbound side of the existing A9 carriageway flowing east to the crossing location at NGR 2902 8164. On the northbound side of the crossing the channel is wide with concrete bed and banks and a large stepped channel bed on the approach to the existing culvert. Downstream of the crossing the channel continues to flow east to discharge to Avie Lochan at NGR 2904 8164.</p> <p>The channel possessed a diverse range of flow types, primarily comprising energetic flows such as chute, cascade, but where sheltered, pond areas were formed. Despite the high energy, there was very little erosion observed; however, some deposition features were noted, mostly corresponding with natural fluvial activity (point bars) and not widespread. Overall, the channel is considered to be functioning as a stable transfer system, with some function as a minor sink for fine sediment.</p>	
5	<p><b>Northern Avie Lochan Burn</b></p> <p>Another small unnamed tributary of Avie Lochan is located approximately 350m north of the previous tributary described, and drains forestry on the northbound side of the existing A9 carriageway. It flows east to its crossing location at NGR 2903 8167. Upstream the gradient is very steep and the channel has been stepped down the slope; there was little flow observed during the walkover survey. Downstream, on the southbound side, there is a small manmade structure which is suspected to be related to water abstraction.</p> <p>The watercourse is too small for a catchment size to be derived using FEH software.</p>	









Scheme Section	River Description	Photograph
6b	<p><b>Allt Cnapach</b></p> <p>Allt Cnapach is a small watercourse with a catchment area of 1.2km<sup>2</sup> that drains forestry on the northbound side of the existing A9 carriageway at Kinveachy. The watercourse flows east to be crossed by the A9 at NGR 2910 8185 and the adjacent Highland Mainline railway. OS mapping and aerial images suggest that the watercourse drains to groundwater at NGR 2913 8184, approximately 350m downstream, east-southeast of the existing crossing.</p> <p>Upstream of the crossing, the channel exhibited energetic and diverse flow types along its course, dominated by a series of cascades over steps. There was minimal evidence of erosion and deposits and overall the channel was a stable transfer. Downstream, the flows were mainly rippled, however the channel became increasingly ponded downstream as the channel becomes increasingly more modified and affected by downstream impoundments. The function relevant to the A9 scheme is considered to be a sediment transfer and downstream sink, overall the channel is considered stable.</p>	
7	<p><b>Feith Mhor</b></p> <p>The Feith Mhor is a tributary of the River Dulnain, rising in the low lying hills to the south east of Carrbridge and the current A9, with an approximate catchment area of 12.1km<sup>2</sup>. The watercourse drains forestry and grassland and predominantly flows northeast to be crossed by the existing A9 at NGR 2908 8207 and then the Highland Mainline railway, approximately 130m downstream. The channel continues to flow northeast to its confluence with the River Dulnain downstream of Carrbridge, at NGR 2943 8241.</p> <p>Upstream of the current A9 crossing, a series of knickpoints were observed with energetic cascades and evidence of incision. Lengths of rippled and smooth running flows, however, are more common, with riffles also present. Downstream the flows become more uniform as the gradient reduces. Large trees were noted to be regulating flows, creating both pooled and rippled flows. The channel on the whole was a stable sediment transfer system.</p>	







Scheme Section	River Description	Photograph
8	<p><b>River Dulnain</b></p> <p>The River Dulnain is a major tributary of the River Spey with an upstream catchment area of 272.2km<sup>2</sup> from the NRFA gauging station 8009<sup>xxxxix</sup> (NGR 2977 8247). Its headwaters rise in the Monadhliath Mountains at an altitude of approximately 800m AOD, flowing northeast towards its confluence with the River Spey at NGR 3004 8238. The River Dulnain is crossed by the existing A9 carriageway at NGR 2897 8226 and then the Highland Mainline railway, approximately 90m downstream.</p> <p>Upstream of the A9 crossing the channel exhibited many large mobile gravel bars and there were few signs of significant active erosion. Flows were energetic and dynamic, with standing waves and rippled flow prevalent. Downstream of the A9 crossing, bank erosion was noted on the Right Hand Bank (RHB) immediately downstream of the railway. The channel is considered overall to be a stable transfer system.</p>	
8	<p><b>Allt nan Ceatharnach (Allt Ruighe Magaig/Baddengorm Burn)</b></p> <p>The Allt nan Ceatharnach has catchment area of 17.2km<sup>2</sup>, and rises on the hills of Carn Loisgte, Creag a' Bhainne and Can a' Chuaille. It is formed from three major tributaries, the Allt Ruighe Magaig, the Allt a' Bhainne and the Bogbain Burn. Draining open grassland and forestry, the burn flows broadly south and is crossed by the Highland Mainline railway at NGR 2892 8233. A further 160m downstream it is crossed by the existing A9 at NGR 2891 8232, before flowing south to its confluence with the River Dulnain approximately 1.2km downstream.</p> <p>In the vicinity of the existing A9 crossing there was a good range of high energy flows, including cascades, broken and unbroken standing waves over the boulder formations and fallen trees; however, there were higher flows than considered normal at the time of the survey. Some bank erosion was noted on the Left Hand Bank (LHB), but mostly appeared quite stable. Terraces on the RHB suggested the channel had previously shifted its course, but there was little evidence to suggest this process was ongoing. Overall, the channel is considered to be a stable transfer system.</p>	









Scheme Section	River Description	Photograph
9	<p><b>Bogbain Burn</b></p> <p>Bogbain Burn is situated at Black Mount and is formed from several headwaters which rise on the southeastern slopes of Carn a' Chuaille and Carn nam Bain-tighearna, which subsequently converge to the north of the Highland Mainline railway. The burn then flows broadly southeast through forestry plantation, roughly parallel with the existing A9, and is crossed several times by the railway and the A938 before joining the Allt nan Ceatharnach at NGR 2888 8239.</p> <p>Although not crossed by the existing A9 the Bogbain Burn lies close to several of the Proposed Black Mount Junction Options. In this area (NGR 2871 8243) the burn is confined within a narrow, steep sided valley and was approximately 2m wide with a cobble and gravel bed.</p>	
10,11	<p><b>Slochd Mhuic (Allt an Aonaich)</b></p> <p>The Slochd Mhuic has a catchment area of 7.3km<sup>2</sup> draining upland moor and forestry. A heavily modified section of the headwater drains Slochd Summit, flows southeast, and is crossed several times over a distance of approximately 1.3km by the existing A9 carriageway (NGR 2841 8250, NGR 2838 8254, NGR 2835 8256 and NGR 2835 82567). The watercourse continues south, running broadly parallel to the existing A9, to the confluence with Allt Ruighe an t-Sabhail, at NGR 2843 8243. From here the Slochd Mhuic flows predominantly south for approximately 4km, converging with several large streams to become the Allt an Aonaich, which converges with the River Dulnain at NGR 2864 8217.</p> <p>The headwaters of the burn are very heavily modified where it criss-crosses the existing A9, Highland Mainline railway and cycle path, with 7 culverts of varying lengths, several straightened reaches, a concrete channel over 400m long and several piped inflows from existing road and rail discharges and one cascade chamber.</p> <p>Downstream of the heavily modified reach the observed flows were mainly rippled, with some cascades over boulders and some very small steps. Overall there was no erosion and little deposition, except for some fine sediment on the bed. The channel did not possess the capacity to undertake any fluvial activity and was mostly a stable sediment transfer system.</p>	






Scheme Section	River Description	Photograph
		
11	<p>Allt Cosach</p> <p>Allt Cosach is a small tributary of the River Findhorn and is located within 200m of the Proposed Scheme at its northern extent. A small headwater drain rises adjacent to the existing A9, is crossed by the Highland Mainline Railway, and joins the main headwater approximately 350m downstream. The Highland Mainline Railway remains between the A9 and the watercourse as the Allt Cosach flows northwest, roughly parallel with the A9 for approximately 400m before continuing to flow northwest beyond the Proposed Scheme and to converge with the River Findhorn approximately 3km downstream at NGR 2806 8287.</p>	







Scheme Section	River Description	Photograph
11	<p><b>The River Findhorn</b></p> <p>The River Findhorn is one of the longest rivers in Scotland, with headwaters rising in the Monadhliath Mountains at 940m AOD (above Ordnance Datum), approximately 23km southwest of Slochd, flowing generally northeast to the Moray Firth. The catchment drains a total area of 786km<sup>2xxx</sup>, with the Proposed Scheme interacting indirectly via the Allt Cosach tributary.</p> <p>The upper reaches of this catchment drains land characterised by upland landscapes such as open moorland and conifer plantation forestry, with channel morphology often of steep gradient and typically flashy.</p> <p>The River Findhorn is crossed by the existing A9 dual carriageway at NGR 2808 8290, approximately 200m downstream of the Findhorn Viaduct Highland Mainline crossing. In this area the River Findhorn is characterised by a meandering, moderate gradient channel, wide floodplain, cobble, gravel and boulder bed, and pool and riffle sequences. At the existing A9 carriageway crossing location, the channel width is approximately 20m.</p>	



## Surface Water Flow Patterns

- 10.3.11. Surface water drainage patterns in the study area include a number of small artificial drainage channels and minor natural watercourses which drain to larger watercourses, including the main channels of the River Spey and River Findhorn. Watercourse flow values vary depending on the size of watercourse catchment, seasonality and due to characteristics within each catchment, such as rainfall, and underlying soils and geology.
- 10.3.12. Two notable SEPA gauging stations are located downstream of the Proposed Scheme. The River Spey at Boat of Garten (NGR 2946 8192) is located approximately 9.5km downstream from the Proposed Scheme, and has a hydrological catchment area of 1267.8km<sup>2</sup>. The River Dulnain at Balnaan Bridge (NGR 2977 8247) is located approximately 11km downstream of the Proposed Scheme crossing location of the River Dulnain, and has a hydrological catchment of 272.2km<sup>2</sup>. NRFA gauged data<sup>xxxix</sup> for the Spey at Boat of Garten reports a mean flow of 29.33m<sup>3</sup>/s and a Q<sub>95</sub> low flow (i.e. the flow exceeded 95% of the time) of 8.55m<sup>3</sup>/s, and for the Dulnain at Balnaan Bridge a mean flow of 6.04m<sup>3</sup>/s, and Q<sub>95</sub> of 1.1m<sup>3</sup>/s, as shown in Table 10.5.
- 10.3.13. For the smaller ungauged watercourses within the study area theoretical runoff rates have been estimated for the full extent of each defined stretch of catchment, i.e. for the flow of the Allt-na-Criche (Lynwilg) upstream of meeting the River Spey. Peak flows have been estimated using the Flood Estimation Handbook<sup>xxx</sup>. Catchment characteristics have been used with the 'FEH Rainfall-Runoff' method to derive a range of peak flow return periods. It is recognised that the FEH rainfall-runoff method may not be the best estimation method for some watercourses, depending on their size and other attributes, however for general characterisation of the watercourses these approximate flow values are considered suitable. Low flow measurements have been determined from the LowFlows 2 software and are quoted as Q<sub>95</sub> (i.e. the flow exceeded 95% of the time). Mean flows have also been determined from the LowFlows 2 software. This data is shown in Table 10.5. Note that the Northern Avie Lochan Burn is too small for a catchment size to be derived using FEH software to enable subsequent flow calculations.



**Table 10.5: Estimated Watercourse Flow Values**

Watercourse	Approx. Catchment Area (km <sup>2</sup> )	Mean Flow Q <sub>mean</sub> (m <sup>3</sup> /s)	Low Flow Q <sub>95</sub> (m <sup>3</sup> /s)	Peak Flow (m <sup>3</sup> /s) Return Periods (yrs)						
				5	10	25	50	100	200	200 +CC
River Spey at Boat of Garten	1268	29.33*	8.55*	620	735	898	1035	1168	1325	1590
Allt an Fhearna	22.4	0.50	0.106	17.5	20.7	25.6	30.4	35.1	40.6	48.7
Allt Chrioichaidh	2.9	0.07	0.018	3.1	3.7	4.4	5.2	6.1	7.1	8.5
Caochan Ruadh	1.8	0.04	0.009	1.9	2.2	2.8	3.2	3.7	4.3	5.2
Ballinluig Burn	1.1	0.02	0.004	0.9	1.1	1.4	1.6	1.8	2.2	2.6
Allt-na-Criche (Lynwilg)	6.2	0.14	0.036	5.8	6.9	8.5	9.8	11.4	13.2	15.9
Aviemore Burn	7.3	0.15	0.025	6.5	7.7	9.4	11.2	12.9	14.9	17.9
The Shieling / Easter Aviemore	1.4	0.02	0.004	1.0	1.1	1.4	1.6	1.9	2.3	2.7
Allt na Criche (Granish)	3.0	0.06	0.011	3.2	3.8	4.7	5.6	6.5	7.6	9.1
Southern Avie Lochan Burn	1.5	0.03	0.005	1.8	2.1	2.6	3.1	3.6	4.3	5.1
Allt Cnapach	1.2	0.02	0.005	1.6	1.9	2.4	2.8	3.2	3.7	4.5
Feith Mhor	12.1	0.16	0.031	6.6	7.8	9.7	11.7	13.5	15.7	18.8
River Dulnain at Balnaan Bridge	272	6.04*	1.1*	136	162	202	235	267	305	366
Allt nan Ceatharnach	17.2	0.35	0.045	15.4	18.3	22.9	26.9	30.9	35.9	43.1
Bogbain	6.4	0.13	0.017	5.7	6.8	8.5	10.0	11.4	13.3	15.9
Allt an Aonaich	21.1	0.43	0.069	17.3	20.6	25.6	30.3	34.8	40.2	48.2
Slochd Mhuic	7.3	0.15	0.023	9.6	11.5	14.2	16.7	19.3	22.4	26.8
Allt Cosach	3.8	0.07	0.010	4.4	5.2	6.5	7.7	8.8	10.2	12.2
River Findhorn at Shenachie	415	14.04	2.13	256	305	377	442	517	607	728

\* Actual measured values



- 10.3.14. The Hydrology of Soil Types (HOST) is a hydrologically-based classification of soils on the basis of their physical properties and their effects on the storage and transmission of water. It makes use of the fact that the physical properties of soils have a major influence on the hydrological response of a catchment. Other parameters can then be derived from the HOST classification. For the purposes of hydrological assessment the Baseflow Index (BFI) and Standard Percentage Runoff (SPR) are the most useful parameters. BFI is the long-term ratio of baseflow to total stream flow, where baseflow represents the contribution to total flow from groundwater. BFI values range from 0.1 in relatively impermeable clay catchments to 0.99 in highly permeable chalk catchments. A very low BFI of 0.15 represents a flashy catchment with minimal storage, low BFI values (e.g. 0.3) indicate a catchment with little storage and active runoff, a BFI of 0.7 (or greater) indicates a significant contribution to flow from a major aquifer. SPR is the average percentage of rainfall that causes the short-term increase in flow seen at a catchment outflow following a storm event.
- 10.3.15. Using the Flood Estimation Handbook<sup>xxx</sup>, the watercourses noted in Table 10.5 have BFI-HOST values ranging between 0.325 – 0.668, with the smaller watercourses generally exhibiting values at the lower end of this range. These outcomes indicate moderate contribution from stored water sources, such as underlying sands and gravels. Smaller watercourses will respond fairly quickly to rainfall events, with a moderate lag time between rainfall occurring and increased stream flow values.
- 10.3.16. The SPR value for the same watercourses range from 29.6 - 53.7%, indicating a moderately flashy response to rainfall, attenuated by local conditions, potentially including forestry cover. The smaller watercourses generally exhibit the greater SPR values, indicating the local geological conditions are less permeable (including underlying peatland) and are more likely to be affected by flash rainfall events. This is typical for smaller watercourses draining the higher altitude areas of upland catchments, which tend to have steeper channel gradients and demonstrate rapid response in flow conditions during and following heavy rainfall events (known as 'flashy').

## Flood Risk

- 10.3.17. There are 44 existing watercourses crossing under the A9 carriageway within the Proposed Scheme extents, which all discharge into River Spey catchment. Of the 44 watercourse crossings there are 18 which are identified on the digital river network and 34 are shown on the 1:10,000 OS Map. An additional 10 crossings were identified from the topographical survey and site visit information.
- 10.3.18. Hydraulic models (1 dimensional) have been used to estimate the existing watercrossing capacity. There are 31 crossings where the current capacity restricts flow downstream of the crossing, the sensitivity of the flood risk receptors associated with each of these watercrossings is summarised in Table 10.6 below. There are 2 structures which were not assessed for capacity due to limitations in the topographical survey. All other crossings can convey the 0.5% AEP event and have therefore been scoped out of further assessment.
- 10.3.19. The SEPA Flood Maps have been reviewed to aid in identification of the floodplains within the study areas. Following modelling of selected watercourses and floodplains by AMJV the floodplain extents have been refined as discussed in Table 10.7 below. This table also provides a summary of receptors sensitive to flood risk for each watercourse/floodplain. Figure 10.1 Surface Water shows the floodplain extents for the SEPA Medium flood risk scenarios and the AMJV 0.5% AEP, for baseline conditions i.e. with the existing A9.



**Table 10.6: Culvert Capacity Receptor Sensitivity**

Section	Watercourse Crossing ID	Watercourse Name	Overall Catchment	Downstream Sensitive Receptor	Sensitivity
1	DS-WC-004	Caochan Ruadh	Loch Alvie	Rural Land, with land classification as land capable of producing a narrow range of crops.	Low
2	DS-WC-005A	Unnamed drain (Allt Dibheach Catchment)	River Spey	Rural land associated with Lynwilg Farm, with land classification as land capable of moderate crop ranges and good yields.	Medium
3a	DS-WC-010 DS-WC-011	Loch Puladdern	River Spey	Rural Land, with classification as land capable of producing a narrow range of crops.	Low
3b	DS-WC-013	Unnamed Drain	Aviemore Burn	Craigellachie National Nature Reserve. Forestry land.	Medium
4	DS-WC-013A	Unnamed Drain	Aviemore Burn	Aviemore Residential and Non Residential properties.	High
4	DS-WC-014	Aviemore Burn	Aviemore Burn	Aviemore Residential and Non Residential properties, the former Aviemore Primary School	High
4	DS-WC-016	The Shieling / Easter Aviemore Burn	River Spey	Rural grasslands of Easter Aviemore. Land use is grazing and rough pasture.	Low
5	DS-WC-017	Southern bifurcation of Allt na Criche (Granish)	River Spey	Land use is a mixture of forestry and agricultural land associated with Granish Farm	Low
5	DS-WC-019	Northern bifurcation of Allt na Criche (Granish)	Allt na Criche (Granish)	Rural grassland and General Wades Military Road.	Low
5	DS-WC-022	Allt na Criche (Granish)	Allt na Criche (Granish)	Forestry commission land.	Medium
5	DS-WC-023	Unnamed Drain	Avie Lochan	Forestry commission land. Discharges to Avielochan.	Medium





Section	Watercourse Crossing ID	Watercourse Name	Overall Catchment	Downstream Sensitive Receptor	Sensitivity
5	DS-WC-024	Southern Avie Burn	Avie Lochan	Forestry commission land. Discharges to Avielochan	Medium
5	DS-WC-026	Northern Avie Lochan Burn	Avie Lochan	Residential Properties at Avielochan	High
6a	DS-WC-027	Unnamed Drain	Loch Vaa	Agricultural Land. No land classification	Low
6a	DS-WC-028	Unnamed Drain	Loch Vaa	Agricultural Land No Classification	Low
6b	DS-WC-032	Allt Cnapach	Allt Cnapach	Highland Mainline Railway	High
6b	DS-WC-035	Unnamed Drain	Gormack Stripe	Highland Mainline Railway	High
7	DS-WC-035A	Unnamed Drain	Gormack Stripe	Forestry Land	Medium
7	DS-WC-036	Feith Mhor	Feith Mhor	Forestry Commission Land	Medium
7	DS-WC-041	Unnamed Drain	Feith Mhor	Forestry Commission Land	Medium
7	DS-WC-043	Unnamed Drain	Feith Mhor	Forestry Commission Land	Medium
8	DS-WC-045	Unnamed Drain	River Dulnain	Highland Mainline Railway and Carrbridge train station	High
9	DS-WC-049	Unnamed Drain	Allt nan Ceatharnach	Forestry Land	Medium
9	DS-WC-050	Unnamed Drain	Bogbain Burn	Grass and Scrub land	Low
9	DS-WC-052	Unnamed Drain	Bogbain Burn	Grass and Scrub land	Low
9	DS-WC-053	Unnamed Drain	Allt Slochd Mhuic	Grass and Scrub land	Low
10	DS-WC-055	Unnamed Drain	Allt Slochd Mhuic	Steep hillside consisting of grass and scrub land.	Low
11	DS-WC-060	Unnamed tributary of Slochd Mhuic	Allt Slochd Mhuic	Steep hillside within a rock outcrop	Low
11	DS-WC-061	Slochd Mhuic	Allt Slochd Mhuic	National Cycle Track	High
11	DS-WC-062	Slochd Mhuic	Allt Slochd Mhuic	Grass and Scrub Land	Low







**Table 10.7: Floodplain Receptor Sensitivity**

Scheme Section	Floodplain	Floodplain Description	Flood Risk Receptors	Sensitivity
1	Allt an Fhearna	<p>The floodplain of the Allt an Fhearna is constrained through forested areas until approximately 15m upstream of the confluence with Allt Each. At this location the Allt an Fhearna appears to be spilling to both the left and right bank, with potential interaction of floodwater from the Allt Each and Allt an Fhearna, upstream of the confluence.</p> <p>Downstream of the Allt Each confluence the Allt an Fhearna floodplain appears to be primarily located on the left bank following the 245m contour, maintaining a constant width. As the channel flows toward the crossing of the existing A9 the floodplain begins to increase in width and flows along the toe of the A9 embankment. In this area the AMJV floodplain is narrower than the SEPA floodplain extents</p> <p>Downstream of the A9 crossing the Allt an Fhearna flows to Loch Alvie with the floodplain widening from 40m to approximately 300m and following the shape of the 220m contour. In this area the AMJV floodplain is similar in extent and shape to the SEPA Medium Likelihood flood map.</p>	Agricultural Land	Medium
1	Loch Alvie	<p>Loch Alvie is approximately 500m downstream of the existing A9. At Loch Alvie, the flood extents generally surround the loch, with the AMJV modelling indicating that the floodplain extent is uniformly wider than the area of flooding shown on the SEPA Medium Likelihood flood map.</p> <p>Along the existing A9 route corridor a minimum distance of 20m is maintained between the A9 and flood extents.</p> <p>To the south of Loch Alvie the floodplain width increases to inundate the B9152, with residential and non-residential properties potentially being inundated at NGR 2867 8091.</p>	B9152	High
			Residential & Non Residential Properties	High
			Agricultural Land	Medium
			Grasslands	Low
2, 3a	Allt na Criche (Lynwilg)	<p>The modelling shows that the floodplains upstream of the A9 are constrained by the valley and follows the 225m contour. It remains a relatively constant width on the approach to the existing A9 crossing.</p> <p>The floodplain width increases on approach to the B9152 and again on the Highland Mainline Railway, this is due to a reduction in channel capacity at these locations. The flood extents at these locations are slightly greater than those shown on the SEPA Medium Likelihood flood outlines, although there are no additional third parties receptors identified.</p> <p>In addition to the fluvial flood extents, the modelling has identified two locations where surface water ponding would occur at the 0.5% AEP. These are located at Lynwilg Farm immediately upstream of the A9, on both the east and west of the Allt na Criche (Lynwilg)</p>	Agricultural land	Medium
			Grassland	Low
			B9152	High
			Highland Mainline Railway	High
4	Aviemore Burn			





Scheme Section	Floodplain	Floodplain Description	Flood Risk Receptors	Sensitivity
		<p>The Aviemore Burn is fed by three main tributaries including Milton burn, Steallan Dubh and Allt Dubh draining the slopes of Carn Dearg Mor (712mAOD). The SEPA flood maps show that there is limited flood risk at the upstream extents of the tributaries and becomes defined at the confluence, 500m from the crossing of the A9. The AMJV floodplain modelling shows that there are differences in the SEPA and AMJV floodplains and flow pathways along the existing A9 between chainage 7400 and 7600 (NGR 2893 8139 and NGR 2892 8137).</p> <p>The Aviemore Burn comes out of bank on both the left and right bank upstream of the A9 Crossing (DS-WC-014), and flows both north and south along the line of the existing A9. These flood flows are conveyed through the existing A9 underpasses and cattle-creeps (A9 1150 C87, unnamed at NGR 2893 8137, and A9 1162) and subsequently over land to the east of the A9 to rejoin the Aviemore Burn channel. The channel then continues through Aviemore with no defined floodplain before its confluence with the River Spey</p> <p>There are several residential and non-residential receptors within the AMJV flood outline. Historical flooding information also indicates the former Aviemore Primary School has flooded in the past, although no information is available on the source of flooding. Additionally the former school is located some 350m east of the burn and outwith the 0.5%AEP floodplain. It is therefore unlikely to be affected by the Proposed Scheme but has been considered here as a precaution.</p>	Residential & Non Residential Properties including the former Aviemore Primary School	High
			Grassland	Low
4	The Shieling/Easter Aviemore Burn	The Shieling/Easter Aviemore Burn, is not shown on the SEPA Medium Likelihood flood outline. The AMJV floodplain extents are approximately 4m wide and are well contained to the channel. Receptors are restricted to agricultural land in the immediate vicinity of the channel.	Agricultural Land	Medium
			Grassland	Low
5	Allt na Criche (Granish)	<p>The Allt na Criche (Granish), and the two separate bifurcating channels, are not shown on the SEPA Medium Likelihood flood outline. The AMJV floodplain modelling shows that the Allt na Criche (Granish) spills onto the right bank immediately upstream of the northern bifurcation channel (NGR 289662, 815130) and along the length of the northern bifurcation channel. The floodplain extents on the right bank of the bifurcating channel varies between 25m to 100m, and flows towards and overtops the A9 at two locations NGR 2898 8149, and 2898 8149.</p> <p>This flow pathway continues towards the B9152, connecting with the southern bifurcation channel of Allt na Criche, at Granish Farm.</p> <p>Immediately downstream of the of the bifurcating channel, the Allt na Criche spills onto the right bank for approximately 100m and flows towards and overtops the A9 at 2898 8150.</p>	Forestry Commission Land	Medium
			A9	High
			B9152 road to the east of Granish	High





Scheme Section	Floodplain	Floodplain Description	Flood Risk Receptors	Sensitivity
		<p>The extent of overtopping of the A9 at this location is 40-50m. It continues to flow north east and surrounds the Residential Property.</p> <p>Between 2898 8153 and 2901 8156 the Allt na Criche floodplains are constrained by the surrounding topography with the floodplain width varying between 10 and 20m.</p> <p>Downstream of the A9 the floodplain extends between 20-40m with no preferential spill direction.</p> <p>There are several receptors to flooding in this area including the A9, B9152, General Wades Road, and both residential and non residential properties.</p>	<p>Residential &amp; Non Residential Properties at Red Stag Lodge (off General Wade's Road)</p>	High
			Grassland between the A9 and B9152	Low
7	Feith Mhor	<p>The SEPA flood maps show no flooding on the Feith Mhor upstream of the existing A9 crossing. However the AMJV flood extents indicate the floodplain upstream of the A9 watercourse crossing DS-WC-036 is approximately 70m wide.</p> <p>Downstream of the A9 the floodplain is approximately 250-300m wide in the land between the A9 and the Highland Mainline railway. This is significantly larger than the SEPA flood extents.</p>	<p>Forestry Commission Land</p>	Medium
			Highland Mainline Railway	High
8	River Dulnain	<p>The River Dulnain drains a catchment of approximately 190km<sup>2</sup> with a defined network of functional floodplain within the upstream extent. The rural areas within the upstream extent contain no known receptors with approximate floodplain extents reaching 120m. In this area the SEPA and AMJV flood extents are generally similar.</p> <p>As the River Dulnain approaches the A9 there are differences in the SEPA and AMJV flood extents, with the SEPA flood outline extending south of the Dulnain. However the AMJV extents show that flow is contained close to the channel on the approach to the existing A9 crossing (DS-WC-046) with limited floodplain in this area.</p> <p>Downstream of the A9 and Highland Mainline crossing towards Carrbridge there is little to no floodplain with most flow remaining in channel.</p>	Agricultural Land	Medium
8	Allt nan Ceatharnach	<p>Allt nan Ceatharnach is fed by several watercourses that include Allt Ruighe Magaig, Allt a Bhainne and Bogbain Burn. The SEPA flood extents indicate an increased area at risk of flooding at the confluence of these burns, in the vicinity of the A938 and the HML railway.</p> <p>Functional floodplain extents are reduced in the vicinity of the A9 crossing and are constant until the confluence with the River Dulnain begins to have a hydraulic influence.</p>	Agricultural Land	Medium



- 10.3.20. The SEPA Flood Map for groundwater shows that there is mostly no likelihood of flooding from groundwater, within the Proposed Scheme. There is an area south of Carrbridge at Kinveachy which has been classified as low likelihood of flooding from groundwater.
- 10.3.21. There is no expectation of flooding from groundwater. However, groundwater often acts as a contributing factor to flooding rather than the primary source, for example groundwater flows contribute to river baseflows. Chapter 9: Geology, Soils and Groundwater details the hydrogeology of the study area, with the Hydrogeological Map of Scotland indicating that the glaciofluvial sands and gravels found in the river valleys represent high productivity aquifers.
- 10.3.22. SEPA has also published flood mapping showing the likelihood of flooding from surface water, these were reviewed on the SEPA website. The surface water flood maps show that there are some relatively small localised pockets of flooding on and adjacent to the A9 between Aviemore and Carrbridge, with high likelihoods of flooding shown on the A9 at Dalraddy and Crannaich.

### Standing Water

- 10.3.23. Details of the standing waters within the study area are summarised in Table 10.8 below.

**Table 10.8: Standing Water Descriptions**

Scheme Section	Standing Water Description
1	<p>Loch Beag</p> <p>Loch Beag is a small standing water body with a surface area of approximately 32,000m<sup>2</sup> (0.03km<sup>2</sup>) located within the Alvie SSSI, upstream to Loch Alvie, centred on NGR 2861 8093. The loch is drained by a small outflow on its north western shore, approximately 450m southeast of the Proposed Scheme, which discharges to Loch Alvie 60m downstream.</p>
1	<p>Loch Alvie</p> <p>The largest standing water body in the study area is Loch Alvie with a surface area of 600,000m<sup>2</sup> (0.6km<sup>2</sup>). The loch and its surrounding area is designated as SSSI and is located southeast of the existing A9 carriageway with the B9152 road and Highland Mainline railway positioned immediately to its southeast. The loch is situated within 50m of the Proposed Scheme at its closest point.</p> <p>The Proposed Scheme crosses several inflows to Loch Alvie including the Allt an Fhearna and Caochan Ruadh. Loch Alvie has a small outflow channel in the southeast at Alvie Bridge (NGR 2871 8093) called the Allt Dibheach. This flows east to a small lochan (known as Bogach), located within a larger area of bog before draining to the north and discharging to the River Spey at NGR 2884 8101.</p>
1,2	<p>Bogach</p> <p>Bogach is a small standing water body with a surface area of 61,000m<sup>2</sup> (0.06m<sup>2</sup>) and is centred on NGR 2881 8096, within a shallow marshland area located within the Alvie SSSI. The water body is 1.1km downstream of Loch Alvie and is approximately 300m to the southeast of the Proposed Scheme. The water body is drained by several small watercourses which collect on the northern shore of the marshland and flow northeast to converge with the River Spey at NGR 2884 8101, approximately 280m downstream.</p>
3a, 3b	Loch Puladdern and Tributary Loch



Scheme Section	Standing Water Description
	<p>Loch Puladdern and a connected unnamed loch are situated within the Craigellachie National Nature Reserve and SSSI. Loch Puladdern is centred on NGR 2891 8121 and has a surface area of approximately 8,000m<sup>2</sup> (0.008km<sup>2</sup>). Its eastern extent borders the existing A9 northbound carriageway embankment which forms its shoreline, with a culvert inlet and a road drainage outfall pipe located in the vicinity of NGR 2891 8121. The culvert outlet drains to a small pond which is centred on NGR 2892 8121, in the grounds of the MacDonald Resort.</p> <p>The unnamed water body to the northwest (centred on NGR 2888 8124) of Loch Puladdern drains via a small unnamed watercourse, flowing east then south, approximately 270m to converge with Loch Puladdern at NGR 2891 8122. This unnamed water body has a surface similar to that of Loch Puladdern and is located 210m west of the Proposed Scheme.</p>
5, 6a	<p>Avie Lochan</p> <p>Avie Lochan is a small water body with a surface area of approximately 70,000m<sup>2</sup> (0.07km<sup>2</sup>), centred on NGR 2907 8165, approximately 200m east of the existing A9 southbound carriageway. The loch is split by the existing A95 in its south western extent, with the small hamlet of Avielochan situated on its northern shoreline. Two small watercourses, flowing east from their sources on the north eastern slopes of An Leth-chreag, are crossed by the existing A9 carriageway at NGR 2902 8164 and NGR 2904 8167, and discharge into the loch on its northwest and southwest shoreline.</p>
6a	<p>Loch Vaa</p> <p>Loch Vaa is designated as a SPA and a SSSI, and is located approximately 300m east of the existing A9 carriageway. The loch is centred on NGR 2914 8175 and has a surface area of approximately 158,000m<sup>2</sup> (0.16km<sup>2</sup>). The loch is surrounded by dense forestry with no significant tributaries or outflows featured on OS mapping.</p>
6b	<p>Loch Roid</p> <p>Loch Roid is located approximately 700m northeast of the small settlement of Kinveachy and 760m east of the existing A9 carriageway at its nearest point. It has a surface area of approximately 30,000m<sup>2</sup> (0.03km<sup>2</sup>) with open moorland and forestry characterising its shoreline</p>
1, 3a, 3b, 5, 6a, 6b, 9, 11	<p>Ponds</p> <p>A number of undesignated ponds, each of less than 3000m<sup>2</sup> in surface area have been identified within 250m of the Proposed Scheme. Notable examples include a cluster of small ponds at Ballinluig, centred on NGR 2862 8101, located approximately 140m from the Proposed Scheme and a small pond in the grounds of the MacDonald Aviemore Resort (NGR 2892 8121) within 25m of the existing southbound A9 carriageway.</p> <p>There are a number of ponds east of the A95 north of Aviemore, including Lochan Ban (NGR 2903 8151) as well as numerous small unnamed ponds. These ponds are likely to be supplied via a combination of surface runoff, direct rainfall and also from groundwater/spring flows, with specific inflows influenced by local conditions.</p> <p>The nature conservation value of these ponds is judged to be of local importance (Chapter 11: Ecology and Nature Conservation). The flow attenuation value of these ponds is currently unknown, but they may provide a drainage or flood relief function.</p>



## Surface Water Quality

- 10.3.24. The WFD is a risk-based classification system. This highlights such issues as stream morphology and existing artificial structures in addition to chemical water quality and ecological diversity. Heavily modified water bodies, which can no longer be considered to be natural, are classified on the basis of 'ecological potential'. The WFD applies to all surface waters, but for practical purposes, SEPA has defined a size threshold above which a river or loch qualifies automatically for characterisation. For lochs, the threshold is a surface area of 0.5km<sup>2</sup> and rivers must have a catchment area of 10km<sup>2</sup> or more. In addition to these larger water bodies, smaller waters have been characterised where there is justification by conservation interests and to meet the requirements of regulatory legislation such as for drinking water supplies. All surface water bodies have an objective to meet or exceed 'Good' overall status by 2027<sup>xl</sup>.
- 10.3.25. One reach of the River Spey and of the River Findhorn, within the study area, have been characterised under WFD, with larger tributaries of the River Spey also characterised as outlined in Table 10.9 and shown in Figure 10.2. The WFD status of these water bodies is taken from the most recent data available on the SEPA website, year 2014.
- 10.3.26. Note that references to the Allt an Fhearna for the purpose of WFD status uses the SEPA WFD Water Body spelling: Allt an Fearna.





**Table 10.9: Current Water Framework Directive Status of Surface Waters, 2014.**

Hydrological Catchment	River Spey	Allt an Fhearna	Allt Dibheach	Allt Dibheach	River Dulnain	Feith Mhor	Allt nan Ceatharnach	Slochd Mhuic	River Findhorn
SEPA Water Body Name	River Spey – R. Feshie to R. Nethy	Allt na Fearna – u/s Loch Alvie	Loch Alvie	Allt na Fearna – d/s Loch Alvie	River Dulnain – lower catchment	River Dulnain – Feith Mhor	River Dulnain – Allt Ruighe Magaig	River Dulnain – Allt an Aonaich	River Findhorn – Tomatin to Garbole
Water Body Type	River	River	Lake/Loch	River	River	River	River	River	River
Water Body ID	23097	23126	100181	23125	23106	23113	23112	23110	23012
Heavily Modified	No	No	No	No	No	No	No	No	No
Overall status (2014)	Moderate	Poor	Good	Good	Good	Poor	Good	Good	Good
Overall ecology	Moderate	Poor	Good	Good	Good	Poor	Good	Good	Good
Physico-chem	Good	Good	High	Good	High	High	High	High	Unreported
pH	High	Good	Unreported	Good	High	High	High	High	Unreported
Dissolved Oxygen	High	High	High	High	High	High	High	High	Unreported
Biological elements	Good	Poor	High	High	High	Poor	High	High	High
Fish	Good	Poor	Unreported	High	High	Poor	High	High	High
Fish ecology	Unreported	Unreported	Unreported	Unreported	High	Unreported	Unreported	Unreported	Unreported
Fish barrier	Good	Poor	High	High	High	Poor	High	High	High
Specific pollutants	Unreported	Unreported	Unreported	Unreported	Pass	Unreported	Unreported	Unreported	Unreported
Hydromorphology	Moderate	Good	Good	High	Good	Good	Good	Good	Good
Morphology	Moderate	Good	High	High	Good	Good	Good	Good	Good
Overall Hydrology	Good	High	Good	High	High	High	High	High	High
Hydrology (medium/high flows)	Good	High	n/a	High	High	High	High	High	High





Hydrological Catchment	River Spey	Allt an Fhearna	Allt Dibeach	Allt Dibeach	River Dulnain	Feith Mhor	Allt nan Ceatharnach	Slochd Mhuic	River Findhorn
SEPA Water Body Name	River Spey – R. Feshie to R. Nethy	Allt na Fearna – u/s Loch Alvie	Loch Alvie	Allt na Fearna – d/s Loch Alvie	River Dulnain – lower catchment	River Dulnain – Feith Mhor	River Dulnain – Allt Ruighe Magaig	River Dulnain – Allt an Aonaich	River Findhorn – Tomatin to Garbole
Hydrology (low flows)	High	High	n/a	High	High	High	High	High	High



- 10.3.27. As shown on Table 10.9, the majority of the local water bodies have been classified as having 'Good' status, with the exception of three:
- River Spey (River Feshie to River Nethy) which has been classified as Moderate due to morphological alterations to the bed and banks of the watercourse;
  - Allt na Fearna (upstream of Loch Alvie) which has been classified as Poor due to barriers to fish migration; and,
  - River Dulnain (Feith Mhor) which has been classified as Poor due to barriers to fish migration.
- 10.3.28. For water bodies that have not been classified, the normal convention is to assume a classification based on downstream or adjacent water bodies, unless there are specific indications to the contrary. On this basis the Allt Chrìochaidh, Caochan Ruadh and the Ballinluig Burn are considered to have Good status as per Loch Alvie.
- 10.3.29. Similarly the Allt-na-Criche (Lynwilg), Aviemore Burn and the Shieling / Easter Aviemore Burn are considered to have Moderate status as per the River Spey. This is considered an appropriate assessment as each burn has an element of morphological alteration, in similarity to the River Spey.
- 10.3.30. The Allt na Criche (Granish), the Avie Lochan Burns, and the Allt Cnapach, do not drain to a WFD classified surface waterbody as they drain to groundwater, in some cases via unclassified lochs or ponds. In this instance it is assumed that these watercourses have Good status, given their rural location and relatively unmodified appearance.
- 10.3.31. The Bogbain Burn, Slochd Mhuic and Allt Cosach are each considered to have Good status, based on the status of their respective downstream watercourses.
- 10.3.32. Watercourses in the Study Area have been identified as ranging from High to Very High sensitivity in relation to water quality. In the case of the Feith Mhor, given its overall WFD status of Poor is attributed to barriers to fish migration, and that its physicochemical elements suggest high water quality, professional judgement has influenced the decision to upgrade its sensitivity from low to high. This is further supported by hydrological survey information and photography in the absence of specific biodiversity survey information in this case.
- 10.3.33. Hydromorphological sensitivity has been evaluated with reference to the SEPA hydromorphology classification under WFD and the A10.1 Hydromorphology Assessment, which applies the Sensitivity Criteria provided in Section 10.2. Individual watercourses in the study area have sensitivities ranging from low to high.
- 10.3.34. Standing water bodies including lochs, lochans, and larger ponds have been evaluated taking into account their designated status and WFD status as outlined in the Sensitivity Criteria, and in some cases have been assigned to a WFD status based on nearby water bodies' classifications, where appropriate. On this basis, such standing water bodies in the Study Area are considered high to very high sensitivity.
- 10.3.35. Chapter 11: Ecology and Nature Conservation, considers all undesignated local ponds to hold nature conservation value of local importance. Thus, with reference to the sensitivity criteria provided in Section 10.2, all such undesignated ponds in the study area are considered of low sensitivity.

## Water Supplies, Abstractions and Discharges

### *Public Water Supplies*

- 10.3.36. The public water supply for the study area has a groundwater source and is considered in Chapter 9: Geology, Soils and Groundwater. Within the study area, there were no Scottish Water surface water supply sources identified.
- 10.3.37. A distribution network and a number of Distribution Service Reservoirs (DSRs) for public supply to local properties are present in the study area. This is addressed in more within the Utilities section of the Engineering Assessment.

### *Private Water Supplies*

- 10.3.38. There is currently limited information available regarding the presence, location and type of private water supplies within the study area. At present a total of 35 properties served by private water supplies have been identified within 1km of the Proposed Scheme Options and up to 5km downstream, all of which are located within the River Spey catchment.
- 10.3.39. At present the type of source (i.e. surface water or groundwater fed) is known for only some of the water supplies and the precise locations of the sources is unknown. A number of supplies have been confirmed as groundwater sources, with these impacts considered further in Chapter 9: Geology, Soils and Groundwater. Details of the remaining supplies, including those where no source type data is available, are provided in Table 10.10. Where supply sources are unknown they have been considered as surface water supplies, as a precautionary approach.
- 10.3.40. Comments have been provided for each supply based on professional judgement, for example, it is likely that surface water supplies are fed from a source up-hill from a property. Sensitivity has been evaluated on the basis of the criteria identified in Section 10.2. Those supplies with justification for not being considered further in this assessment have been further identified as not applicable ('n/a') in the supply sensitivity column.
- 10.3.41. A number of additional rural properties were identified within 1km or 5km downstream of the Proposed Scheme that are not included in the private water supply dataset provided by the Highland Council. These are likely to be on public water supply, but may have historic private water supplies. These properties include Baddengorm, Dalrachney Beag, Lynphail, Kinrara Croft, The Bothy, Tor Alvie, The Rowan Tree, The Rowan Tree Hotel, The Rowan Tree Cottage, Ballinluig Cottage, Kinloch Cottage, Tiskety-Boo, Zippity-doda, Pooh Corner Cottage, Hillview, 1 and 2 Railway Cottage, Croftgowan, Loch Alvie Cottage, Inverdrue House, Jasmine Cottage, Honeysuckle Cottage, Boat House. These properties will be included as part of landowner surveys at the DMRB Stage 3 assessment.



**Table 10.10: Private Water Supplies Located Within 1km of the Proposed Scheme and 5km Downstream**

Source Name NGR Chainage Section	Data Source	Source Type	Properties Supplied / NGR	River Catchment and Relative Location	Comment	Supply Sensitivity
Easter Delfour NGR Unknown Near Ch.0 Section 1	The Highland Council	Surface Water	Easter Delfour Farmhouse	Allt an Fhearna  Approximately 1.2km upstream of nearest Proposed Scheme Option.	The supply is likely to be somewhere on the Allt an Fhearna nearby the property location provided. Given the distance upstream of the Proposed Scheme the supply is likely to be unaffected.	n/a
PWS Alvie Manse NGR Unknown Near Ch. 1100 Section 1	The Highland Council	Surface Water	Easter Dalraddy Cottage  Wester Dalraddy Cottage  Alvie Manse (NGR 2863 8093)	Allt an Fhearna  0.5km south-east of nearest Proposed Scheme Option.	Supply location provided is for the property at Alvie Manse, with the supply location more likely to be upstream of the properties.  If sourced from Allt an Fhearna catchment, supply may be impacted from discharges to surface water. If Allt Dibheach catchment, supply is likely to be unaffected.	High
Doune Farm NGR Unknown Near Ch. 3200 Section 2	AMJV desk study (OS Map)	Unknown	Doune Farm Doune Farm Cottage Doune (NGR 2886 8100)	River Spey  0.5km south and upstream of nearest Proposed Scheme Option.	Source location unknown but likely to be from stream or hill run-off from slopes to the southeast. Location of source is likely to be upstream of Proposed Scheme and therefore unaffected.	n/a
Visitors Centre Inverdrue NGR Unknown Near Ch. 4500 Section 3a	The Highland Council	Unknown	Visitors Centre Inverdrue (NGR 2900 8110)	River Druie  Approximately 900m east of nearest Proposed Scheme Option.	If surface water fed, most likely source is the River Druie and is upstream from any potential interaction with the Proposed Scheme.	n/a
PWS Wendy NGR Unknown Near Ch. 7400	The Highland Council	Unknown	7 Dalfaber Park, Aviemore Quirky Cake Company (NGR 2904 8139)	The Shielling / Easter Aviemore Burn	If surface water fed, most likely source is the Shielling / Easter Aviemore Burn approx. 90m northeast of property.	High





Source Name NGR Chainage Section	Data Source	Source Type	Properties Supplied / NGR	River Catchment and Relative Location	Comment	Supply Sensitivity
Section 4				1km east and downstream of nearest Proposed Scheme Option.		
PWS Pityoulish NGR 2947 8142 ~5km east of Ch. 7600 Section 4	The Highland Council	Stream	Pityoulish House Loch Cottage The Bothy Pityoulish Farm Pityoulish Farm Cottage Pityoulish Cottage Factors House Grieves House Auchgourish Farmhouse Auchgourish Auchgourish Cottage Glencairn Muir of Knock West Croftmore Miltonburn Milton Cottage Kincardine Cottage	Allt Garbh  Approximately 5km east and upstream of the nearest Proposed Scheme Option.	Highland Council data indicates stream source located at Allt Garbh, upstream of River Spey, therefore unaffected by the Proposed Scheme. However, this is located 2.5km east of some of the connected properties and seems unlikely for a source location. Pityoulish and Auchgourish may also have two separate supplies.  Given the distance, dilution potential of the River Spey and intervening topography this supply is likely to be unaffected.	n/a
PWS Sluggangranish NGR Unknown Near Ch. 7900 Section 4	The Highland Council	Unknown	Sluggangranish Farm  Sluggangranish Farm Cottage (NGR 2898 8144)	The Shielling / Easter Aviemore Burn  0.2km east and downstream of nearest Proposed Scheme Option.	If the source is surface water, the supply is either fed from the Shielling / Easter Aviemore Burn or the southern bifurcation of the Allt na Criche at Granish.	High







Source Name NGR Chainage Section	Data Source	Source Type	Properties Supplied / NGR	River Catchment and Relative Location	Comment	Supply Sensitivity
PWS Eilan Cottage NGR 2902 8164 Ch. 9900 Section 5	The Highland Council	Stream	Eilan Cottage	Southern Avie Lochan Burn  Located within footprint of the Proposed Scheme.	Source located along stream west of existing A9 route, with pipework passing underneath the route 385m east towards Eilan Cottage, beside Avielochan. Pipework will be disrupted with potential for source to be disrupted too.	Medium
PWS Avielochan NGR 2903 8168 Ch. 10200 Section 5	AMJV desk study (OS Map) and site survey	Stream	Avielochan Cottage Recharr (NGR 8164 2911)	Northern Avie Lochan Burn  0.01km west and upstream of nearest Proposed Scheme Option.	Source fed from stream flowing east on slopes of An Leth-chreag towards Avie Lochan. The supply feeds properties at Avielochan farm and passes underneath the A95 past Avie Lochan towards Recharr. Due to the close proximity of the supply to the Proposed Scheme this supply will be impacted.	High
PWS Birch View NGR Unknown Near Ch.11900 Section 6b	The Highland Council	Stream	Birch View (NGR 2911 8182)	Allt Cnapach  0.17m east and downstream of the nearest Proposed Scheme Option.	Source likely to be from Allt Cnapach, 230m north of property, downstream of the Proposed Scheme.	Medium
West Foregin Unknown source location Near chainage 19600 Section 9	AMJV desk study (OS Map)	Unknown	West Foregin (NGR 2871 8250)	Bogbain Burn  Approximately 0.8km north of the Proposed Scheme Options.	Source location unknown but likely to be from stream or hill run-off from nearby slopes. Location of source is likely to be upstream of any interaction with the Proposed Scheme and would therefore be unaffected.	n/a
PWS Slochd NGR 2846 8244 Near Ch. 22500 Section 10	The Highland Council	Hill Runoff	Slochd Mhor Lodge	Slochd Mhuic  150m north east and upstream of nearest Proposed Scheme Option.	Source located on southern slopes of Carn nam Bain-tighearna, source is upstream of Proposed Scheme, however supply pipe passes under existing A9 route and pipework will be disrupted.	Medium



- 10.3.42. As can be seen from Table 10.10, a number of the local private water supplies have been eliminated from further assessment, due to lack of hydrological linkage, intervening distance and topography between source and the Proposed Scheme, or because they are confirmed groundwater sources (dealt with within Chapter 9: Geology, Soils and Groundwater).
- 10.3.43. The remaining seven supplies are assumed as surface water sources and are considered of medium to high sensitivity, as per the criteria provided in Section 10.2, dependent upon the number of properties supplied by each source.

### *SEPA Registered Abstractions and Discharges*

- 10.3.44. A number of abstraction and discharge locations have been identified within 1km of the Proposed Scheme, and surface water abstractions up to 5km downstream, to focus on locations with potential hydrological linkage, based on licence information provided by SEPA. These are licensed locations under The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (CAR), and The Waste Management Licensing (Scotland) Regulations 2011.
- 10.3.45. There are three levels of activity under the CAR<sup>ix</sup>, based on the type and scale of activity. These include:
- General Binding Rules – these are low risk activities which do not need to be notified to SEPA. Therefore they are not included within the dataset below;
  - Registrations – these are medium risk activities where SEPA can monitor cumulative impacts and set additional conditions if required; and
  - Licence (Simple and Complex) – these are high risk activities which contain site specific conditions and identification of a responsible person to ensure compliance of required conditions. ‘Simple’ and ‘Complex’ licences vary depending upon activity size and risk.
- 10.3.46. Within the SEPA dataset, licences are listed as ‘Simple Licence’ and ‘Licence’. Unless stated otherwise, any activity listed as ‘licence’ is considered to be a ‘Complex Licence’.
- 10.3.47. A total of 166 CAR licensed activities were identified, located within 1km of the Proposed Scheme, including up to 5km downstream. These include both domestic and industrial uses for both abstractions from and discharges to the water environment within the River Spey and River Findhorn catchments. These are summarised in Table 10.11, by licence type and activity.

**Table 10.11: CAR Licensed Activities Within 1km of the Proposed Scheme, Including Surface Water Abstractions up to 5km Downstream**

CAR Activity Type	Regulatory Level			
	Licence (Complex)	Simple Licence	Registration	Total
Disposal to Land	0	1	0	1
Engineering	1	5	4	10
Point Source	5	4	61	70
Water Resources	2	0	1	3
Unknown	8	8	66	82
<b>Total</b>	<b>15</b>	<b>18</b>	<b>132</b>	<b>166</b>

10.3.48. With reference to Table 10.11 there are a number of types of activity:

- Disposal to Land – there are four locations of sheep dip activity at Ballinluig Farm covered by a simple licence. These activities range from approximately 30m-70m upstream of the Proposed Scheme.
- Engineering Activities include:
  - Registrations – there are four registrations for utilities crossing different watercourses including the River Spey and Milton Burn.
  - Simple licences – there are 5 simple licences, including one for river crossing of the Allt an Fhearna and one for in-stream boulder placements in the Steallan Dubh (Aviemore Burn), as part of previous engineering works, located within the Proposed Scheme footprint. The remainder cover river crossings, bank modifications and in-stream structures in the Allt Lorgy catchment, more than 0.9km upstream of the Proposed Scheme; and, bank modifications of the River Dulnain, more than 1km downstream of the scheme.
  - Complex licences – There are five complex licences for river crossings for pipes and cables, and a bridge culvert, at High Burnside for construction purposes.
- Point Source Discharge include:
  - Registrations – there are 61 registrations for public and private sewage with two being located within the Proposed Scheme footprint at Kinakyle and Granish.
  - Simple licences – there are four simple licences, one relating to a Scottish Water potable water treatment outfall to a River Spey tributary, west of Inverdrue, with the remainder for surface water drainage along the A9 between Dalraddy and Slochd, four of which are within the Proposed Scheme footprint.
  - Complex licences – there are five complex licences, one of which relates to a fish farm at Rothiemurchus with the remainder relating to Scottish Water public sewerage assets. Three of the sewerage assets covered by these licences are located approximately 900m downstream of the Proposed Scheme on the Aviemore Burn, in Aviemore.
- Water Resources include (also summarised in Table 10.12, below):
  - Registrations – there is one registration for an abstraction near Lochan Ba at Granish Landfill site for industrial processes, approximately 300m downstream of the Proposed Scheme.
  - Complex licences – there is one complex licence which relates to abstraction and impoundment at a fish farm at Rothiemurchus which is upstream of any interaction with the Proposed Scheme. An additional complex licence has been identified relating to an abstraction location 2.9km downstream from the Proposed Scheme on the Allt Cosach, north west of Slochd Summit. This abstraction is associated with a hydropower station.
- Unknown – there are 81 CAR records of unknown activities. Of the 66 registrations, the majority relate to private properties with the remainder relating to construction, business, mining and quarrying, and other utilities. There are seven simple licences relating to private properties, fisheries, infrastructure business, and utilities. There are eight complex licences relating to utilities, fish farming, and construction.
  - Of the 81 records of unknown activities, there are 19 records within close proximity (100m) of the Proposed Scheme Options; 16 registrations and three simple licences.
  - The majority of these registrations appear to be related to private contacts with the remaining two relating to construction and utilities. The three simple licences appear to relate to transport infrastructure and utilities.

- Of the 81 records of unknown activities, five have been identified as being located under the Proposed Scheme Options footprint. Three of which are located in Kinakyle, 1km south of Aviemore and comprise one simple licence relating to utilities and two registrations relating to private contacts. There is one registration at the Shieling, Aviemore which is associated with utilities, and one simple licence at Crannaich, 1km south of Carrbridge associated with transport infrastructure.

**Table 10.12: Abstractions within 1km of the Proposed Scheme or within 5km Downstream.**

Section	Abstraction Name NGR Chainage Section	CAR Licence / Registration	Data Source	Abstraction Purpose	River Catchment and Relative Location	Supply Sensitivity
3a	Rothiemurchus Fisheries, Aviemore NGR 2903 8114	Licence CAR/L/1011437	SEPA	Fish Production	River Drurie - Upstream of Proposed Scheme Options.	n/a
5	Granish Landfill Site NGR 2901 8149	Registration CAR/R/1012007	SEPA	Industrial or Commercial: Process Water	River Spey - 300m downstream of the Proposed Scheme Options.	Medium
11	Altchosach Hydrostation NGR 2807 8276	Licence CAR/L/1010493	SEPA	Hydropower	Allt Cosach - 2.9km downstream from the Proposed Scheme Options, north west of Slochd Summit.	Medium

- 10.3.49. A further five sites were identified under The Waste Management Licensing (Scotland) Regulations 2011; one of which relates to recycling activities at Granish, and the remaining four are exemptions relating to composting and recycling, and a Scottish Water WWTP, also in Granish. The licensed locations outlined will be examined in further detail as part of the DMRB Stage 3 assessment when more information is available.
- 10.3.50. There are eight licences for Pollution Prevention Control permits, five of which relate to a landfill site and a batching plant in Granish, and the remaining three relate to a car dealership, and a laundry and dry cleaning business in Aviemore.

### Receptor Sensitivity

- 10.3.51. Receptor sensitivity has been evaluated on the basis of the baseline data available. Given data limitations at DMRB Stage 2, as previously outlined, a precautionary approach has been adopted. Tables 10.13 and 10.14 present a summary of the sensitivity of surface water receptors.
- 10.3.52. In relation to flood risk there may be several receptors sensitive to changes in flood risk within the watercourses/floodplains identified, with each flood receptor having a different sensitivity to flooding. Table 10.13 summarises the range of sensitivities associated with



each watercourse/floodplain, while Tables 10.6 and 10.7 provide a more detailed breakdown of each flood risk receptor associated with the identified watercourses/floodplains.





**Table 10.13: Summary of Watercourse Receptor Sensitivity**

Receptor	Section	WFD Catchment	Attribute	Comment	Sensitivity
River Spey	1 – 7	River Spey – R. Feshie to R. Nethy	Surface Water Quality & Biodiversity	SAC, SSSI 'Moderate' overall WFD status	Very High
			Hydromorphology	'Moderate' WFD status (as a result of modifications to bed, banks and shores). Tributaries of the River Spey commonly feature natural channel reaches with defined meanders, culverted below the existing A9 carriageway.	Medium
			Hydrology & Flood Risk	The River Spey interacts with agricultural and forestry land on both the right and left banks. The River Spey and its associated floodplains bound the town of Aviemore on the left bank.	Medium - High
			Water Supplies / Abstractions	Granish Landfill Site	Medium
Allt an Fhearna	1	Allt na Fearna (u/s Loch Alvie)	Surface Water Quality & Biodiversity	'Poor' overall WFD status (due to barriers to fish migration, physico-chem results indicate 'Good' status) Active stream system likely to support a range of habitats and species.	High
			Hydromorphology	'Good' WFD status A diverse range of morphological processes and features (including large gravel deposits, steps, large wood and bank erosion). It has been historically modified (straightened) and is constrained underneath and alongside the existing A9.	Medium
			Hydrology & Flood Risk	The Allt an Fhearna floodplain is generally unpopulated with land use of mixture of grass lands, and forestry. The B9162 is located downstream of the Allt an Fhearna and contained within the Loch Alvie floodplain. The B9162 is classified within SPP as "Essential Infrastructure".	Low-High
			Water Supplies / Abstractions	PWS Alvie Manse (3)	High







Receptor	Section	WFD Catchment	Attribute	Comment	Sensitivity
Allt Chriochaidh	1	Loch Alvie	Surface Water Quality & Biodiversity	'Good' overall WFD status Relatively active stream system likely to support a range of habitats and species.	High
			Hydromorphology	A diverse range of morphological forms and processes, with the downstream reaches shown to be able to partially laterally adjust the planform. Modifications are significant, but limited to the existing A9 crossing.	Medium
			Hydrology & Flood Risk	The area surrounding the Allt Chriochaidh is generally unpopulated with land use of mixture of grass lands, and forestry. The Allt Chriochaidh flows directly into Loch Alvie.	Low-Medium
			Water Supplies / Abstractions	None	Low
Caochan Ruadh	1	Loch Alvie	Surface Water Quality & Biodiversity	'Good' overall WFD status Relatively active stream system likely to support a range of habitats and species.	High
			Hydromorphology	The channel has been historically modified around the existing crossing and along the upper reaches, but does possess some geomorphic diversity, particularly upstream with a steep step-pool bedrock system evident.	Medium
			Hydrology & Flood Risk	The area surrounding the Caochan is generally unpopulated with land use of mixture of grass lands, forestry and some agricultural land. The Caochan flows directly into Loch Alvie.	Low-Medium
			Water Supplies / Abstractions	None	Low
Ballinluig Burn	1	Loch Alvie	Surface Water Quality & Biodiversity	'Good' overall WFD status	High
			Hydromorphology	Modified and constrained watercourse, with uniform flows (heavily vegetated in-channel) and little morphological diversity evident.	Low
			Hydrology & Flood Risk	The area surrounding the Ballinluig Burn is generally unpopulated with land use of mixture of grass lands, forestry, and agricultural land. There is one residential dwelling and a number of farm buildings	Low-High





Receptor	Section	WFD Catchment	Attribute	Comment	Sensitivity
			Water Supplies / Abstractions	None	Low
Smaller Drains (Allt Dibheach catchment)	2	River Spey – R. Feshie to R. Nethy	Surface Water Quality & Biodiversity	Unclassified heavily modified/artificial drains and ditches, which do not support any significant species	Low
			Hydromorphology	Heavily modified/artificial drains and ditches with no morphological diversity	Low
			Hydrology & Flood Risk	The agricultural land in the vicinity of this drain is associated with Lynwilg Farm and has an LCA classification of moderate crop range and good yields.	Medium
			Water Supplies / Abstractions	None	Low
Allt-na-Criche (Lynwilg)	2 – 3a	River Spey – R. Feshie to R. Nethy	Surface Water Quality & Biodiversity	SAC (River Spey) 'Moderate' overall WFD status Relatively active stream system likely to support a range of habitats and species, known to support salmonids.	Very High
			Hydromorphology	Morphologically diverse in the upper reaches, with large gravel bars. Significantly modified adjacent to Lynwilg properties (gabion bank protection) and through the existing A9 and railway crossing (straightened and widened). However, there are signs of recovery underneath the A9 as the channel is shown to be narrowing through deposition of coarse substrate.	Medium
			Hydrology & Flood Risk	The Allt na Criche (Lynwilg) floodplain, is predominately unpopulated, with agricultural land to the east and west of the Allt na Criche which has an LCA classification of moderate crop range and good yields. Between the existing A9 and B9152 the land in this area considered to be predominately grasslands, with low productivity. Downstream of the B9152 the agricultural land with a LCA classification of moderate crop range and good yields. Both the A9 and B9152 are considered to be essential infrastructure.	Low - High
			Water Supplies / Abstractions	None	Low
Smaller Drains (River)	3a – 6b	River Spey – R. Feshie to R. Nethy	Surface Water Quality & Biodiversity	Unclassified heavily modified/artificial drains and ditches, which do not support any significant species	Low





Receptor	Section	WFD Catchment	Attribute	Comment	Sensitivity
Spey Catchment)			Hydromorphology	Heavily modified/artificial drains and ditches with no morphological diversity	Low
			Hydrology & Flood Risk	Flood risk receptors include rural Land, with classification as land capable of producing a narrow range of crops.	Low
			Water Supplies / Abstractions	None	Low
Smaller Drains (Aviemore Burn Catchment)	3b -4	River Spey – R. Feshie to R. Nethy	Surface Water Quality & Biodiversity	Unclassified heavily modified/artificial drains and ditches, which do not support any significant species	Low
			Hydromorphology	Heavily modified/artificial drains and ditches with no morphological diversity	Low
			Hydrology & Flood Risk	Flood risk receptors include Craigellachie National Nature Reserve, forestry land, Aviemore residential and non residential properties	Medium - High
			Water Supplies / Abstractions	None	Low
Aviemore Burn	4	River Spey – R. Feshie to R. Nethy	Surface Water Quality & Biodiversity	‘Moderate’ overall WFD status Relatively active stream system likely to support a range of habitats and species, known to support salmonids.	Very High
			Hydromorphology	Diverse watercourse throughout with a good range of flows and morphological features, however, significantly constrained through recently constructed housing estate and existing crossings.	Medium
			Hydrology & Flood Risk	The Aviemore Burn and its floodplains flow through Aviemore, with sensitive receptors including residential, and non-residential properties and the former Aviemore Primary School. There is an area of grasslands between the existing A9 and Carn Elrig which are classed as having limited potential.	Low- High
			Water Supplies / Abstractions	None	Low
Smaller Drains (Shieling / Easter	4	River Spey – R. Feshie to R. Nethy	Surface Water Quality & Biodiversity	Unclassified heavily modified/artificial drains and ditches, which do not support any significant species	Low
			Hydromorphology	Heavily modified/artificial drains and ditches with no morphological diversity	Low





Receptor	Section	WFD Catchment	Attribute	Comment	Sensitivity
Aviemore Catchment)			Hydrology & Flood Risk	No flood risk impacts are anticipated, therefore scoped out of further assessment	n/a
			Water Supplies / Abstractions	None	Low
Shieling / Easter Aviemore Burn	4	River Spey – R. Feshie to R. Nethy	Surface Water Quality & Biodiversity	‘Moderate’ overall WFD status Relatively active stream system likely to support a range of habitats and species.	High
			Hydromorphology	Some lengths possess diverse morphology especially in the upper reaches with step sequences common and clean coarse gravel substrate. However, overall the watercourse has historically been modified for residential and agricultural drainage purposes. Minor fine sediment deposition was noted on the downstream reaches where flow energy reduced.	Medium
			Hydrology & Flood Risk	The Shieling / Easter Aviemore Burn flows through predominantly open forestry and agricultural land. Immediately downstream of the A9 is grasslands and agricultural land which is used for grazing.	Low-Medium
			Water Supplies / Abstractions	PWS Wendy (2) Possibly PWS Slugganranish (2)	High High
Southern bifurcation of Allt na Criche (Granish)	5	River Spey – R. Feshie to R. Nethy	Surface Water Quality & Biodiversity	‘Good’ overall WFD status Minor, but relatively dynamic stream system potentially supporting a range of habitats and species.	High
			Hydromorphology	Bifurcation channel is a heavily modified/artificial drain with no morphological diversity	Low
			Hydrology & Flood Risk	Land use is a mixture of forestry and low value agricultural land associated with Granish Farm	Low
			Water Supplies / Abstractions	Possibly PWS Slugganranish (2)	High
Northern bifurcation of Allt na	5	River Spey – R. Feshie to R. Nethy	Surface Water Quality & Biodiversity	‘Good’ overall WFD status Minor, but relatively dynamic stream system potentially supporting a range of habitats and species.	High





Receptor	Section	WFD Catchment	Attribute	Comment	Sensitivity
Criche (Granish)			Hydromorphology	Bifurcation channel is a heavily modified/artificial drain with no morphological diversity	Low
			Hydrology & Flood Risk	Flood risk receptors include the A9, the B9152, residential properties at Red Stag Lodge, rural grassland and General Wades Military Road	Low - High
			Water Supplies / Abstractions	None	Low
Allt na Criche (Granish)	5	River Spey – R. Feshie to R. Nethy	Surface Water Quality & Biodiversity	‘Good’ overall WFD status Minor, but relatively dynamic stream system potentially supporting a range of habitats and species.	High
			Hydromorphology	Although largely unmodified (except for the existing A9 crossing) morphological diversity was confined to localised lengths. The presence of boulders and large wood in the watercourse did create more dynamic flows, but overall some fine sediment deposition along the bed was noted.	Medium
			Hydrology & Flood Risk	Flood risk receptors include the A9, the B9152, residential properties at Red Stag Lodge, rural grassland and General Wades Military Road	Low - High
			Water Supplies / Abstractions	None	Low
Smaller Drains (Southern Avie Lochan Burn Catchment)	5	River Spey – R. Feshie to R. Nethy	Surface Water Quality & Biodiversity	Unclassified heavily modified/artificial drains and ditches, which do not support any significant species	Low
			Hydromorphology	Heavily modified/artificial drains and ditches with no morphological diversity	Low
			Hydrology & Flood Risk	Forestry commission land. Discharges to Avielochan.	Medium
			Water Supplies / Abstractions	None	Low
Southern Avie Lochan Burn	5	River Spey – R. Feshie to R. Nethy	Surface Water Quality & Biodiversity	‘Good’ overall WFD status Relatively active stream system likely to support a range of habitats and species.	High





Receptor	Section	WFD Catchment	Attribute	Comment	Sensitivity
			Hydromorphology	Vast variety of morphological features, including high energy step-pool system in the upstream and meandering planform in the downstream. Heavily modified over short distance around existing A9 crossing.	Medium
			Hydrology & Flood Risk	The Southern Avie Lochan Burn flows through Forestry Commission land and agricultural land.	Medium
			Water Supplies / Abstractions	PWS Eilan Cottage	Medium
Northern Avie Lochan Burn	5	River Spey – R. Feshie to R. Nethy	Surface Water Quality & Biodiversity	Assumed 'Good' overall WFD status	High
			Hydromorphology	A variety of morphological features, including step-pool system and a steep, meandering planform upstream. Heavily modified around existing A9 crossing.	Medium
			Hydrology & Flood Risk	The Northern Avie Lochan Burn flows through predominantly open forestry and agricultural land. There are residential properties and non-residential properties, which are within 100m of the burn.	High
			Water Supplies / Abstractions	PWS Avielochan (2)	High
Smaller Drains (Loch Vaa Catchment)	6a	River Spey – R. Feshie to R. Nethy	Surface Water Quality & Biodiversity	Unclassified heavily modified/artificial drains and ditches, which do not support any significant species	Low
			Hydromorphology	Heavily modified/artificial drains and ditches with no morphological diversity	Low
			Hydrology & Flood Risk	Agricultural Land No Classification	Low
			Water Supplies / Abstractions	None	Low
Allt Cnapach	6b	River Spey – R. Feshie to R. Nethy	Surface Water Quality & Biodiversity	'Good' overall WFD status Relatively active stream system likely to support a range of habitats and species.	High
			Hydromorphology	Good range of flows and dynamic morphological features, but significantly modified in the downstream reaches. Few active morphological processes	Medium







Receptor	Section	WFD Catchment	Attribute	Comment	Sensitivity
				occurring and some fine sediment deposition was noted in the downstream reaches (including poaching downstream).	
			Hydrology & Flood Risk	The Allt Cnapach flows through predominantly open forestry and agricultural land. Downstream of the existing A9 is the Highland Mainline Railway, which is classed as essential infrastructure.	Low-High
			Water Supplies / Abstractions	PWS Birch View	Medium
Smaller Drains (Gormack Stripe Catchment)	6b - 7	River Spey – R. Feshie to R. Nethy	Surface Water Quality & Biodiversity	Unclassified heavily modified/artificial drains and ditches, which do not support any significant species	Low
			Hydromorphology	Heavily modified/artificial drains and ditches with no morphological diversity	Low
			Hydrology & Flood Risk	Land use includes Highland Mainline Railway, Forestry Commission land	Medium - High
			Water Supplies / Abstractions	None	Low
Feith Mhor	7	River Dulnain – Feith Mhor	Surface Water Quality & Biodiversity	‘Poor’ overall WFD status (due to barriers to fish migration) WFD classifications for other parameters suggest it is possible that the watercourse may support a range of habitats and species.	High
			Hydromorphology	‘Good’ WFD status Some incision (knickpoints) evident in the upper reaches resulting in a series of steps, but on the whole flows were uniform around the A9 crossing. The channel lacked energy to recover from historic modifications downstream.	Medium
			Hydrology & Flood Risk	The land use of the Feith Mhor floodplain is predominantly forestry, which is managed by the forestry commission. Downstream of the existing A9 is the Highland Mainline Railway, which is classed as essential infrastructure.	Medium-High
			Water Supplies / Abstractions	None	Low
Smaller Drains (Feith)	7	River Dulnain – Feith Mhor	Surface Water Quality & Biodiversity	Unclassified heavily modified/artificial drains and ditches, which do not support any significant species	Low





Receptor	Section	WFD Catchment	Attribute	Comment	Sensitivity
Mhor Catchment)			Hydromorphology	Heavily modified/artificial drains and ditches with no morphological diversity	Low
			Hydrology & Flood Risk	Land use includes Forestry Commission land	Medium
			Water Supplies / Abstractions	None	Low
Smaller Drains (River Dulnain Catchment)	7 - 8	River Dulnain – Lower Catchment	Surface Water Quality & Biodiversity	Unclassified heavily modified/artificial drains and ditches, which do not support any significant species	Low
			Hydromorphology	Heavily modified/artificial drains and ditches with no morphological diversity	Low
			Hydrology & Flood Risk	Land use includes Highland Mainline Railway and Carrbridge train station	High
			Water Supplies / Abstractions	None	Low
River Dulnain	8	River Dulnain – Lower Catchment	Surface Water Quality & Biodiversity	SAC (River Spey) 'Good' overall WFD status Active river system likely to support a range of habitats and species, and known to support salmonids.	Very High
			Hydromorphology	'Good' WFD status Significant and highly active gravel bed river channel, with a dynamic and diverse range of morphological features, including large gravel bars. The river channel has been significantly modified underneath the A9 and through Carrbridge.	High
			Hydrology & Flood Risk	The floodplains upstream of the existing A9 are large, with the land use predominantly agricultural in this area with an LCA classification of moderate crop range producing good yields. Downstream of the A9 the River Dulnain flows through village of Carrbridge, with potential flood risk impacts to residential and non-residential properties.	Medium – High
			Water Supplies / Abstractions	None	Low





Receptor	Section	WFD Catchment	Attribute	Comment	Sensitivity
Allt nan Ceatharnach	8 – 9	River Dulnain – Allt Ruighe Magaig	Surface Water Quality & Biodiversity	SAC (River Spey) 'Good' overall WFD status Active river system likely to support a range of habitats and species, and known to support salmonids.	Very High
			Hydromorphology	'Good' WFD status Very active, steep river channel although modified and constrained in sections due to existing river crossings and agricultural drainage. Watercourse and bedrock features have forms a dynamic range of flows.	High
			Hydrology & Flood Risk	The Allt nan Ceatharnach flows through a mixture of open forestry and agricultural land and crosses under the existing A9 is the Highland Mainline Railway, which is classed as essential infrastructure. The floodplains downstream of existing A9 are large and interact with those of the River Dulnain, with the land use in this area is predominantly agricultural in this area with an LCA classification of moderate crop range producing good yields.	Low- High
			Water Supplies / Abstractions	None	Low
Smaller Drains (Allt nan Ceatharnach Catchment)	8	River Dulnain – Allt Ruighe Magaig	Surface Water Quality & Biodiversity	Unclassified heavily modified/artificial drains and ditches, which do not support any significant species	Low
			Hydromorphology	Heavily modified/artificial drains and ditches with no morphological diversity	Low
			Hydrology & Flood Risk	Land use includes forestry land	Medium
			Water Supplies / Abstractions	None	Low
Bogbain Burn	9	River Dulnain – Allt Ruighe Magaig	Surface Water Quality & Biodiversity	'Good' overall WFD status Relatively active stream system likely to support a range of habitats and species, and known to support salmonids.	Very High
			Hydromorphology	Heavily modified around the Highway Mainline Railway, but mapping and photographic evidence suggests natural meandering upstream, with diverse	Medium





Receptor	Section	WFD Catchment	Attribute	Comment	Sensitivity
				and dynamic flow patterns likely, including a coarse cobble/gravel substrate and some woody debris from adjacent woodland.	
			Hydrology & Flood Risk	The Bogbain Burn flows through a mixture of open forestry and agricultural land	Low-Medium
			Water Supplies / Abstractions	None	Low
Smaller Drains (Bogbain Burn Catchment)	9-10	River Dulnain – Allt Ruighe Magaig	Surface Water Quality & Biodiversity	Unclassified heavily modified/artificial drains and ditches, which do not support any significant species	Low
			Hydromorphology	Heavily modified/artificial drains and ditches with no morphological diversity	Low
			Hydrology & Flood Risk	Land use is limited to low value agricultural land and wildland	Low
			Water Supplies / Abstractions	None	Low
Slochd Mhuic	10 – 11	River Dulnain – Allt an Aonaich	Surface Water Quality & Biodiversity	'Good' overall WFD status	High
			Hydromorphology	Heavily modified channel culverted several times and lined with concrete over long lengths.	Low
			Hydrology & Flood Risk	A steep catchment with few receptors. Land use is forestry and hillside scrub. The National Cycle Network track and existing A9 cross the Slochd Mhuic in a number of locations.	Low-High
			Water Supplies / Abstractions	PWS Slochd	Medium
Smaller Drains (Slochd Mhuic Catchment)	9-10	River Dulnain – Allt an Aonaich	Surface Water Quality & Biodiversity	Unclassified heavily modified/artificial drains and ditches, which do not support any significant species	Low
			Hydromorphology	Heavily modified/artificial drains and ditches with no morphological diversity	Low
			Hydrology & Flood Risk	Land use is limited to low value agricultural land and wildland	Low





Receptor	Section	WFD Catchment	Attribute	Comment	Sensitivity
			Water Supplies / Abstractions	None	Low
Allt Cosach	11	River Findhorn – Tomatin to Garbole	Surface Water Quality & Biodiversity	'Good' overall WFD status	High
			Hydromorphology	The channel has been historically modified in its upper reaches, adjacent to the existing A9 and the Mainline Railway crossing, but does possess some geomorphic diversity downstream.	Medium
			Hydrology & Flood Risk	A steep catchment at the headwaters with few receptors. Land use is forestry and hillside scrub. The National Cycle Network track and existing A9 cross the Allt Cosach in a number of locations.	Low-Medium
			Water Supplies / Abstractions	Altcosach Hydrostation	Medium





**Table 10.14: Summary of Standing Water Body Receptor Sensitivity**

Receptor	Section	WFD Catchment	Attributes	Sensitivity
Loch Beag	1	Loch Alvie	SSSI – National importance 'Good' overall WFD status	High
Loch Alvie	1	Loch Alvie	SSSI – National importance 'Good' overall WFD status Private water supply serving a single property: PWS Alvie Manse	High
Bogach	2	Allt na Fearnna (d/s Loch Alvie) (including Loch Alvie)	SSSI – National importance 'Good' overall WFD status	High
Loch Puladdern	3a	River Spey – R. Feshie to R. Nethy	SSSI, NNR – National importance	High
Avie Lochan	5	River Spey – R. Feshie to R. Nethy	Assumed 'Good' overall WFD status	High
Loch Vaa	6a	River Spey – R. Feshie to R. Nethy	SPA, SSSI – International importance	Very High
Loch Roid	6b	River Spey – R. Feshie to R. Nethy	Assumed 'Good' overall WFD status	High
Ponds	Scheme Wide	Scheme Wide	All local undesignated ponds are judged to have a nature conservation value of local importance.	Low





## 10.4. Potential Impacts

- 10.4.1. The potential impacts for each of the Proposed Scheme Options are discussed in this section, subdivided into construction and operational impacts. For the purposes of this assessment construction impacts are generally considered to be short-term impacts which occur during the construction phase only. Operational impacts are considered to be long-term or permanent impacts affecting receptors after the construction phase is complete. It is recognised that many operational impacts are initiated by construction activities, however, the full effect of the impact may only manifest itself in the long-term.
- 10.4.2. Each impact is assessed using the methods outlined in Section 10.2. The potential impacts are assessed without mitigation and therefore considers a worst-case scenario.

### Impacts Common to All Mainline Alignment Options

#### *Construction Impacts*

#### Construction Pollution

- 10.4.3. Silt and sediment laden site runoff generated during construction activities, such as soil stripping and earthworks can have a detrimental impact if allowed to enter watercourses untreated. Fine sediments can increase water turbidity and smother stream beds, affecting water quality and causing harm to fish, aquatic invertebrates and plants by interfering with feeding, respiration and spawning. The effects of sediment release can extend considerable distances downstream.
- 10.4.4. In addition, spillages of potential pollutants such as oils, fuels, concrete, cement and sewage from construction staff welfare facilities can potentially occur during construction. Oils form a film on the water surface and can coat organisms, blocking respiration, photosynthesis and feeding. Biodegradation of oils in aquatic systems can lead to oxygen depletion and many hydrocarbons are toxic, persistent and bio-accumulate in the environment i.e. they build-up in the body tissue both directly and from feeding on other contaminated organisms. Concrete and cement is highly alkaline and can harm aquatic organisms if the pH of the receiving waters are affected.
- 10.4.5. The highest risk of sedimentation or spillage affecting water bodies, and dependent private water supplies would be at locations where construction would be required alongside and within 50m of a watercourse and also at locations where direct interaction with the water environment occurs, such as bridge and culvert crossing structures, where watercourse diversions are required and at drainage discharge outfalls.
- 10.4.6. Construction is anticipated within 50m of water bodies for each of the Proposed Mainline Alignment Options, as detailed in Table 10.15. For Options 1, 1A, and 2 the total length of mainline within 50m of water bodies is 2.0km, 2.1km, and 2.3km, respectively.
- 10.4.7. Based on the preliminary road drainage design, it is anticipated that there would be 32 road drainage outfalls associated with the combined mainline and junction drainage networks discharging to surface waters. This is the case for each of the Proposed Mainline Alignment Options. These outfalls would require construction activity on channel banks, including pipe-laying and installation of appropriate outfall structures. Details of the watercourses affected by outfall construction are provided in Table 10.15.
- 10.4.8. It is anticipated that there shall be a requirement for 52 watercourse crossing structures (existing structures to be extended/upgraded/replaced, plus new structures) on all of the Proposed Mainline Alignment Options. It is anticipated that the current structure dimensions in most cases will be indicative of the minimum size of the new crossing

structures to be installed in their place. Details of indicative watercourse crossing structures are provided in Table 10.15.

- 10.4.9. At DMRB Stage 2, whilst the drainage design is being developed, the requirement for watercourse diversions is unknown and this will be re-visited and assessed at DMRB Stage 3.
- 10.4.10. Based on the information discussed above and presented in Table 10.15 the magnitude and significance of the potential construction pollution impact on each affected water body has been determined for each Mainline Alignment Option using the criteria provided in Section 10.2. The sensitivity ratings used in the assessment of construction pollution impacts are those associated with the surface water quality & biodiversity attribute.
- 10.4.11. As can be seen, although there are small differences in the receptor interactions between the different options, there is no material difference in the impact significance.
- 10.4.12. The majority of water bodies have been assessed as having an impact magnitude of Major Adverse, and associated significance of Large / Very Large. For all Mainline Options the impact significance is greatest for the Aviemore Burn, River Dulnain, Allt nan Ceatharnach, and the Bogbain Burn due to their Very High sensitivities related to known salmonid presence. Interactions with each of these water bodies have an impact magnitude of Major and a significance of Very Large.



**Table 10.15: Potential Construction Pollution Interactions for Proposed Mainline Alignment Options**

Section	Receptor	Sensitivity	Mainline Alignment Option 1			Mainline Alignment Option 1A			Mainline Alignment Option 2		
			Interactions	Magnitude	Significance	Interactions	Magnitude	Significance	Interactions	Magnitude	Significance
1	Allt an Fhearna	High	394m 1 x O 1 x B	Maj	Large / Very Large	394m 1 x O 1 x B	Maj	Large / Very Large	398m 1 x O 1 x B	Maj	Large / Very Large
1	Loch Alvie	High	Tributary interactions <1km upstream of the confluence	Mod	Moderate / Large	Tributary interactions <1km upstream of the confluence	Mod	Moderate / Large	Tributary interactions <1km upstream of the confluence	Mod	Moderate / Large
1	Allt Chrioichaidh	High	204m 1 x O 1 x B	Maj	Large / Very Large	204m 1 x O 1 x B	Maj	Large / Very Large	198m 1 x O 1 x B	Maj	Large / Very Large
1	Caochan Ruadh	High	169m 1 x O 1 x B	Maj	Large / Very Large	166m 1 x O 1 x B	Maj	Large / Very Large	179m 1 x O 1 x B	Maj	Large / Very Large
1	Ballinluig Burn	High	236m 1 x O 1 x B	Maj	Large / Very Large	236m 1 x O 1 x B	Maj	Large / Very Large	291m 1 x O 1 x B	Maj	Large / Very Large
2	Smaller Drains (Allt Dibheach catchment)	Low	100m 1 x EC	Maj	Slight / Moderate	100m 1 x EC	Maj	Slight / Moderate	100m 1 x EC	Maj	Slight / Moderate
3a	Allt-na-Criche (Lynwilg)	Very High	106m 2 x O 1 x B	Maj	Very Large	106m 2 x O 1 x B	Maj	Very Large	106m 2 x O 1 x B	Maj	Very Large





Section	Receptor	Sensitivity	Mainline Alignment Option 1			Mainline Alignment Option 1A			Mainline Alignment Option 2		
			Interactions	Magnitude	Significance	Interactions	Magnitude	Significance	Interactions	Magnitude	Significance
3a	River Spey	Very High	Tributary interactions <1km upstream of the confluence	Mod	Large / Very Large	Tributary interactions <1km upstream of the confluence	Mod	Large / Very Large	Tributary interactions <1km upstream of the confluence	Mod	Large / Very Large
3a – 6b	Smaller Drains (River Spey catchment)	Low	806m 6 x EC	Maj	Slight / Moderate	868m 6 x EC	Maj	Slight / Moderate	952m 6 x EC	Maj	Slight / Moderate
3a	Loch Puladdern	High	191m 1 x O 1 x EC	Maj	Large / Very Large	191m 1 x O 1 x EC	Maj	Large / Very Large	205m 1 x O 1 x EC	Maj	Large / Very Large
3b	Smaller Drains (Aviemore Burn)	Low	321m 2 x EC	Maj	Slight / Moderate	321m 2 x EC	Maj	Slight / Moderate	378m 2 x EC	Maj	Slight / Moderate
4	Aviemore Burn	Very High	321m 1 x O 1 x B	Maj	Very Large	321m 1 x O 1 x B	Maj	Very Large	378m 1 x O 1 x B	Maj	Very Large
4	Smaller Drains (The Shieling / Easter Aviemore Burn catchment)	Low	190m 1 x EC	Maj	Slight / Moderate	190m 1 x EC	Maj	Slight / Moderate	187m 1 x EC	Maj	Slight / Moderate
4	The Shieling / Easter Aviemore Burn	High	190m 1 x EC	Maj	Large / Very Large	190m 1 x EC	Maj	Large / Very Large	187m 1 x EC	Maj	Large / Very Large
5	Southern bifurcation of Allt na Criche (Granish)	High	190m 1 x O 1 x EC	Maj	Large / Very Large	190m 1 x O 1 x EC	Maj	Large / Very Large	187m 1 x O 1 x EC	Maj	Large / Very Large





Section	Receptor	Sensitivity	Mainline Alignment Option 1			Mainline Alignment Option 1A			Mainline Alignment Option 2		
			Interactions	Magnitude	Significance	Interactions	Magnitude	Significance	Interactions	Magnitude	Significance
5	Northern bifurcation of Allt na Criche (Granish)	High	97m 1 x O 1 x EC	Maj	Large / Very Large	97m 1 x O 1 x EC	Maj	Large / Very Large	97m 1 x O 1 x EC	Maj	Large / Very Large
5	Allt na Criche (Granish)	High	160m 1 x O 1 x EC	Maj	Large / Very Large	160m 1 x O 1 x EC	Maj	Large / Very Large	135m 1 x O 1 x EC	Maj	Large / Very Large
5	Smaller Drains (Southern Avie Lochan Burn catchment)	Low	137m 1 x O 2 x EC	Maj	Slight / Moderate	137m 1 x O 2 x EC	Maj	Slight / Moderate	131m 1 x O 2 x EC	Maj	Slight / Moderate
5	Southern Avie Lochan Burn	High	137m 1 x O 1 x EC	Maj	Large / Very Large	137m 1 x O 1 x EC	Maj	Large / Very Large	131m 1 x O 1 x EC	Maj	Large / Very Large
5	PWS Sluggangranish	High	<1km downstream	Min	Slight / Moderate	<1km downstream	Min	Slight / Moderate	<1km downstream	Min	Slight / Moderate
5	PWS Eilan Cottage	Medium	<50m upstream of Scheme	Maj	Large	<50m upstream of Scheme	Maj	Large	Under Scheme Footprint	Maj	Large
5	Northern Avie Lochan Burn	High	111m 1 x O 1 x EC	Maj	Large / Very Large	111m 1 x O 1 x EC	Maj	Large / Very Large	106m 1 x O 1 x EC	Maj	Large / Very Large
5	PWS Avielochan	High	<50m upstream of Scheme	Maj	Large	<50m upstream of Scheme	Maj	Large	Under Scheme Footprint	Maj	Large





Section	Receptor	Sensitivity	Mainline Alignment Option 1			Mainline Alignment Option 1A			Mainline Alignment Option 2		
			Interactions	Magnitude	Significance	Interactions	Magnitude	Significance	Interactions	Magnitude	Significance
5	CAR Registration – Granish Landfill Site	Medium	<300m downstream of Scheme	Min	Slight	<300m downstream of Scheme	Min	Slight	<300m downstream of Scheme	Min	Slight
6b	Allt Cnapach	High	94m 1 x O 1 x EC	Maj	Large / Very Large	94m 1 x O 1 x EC	Maj	Large / Very Large	99m 1 x O 1 x EC	Maj	Large / Very Large
7	Feith Mhor	High	461m 1 x O 1 x B	Maj	Large / Very Large	461m 1 x O 1 x B	Maj	Large / Very Large	466m 1 x O 1 x B	Maj	Large / Very Large
7	Smaller Drains (Feith Mhor catchment)	Low	461m 1 x O 7 x EC	Maj	Slight / Moderate	461m 1 x O 7 x EC	Maj	Slight / Moderate	466m 1 x O 7 x EC	Maj	Slight / Moderate
7 – 8	Smaller Drains (River Dulnain catchment)	Low	672m 2 x EC	Maj	Slight / Moderate	674m 2 x EC	Maj	Slight / Moderate	823m 2 x EC	Maj	Slight / Moderate
8	River Dulnain	Very High	672m 1 x O 1 x B	Maj	Very Large	674m 1 x O 1 x B	Maj	Very Large	823m 1 x O 1 x B	Maj	Very Large
8	Allt nan Ceatharnach	Very High	213m 2 x O 1 x B	Maj	Very Large	213m 2 x O 1 x B	Maj	Very Large	235m 2 x O 1 x B	Maj	Very Large
8	Smaller Drains (Allt nan Ceatharnach catchment)	Low	213m 2 x EC	Maj	Slight / Moderate	213m 2 x EC	Maj	Slight / Moderate	235m 2 x EC	Maj	Slight / Moderate







Section	Receptor	Sensitivity	Mainline Alignment Option 1			Mainline Alignment Option 1A			Mainline Alignment Option 2		
			Interactions	Magnitude	Significance	Interactions	Magnitude	Significance	Interactions	Magnitude	Significance
10	Bogbain Burn	Very High	1 x O	Maj	Very Large	91m 1 x O	Maj	Very Large	1 x O	Maj	Very Large
9 – 10	Smaller Drains (Bogbain Burn catchment)	Low	3 x O 3 x EC	Maj	Slight / Moderate	91m 3 x O 3 x EC	Maj	Slight / Moderate	3 x O 3 x EC	Maj	Slight / Moderate
11	Slochd Mhuic	High	1653m 4 x O 2 x B 2 x EC	Maj	Large / Very Large	1668m 4 x O 2 x B 2 x EC	Maj	Large / Very Large	1922m 4 x O 2 x B 2 x EC	Maj	Large / Very Large
11	Smaller Drains (Slochd Mhuic catchment)	Low	1653m 1 x O 5 x EC	Maj	Slight / Moderate	1668m 1 x O 5 x EC	Maj	Slight / Moderate	1922m 1 x O 5 x EC	Maj	Slight / Moderate
11	Allt Cosach	High	1 x O	Maj	Large / Very Large	1 x O	Maj	Large / Very Large	1 x O	Maj	Large / Very Large
11	CAR Licence – Altchosach Hydrostation	Medium	<3km downstream of Scheme	Neg	Neutral	<3km downstream of Scheme	Neg	Neutral	<3km downstream of Scheme	Neg	Neutral
Scheme wide	Ponds	Low	1235m	Maj	Slight / Moderate	1224m	Maj	Slight / Moderate	1370m	Maj	Slight / Moderate

Interactions are listed by water body as:

500m – length of mainline alignment option within 50m of a water body

1 x O – number of outfalls discharging to a water body

1 x EC, 1 x B – number of watercourse crossings on a waterbody (EC – Extend/re-construct existing culvert, C – new culvert, B – Bridge, representing all structures >2m diameter)

Interactions are listed by PWS as:

<50m – PWS located within 50m of Scheme

Under Scheme Footprint – PWS located under Scheme Footprint



## *Operational Impacts*

### Pollution from Routine Runoff

- 10.4.13. During operation, a broad range of potential pollutants, such as hydrocarbons i.e. fuel and lubricants, fuel additives, metal from corrosion of vehicles, de-icer and gritting material, can accumulate on road surfaces. These can subsequently be washed off the road during rainfall events, polluting the receiving water bodies. Routine runoff from road drainage networks can result in both acute and chronic impacts on water quality and subsequently on the biodiversity of the receiving watercourses, due to both soluble (in particular, dissolved copper and dissolved zinc) and sediment bound pollutants.
- 10.4.14. A preliminary drainage design has been developed for the Proposed Scheme as detailed in Chapter 7. There are 39 networks in total with 32 draining to surface water. The outfall locations for the networks are common across all the Mainline Alignment Options. The area draining to several of these outfalls varies between the options, however the differences are small and have no effect on the routine runoff assessment calculation results, which are identical across all three Mainline Alignment Options.
- 10.4.15. The drainage design for each mainline and junction network includes at least two levels of treatment, in the form of sustainable drainage systems (SuDS), as standard. A third stage of treatment has been provided where preliminary water quality assessments indicated a requirement. The treatment stages typically consist of filter drains and wet/retention or dry/detention ponds, with swales proposed as a third level of treatment where required. The SuDS have been positioned outwith the mapping extents of SEPA's medium flood risk zones where practicable, the extents of these zones will be subject to further verification in DMRB Stage 3, and contributions to compensatory floodplain storage will be considered where required. As these measures are considered as embedded design features and not as additional mitigation the routine runoff calculations have been undertaken assuming these features are included on each network as appropriate.
- 10.4.16. All of the proposed surface water outfalls have been subject to the HAWRAT and EQS assessments described in the Section 10.2. At this stage Tier 1 simple assessments have been carried out due to the level of watercourse information gathered at this stage. At Stage 3 a Tier 2 detailed assessment will be carried out which will utilise more detailed site specific survey data for each receiving watercourse. The results of the assessments are provided in Appendix A10.3 Drainage Network Water Quality Calculations and are summarised in Table 10.16, below. It should be noted that the receptor sensitivity quoted relates to the surface water quality attribute of each watercourse.
- 10.4.17. All networks pass all elements of the HAWRAT and Environmental Quality Standards (EQS) routine runoff assessments. Note that the uncertainty of final locations of drainage outfalls and limited availability of watercourse data has led to cumulative assessment of closely-positioned outfalls being programmed to occur during DMRB Stage 3.
- 10.4.18. At DMRB Stage 2 there is no information available on the proposed drainage design for side roads and accommodation tracks, therefore no assessment of routine runoff impacts has been carried out at this stage. Assessment of side road and accommodation track drainage proposals will be carried out at Stage 3.



**Table 10.16: Summary of Routine Runoff Assessment for Proposed Mainline Alignment Options**

Section	Drainage Network ID	Receptor	Sensitivity	Mainline Alignment Option 1			Mainline Alignment Option 1A			Mainline Alignment Option 2		
				Routine Runoff Result	Magnitude	Significance	Routine Runoff Result	Magnitude	Significance	Routine Runoff Result	Magnitude	Significance
1	1B	Allt an Fhearna	H	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral
1	1C	Allt Chriochaidh	H	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral
1	1E	Caochan Ruadh	H	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral
1	1F	Ballinluig Burn	H	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral
2 - 3a	2A (Mainline & South Aviemore Junction Option A18), 3A B1	Allt-na-Criche (Lynwilg)	VH	2 x Pass	Neg	Neutral	2 x Pass	Neg	Neutral	2 x Pass	Neg	Neutral
3a	3B	Loch Puladdern	H	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral
4	4A	Aviemore Burn	VH	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral
5	5A	Southern bifurcation of Allt na Criche (Granish)	H	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral





Section	Drainage Network ID	Receptor	Sensitivity	Mainline Alignment Option 1			Mainline Alignment Option 1A			Mainline Alignment Option 2		
				Routine Runoff Result	Magnitude	Significance	Routine Runoff Result	Magnitude	Significance	Routine Runoff Result	Magnitude	Significance
5	5B	Northern bifurcation of Allt na Criche (Granish)	H	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral
5	5D	Allt na Criche (Granish)	H	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral
5	5E	Unnamed drain (to pond)	L	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral
5	5F	Unnamed drain (to Avie Lochan)	L	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral
5	5G	Northern Avie Lochan Burn	H	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral
5	Granish Junction Option C34	Allt na Criche (Granish)	H	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral
6b	6B B	Allt Cnapach	H	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral
7	7A	Feith Mhor	H	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral
7	7B	unnamed tributary of Feith Mhor	L	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral
8	8A	River Dulnain	VH	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral
8	8C, 8D	Allt nan Ceatharnach	VH	2 x Pass	Neg	Neutral	2 x Pass	Neg	Neutral	2 x Pass	Neg	Neutral





Section	Drainage Network ID	Receptor	Sensitivity	Mainline Alignment Option 1			Mainline Alignment Option 1A			Mainline Alignment Option 2		
				Routine Runoff Result	Magnitude	Significance	Routine Runoff Result	Magnitude	Significance	Routine Runoff Result	Magnitude	Significance
9	9A	Unnamed drain (to Bogbain Burn)	L	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral
9	9B (Black Mount Junction Option D51)	Unnamed drain (to Bogbain Burn)	L	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral
9	9D	Unnamed drain (to Bogbain Burn)	L	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral
9 – 10	10A	Bogbain Burn	VH	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral
10 – 11	10B, 10C, 11C, 11J	Slochd Mhuic	H	4 x Pass	Neg	Neutral	4 x Pass	Neg	Neutral	4 x Pass	Neg	Neutral
11	11D	Unnamed drain (to Slochd Mhuic)	L	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral
11	11K	Allt Cosach	H	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral

Routine runoff results are listed as: 1 x Pass – 1 outfall, passing all elements of the routine runoff assessment, 2 x Pass – 2 outfalls, both passing all elements of the routine runoff assessment, etc.





- 10.4.19. As can be seen all outfalls pass all elements of the routine runoff assessment, for each of the Proposed Mainline Alignment Options. Consequently the impact magnitude for each outfall has been assessed as Negligible, resulting in an impact significance of Neutral, for all outfalls across all options, regardless of the sensitivity of the receiving watercourses.

#### Pollution from Accidental Spillage

- 10.4.20. During operation, there is a risk that road traffic accidents or vehicle fires may result in accidental spillage of potential pollutants on the road surface. These may then enter the road drainage network and subsequently be discharged to the water environment, causing an acute pollution event.
- 10.4.21. The results of the calculations relating to accidental spillage during use demonstrate that, whilst applying conservatively high traffic data, all Mainline Alignment Option surface water discharge networks meet the minimum DMRB standard for sensitive watercourses of a 1 in 200 year return period (0.5% probability), with preliminary outcomes estimating 1 in 608 year return period for the worst-performing drainage network (Drainage Network 2A (Mainline & Junction Option A18)). These outcomes determine that no further mitigation would be required. Outcomes for individual drainage networks are provided in Table 10.17 below and Appendix A10.3 Drainage Network Water Quality Calculations.
- 10.4.22. It has accordingly been concluded that the magnitude of potential impact on the receiving surface watercourses would be negligible for all three Mainline Alignment Options, with the associated significance being neutral.







**Table 10.17: Summary of Accidental Spillage Assessment for Proposed Mainline Alignment Options**

Section	Drainage Network ID	Receptor	Sensitivity	Mainline Alignment Option 1			Mainline Alignment Option 1A			Mainline Alignment Option 2		
				Accidental Spillage Result	Magnitude	Significance	Accidental Spillage Result	Magnitude	Significance	Accidental Spillage Result	Magnitude	Significance
1	1B	Allt an Fhearna	H	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral
1	1C	Allt Chriochaidh	H	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral
1	1E	Caochan Ruadh	H	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral
1	1F	Ballinluig Burn	H	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral
3a	2A (Mainline & South Aviemore Junction Option A18), 3A B1	Allt-na-Criche (Lynwilg)	VH	2 x Pass	Neg	Neutral	2 x Pass	Neg	Neutral	2 x Pass	Neg	Neutral
3a	3B	Loch Puladdern	H	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral
4	4A	Aviemore Burn	VH	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral
5	5A	Southern bifurcation of Allt na Criche (Granish)	H	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral
5	5B	Northern bifurcation of Allt na Criche (Granish)	H	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral
5	5D	Allt na Criche	H	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral





Section	Drainage Network ID	Receptor	Sensitivity	Mainline Alignment Option 1			Mainline Alignment Option 1A			Mainline Alignment Option 2		
				Accidental Spillage Result	Magnitude	Significance	Accidental Spillage Result	Magnitude	Significance	Accidental Spillage Result	Magnitude	Significance
5	5E	Unnamed drain (to pond)	L	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral
5	5F	Unnamed drain (to Avie Lochan)	L	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral
5	5G	Northern Avie Lochan Burn	H	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral
5	Granish Junction Option C34	Allt na Criche (Granish)	H	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral
6b	6B B	Allt Cnapach	H	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral
7	7A	Feith Mhor	H	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral
7	7B	unnamed tributary of Feith Mhor	L	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral
8	8A	River Dulnain	VH	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral
8	8C, 8D	Allt nan Ceatharnach	VH	2 x Pass	Neg	Neutral	2 x Pass	Neg	Neutral	2 x Pass	Neg	Neutral
9	9A	Unnamed drain (to Bogbain Burn)	L	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral
9	9B (Black Mount Junction Option D51)	Unnamed drain (to Bogbain Burn)	L	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral





Section	Drainage Network ID	Receptor	Sensitivity	Mainline Alignment Option 1			Mainline Alignment Option 1A			Mainline Alignment Option 2		
				Accidental Spillage Result	Magnitude	Significance	Accidental Spillage Result	Magnitude	Significance	Accidental Spillage Result	Magnitude	Significance
9	9D	Unnamed drain (to Bogbain Burn)	L	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral
9 – 10	10A	Bogbain Burn	VH	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral
10 – 11	10B, 10C, 11C, 11J	Slochd Mhuic	H	4 x Pass	Neg	Neutral	4 x Pass	Neg	Neutral	4 x Pass	Neg	Neutral
11	11D	Unnamed drain (to Slochd Mhuic)	L	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral
11	11K	Allt Cosach	H	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral	1 x Pass	Neg	Neutral

Routine runoff results are listed as: 1 x Pass – 1 outfall, passing the accidental spillage assessment, 2 x Pass – 2 outfalls, both passing the accidental spillage assessment, etc.



### Alterations to Hydromorphological Regime

- 10.4.23. Typical hydromorphological impacts upon receptors may include channel realignments, loss of features and potential failure of hydromorphological elements (morphology, quantity and dynamics of flow) resulting from works, loss or damage to existing habitats, replacement of natural bed and/or banks with artificial materials, and changes to planform.
- 10.4.24. A hydromorphology screening exercise was carried out for a long list of watercourses crossed by the Proposed Scheme, in order to identify those which met the following broad set of criteria:
- The watercourse is a permanent flowing system with a channel width >1m; and,
  - the watercourse is to be lost/culverted/diverted or potentially experience a significant change in water quality or quantity<sup>1</sup>; and,
  - is not obviously canalised or heavily managed; or,
  - is hydrologically linked to a designated water-dependent site.
- 10.4.25. The hydromorphology screening exercise identified a total of 14 watercourses which required further investigation, in the River Spey catchment area. Supporting information for each of these watercourses is provided in Appendix A10.1 Hydromorphology Assessment, including specific details of hydromorphology impact for each of the Proposed Mainline Alignment Options. Table 10.18 below, summarises these outcomes.
- 10.4.26. The impacts span the construction and operation phase of the Proposed Scheme. The overall significance of the impacts does not generally vary between the Proposed Mainline Alignment Options with the exception of on the Allt Cnapach where, due to the increased width of footprint of Mainline Alignment Option 2 at this location, potential requirement for a realignment (>10m) has been identified. This results in an increase from a magnitude of Minor Adverse and associated significance of Slight, to a magnitude of Major Adverse and Moderate / Large Significance.
- 10.4.27. For all watercourses along the Proposed Scheme, the magnitude of the potential impacts range from Minor to Major Adverse, with associated significance ranging from Neutral to Moderate / Large.

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<sup>1</sup> Note. this was difficult to assess at the time as the options were still to be confirmed



**Table 10.18: Summary of Hydromorphology Assessment for Proposed Mainline Alignment Options**

Section	Receptor	Sensitivity	Mainline Alignment Option 1		Mainline Alignment Option 1A		Mainline Alignment Option 2	
			Magnitude	Significance	Magnitude	Significance	Magnitude	Significance
1	Allt an Fhearna	Medium	Major	Large	Major	Large	Major	Large
1	Allt Chriochaidh	Medium	Major	Large	Major	Large	Major	Large
1	Caochan Ruadh	Medium	Minor	Slight	Minor	Slight	Minor	Slight
1	Ballinluig Burn	Low	Minor	Neutral	Minor	Neutral	Minor	Neutral
3a	Allt-na-Criche (Lynwilg)	Medium	Minor	Slight	Minor	Slight	Minor	Slight
4	Aviemore Burn	Medium	Minor	Slight	Minor	Slight	Minor	Slight
4	The Shieling / Easter Aviemore Burn	Medium	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate
5	Allt na Criche (Granish)	Medium	Minor	Slight	Minor	Slight	Minor	Slight
5	Southern Avie Lochan Burn	Medium	Minor	Slight	Minor	Slight	Minor	Slight
5	Northern Avie Lochan Burn	Medium	Minor	Slight	Minor	Slight	Minor	Slight
6b	Allt Cnapach	Medium	Minor	Slight	Minor	Slight	Major	Large
7	Feith Mhor	Medium	Minor	Slight	Minor	Slight	Minor	Slight
8	River Dulnain	High	Minor	Slight / Moderate	Minor	Slight / Moderate	Minor	Slight / Moderate
8	Allt nan Ceatharnach	High	Minor	Slight / Moderate	Minor	Slight / Moderate	Minor	Slight / Moderate
9	Bogbain Burn	Medium	Negligible	Neutral	Negligible	Neutral	Negligible	Neutral
11	Slochd Mhuic	Low	Major	Slight / Moderate	Major	Slight / Moderate	Major	Slight / Moderate



### Increased Flood Risk

- 10.4.28. The Proposed Scheme could potentially increase flood risk as a result of capacity improvements in existing watercourse crossings, development within the floodplain, increased runoff rates and volumes from hardstanding areas and proposed channel modification such as watercourse realignments. These impacts span both the construction and operational phases of the Proposed Scheme. Further details are available in Appendix A10.2 Stage 2 DMRB Flood Risk Assessment.
- 10.4.29. Flood risk impacts related to potential fluvial flow regime impact, floodplain impacts and surface water flooding impacts are discussed individually below. Flood risk from groundwater sources is considered negligible across the Proposed Scheme Options.

### Increased Flood Risk Due to Changes in Flow Regime

- 10.4.30. There are 44 existing watercourse crossings, which will either need to be extended and/or replaced to accommodate the Proposed Scheme. Current guidance from SEPA indicates that all water crossings should be designed to include for climate change allowance and freeboard on the 0.5% AEP flood event<sup>iv</sup>. In addition to this there are also ecological, and operational and maintenance factors which will contribute to the size of all water crossings. It is assumed that all watercourse crossing will be sized to meet the 0.5%AEP flood event as a minimum.
- 10.4.31. From the baseline capacity assessment 23 existing culverts have been identified having a Slight to Major significance to the downstream receptors, if the culvert are to be upsized to accommodate higher flows. Table 10.19 below details the magnitude of impact at each of these culverts, assessed based on the proposed change in capacity. A further 2 culverts were not fully assessed, due to limited topographical survey data currently available. These culverts have been included in Table 10.19, with a qualitative assessment of likely impact, based on professional judgement.





**Table 10.19: Flood Risk Impacts Related to Flow Regime Changes.**

Section	Watercourse Crossing ID	Culvert Size	Watercourse Name	Overall Catchment	0.5% Flow (m <sup>3</sup> /s)	Current Estimated Culvert Capacity		Magnitude	Downstream Sensitive Receptor	Sensitivity	Significance
						Surcharge to Soffit	Max Surcharge Available				
1	DS-WC-004	2.0m Ø	Caochan Ruadh	Loch Alvie	5.02	5.42 / 0.5%	21.83 / >0.1%	Mod	Rural Land, with land classification as land capable of producing a narrow range of crops.	L	Slight
2	DS-WC-005A	0.9m Ø	Unnamed drain (Allt Dibheach Catchment)	River Spey	1.42	0.76/ 10%	1.18/ 2%	Mod	Rural land associated with Lynwilg Farm, with land classification as land capable of moderate crop ranges and good yields.	M	Moderate
3a	DS-WC-010 DS-WC-011	0.9m Ø 0.5m Ø	Loch Puladdern	River Spey	4.97	0.3 / <50%	0.48 / <50%	Mod	Rural Land, with classification as land capable of producing a narrow range of crops.	L	Slight
3b	DS-WC-013	1m Ø	Unnamed Drain	Aviemore Burn	1.53	Awaiting topo data	Awaiting topo data	Neg - Mod*	Craigellachie National Nature Reserve. Forestry land.	M	Slight*
4	DS-WC-013A	0.8m Ø	Unnamed Drain	Aviemore Burn	0.82	0.99 / 0.5%	2.46/ >0.1%	Neg	Aviemore Residential and Non Residential properties	H	Neutral *
4	DS-WC-014	2.4m Ø	Aviemore Burn	Aviemore Burn	15.32	8.05 / 10%	9.64 / 4%	Maj	Aviemore Residential and Non Residential properties.	H	Large/ Very Large
4	DS-WC-016	0.9m Ø	The Shieling / Easter Aviemore Burn	River Spey	1.76	0.89 / 10%	2.15 / 0.5%	Mod	Rural grasslands of Easter Aviemore. Land use is grazing and rough pasture	L	Slight





Section	Watercourse Crossing ID	Culvert Size	Watercourse Name	Overall Catchment	0.5% Flow (m³/s)	Current Estimated Culvert Capacity		Magnitude	Downstream Sensitive Receptor	Sensitivity	Significance
						Surcharge to Soffit	Max Surcharge Available				
5	DS-WC-017	1.2m Ø	Southern bifurcation of Allt na Criche (Granish)	River Spey	5.75	1.78 / <50%	1.12/ <50%	Maj	Land use is a mixture of forestry and agricultural land associated with Granish Farm	L	Slight / Moderate
5	DS-WC-019	1.2m Ø	Northern bifurcation of Allt na Criche (Granish)	Allt na Criche (Granish)	0.66	0.124 / <50%	0.163 / <50%	Min	Rural grassland and General Wades Military Road	L	Neutral
5	DS-WC-022	1.1m Ø	Allt na Criche (Granish)	Allt na Criche (Granish)	8.35	1.44 / <50%	3.08 / 50%	Maj	Forestry commission land.	M	Large
5	DS-WC-024	1.45m Ø	Southern Avie Burn	Avie Lochan	4.14	1.43 / 50%	1.85 / 20%	Mod	Forestry commission land. Discharges to Avielochan	M	Moderate
5	DS-WC-026	0.9m Ø	Northern Avie Lochan Burn	Avie Lochan	1.75	0.9 / 10%	0.9 / 1%	Mod	Residential Properties at Avielochan	H	Large
6a	DS-WC-027	0.4m Ø	Unnamed Drain	Loch Vaa	1.06	0.09 / <50%	0.20 / <50%	Mod	Agricultural Land. No land classification	L	Slight
6a	DS-WC-028	0.6m Ø	Unnamed Drain	Loch Vaa	0.55	0.38 / 3.3%	1.21 / >0.1%	Min	Agricultural Land No Classification	L	Neutral
6b	DS-WC-032	1.5m Ø	Allt Cnapach	Allt Cnapach	6.9	3.17 / 20%	6 / 2%	Mod	Highland Mainline Railway	H	Moderate / Large
6b	DS-WC-035	0.3m Ø	Unnamed Drain	Gormack Stripe	0.93	0.11 / <50%	0.16 / <50%	Min	Highland Mainline Railway	H	Slight / Moderate
7	DS-WC-035A	0.3m Ø	Unnamed Drain	Gormack Stripe	0.35	0.04 / <50%	0.12 / 50%	Min	Forestry Land	M	Slight
7	DS-WC-036	2.0m Ø	Feith Mhor	Feith Mhor	6.2	4.74 / 2%	3.13 / 10%	Mod	Forestry Commission Land	M	Moderate





Section	Watercourse Crossing ID	Culvert Size	Watercourse Name	Overall Catchment	0.5% Flow (m³/s)	Current Estimated Culvert Capacity		Magnitude	Downstream Sensitive Receptor	Sensitivity	Significance
						Surcharge to Soffit	Max Surcharge Available				
7	DS-WC-043	1.1m Ø	Unnamed Drain	Feith Mhor	2.9	1.35 / 20%	1.78 / 10%	Mod	Forestry Commission Land	M	Moderate
8	DS-WC-045	0.45m	Unnamed Drain	River Dulnain	0.47	0.15 / 50%	N/A	Min	Highland Mainline Railway and Carrbridge train station	H	Slight / Moderate
9	DS-WC-049	0.45m	Unnamed Drain	Allt nan Ceatharnach	0.38	0.15 / 50%	0.26 / 3.33%	Min	Forestry Land	M	Slight
9	DS-WC-050	0.6m	Unnamed Drain	Bogbain Burn	0.66	0.24 / 50%	0.34 / 10%	Min	Grass and Scrub land	L	Neutral
9	DS-WC-052	0.5m Ø	Unnamed Drain	Bogbain Burn	1.4	0.20 / 50%	0.62 / 20%	Mod	Grass and Scrub land	L	Slight
9	DS-WC-053	1.0m Ø	Unnamed Drain	Allt Slochd Mhuic	1.6	1.22 / 1%	2.5 / >0.1%	Min	Grass and Scrub land	L	Neutral
10	DS-WC-055	0.7m Ø	Unnamed Drain	Allt Slochd Mhuic	1.6	0.47 / 50%	1.4 / 1%	Mod	Steep hillside consisting of grass and scrub land.	L	Slight
11	DS-WC-060	1.6m x 2.7m	Unnamed tributary of Slochd Mhuic	Allt Slochd Mhuic	7.6	7.6 / 0.5%	15.6 / >0.1%	Mod	Steep hillside within a rock outcrop	L	Slight
11	DS-WC-061	1.6m Ø	Slochd Mhuic	Allt Slochd Mhuic	7.6	2.7 / 50%	8.83 / 0.5%	Maj	National Cycle Track	H	Large / Very Large
11	DS-WC-062	1.6m Ø	Slochd Mhuic	Allt Slochd Mhuic	7.6	3.53 / 20%	9 / 0.5%	Maj	Grass and Scrub Land	L	Slight / Moderate

\*Qualitative assessment of magnitude and significance, based on professional judgement



- 10.4.32. The impacts for each structure are the same for all Mainline Options. There are 5 watercourse crossings which have the potential to have an impact of Major magnitude on peak flows downstream of the structure:
- DS-WC-014 Aviemore Burn;
  - DS-WC-017 Southern bifurcation of Allt na Criche (Granish);
  - DS-WC-022 Allt na Criche (Granish)
  - DS-WC-061 Slochd Mhuic; and
  - DS-WC-062 Slochd Mhuic.
- 10.4.33. Additionally there are 14 watercourse crossings with an impact of Moderate magnitude and a further 6 with impacts of Minor magnitude. For each impact the significance of the impact varies depending on the receptor.
- 10.4.34. There are two structures which are considered to have a Large/Very large significance these are DS-WC-014 Aviemore Burn and DS-WC-061 Slochd Mhuic. One structure with a Large significance (DS-WC-022 Allt na Criche (Granish)) and 8 with a Moderate or Slight /Moderate significance.
- 10.4.35. Downstream receptors of DS-WC-014 are the residential and non-residential properties including Aanside, Millside House, Croftside, Grampian Way, and the town of Aviemore. Historical flooding information indicates that Craig-na-Gower Avenue and the former Aviemore Primary School flooded in February 1990. This is considered to be a High sensitivity receptor with an associated Large/Very Large Significance. At this location mitigation measures and further assessment will be required.
- 10.4.36. The immediate downstream receptors of DS-WC-061 is the National Cycle Network route and the Highland Mainline Railway. Increases in culvert capacity could increase flow conveyance upstream of these assets. This is considered to be a High sensitivity receptor with an associated Large/Very Large Significance. At this location mitigation measures and further assessment will be required.
- 10.4.37. The immediate downstream receptor of the Allt na Criche (DS-WC-022) is forestry land, which is considered to be of Medium Sensitivity with a Large Significance. The A95, and the Highland Mainline Railway would be considered to have a high sensitivity, however there is no evidence of historical flooding at either location.

#### [Increased Flood Risk Due to Changes in Floodplain](#)

- 10.4.38. There are 8 areas of significant floodplains along the route of the Proposed Scheme, as identified in Section 10.3. Tests 1 and 2 of the sequential test has be applied to all identified floodplains.
- 10.4.39. From the review of the Mainline Options, The Shieing/Easter Aviemore Burn and the River Dulnain are not impacted by any of the Proposed Options and pass Test 1. Accordingly the magnitude of impact on the flood risk receptors associated with these floodplains will be Negligible, resulting in a significance of Neutral, for all Mainline Options.
- 10.4.40. The assessment has identified 6 locations of floodplain which would be impacted by the Proposed Mainline Options via either disconnection, displacement and/or encroachment onto the floodplain. These locations (shown in Figure A.10.2.8) are:
- Allt an Fhearna

- Loch Alvie
- Allt-na-Criche (Lynwilg)
- Aviemore
- Allt na Criche (Granish); and
- Feith Mhor

10.4.41. A review of the Mainline Alignment Options shows that all options will have an impact on the 6 existing floodplains identified. The assessment has sought to understand the flood risk impacts associated with the disconnection, displacement and/or encroachment from the Proposed Scheme. The 1D/2D linked models were updated to represent each of the Proposed Mainline Alignment Options.

10.4.42. The volume of water affected by each Mainline Option, the subsequent changes to floodplain extents and flood levels and the resulting impacts on the associated flood risk receptors is summarised in Table 10.20.



**Table 10.20: Flood Risk Impacts Associated with Floodplain Loss for Mainline Options**

Floodplain	Receptor	NGR	Sensitivity	Mainline Alignment Option 1			Mainline Alignment Option 1A			Mainline Alignment Option 2		
				FP Vol (m <sup>3</sup> ) Change in extent Change in depth (mm)	Magnitude	Significance	FP Vol (m <sup>3</sup> ) Change in extent Change in depth (mm)	Magnitude	Significance	FP Vol (m <sup>3</sup> ) Change in extent Change in depth (mm)	Magnitude	Significance
Allt an Fhearna (Section 1, Ch 0 - 400)	Rural land on right bank with LCA classification of land capable of producing a narrow crop range	285310 809145	Med	2677 No 200	Maj	Large	2677 No 200	Maj	Large	2689 No 0	Neg	Neutral
	Forestry land on the left bank	285359 809253	Med	2667 No 30	Min	Slight	2677 No 30	Min	Slight	2689 No 0	Neg	Neutral
	Agricultural land used for rough grazing, downstream of existing A9	285432 809204	Med	2667 No 0	Neg	Neutral	2677 No 0	Neg	Neutral	2689 No 20	Min	Slight
Loch Alvie Section 1, Ch 1000 - 2700	Rural land, with LCA as grassland with limited potential	285886 809578	Low	4632 No <5	Neg	Neutral	4530 No <5	Neg	Neutral	4835 No <5	Neg	Neutral
	Rural, unpopulated area with a primary land use of forestation.	286645 891000	Low	4632 No 2	Neg	Neutral	4530 No 2	Neg	Neutral	4835 No 2	Neg	Neutral
	The B9162 road between Kincaig and Aviemore	286821 809173	High	4632 No <5	Neg	Neutral	4530 No <5	Neg	Neutral	4832 No <5	Neg	Neutral
	Downstream of Loch Alvie	287097	Low	4632	Neg	Neutral	4530	Neg	Neutral	4832	Neg	Neutral







Floodplain	Receptor	NGR	Sensitivity	Mainline Alignment Option 1			Mainline Alignment Option 1A			Mainline Alignment Option 2		
				FP Vol (m <sup>3</sup> ) Change in extent Change in depth (mm)	Magnitude	Significance	FP Vol (m <sup>3</sup> ) Change in extent Change in depth (mm)	Magnitude	Significance	FP Vol (m <sup>3</sup> ) Change in extent Change in depth (mm)	Magnitude	Significance
		809299		No <5			No <5			No <5		
Allt na Criche – Lynwilg (Section 2 & 3a, Ch 3300 – 4500)	Agricultural land to the east of the Allt na Criche. LCA of moderate crop range and good yields.	288412 810661	Med	725 No 50-400	Maj	Large	730 No 50-400	Maj	Large	1160 No 50-400	Maj	Large
	Lynwilg farmland to the west of the Allt na Criche. Land classification of moderate crop range and good yields.	288087 810503	Med	725 No 30-100	Maj	Large	730 No 30-100	Maj	Large	1160 No 30-100	Maj	Large
	Grassland area between the existing A9 and B9152.	288384 810593	Low	725 No 5-10	Min	Neutral	730 No 5-10	Min	Neutral	1160 No 5-10	Min	Neutral
	Agricultural land, with land classification of moderate crop range and good yields.	288461 810511	Med	725 No 5-10	Min	Slight	730 No 5-10	Min	Slight	1160 No 5-10	Min	Slight
Aviemore Burn (Section 4 Ch 7100 – 8000)	Grassland area between the existing A9 and Carn Elrig, north of DS-WC-014. Land Classification as grassland with limited potential. A9 road embankment retains water upstream of Aviemore.	289317 813889	Low	237 Yes 200	Maj	Slight / Moderate	194 Yes 200	Maj	Slight / Moderate	1661 Yes 200	Maj	Slight / Moderate





Floodplain	Receptor	NGR	Sensitivity	Mainline Alignment Option 1			Mainline Alignment Option 1A			Mainline Alignment Option 2		
				FP Vol (m <sup>3</sup> ) Change in extent Change in depth (mm)	Magnitude	Significance	FP Vol (m <sup>3</sup> ) Change in extent Change in depth (mm)	Magnitude	Significance	FP Vol (m <sup>3</sup> ) Change in extent Change in depth (mm)	Magnitude	Significance
	Aviemore Burn downstream of DS-WC-014, residential properties.	289394 813871	High	237 Yes 20	Min	Slight / Moderate	194 Yes 20	Min	Slight / Moderate	1661 Yes 20	Min	Slight / Moderate
	Residential Properties at Strathspey Avenue	289375 813705	High	237 Yes <5	Maj	Large / Very Large	194 Yes <5	Maj	Large / Very Large	1661 Yes <5	Maj	Large / Very Large
	Aviemore Burn at Strathspey Avenue	289459 813646	High	237 Yes 30	Min	Slight / Moderate	194 Yes 30	Min	Slight / Moderate	1661 Yes 30	Min	Slight / Moderate
Allt na Criche (Granish) (Section 5 Ch8300-9600)	Forestry Commission Land	289731 814913	Med	1075 Yes >-100	Maj Ben	Large Benefit	1075 Yes >-100	Maj Ben	Large Benefit	1999 Yes >-50	Maj Ben	Large Benefit
	B9152 road to the east of Granish	289941 814737	High	1075 Yes -20	Min Ben	Slight / Moderate Benefit	1075 Yes -20	Min Ben	Slight / Moderate Benefit	1999 Yes -20	Min Ben	Slight / Moderate Benefit
	Residential & Non Residential Properties at Red Stag Lodge (off General Wade's Road)	289885 815047	High	1075 Yes 40	Min	Slight / Moderate	1075 Yes 40	Min	Slight / Moderate	1999 Yes >-100	Maj Ben	Large / Very Large Benefit
	Grassland between the A9 and B9152	289869 814935	Low	1075 Yes 30	Min	Neutral	1075 Yes 30	Min	Neutral	1999 Yes <-5	Neg	Neutral





Floodplain	Receptor	NGR	Sensitivity	Mainline Alignment Option 1			Mainline Alignment Option 1A			Mainline Alignment Option 2		
				FP Vol (m <sup>3</sup> ) Change in extent Change in depth (mm)	Magnitude	Significance	FP Vol (m <sup>3</sup> ) Change in extent Change in depth (mm)	Magnitude	Significance	FP Vol (m <sup>3</sup> ) Change in extent Change in depth (mm)	Magnitude	Significance
	A9	289905 814999	High	1075 Yes 70	Mod	Moderate/ Large	1075 Yes 70	Mod	Moderate/ Large	1999 Yes 50	Min	Slight / Moderate
	Forestry Commission land downstream of DS-WC-022	290140 815672	Med	1075 Yes -25	Min Ben	Slight Benefit	1075 Yes -25	Min Ben	Slight Benefit	1999 Yes -45	Min Ben	Slight Benefit
Feith Mhor (Section 7 Ch14700 - 15000)	Forestry Commission Land Upstream of the A9 DS-WC-039	290687 820841	Med	5016 No 0	Neg	Neutral	5000 No 0	Neg	Neutral	1417 No 0	Neg	Neutral
	Forestry Commission Land Upstream of the DS-WC-036 A9 Crossing	290712 820712	Med	5016 Yes 300-400	Maj	Large	5000 Yes 300-400	Maj	Large	1417 Yes 300-400	Maj	Large
	Forestry Commission Land Between the Highland Mainline Railway and A9	290808 820873	Med	5016 No 60	Mod	Moderate	5000 No 60	Mod	Moderate	1417 No 0	Neg	Neutral
	Highland Mainline Railway embankment	290825 820931	High	5016 No 60	Mod	Moderate/ Large	5000 No 60	Mod	Moderate / Large	1417 No 0	Neg	Neutral
	Downstream of the Highland Railway	290878 820896	Med	5016 No 10	Min	Slight	5000 No 10	Min	Slight	1417 No 0	Neg	Neutral



- 10.4.43. At Lynwilg the flooding in this area is considered to be surface water ponding, rather than fluvial flooding from the Allt na Criche. All Mainline Options are considered to have a local impact on the flood depths of Major magnitude, with an overall significance of Large at the point of volume loss, with impacts of Slight to Neutral significance downstream.
- 10.4.44. At Aviemore all Mainline Options result in changes in modelled flood extents, changes in flood depth and increases in downstream peak level and flows. The former Aviemore Primary School, which was reported to have been flooded in February 1990, is located some 350m to the east of the burn and is not located on the 0.5% AEP floodplain. With respect to the residential properties on Strathspey Avenue the flood extents have increased such that additional properties have become vulnerable to flooding at the 0.5% AEP. Although the depth of flooding at these properties (4mm) only constitutes a negligible magnitude impact, it is felt that the introduction of any new vulnerable properties is an overriding factor, and as such the impact at Aviemore is considered to be of Major magnitude, with a significance of Large / Very Large for all Mainline Options. Further modelling will be required at Stage 3 to understand and mitigate against the impacts on floodplain within the Aviemore and Boat of Garten PVA.
- 10.4.45. At Granish, all scheme options result in changes in the modelled flood extents and depth of flooding, with the displacement of floodplain storage. The impacts reported in Table 10.20 are based on the numerical outputs from the model and indicate that, due to modifications in runoff drainage paths, there are potential reductions in flood levels at some downstream receptors, but that the A9 is at risk of flooding.
- 10.4.46. The model outputs also suggest that the changes in flood levels vary between the options, potentially providing a differentiator between the Mainline Options. However, the modelled water levels are very sensitive to the assumed dimensions of the replacement crossings (specifically DS-WC-019 and DS-WC-022) and the finished ground levels and it is considered that the results should not be used to differentiate between options at this stage. The absolute change in flood depths will be confirmed at Stage 3, once the final ground levels are known and the proposed watercourse crossings and drainage design are developed further.
- 10.4.47. Nevertheless, the model outputs consistently show that all Mainline Options will result in some increase in water depth crossing the A9. As such, the impact for all Mainline Options is considered to be of Moderate magnitude, with an overall significance of Moderate/Large
- 10.4.48. For the vast majority of the identified floodplains and their associated flood risk receptors the magnitude and subsequent significance of impact is the same across all the Mainline Options. In many cases there are minor differences in the change to floodplain volumes, extents and depths associated with each option, however these differences have no material effect on the impact magnitude and significance.
- 10.4.49. There are, however, two notable exceptions (excluding Granish, as discussed above):
- On the Allt an Fhearna Options 1 and 1A have an impact of Large significance on the agricultural land located on the right banks with a local increase of 200mm in the peak flood levels. Meanwhile Option 2 has no impact on peak flood levels for this receptor and subsequently has a significance of Neutral. Conversely Option 2 increases the peak flood level by 20mm on agricultural land downstream of the Proposed Scheme, resulting in an impact of Minor magnitude and Slight significance. Options 1 and 1A have no impact on flood levels at this receptor, resulting in an impact magnitude of Negligible and significance of Neutral.

- On the Feith Mhor all Mainline Options result in localised changes to the modelled flood extents and flood depths, and are all considered to have an overall impact of Major magnitude and Large significance; due to increases of 300-400mm in flood depth within Forestry Commission land upstream of the A9. However, the majority of the floodplain extent on this watercourse is located downstream of the A9, contained between the existing A9 and the Highland Mainline railway. In this area the southbound widening Options 1, and 1A would result in a greater impact, compared to the northbound widening Option 2, due to a greater number of receptors impacted and larger impact magnitudes.

10.4.50. Flood compensation measures will be required to be considered at Allt an Fhearna, Allt na Criche (Lynwilg), Aviemore, Allt na Criche (Granish) and Feith Mhor for all Mainline Options, as the criteria of Test 1 and 2 of the sequential test cannot be achieved for any of the Mainline Options. Table 10.21 details the requirements of the Stage 3 Assessment.

**Table 10.21: Summary of Sequential Test Results and Requirements for the Stage 3 Assessment**

Watercourse / Floodplain	Stage 2 DMRB Preliminary FRA		Requirements of Stage 3 Assessment
	Test 1	Test 2	
Allt an Fhearna	Fail	Fail	Floodplain loss has been identified, therefore Test 3 of the sequential test is required.
Loch Alvie	Fail	Fail	Test 3 of the sequential test is required.
Allt-na-Criche (Lynwilg)	Fail	Fail	Floodplain loss related to the mainline and junction option A02 has been identified, therefore Test 3 of the sequential test is required.
Aviemore Burn	Fail	Fail	Floodplain loss has been identified, therefore Test 3 of the sequential test is required. In addition to this the 1D/2D linked model will be refined.
The Shieling/Easter Aviemore Burn	Pass	N/A	No further assessment required.
Allt na Criche (Granish)	Fail	Fail	Floodplain loss has been identified, therefore Test 3 of the sequential test is required.
Feith Mhor	Fail	Fail	Floodplain loss has been identified, therefore Test 3 of the sequential test is required.
River Dulnain	Pass	N/A	No further assessment required.

#### Increased Flood Risk Due to Changes in Surface Water Runoff

10.4.51. The drainage design for the Proposed Scheme will consist of new gravity drainage networks, which will convey flow to suitable outfall points via sustainable drainage systems (SuDS). The discharge rates into the receiving watercourse will be limited to the existing runoff rates. The Proposed Scheme will be designed to be free from surface water flooding at the 20% AEP event and not result in flooding to third parties at the



0.5% AEP. As a result the impact from increasing the impermeable surface area is considered to be of Negligible magnitude and Neutral significance.

#### Loss of Standing Water

- 10.4.52. Construction of the Proposed Mainline Alignment Options would involve the loss of area of standing water bodies (lochs and ponds) adjacent to the existing A9 carriageway, with knock-on effects into the operational phase. Impact could be as a result of direct infilling for road construction and/or embankment creation or by indirect disruption to inflowing surface water or groundwater, leading to drying out or a reduction in pond surface area or depth. The specific number of ponds and aggregate surface area lost is dependent upon the selected option, as summarised below.
- 10.4.53. All of the Proposed Mainline Alignment Options involve losses of standing water, with total surface area losses ranging from approximately 1046m<sup>2</sup> to 3166m<sup>2</sup>. This equates to a range of 0.4% to 1.2% of the aggregated standing water surface area within 250m of the Proposed Scheme Footprint.
- 10.4.54. The standing water body affected by the largest loss of area is Loch Puladdern with 2190m<sup>2</sup> loss, associated with Mainline Alignment Option 2. This loss equates to 27% of its total surface area. There are no direct losses from Loch Puladdern associated with Mainline Alignment Options 1 and 1A, although both options are located within 10m of the water body. Based on the criteria specified in Section 10.2 an impact magnitude of Moderate Adverse has been applied for in relation to Option 2, resulting in an impact significance of Moderate / Large. Option 1 and 1A are considered to have an impact magnitude of Minor, resulting in a significance of Slight / Moderate.
- 10.4.55. Other direct losses have been identified in relation to a number of small ponds located throughout the Study Area. These losses are common to all three of the Mainline Alignment Options with aggregated surface areas of 1067m<sup>2</sup>, 1046m<sup>2</sup> and 976m<sup>2</sup> lost for Options 1, 1A, and 2, respectively. As a proportion of the aggregated total surface area of all ponds within the 250m buffer area, these equate to 2.7% for Options 1 and 1A, and 2.5% for Option 2.
- 10.4.56. A number of ponds, are within the Mainline Alignment Options Footprint, with some subject to proportionally large losses of their individual surface area. The largest individual direct loss is from a pond north of Avie Lochan with 100% of its 488.6m<sup>2</sup> surface area lost under all Options.
- 10.4.57. However, there are 41 ponds in total within the 250m buffer area which are mostly situated in clusters in the southern half of the Proposed Scheme. In proportion to the total, the number of ponds with direct losses equate to 15% for Option 1 and 1A, and 10% for Option 2. For each case, an impact magnitude of Minor Adverse has been collectively applied for ponds which results in an impact significance of Neutral.
- 10.4.58. The three remaining large standing water bodies within the 250m buffer are not subject to any direct losses. Loch Alvie is located approximately 60m from each of the Mainline Alignment Options, Loch Vaa is located approximately 210m from each option, and Avie Lochan is approximately 180m from Options 1 and 1A, and 190m from Option 2. Based on their proximity to the Options, an impact magnitude of Minor Adverse has been applied, resulting in an impact significance of Moderate / Large for Loch Vaa, and Slight / Moderate for both Loch Alvie and Avie Lochan, for each of the Options.
- 10.4.59. The results of the standing water losses assessment is summarised in Table 10.22 below.





**Table 10.22: Summary of Standing Water Losses for Proposed Mainline Alignment Options**

Section	Receptor	Sensitivity	Mainline Alignment Option 1		Mainline Alignment Option 1A		Mainline Alignment Option 2	
			Magnitude	Significance	Magnitude	Significance	Magnitude	Significance
1	Loch Alvie	H	Min	Slight / Moderate	Min	Slight / Moderate	Min	Slight / Moderate
3a	Loch Puladdern	H	Min	Slight / Moderate	Min	Slight / Moderate	Mod	Moderate / Large
6a	Loch Vaa	VH	Min	Moderate / Large	Min	Moderate / Large	Min	Moderate / Large
5	Avie Lochan	H	Min	Slight / Moderate	Min	Slight / Moderate	Min	Slight / Moderate
Scheme wide	Ponds	L	Min	Neutral	Min	Neutral	Min	Neutral

#### Loss or Change to Water Supplies

- 10.4.60. Water supplies with surface water sources located downstream of the Proposed Scheme could potentially be impacted by disruption to surface water flow paths. The construction of cuttings and embankments, and the associated pre-earthworks drainage, across a surface water catchment could alter the local drainage regime, increasing flows in some sub-catchments with associated reductions elsewhere. These factors may reduce yields for local private water supplies downstream of the Proposed Scheme. Sources abstracting from larger watercourses, or located some distance downstream of the Proposed Scheme are less likely to be impacted as the proportion of the contributing catchment disrupted by the scheme will be relatively small.
- 10.4.61. Disruption of supply infrastructure, such as pipework conveying water from a source located on one side of the Proposed Scheme to a property located on the other, is considered as part of the Engineering Assessment.
- 10.4.62. The results of the assessment on loss or change to surface water supplies are discussed below and summarised in Table 10.23.
- 10.4.63. Two surface water fed private water supplies will be lost under the footprint of Mainline Alignment Option 2. PWS Eilan Cottage is a single property supply whilst PWS Avielochan supplies 2 properties, as detailed in Table 10.10 in Section 10.3. In both cases the source locations also fall within 20m of both Mainline Alignment Option 1 and 1A, and it is therefore considered likely that these supplies will be severely affected, to the point that these supplies will be lost entirely. As such the magnitude of impact from each of the Mainline Options on these supplies is considered to be Major, resulting in an impact significance of Large and Large / Very Large, respectively, based on their individual sensitivity ratings.
- 10.4.64. Four private water supplies have been identified as potentially experiencing a temporarily reduced quality supply due to their locations downstream of the Proposed Scheme; this being the case for each of the three Mainline Alignment Options. Of the 4 supplies PWS Alvie Manse, PWS Wendy and PWS Slugganranish are each considered to be of High sensitivity, while PWS Birch is considered to be of Medium

sensitivity. The impact magnitude assigned to each supply, in relation to each Mainline Option, is Minor Adverse, which results in an impact significance of Slight / Moderate for PWS Alvie, PWS Wendy and PWS Slugganranish, and a significance of Slight for PWS Birch View.

- 10.4.65. One private water supply is not anticipated to be affected by the any of the Mainline Alignment Options. PWS Slochd is a supply for a single property and has been assigned an impact magnitude of Negligible, due to its location 150m uphill of each of the options, which results in an impact significance of Neutral.
- 10.4.66. Two CAR surface water abstractions, a registration for abstraction from a pond at Granish Landfill Site and a licensed abstraction for hydropower from the Allt Cosach, are not anticipated to be affected by the Mainline Alignment Options, due to their distance from the Proposed Scheme. They have therefore been assigned an impact magnitude of Negligible and an impact significance of Neutral.
- 10.4.67. As the impacts on the supplies identified are common to all the Proposed Scheme Options, there is no differentiation between the Proposed Scheme Options.

**Table 10.23: Summary of Surface Water Supply Impacts for Proposed Mainline Alignment Options**

Section	Receptor	Sensitivity	Mainline Alignment Option 1		Mainline Alignment Option 1A		Mainline Alignment Option 2	
			Magnitude	Significance	Magnitude	Significance	Magnitude	Significance
1	PWS Alvie Manse	H	Min	Slight / Moderate	Min	Slight / Moderate	Min	Slight / Moderate
4	PWS Wendy	H	Min	Slight / Moderate	Min	Slight / Moderate	Min	Slight / Moderate
4	PWS Slugganranish	H	Min	Slight / Moderate	Min	Slight / Moderate	Min	Slight / Moderate
5	CAR Registration – Granish Landfill Site	M	Min	Slight	Min	Slight	Min	Slight
5	PWS Eilan Cottage	M	Maj	Large	Maj	Large	Maj	Large
5	PWS Avielochan	H	Maj	Large / Very Large	Maj	Large / Very Large	Maj	Large / Very Large
6b	PWS Birch View	M	Min	Slight	Min	Slight	Min	Slight
10	PWS Slochd	M	Neg	Neutral	Neg	Neutral	Neg	Neutral
11	CAR Licence – Altchosach Hydrostation	M	Neg	Neutral	Neg	Neutral	Neg	Neutral

## Impacts Specific to Mainline Alignment Options

### Construction Impacts

- 10.4.68. There are no construction impacts specific to any of the Mainline Alignment Options.

## *Operational Impacts*

### Alterations to Hydromorphological Regime

- 10.4.69. As previously discussed in para 10.4.26 the hydromorphological impact on the Allt Cnapach varies between the Mainline Options.
- 10.4.70. The northbound widening associated with Option 2 requires a greater embankment footprint and subsequently presents the potential requirement for a watercourse realignment of greater than ten metres, in order to tie-in with either a replacement or extended existing culvert. This results in an increased impact magnitude of Major and significance of Large for Option 2, compared to a Minor magnitude and Slight significance for Options 1 and 1A.

### Increased Flood Risk

- 10.4.71. As previously discussed in para 10.4.49 and summarised in Table 10.20 flood risk impacts associated with the Allt an Fhearna and Feith Mhor floodplains vary between the Mainline Alignment Options.
- 10.4.72. On the Allt an Fhearna Options 1 and 1A have an impact of Large significance on the agricultural land located on the right banks, with a local increase of 200mm in the peak flood levels. Meanwhile Option 2 has no impact on peak flood levels for this receptor and subsequently has a significance of Neutral. Conversely Option 2 increases the peak flood level by 20mm on agricultural land downstream of the Proposed Scheme, resulting in an impact of Minor magnitude and Slight significance. Options 1 and 1A have no impact on flood levels at this receptor, resulting in an impact magnitude of Negligible and significance of Neutral.
- 10.4.73. On the Feith Mhor all Mainline Options result in localised changes to the modelled flood extents and flood depths, and are all considered to have an overall impact of Major magnitude and Large significance; due to increases of 300-400mm in flood depth within Forestry Commission land upstream of the A9. However, the majority of the floodplain extent on this watercourse is located downstream of the A9, contained between the existing A9 and the Highland Mainline railway. In this area the southbound widening Options 1, and 1A would result in a greater impact, compared to the northbound widening Option 2, due to a greater number of receptors impacted and larger individual impact magnitudes.

### Loss of Standing Water

- 10.4.74. The northbound widening associated with Mainline Alignment Option 2 will result in a loss of 2190m<sup>2</sup> of the surface area of Loch Puladdern, This loss equates to 27% of its total surface area and is subsequently considered to be an impact of Moderate magnitude, with a significance of Moderate / Large.
- 10.4.75. By contrast, there are no direct losses from Loch Puladdern associated with Mainline Alignment Options 1 and 1A, although both options are located within 10m of the water body. Option 1 and 1A are considered to have an impact magnitude of Minor, resulting in a significance of Slight / Moderate.

## Impacts Common to Aviemore South Junction Options

### *Construction Impacts*

#### Construction Pollution

- 10.4.76. Potential construction pollution interactions, and associated impact magnitude and significance related to each of the Aviemore South Junction Options are summarised in Table 10.24, below.
- 10.4.77. Construction is anticipated within 50m of the Ballinluig Burn for Option A18 only. The length of interception between the water body 50m buffer and Junction Option is 143m, as detailed in Table 10.24, below. The magnitude of this impact is considered to be Moderate, resulting in a significance of Moderate / Large. Junction Options A02 and A09 have no interactions with the Ballinluig Burn and consequently the impact magnitude is assessed to be Negligible, resulting in a significance of Neutral.
- 10.4.78. Based on the preliminary road drainage design, it is anticipated that there would be one road drainage outfall associated with all Aviemore South Junction Options discharging to the Allt-na-Criche (Lynwilg). Due to the in-channel works required to construct this outfall the impact magnitude is considered to be Major, resulting in a significance of Very Large.
- 10.4.79. It is anticipated that, for all Aviemore South Junction Options, there shall be a requirement for one existing watercourse crossing structure to be extended/upgraded/replaced on a small tributary of the Allt Dibheach catchment. As in-channel works will be required the construction pollution impact is considered to be of Major magnitude, and Slight / Moderate significance.



**Table 10.24: Potential Construction Pollution Interactions for Proposed Aviemore South Junction Options**

Section	Receptor	Sensitivity	Aviemore South Option A02			Aviemore South Option A09			Aviemore South Option A18		
			Interactions	Magnitude	Significance	Interactions	Magnitude	Significance	Interactions	Magnitude	Significance
1	Ballinluig Burn	H	-	Neg	Neutral	-	Neg	Neutral	143m	Mod	Moderate / Large
2	Smaller Tributaries (Allt Dibheach catchment)	L	100m 1 x EC	Maj	Slight / Moderate	100m 1 x EC	Maj	Slight / Moderate	100m 1 x EC	Maj	Slight / Moderate
3a	Allt-na-Criche (Lynwilg)	VH	1 x O	Maj	Very Large	1 x O	Maj	Very Large	1 x O	Maj	Very Large

Interactions are listed as:

500m – length of junction option within 50m of a water body

1 x O – number of outfalls discharging to a water body

1 x EC, 1 x B – number of watercourse crossings on a water body (EC – Extend/re-construct existing culvert, C – new culvert, B – Bridge, representing all structures >2m diameter)



## *Operational Impacts*

### Pollution from Routine Runoff

- 10.4.80. For the junctions, as with the mainline, a single drainage design has been provided for each junction location. At each junction the location of outfalls are common to all the Proposed Junction Options, there are however significant differences in the complexity of junction layouts and the drainage network areas draining to each outfall. To overcome this the junction option deemed to have the greatest complexity and drainage area has been selected for drainage design and water quality assessment. In the case of the Aviemore South Junction this is Junction Option A18. This assessment approach follows a precautionary principal and allows for a conservative assessment in that the other junction options, which are of a lower drainage area or less complex layout, can be assumed to perform better in relation to potential water quality impacts.
- 10.4.81. A single outfall to surface waters is proposed for the Aviemore South Junction, which will discharge into the Allt-na-Criche (Lynwilg). The outfall passes all elements of the routine runoff assessment. Consequently the impact magnitude has been assessed as Negligible, resulting in an impact significance of Neutral. This assessment applies to all Aviemore South Junction Options.

### Pollution from Accidental Spillage

- 10.4.82. The accidental spillage probability calculated for the single outfall associated with all of the Aviemore South Junction Options is less than 0.5% (i.e. greater than 1 in 200 years). As a result the impact magnitude is considered to be Negligible, and the significance Neutral for all junction options.

### Alterations to Hydromorphological Regime

- 10.4.83. There are no hydromorphological receptors present in the Aviemore South Junction Option area.

### Increased Flood Risk

- 10.4.84. The Aviemore South Junction location lies in the vicinity of the Allt na Criche (Lynwilg) floodplain.
- 10.4.85. Agricultural land at Lynwilg is marginally affected by junction option A02, with 18.3m<sup>3</sup> of the surface water flood storage area affected, as shown in Table 10.25 below. This is considered to have an impact magnitude of Negligible, and subsequent significance of Neutral, when considered on its own. Similarly the other junction options have no impact on the floodplain and have subsequently been assessed as having Neutral significance. However when paired with the mainline route options the junction would have an impact of Large significance for all Aviemore South Junction Options.





**Table 10.25: Flood Risk Impacts Associated with Floodplain Loss for the Aviemore South Junctions**

Floodplain	Receptor	NGR	Sensitivity	Junction Option A02			Junction Option A09			Junction Option A18		
				FP Vol (m <sup>3</sup> ) Change in extent Change in depth (m)	Magnitude	Significance	FP Vol (m <sup>3</sup> ) Change in extent Change in depth (m)	Magnitude	Significance	FP Vol (m <sup>3</sup> ) Change in extent Change in depth (m)	Magnitude	Significance
Allt na Criche – Lynwilg (Section 2 & 3a Ch 3300 – 4500)	Agricultural land to the east of the Allt na Criche. LCA of moderate crop range and good yields.	288412 810661	Med	28 No 0	Neg	Neutral	0 No 0	Neg	Neutral	0 No 0	Neg	Neutral
	Lynwilg farmland to the west of the Allt na Criche. Land classification of moderate crop range and good yields.	286645 891000	Med	18.3 No 0	Neg	Neutral	0 No 0	Neg	Neutral	0 No 0	Neg	Neutral
	Grassland area between the existing A9 and B9152.	288384 810593	Low	18.3 No 0	Neg	Neutral	0 No 0	Neg	Neutral	0 No 0	Neg	Neutral
	Agricultural land, with land classification of moderate crop range and good yields.	288435 810541	Med	18.3 No 0	Neg	Neutral	0 No 0	Neg	Neutral	0 No 0	Neg	Neutral



### Loss of Standing Water

- 10.4.86. Construction of the Proposed Aviemore South Junction Options would involve no direct loss of standing water bodies, however, Loch Alvie is located within 250m of the proposed junction which results in an impact magnitude of Minor Adverse and Slight / Moderate significance for each option.

### Loss or Change to Water Supplies

- 10.4.87. There are no private water supplies located within 1km or 5km downstream of any of the Proposed Aviemore South Junction Options, therefore no impacts expected.

## **Impacts Specific to Aviemore South Junction Options**

### *Construction Impacts*

- 10.4.88. As discussed previously construction is anticipated within 50m of the Ballinluig Burn for Option A18 only. The length of interception between the water body 50m buffer and Junction Option is 143m, as detailed in Table 10.24. The magnitude of this impact is considered to be Moderate, resulting in a significance of Moderate / Large.
- 10.4.89. Junction Options A02 and A09 have no interactions with the Ballinluig Burn and consequently the impact magnitude is assessed to be Negligible, resulting in a significance of Neutral.

### *Operational Impacts*

- 10.4.90. There are no operational impacts specific to any of the Aviemore South Junction Options.

## **Impacts Common to Granish Junction Options**

### *Construction Impacts*

#### Construction Pollution

- 10.4.91. Potential construction pollution interactions, and associated impact magnitude and significance related to each of the Granish Junction Options are summarised in Table 10.26, below.
- 10.4.92. As can be seen construction is anticipated within 50m of the Allt na Criche (Granish), and its Northern bifurcation channel, for each of the Proposed Granish Junction Options. The length of mainline in close proximity to the Allt na Criche itself is notable for each of the options, ranging from 300 to 460m.
- 10.4.93. Based on the preliminary road drainage design, it is anticipated that there will be two road drainage outfalls associated with each of the Granish Junction Options discharging to surface waters.
- 10.4.94. It is anticipated that there shall be a requirement for three watercourse crossing structures on Options C21 and C31, and two on Options C18 and C34.
- 10.4.95. As can be seen, although there are some differences in the waterbody interactions between the different junction options, there is no material difference in the impact



significance. The two water bodies have been assessed as having an impact magnitude of Major Adverse and associated significance of Large / Very Large.

- 10.4.96. One CAR Registration for surface water abstraction has been identified approximately 300m downstream of all four of the Junction Options. Given that the exact location of this abstraction is from a pond located downstream of the northern bifurcation of Allt na Criche (Granish), it has been assigned an impact magnitude of Minor Adverse and a significance of Slight.





**Table 10.26: Potential Construction Pollution Interactions for Proposed Granish Junction Options**

Section	Receptor	Sensitivity	Granish Option C18			Granish Option C21			Granish Option C31			Granish Option C34		
			Interactions	Magnitude	Significance	Interactions	Magnitude	Significance	Interactions	Magnitude	Significance	Interactions	Magnitude	Significance
5	Northern bifurcation of Allt na Criche (Granish)	H	150m 1 x 0 1 x EC	Maj	Large / Very Large	137m 1 x 0 1 x EC	Maj	Large / Very Large	150m 1 x 0 1 x EC	Maj	Large / Very Large	121m 1 x 0 1 x EC	Maj	Large / Very Large
5	Allt na Criche (Granish)	H	459m 1 x 0 1 x EC	Maj	Large / Very Large	349m 1 x 0 1 x EC 1 x C	Maj	Large / Very Large	361m 1 x 0 1 x EC 1 x C	Maj	Large / Very Large	305m 1 x 0 1 x EC 1 x C	Maj	Large / Very Large
5	CAR Registration – Granish Landfill Site	M	<300m downstream of Scheme	Min	Slight	<300m downstream of Scheme	Min	Slight	<300m downstream of Scheme	Min	Slight	<300m downstream of Scheme	Min	Slight

Interactions are listed as:

500m – length of junction option within 50m of a water body

1 x O – number of outfalls discharging to a water body

1 x EC, 1 x B – number of watercourse crossings on a water body (EC – Extend/re-construct existing culvert, C – new culvert, B – Bridge, representing all structures >2m diameter)



## Operational Impacts

### Pollution from Routine Runoff

- 10.4.97. For the junctions, as with the mainline, a single drainage design has been provided for each junction location. At each junction the location of outfalls are common to all the Proposed Junction Options, there are however significant differences in the complexity of junction layouts and the drainage network areas draining to each outfall. To overcome this the junction option deemed to have the greatest complexity and drainage area has been selected for drainage design and water quality assessment. In the case of the Granish Junction this is Junction Option C34. This assessment approach follows a precautionary principal and allows for a conservative assessment in that the other junction options, which are of a lower drainage area or less complex layout, can be assumed to perform better in relation to potential water quality impacts.
- 10.4.98. Two outfalls to surface waters are proposed for the Granish Junction Options, which will discharge into the Allt na Criche (Granish), and its Northern bifurcation channel. The outfalls pass all elements of the routine runoff assessment. Consequently the impact magnitude has been assessed as Negligible, resulting in an impact significance of Neutral. This assessment applies to all Granish Junction Options.

### Pollution from Accidental Spillage

- 10.4.99. The accidental spillage probability calculated for the two outfalls associated with all of the Granish Junction Options is less than 0.5% (i.e. greater than 1 in 200 years). As a result the impact magnitude is considered to be Negligible, and the significance Neutral for all junction options.

### Alterations to Hydromorphological Regime

- 10.4.100. A summary of the hydromorphology impacts for each Proposed Granish Junction option are summarised below in Table 10.27.
- 10.4.101. The footprints of Junction Options C21, C31, and C34 coincide with the Allt na Criche (Granish) to the west of the Proposed Scheme, as a result each option will require a new crossing as a minimum, and may also require significant realignment. As a consequence the impact magnitude is considered to be Major, resulting in a significance of Large.
- 10.4.102. Option C18 does not encroach upon the watercourse in this location, however the separation between two is minimal (approximately 30m) and it is possible that some engineering may be required to ensure the stability of the watercourse. As a result the potential impact is considered to be of Moderate magnitude and of Moderate significance.

**Table 10.27: Summary of Hydromorphology Assessment for Proposed Granish Junction Options**

Section	Receptor	Sensitivity	Hydromorphology Impact Significance			
			Option C18	Option C21	Option C31	Option C34
5	Allt na Criche (Granish)	M	Moderate	Large	Large	Large

### Increased Flood Risk

- 10.4.103. The Granish Junction location lies in the vicinity of the Allt na Criche (Granish) floodplain, with all options resulting in a displacement of floodplain. The topography around the A9 at Granish is such that all junction options will be cut into the existing ground profile. The impact of this, for all junction options, is that the cutting required could potentially connect with the floodplain at chainage 8500 and 8750 (NGR 2898 8152, and 2898 8153), resulting in flood water collecting at the new junction at chainage 8700 (NGR 2899 8153).
- 10.4.104. Consideration will be given at Stage 3 to the design of the junction, the proposed replacement culverts for the Allt na Criche (Granish) and its northern bifurcation (DS-WC-22 and DS-WC-019 respectively) and associated channel works, to ensure that flood flows are contained within the existing floodplain and are not displaced towards the proposed junction.
- 10.4.105. The modelled displacement of the floodplain for all junction options results in localised changes to the flood depth across the floodplain, with reductions in flood depth at some of the identified receptors, as shown in Table 10.28. As can be seen the changes in flood depth vary for the different junction options, potentially providing a differentiator between the options. However, as previously discussed in paras 10.4.45 – 10.4.47, the current Granish model outputs should not be used for this purpose due to the sensitivity to assumed ground levels and the dependency between the impacts on the floodplain of the mainline alignment and the junction. Once the scheme design is developed to prevent displacement of floodwaters towards the junction the flood depths across the floodplain will change from those reported in Table 10.28.
- 10.4.106. It is also not possible to separate the magnitude of the impacts associated with the junction or mainline options. It is therefore considered appropriate to conclude that the significance of all junction options is Moderate/Large.
- 10.4.107. The sequential test at this location is failed and mitigation measures will be required at Stage 3 to ensure that flood risk does not increase.





**Table 10.28: Flood Risk Impacts Associated with Floodplain Loss for the Proposed Granish Junction Options**

Floodplain	Receptor	NGR	Sensitivity	Junction Option C18			Junction Option C21			Junction Option C31			Junction Option C34		
				FP Vol (m <sup>3</sup> ) Change in extent Change in depth (m)	Magnitude	Significance	FP Vol (m <sup>3</sup> ) Change in extent Change in depth (m)	Magnitude	Significance	FP Vol (m <sup>3</sup> ) Change in extent Change in depth (m)	Magnitude	Significance	FP Vol (m <sup>3</sup> ) Change in extent Change in depth (m)	Magnitude	Significance
Allt na Criche (Granish) (Section 5 Ch8300-9600)*	Forestry Commission Land	289731 814913	Med	3473 Yes -70	Mod Ben	Mod Benefit	3727 Yes -100	Mod Ben	Mod Benefit	3843 Yes >-100	Maj	Large	3001 Yes >-100	Maj Ben	Large
	B9152 road to the east of Granish	289941 814737	High	3473 Yes -20	Min Ben	Slight / Mod Benefit	3727 Yes -10	Min Ben	Slight / Mod Benefit	3843 Yes -35	Min Ben	Slight / Mod Benefit	3001 Yes -20	Min Ben	Slight / Mod Benefit
	Residential & Non Residential Properties	289896 815047	High	3473 Yes -20	Min Ben	Slight / Mod Benefit	3727 No -50	Mod Ben	Mod / Large Benefit	3843 Yes >-100	Maj Ben	Large / Very Large Benefit	3001 No 40	Min	Slight / Mod
	Grassland between the A9 and B9152	289569 814935	Low	3473 Yes 0	Neg	Neutral	3727 Yes -60	Mod Ben	Slight Benefit	3843 Yes >-100	Maj Ben	Slight / Mod Benefit	300 Yes 30	Min	Neutral
	A9	289905 814999	High	3473 Yes -50	Min	Slight / Mod	3727 Yes -60	Mod Ben	Mod / Large Benefit	3843 Yes >-100	Maj Ben	Large / Very Large Benefit	3001 Yes 70	Mod	Mod / Large
	Forestry Commission land d/s of DS-WC-022	290140 815672	Med	3473 Yes >-100	Maj Ben	Large Benefit	3473 Yes -50	Mod Ben	Mod Benefit	3843 Yes >-100	Maj	Large	3001 Yes -30	Min Ben	Slight Benefit





### Loss of Standing Water

10.4.108. Options C31 and C34 involve direct loss of area from a single pond with their proportionate loss of the total aggregated pond area within 250m of the junction footprint being 2% and 0.3%, respectively. All Options are within 250m of a pond and therefore have all been assigned an impact magnitude of Minor Adverse and a significance of Neutral. This is detailed in Summary Table 10.29.





**Table 10.29: Summary of Standing Water Losses for Proposed Granish Junction Options**

Section	Receptor	Sensitivity	Option C18			Option C21			Option C31			Option C34		
			Standing Water Losses	Magnitude	Significance	Standing Water Losses	Magnitude	Significance	Standing Water Losses	Magnitude	Significance	Standing Water Losses	Magnitude	Significance
5	Ponds	L	<250m	Min	Neutral	<250m	Min	Neutral	1 / 2% <250m	Min	Neutral	1 / 0.3% <250m	Min	Neutral

Standing water losses are listed as:

For individual standing waters: proximity to the option footprint / %age loss of standing water surface area under the footprint of the option

For grouped small ponds: No. water bodies entirely or partially under the footprint of the option / %age of aggregated standing water area within 250m of the option lost



### Loss or Change to Water Supplies

- 10.4.109. One CAR Registration for abstraction has been identified approximately 300m downstream of all four of the Junction Options. Given that the exact location of this abstraction is from a pond located downstream of the northern bifurcation of Allt na Criche (Granish), it has been assigned an impact magnitude of Minor Adverse and a significance of Slight.

## **Impacts Specific to Granish Junction Options**

### *Construction Impacts*

- 10.4.110. There are no construction impacts specific to any of the Granish Junction Options.

### *Operational Impacts*

### Alterations to Hydromorphological Regime

- 10.4.111. As discussed previously the footprints of Junction Options C21, C31, and C34 coincide with the Allt na Criche (Granish) to the west of the Proposed Scheme, as a result each option will require a new crossing as a minimum, and may also require significant realignment. As a consequence the impact magnitude is considered to be Major, resulting in a significance of Large.
- 10.4.112. Option C18 does not encroach upon the watercourse in this location, however the separation between two is minimal (approximately 30m) and it is possible that some engineering may be required to ensure the stability of the watercourse. As a result the potential impact is considered to be of Moderate magnitude and of Moderate significance.

## **Impacts Common to Black Mount Junction Options**

### *Construction Impacts*

### Construction Pollution

- 10.4.113. Potential construction pollution interactions, and associated impact magnitude and significance related to each of the Black Mount Junction Options are summarised in Table 10.30, below.
- 10.4.114. Construction is anticipated within 50m of the Bogbain Burn for Junction Options D07 and D51.
- 10.4.115. Based on the preliminary road drainage design, it is anticipated that there would be one road drainage outfall associated with each of the Black Mount Junction Options discharging to surface waters.
- 10.4.116. As can be seen, although there are some differences in the waterbody interactions between the different options, there is no material difference in the impact significance. For each Option the Bogbain Burn has been assessed as having an impact magnitude of Major Adverse, and associated significance of Very Large.



**Table 10.30: Potential Construction Pollution Interactions for Proposed Black Mount Junction Options**

Section	Receptor	Sensitivity	Option D02			Option D03			Option D07			Option D12			Option D13			Option D51		
			Interactions	Magnitude	Significance	Interactions	Magnitude	Significance	Interactions	Magnitude	Significance	Interactions	Magnitude	Significance	Interactions	Magnitude	Significance	Interactions	Magnitude	Significance
9	Bogbain Burn	VH	1 x O	Maj	Very Large	1 x O	Maj	Very Large	104m 1 x O	Maj	Very Large	1 x O	Maj	Very Large	1 x O	Maj	Very Large	224m 1 x O	Maj	Very Large



## *Operational Impacts*

### Pollution from Routine Runoff

- 10.4.117. For the junctions, as with the mainline, a single drainage design has been provided for each junction location. At each junction the location of outfalls are common to all the Proposed Junction Options, there are however significant differences in the complexity of junction layouts and the drainage network areas draining to each outfall. To overcome this the junction option deemed to have the greatest complexity and drainage area has been selected for drainage design and water quality assessment. In the case of the Black Mount Junction this is Junction Option D51. This assessment approach follows a precautionary principal and allows for a conservative assessment in that the other junction options, which are of a lower drainage area or less complex layout, can be assumed to perform better in relation to potential water quality impacts.
- 10.4.118. A single outfall to surface waters is proposed for the Black Mount Junction Options, which will discharge into the Bogbain Burn. The outfall passes all elements of the routine runoff assessment. Consequently the impact magnitude has been assessed as Negligible, resulting in an impact significance of Neutral. This assessment applies to all Black Mount Junction Options.

### Pollution from Accidental Spillage

- 10.4.119. The accidental spillage probability calculated for the two outfalls associated with all of the Black Mount Junction Options is less than 0.5% (i.e. greater than 1 in 200 years). As a result the impact magnitude is considered to be Negligible, and the significance Neutral for all junction options.

### Alterations to Hydromorphological Regime

- 10.4.120. There are no hydromorphological receptors present in the Black Mount Junction Option area.

### Increase Flood Risk

- 10.4.121. There are no flood risk receptor present in the Black Mount Junction Option area

### Loss of Standing Water

- 10.4.122. There are no standing water bodies located within 250m of any of the Proposed Black Mount Junction options, therefore no impacts expected.

### Loss or Change to Water Supplies

- 10.4.123. There are no private water supplies located within 1km or 5km downstream of any of the Proposed Black Mount Junction options, therefore no impacts expected.

## **Impacts Specific to Black Mount Junction Options**

### *Construction Impacts*

- 10.4.124. There are no construction impacts specific to any of the Black Mount Junction Options.

### *Operational Impacts*

- 10.4.125. There are no operational impacts specific to any of the Black Mount Junction Options.



## 10.5. Potential Mitigation

- 10.5.1. To prevent any deviation from achieving WFD 'Good' status for receiving watercourses or increase in flood risk, the objective is to keep water quality and runoff to pre-development levels, whilst recognising that natural variability in flow values and water quality do occur.

### Mitigation during Construction

#### *Construction Pollution*

- 10.5.2. There are a number of Pollution Prevention Guidelines (PPGs) good practice guidance documents available from SEPA, The Highland Council<sup>xii</sup> and organisations such as CIRIA<sup>xvi</sup> for site environmental management. From such documents there are a number of mitigation measures which would be applied in all cases and some which are specific to particular design features and locations. These mitigation measures would be anticipated to be collated within the Construction Environmental Management Plan for the Proposed Scheme.
- 10.5.3. Pollution prevention planning prioritises prevention at source, followed by mitigation measures local to source. Pollution incident management would operate on two main principles:
- reducing the likelihood of an incident occurring; and
  - minimising the magnitude (or severity) of any incident that does occur.
- 10.5.4. In tandem, these principles would reduce the potential for contamination of surface water and associated habitats. To achieve this, the following principles would be expected to be included:
- preparation of method statements and environmental incident response plans, including staff training, to be agreed prior to commencement of works with SEPA, with specific additional detail for all locations where working is required within 50m of existing watercourses;
  - secure storage of fuels (as per the Water Environment (Oil Storage) (Scotland) Regulations 2006) and other potentially hazardous construction materials;
  - good practice earthworks, structural and drainage installation to minimise and treat sediment-laden runoff;
  - where feasible, new culverts and diversions to be constructed offline, with water diversion to the new channel timed to allow for the establishment of vegetation within the channel. Construction would proceed from the low end of the newly constructed watercourse channels, to minimise sedimentation, with 'breakthrough' of upper end of the channel and release of flow only when new channel is suitably prepared;
  - use of pre-cast concrete structural materials, where feasible, to minimise use of wet concrete in near-channel or in-channel works; and
  - watercourse monitoring at locations where construction activity has reasonable potential to affect water quality.

#### *Flood Risk*

- 10.5.5. To protect the site and third party land from increased flood risk during the construction phase of the proposed scheme the following should be considered.

- 10.5.6. The proposed scheme development site should be listed on the SEPA flood warning register. The flood warning service monitors rainfall and river levels 24 hours a day and uses this information to forecast the possibility of flooding.
- 10.5.7. A flood warning and emergency evacuation plan will be prepared and submitted to Transport Scotland for approval before construction work commences. The emergency evacuation plan will include the following:
- how the flood warning should be provided and disseminated;
  - what will be done to protect the critical infrastructure of the development and how easily damaged items will be relocated;
  - the availability of staff and time taken to respond to a flood warning;
  - the use of high level refuges for staff within the plant;
  - the time needed to evacuate the site;
  - provision of safe access to and from the development;
  - the ability to maintain key operations during a flood event; and
  - expected time taken to re-establish normal operation following a flood event.
- 10.5.8. To ensure the effects of flood risk are minimised during construction, the work will be undertaken when flood events are unlikely and not predicted. Should a storm with flood potential be predicted then measures will be put in place to reduce the impacts of flooding, e.g. remove machinery from low-lying areas
- 10.5.9. All temporary channels and pumping operations to be sized in accordance with the flood risk for each location.
- 10.5.10. The excavation and construction works could lead to the blockage and severance of existing surface water drainage systems and watercourse crossing structures, which could result in low frequency localised flooding to the site. The Construction Environment Management Plan (CEMP) will outline the mechanisms to manage surface water flooding and will mitigate the risk from the blockage and severance of drainage pathways.
- 10.5.11. Stockpiles and site compounds should all be located out with the 0.5% AEP flood envelope.
- 10.5.12. During construction, the operation of machinery may result in compaction of the soil which will reduce the infiltration capacity. This could result in an increase in surface water runoff and could lead to localised flooding and runoff into the watercourses and rivers. As part of the CEMP, surface water runoff will be managed such that it will not increase the risk of flooding at the proposed development site, or to land within the surrounding area.

## Mitigation during Operation

### *Pollution from Routine Runoff*

- 10.5.13. Considered as embedded mitigation inherent within the drainage design, a minimum of two levels of treatment to remove contaminants will be provided on each drainage network, with a further level of treatment to potentially be provided should preliminary HAWRAT and EQS calculations indicate that any road drainage outfall would fail these assessments and that an adverse impact would result.

- 10.5.14. There are two primary options for the mitigation of acute impacts from soluble pollutants: flow attenuation which ensures there is sufficient dilution in the receiving watercourse, or treatment to reduce the concentration of soluble pollutants in the road runoff before discharge. The principal processes that would remove soluble metal pollutants from road runoff are adsorption, where pollutants bind to soil particles, or uptake by plants. There are a variety of sustainable drainage techniques and specialist proprietary systems that can provide varying levels of treatment for soluble pollutants.
- 10.5.15. From previous experience on similar schemes, it is anticipated that the HAWRAT assessment may indicate that no treatment is required on a number of the mainline networks, due to the combination of low traffic volumes, small drainage networks and large receiving watercourses. However, it is still intended that two levels of treatment will be provided as standard on mainline and junction networks, regardless of the HAWRAT results.

#### *Pollution from Accidental Spillage*

- 10.5.16. The Stage 2 accidental spillage calculations have indicated that there is no requirement for mitigation, specifically for accidental spillage. However ponds and other sustainable drainage techniques, which may be proposed in each drainage network to address routine runoff impacts, would also provide containment and treatment following an accidental spillage incident.

#### *Alteration to Hydromorphological Regime*

- 10.5.17. The design for bridges, culverts, watercourse diversions and drainage outfalls shall be developed in light of both generic good practice embedded in the design and location-specific measures to be identified during DMRB Stage 3. Generic good practice measures are discussed further in Appendix A10.1 and outlined below:
- Information derived from the hydromorphology assessment shall input into the design of structures interacting with the water environment;
  - open clear span structures for proposed bridges, crossing the larger watercourses ensure the existing channel section and vertical profile are subject to minimal alteration;
  - setting back of bridge supports from the river channel and bank where possible would allow the continuation of the riparian corridor beneath the bridge;
  - upstream faces of bridge piers would be streamlined to reduce the risk of large wood debris becoming trapped during flood flows, which can lead to turbulence and potentially increased erosion, sedimentation and flooding;
  - outfalls, culverts and diversions to be appropriately designed in terms of location, size, orientation, gradient, and to include scour pools where appropriate, to minimise adverse effects on flows, erosion/deposition processes and passage of fish or mammals; and
  - temporary works, including diversions, should consider watercourse interactions as temporary channels can have lasting effects on the local channel and catchment area.

#### *Increased Flood Risk*

- 10.5.18. The Proposed Scheme will be designed to avoid increasing flood risk to the proposed scheme and third parties.



- 10.5.19. Where the assessment identifies an increases to flood risk, mitigation measures will be required to offset the impact. No mitigation measures have been assessed as part of the Stage 2 Assessment and this will be undertaken at Stage 3.
- 10.5.20. There are 23 existing watercourse crossings which were positively identified as being unable to convey the 0.5% AEP event. Upgrading of these culverts to meet the current design standard from SEPA, ecological requirements and to ensure health and safety during construction and maintenance periods, would result in additional flow conveyance. This has potential to increase flood risk downstream of these A9 crossings. For these structures the following will be considered:
- Maintaining the existing structure capacity
  - Upsizing the structure but enabling the channel to spill upstream of the culvert maintaining the existing conveyance.
- 10.5.21. Where the above is not possible/feasible/realistic, sensitivity testing will be undertaken for each of the identified culverts, to understand both the local and regional impact on downstream peak flows, and water levels.
- 10.5.22. In order to meet the requirements of DMRB HD45/09 (Para 2.37, black box) the following should be adhered to;
- The Proposed Scheme must remain operational and safe for use in times of flood;
  - The Proposed Scheme should result in no net loss of floodplain storage;
  - The Proposed Scheme should not impede water flows; and
  - there should be no increase in flood risk elsewhere.
- 10.5.23. The proposed mitigation strategy will be to use a sequential test for storage compensation, similar to the approach used in Planning Policy Statement 25 (PPS25) to flood risk and development. This strategy aligns with SEPA's guidance to stakeholders. Appendix A10.2 – A9 Dualling, Dalraddy – Slochd: Preliminary Flood Risk Assessment provides further details on the proposed sequential test for compensation.
- 10.5.24. It is not possible to entirely avoid floodplains from the proposed scheme and the impact significance is considered to be:
- Large Adverse at Allt an Fhearna
  - Large Adverse at Allt na Criche (Lynwilg)
  - Very Large Adverse at Aviemore;
  - Moderate / Large Adverse at Allt na Criche (Granish) and
  - Large Adverse at Feith Mhor
- 10.5.25. At these locations Test 3 of the sequential test will apply.
- 10.5.26. Where flood compensation storage is required this can be achieved through a number of options including
- Landscaped features, through the re-profiling of the ground to replace the level for level volume loss. Consideration will be given to the floodplain conveyance, storage, land use and connectivity.
  - Creation of enlarged channels, whereby increasing the storage available in channels that cross a floodplain (direct storage) or that connect a floodplain (in-direct storage).



- Offline depressions or basins, which provide additional storage areas that can be linked to the 0.5% AEP floodplain with hydraulic structures to ensure level for level storage. It might be feasible to use culvert structures to control the flow through the embankment to neutralise the effect of the scheme. However, if all culverts are to be enlarged then it's unlikely that this approach will be an option. It may be that culverts through existing side roads and the railway already serve this purpose.

- 10.5.27. The floodplain loss associated with the Allt an Fhearna is localised upstream of the existing A9, with Neutral significance downstream. However at the point of loss the impact is considered Large Adverse, and compensation flood storage should be considered.
- 10.5.28. Although the loss of floodplain storage associated with Loch Alvie is considered to be Negligible. It is considered best practice to provide flood compensation storage, in accordance with the SEPA flood risk guidance for stakeholders.
- 10.5.29. The surface water flood storage associated with the Lynwilg farmland is considered of Medium importance, due to the high value agricultural land use. The impacts from the storages loss are locally contained, with negligible impacts on peak levels downstream.
- 10.5.30. The floodplains associated with the Aviemore Burn and Aviemore are considered of High importance, providing protection to a range of receptors including residential and non-residential properties. The impact from changing the flood outline and increases in flood depth, means avoidance or full mitigation of the 5467m<sup>3</sup> lost storage volume will be required to mitigate the impact.
- 10.5.31. The floodplains associated with the Allt na Criche (Granish) currently present a flood risk to the existing A9, with the Proposed Scheme altering the flood risk to the A9 and downstream receptors. The impact from the changing flood outline and flood depths means avoidance and/or full mitigation of the 3000-4000m<sup>3</sup> lost storage will be required to mitigate the impact.
- 10.5.32. The floodplains of Feith Mhor are primarily located between the existing A9 and Highland Mainline Railway. The impacts from the floodplain loss in this area are locally contained in this area. Although peak flows increase in the immediate area next to this displacement, the preliminary testing indicated negligible change in the peak levels downstream of the railway and the effect of the floodplain loss is local to the point of loss.
- 10.5.33. At the following locations the impacts of floodplain losses are locally contained and the downstream impact is considered to be Slight or Neutral significance.
- Allt an Fhearna
  - Loch Alvie
  - Allt na Criche (Lynwilg); and
  - Feith Mhor
- 10.5.34. It may be possible at these locations that partial compensation is suitable if full compensation is not practically achievable.
- 10.5.35. The Aviemore Burn and Allt na Criche (Granish) are considered to have downstream impacts, which will require further consideration. As part of the Stage 3 design consideration will be given to the optimisation of earthworks, and the proposed hydraulic capacity to further reduce the flood risk impacts identified, and the extent of mitigation required.

- 10.5.36. Any impacts to existing ponds adjacent to the existing A9, particularly where they serve a flood storage or conveyance function, would be likely to require mitigation.
- 10.5.37. All the Proposed Scheme Options consider sustainable drainage within the embedded design and surface water runoff would be attenuated.

#### *Loss of Standing Water*

- 10.5.38. The drainage strategy for the Proposed Scheme shall adopt sustainable drainage systems, which is anticipated to include pond features at appropriate locations. These ponds would have a number of functions including flow attenuation and treatment of road runoff to improve water quality, with ecological issues factored into individual pond design to maximise ecological value (Chapter 11: Ecology and Nature Conservation). It would be expected that the drainage ponds shall provide some replacement habitat for the loss of the existing standing water bodies, although would not be anticipated as being a substitute.

#### *Loss or Change to Water Supplies*

- 10.5.39. The owners of private surface water abstractions located within 1km of the Proposed Scheme, or within 5km downstream of the scheme, shall be consulted at the detailed design stage to establish specific information on existing supply infrastructure, exact supply location, water resource requirements and, if applicable, an appropriate monitoring strategy commencing pre-construction, to ensure continuity of supply. Potential temporary and permanent substitution of supply options shall be identified as contingency measures, should monitoring confirm reduced resource availability.
- 10.5.40. The landowners, SEPA and The Highland Council shall be informed of the programme of anticipated construction activities and consulted to establish appropriate locations, parameters, frequency of monitoring and reporting of water quality data prior to construction commencing.
- 10.5.41. The flow patterns of the drainage design shall take account of downstream abstractions, with an objective to minimise alterations to baseline flow conditions.
- 10.5.42. Prior to construction, further surveys shall be undertaken for surface abstraction assets. Should additional locations be identified, these supplies would be treated on the same basis as the supplies discussed above.

## **10.6. Summary of Route Option Impacts**

- 10.6.1. A summary of the impact assessment for each Proposed Scheme Option is provided in Table 10.29 below. It should be noted that, with the exception of flood risk and hydromorphology impacts, the impact significance stated in the table represents the residual impact, taking into account the mitigation discussed above. As such there may be differences in the significance ratings listed compared with those discussed in Section 10.4: Potential Impacts. With respect to flood risk and hydromorphology impacts there is insufficient certainty on potential mitigation proposals at this time to derive residual impacts. Therefore the potential impacts without mitigation, as discussed in Section 10.4, are presented in Table 10.31 below.





**Table 10.31: Summary of Impacts – Mainline Alignment Options**

Sub-topic	Receptor	Potential Impact	Impact Significance (Residual Impacts)			Comparative Appraisal
			Mainline Alignment Options			
			Option 1	Option 1A	Option 2	
<b>Construction Phase Impacts</b>						
Construction Pollution	Allt an Fhearna	Reduction in water quality	Slight / Moderate			
	Loch Alvie		Slight / Moderate			
	Allt Chriochaidh		Slight / Moderate			
	Caochan Ruadh		Slight / Moderate			
	Ballinluig Burn		Slight / Moderate			
	Smaller Drains (Allt Dibheach catchment)		Neutral			
	Allt-na-Criche (Lynwilg)		Moderate / Large			
	River Spey		Moderate / Large			
	Smaller Drains (River Spey catchment)		Neutral			
	Loch Puladdern		Slight / Moderate			
	Smaller Drains (Aviemore Burn)		Neutral			
	Aviemore Burn		Moderate / Large			
	Smaller Drains (The Shieling / Easter Aviemore Burn catchment)		Neutral			
	The Shieling / Easter Aviemore Burn		Slight / Moderate			
Southern bifurcation of Allt na Criche (Granish)	Slight / Moderate					





Sub-topic	Receptor	Potential Impact	Impact Significance (Residual Impacts)			Comparative Appraisal
			Mainline Alignment Options			
			Option 1	Option 1A	Option 2	
	Northern bifurcation of Allt na Criche (Granish)		Slight / Moderate			
	Allt na Criche (Granish)		Slight / Moderate			
	Smaller Drains (Southern Avie Lochan Burn catchment)		Neutral			
	Southern Avie Lochan Burn		Slight / Moderate			
	PWS Eilan Cottage		Slight			
	Northern Avie Lochan Burn		Slight / Moderate			
	CAR Registration – Granish Landfill Site		Neutral			
	Allt Cnapach		Slight / Moderate			
	Feith Mhor		Slight / Moderate			
	Smaller Drains (Feith Mhor catchment)		Neutral			
	Smaller Drains (River Dulnain catchment)		Neutral			
	River Dulnain		Moderate / Large			
	Allt nan Ceatharnach		Moderate / Large			
	Smaller Drains (Allt nan Ceatharnach catchment)		Neutral			
	Bogbain Burn		Moderate / Large			
	Smaller Drains (Bogbain Burn)		Neutral			
	Slochd Mhuic		Slight / Moderate			





Sub-topic	Receptor	Potential Impact	Impact Significance (Residual Impacts)			Comparative Appraisal	
			Mainline Alignment Options				
			Option 1	Option 1A	Option 2		
	Smaller Drains (Slochd Mhuic catchment)		Neutral				
	Allt Cosach		Slight / Moderate				
	CAR Licence – Altchosach Hydrostation		Slight				
<b>Operational Phase Impacts</b>							
Pollution from Routine Runoff	All Watercourses (see Table 10.15)	Reduction in water quality	Neutral				
Pollution from Accidental Spillage	All Watercourses (see Table 10.16)		Neutral				
Hydromorphology	Allt an Fhearna	Alterations to Hydromorphological regime	Large				
	Allt Chriochaidh		Large				
	Caochan Ruadh		Slight				
	Ballinluig Burn		Neutral				
	Allt-na-Criche (Lynwilg)		Slight				
	Aviemore Burn		Slight				
	The Shieling / Easter Aviemore Burn		Moderate				
	Allt na Criche (Granish)		Slight				
	Southern Avie Lochan Burn		Slight				
	Northern Avie Lochan Burn		Slight				
	Allt Cnapach		Slight	Slight	Large	Option 2 requires a watercourse realignment, unlike the other options	
	Feith Mhor		Slight				





Sub-topic	Receptor	Potential Impact	Impact Significance (Residual Impacts)			Comparative Appraisal
			Mainline Alignment Options			
			Option 1	Option 1A	Option 2	
	River Dulnain		Slight / Moderate			
	Allt nan Ceatharnach		Slight / Moderate			
	Bogbain Burn		Neutral			
	Slochd Mhuic		Slight / Moderate			
Flooding	Groundwater	Increased Flood Risk	Negligible			
	Caochan Ruadh	Changes to flow regime	Slight			
	Smaller Drains (River Spey catchment)		Slight			
	Loch Puladdern		Slight			
	Smaller Drains (Aviemore Burn)		Slight			
	Aviemore Burn		Large / Very Large			
	The Shieling / Easter Aviemore Burn		Slight			
	Southern bifurcation of Allt na Criche (Granish)		Slight / Moderate			
	Northern bifurcation of Allt na Criche (Granish)		Neutral			
	Allt na Criche (Granish)		Large			
	Southern Avie Lochan Burn		Moderate			
	Northern Avie Lochan Burn		Large			
	Smaller Drains (Loch Vaa Catchment)		Slight			





Sub-topic	Receptor	Potential Impact	Impact Significance (Residual Impacts)			Comparative Appraisal
			Mainline Alignment Options			
			Option 1	Option 1A	Option 2	
	Allt Cnapach		Moderate / Large			
	Smaller Drains (Gormack Stripe)		Slight / Moderate			
	Feith Mhor		Moderate			
	Smaller Drains (Feith Mhor catchment)		Moderate			
	Smaller Drains (River Dulnain catchment)		Slight / Moderate			
	Smaller Drains (Allt nan Ceatharnach catchment)		Slight			
	Smaller Drains (Bogbain Burn)		Slight			
	Slochd Mhuic		Large / Very Large			
	Smaller Drains (Slochd Mhuic catchment)		Slight			
	Allt na Fhearna		Loss of Floodplain	Large	Large	Slight
	Loch Alvie	Neutral				
	Allt na Criche (Lynwilg)	Large				
	Aviemore Burn	Large / Very Large				
	The Shieling / Easter Aviemore Burn		Neutral			





Sub-topic	Receptor	Potential Impact	Impact Significance (Residual Impacts)			Comparative Appraisal
			Mainline Alignment Options			
			Option 1	Option 1A	Option 2	
	Allt na Criche (Granish)		Moderate / Large			Options 1 and 1A result in a greater impact, compared to Option 2, due to a greater number of flood risk receptors impacted and larger individual impact magnitudes.
	Feith Mhor		Large & Moderate	Large & Moderate	Large & Neutral	
	River Dulnain		Neutral			
Standing Waters	Loch Alvie	Loss of Standing Water	Slight / Moderate			Option 2 results in a direct 27% loss in water body area, due to direct loss under the footprint. Options 1 and 1A result in indirect loss to waterbody due to close proximity
	Loch Puladdern		Slight / Moderate	Slight / Moderate	Moderate / Large	
	Loch Vaa		Moderate / Large			
	Avie Lochan		Slight / Moderate			
	Ponds		Slight / Moderate			
Private Water Supplies	PWS Alvie Manse	Loss of Supply	Neutral			
	PWS Wendy		Neutral			
	PWS Slugganranish		Neutral			
	CAR Registration – Granish Landfill Site		Neutral			
	PWS Eilan Cottage		Slight			
	PWS Avielochan		Slight / Moderate			
	PWS Birch View		Neutral			
	PWS Slochd		Neutral			
	CAR Licence – Altchosach Hydrostation		Neutral			







**Table 10.32: Summary of Impacts – Aviemore South Junction Options**

Sub-topic	Receptor	Potential Impact	Impact Significance (Residual Impacts)			Comparative Appraisal
			Aviemore South Junction Options (Route Sections 1 &2)			
			Option A02	Option A09	Option A18	
<b>Construction Phase Impacts</b>						
Construction Pollution	Ballinluig Burn	Reduction in water quality	Neutral	Neutral	Slight / Moderate	Option A18 involves construction within 50m of the Ballinluig Burn, whereas the other options do not
	Smaller Tributaries (Allt Dibheach catchment)		Neutral			
	Allt-na-Criche (Lynwilg)		Moderate / Large			
<b>Operational Phase Impacts</b>						
Pollution from Routine Run-off	Allt-na-Criche (Lynwilg)	Reduction in water quality	Neutral			
Pollution from Accidental Spillage	Allt-na-Criche (Lynwilg)	Reduction in water quality	Neutral			
Flood Risk	Allt-na-Criche (Lynwilg)	Loss of Floodplain	Neutral			
Standing Water	Loch Alvie	Loss of standing water	Neutral			





**Table 10.33: Summary of Impacts – Granish Junction Options**

Sub-topic	Receptor	Potential Impact	Impact Significance (Residual Impacts)				Comparative Appraisal
			Granish Junction Options (Route Section 5)				
			Option C18	Option C21	Option C31	Option C34	
<b>Construction Phase Impacts</b>							
Construction Pollution	Northern bifurcation of Allt na Criche (Granish)	Reduction in water quality	Slight / Moderate				
	Allt na Criche (Granish)		Slight / Moderate				
	CAR Registration – Granish Landfill Site		Neutral				
<b>Operational Phase Impacts</b>							
Pollution from Routine Run-off	Northern bifurcation of Allt na Criche (Granish)	Reduction in water quality	Neutral				
	Allt na Criche (Granish)		Neutral				
Pollution from Accidental Spillage	Northern bifurcation of Allt na Criche (Granish)	Reduction in water quality	Neutral				
	Allt na Criche (Granish)		Neutral				





Sub-topic	Receptor	Potential Impact	Impact Significance (Residual Impacts)				Comparative Appraisal
			Granish Junction Options (Route Section 5)				
			Option C18	Option C21	Option C31	Option C34	
Hydromorphology	Allt na Criche (Granish)	Alterations to Hydromorphological regime	Moderate	Large	Large	Large	Watercourse lies under the footprint of Options C21, C31 and C34, all are likely to require a new watercourse crossing and may require significant realignment of the watercourse. C18 is in close proximity of the watercourse and it is possible that some engineering may be required to ensure its stability
Flood Risk	Allt na Criche (Granish)	Loss of Floodplain	Moderate / Large				
Standing Waters	Ponds	Loss of Standing Water	Neutral				
Private Water Supplies	CAR Licence – Granish Landfill Site	Loss of Supply	Neutral				





**Table 10.34: Summary of Impacts – Black Mount Junction Options**

Sub-topic	Receptor	Potential Impact	Impact Significance (Residual Impacts)						Comparative Appraisal
			Black Mount Junction Options						
			Option D02	Option D03	Option D07	Option D12	Option D13	Option D51	
<b>Construction Phase Impacts</b>									
Construction Pollution	Bogbain Burn	Reduction in Water Quality	Moderate / Large						
<b>Operational Phase Impacts</b>									
Pollution from Routine Run-off Surface water	Bogbain Burn	Reduction in Water Quality	Neutral						
Pollution from Accidental Spillage	Bogbain Burn	Reduction in Water Quality	Neutral						



## 10.7. Scope of DMRB Stage 3 Assessment

- 10.7.1. For DMRB Stage 3 (following selection of a preferred route), a review of the hydrology and flooding strategy will be undertaken in liaison with project design teams, SEPA, The Highland Council, Transport Scotland and other stakeholders to ensure that the most appropriate approaches are followed, including consideration of site specific features and local constraints.
- 10.7.2. Additional baseline information shall be collated to supplement the data available at DMRB Stage 2.
- 10.7.3. Cumulative and indirect impacts will be considered at DMRB Stage 3, as further data is collated for the Preferred Scheme.
- 10.7.4. Specific mitigation measures applicable to the potential impacts shall be identified and established as technically feasible following final design of the preferred route and reported in the DMRB Stage 3 Assessment. These measures would reduce potential impacts upon water quality, hydromorphology, flood risk and water supply receptors. DMRB Stage 3 technical items specific for identified impacts are outlined in the sections below.

### Construction Pollution

- 10.7.5. Abstractions and discharges registered within the SEPA CAR and waste management licencing system shall be investigated to identify source-pathway-receptor linkages.
- 10.7.6. Water quality monitoring shall be conducted on local watercourses and standing waters, including control locations upstream of the Proposed Scheme and on separate catchments. Monitoring shall commence pre-construction to gain an understanding of natural seasonal variations prior to site activities commencing. Water quality monitoring locations shall be co-located with aquatic monitoring locations, where feasible. Locations, frequency of sampling and parameters tested shall be agreed in advance with stakeholders, including SEPA and the Spey Fishery Board.

### Pollution from Routine Runoff

- 10.7.7. Site-specific data for routine runoff for the Preferred Scheme will enable refined surface water quality calculations to be undertaken, following DMRB methodologies. The preliminary calculations presented at Stage 2 have applied the Tier 1 methodology. The Tier 1 method is recognised as a very conservative approach for locations with limited watercourse channel data. As more data is gathered for the Preferred Route in DMRB Stage 3 the calculations will be updated using the less conservative Tier 2 method. As a less conservative assessment it is anticipated that the results will improve. However where necessary suitable mitigation measures or alternative discharge locations will be identified to meet the sediment treatment requirement for all drainage networks.
- 10.7.8. Side roads shall be individually assessed following the SUDS for Roads guidance<sup>vii</sup> and SEPA Regulatory Method (WAT-RM-08) Sustainable Urban Drainage Systems<sup>xv</sup>, to ensure discharges meet good practice requirements.
- 10.7.9. Should particularly sensitive habitats or species, such as freshwater pearl mussels, be identified within 1km downstream of planned discharge outfalls, as per DMRB HD 45/09 Method A assessment guidance, water quality discharge modelling may be necessary in order to confirm potential downstream effect. This may lead to a revised outfall location or additional design measures to reduce effect prior to discharge.



- 10.7.10. Ongoing inputs for water quality and flood risk requirements shall be provided as part of the iterative drainage design process during DMRB Stage 3.

### **Pollution from Accidental Spillage**

- 10.7.11. At DMRB Stage 3, the revised traffic data will enable the risk of accidental spillage to be refined for surface water drainage networks.

### **Alteration to Hydromorphological Regime**

- 10.7.12. A more detailed assessment of the hydromorphological impacts shall be undertaken at DMRB Stage 3 once the Preferred Option has been selected and the precise nature of the engineering works ascertained. This shall improve the understanding of sensitivities and magnitude of the proposed works. Potential mitigation can then be included in the Preferred Option design for each potential crossing and realignment. Following this, the residual impacts would be identified.
- 10.7.13. Direct and indirect impacts will also be considered with regards to the cumulative impacts relating to the wider WFD objectives in the vicinity of the Proposed Scheme, with a WFD Assessment undertaken at DMRB Stage 3.
- 10.7.14. Opportunities to improve local hydromorphology shall also be considered at DMRB Stage 3 where feasible and, with clear benefit i.e. removal of existing channel impediments or poorly performing structures.

### **Increased Flood Risk**

- 10.7.15. The Stage 2 assessment has confirmed that the Proposed Scheme would impact floodplains across the route; and mitigation measures are required to mitigate the flood risk in accordance with SPP.
- 10.7.16. The DMRB Stage 3 assessment will develop mitigation measures and strategies in line with the sequential test. It compares the pre and post development scenarios, based on a preferred route option. The following key tasks and considerations will be undertaken as part of the Stage 3 assessment.
- Baseline hydraulic capacity determined for Structures DS-WC-013 and DS-WS-31
  - The baseline model for Aviemore will be refined to include additional topographical survey information. Cattle creeps and road underpasses are conveying flood waters and their representation in the hydraulic model needs to be confirmed.
  - Verification of the flood model extents compared with local flood history in Aviemore; additional information may be required from Highland Council and SEPA.
  - Detailed consideration will be given to the possible mitigation measures at Aviemore and consultation will be undertaken with the highways and structures design teams
  - DS-WC-014 to be incorporated into the Aviemore model and considered as part of any mitigation strategy.
  - Detailed consideration will be given to the possible mitigation measures at Allt na Criche (Granish) and consultation will be undertaken with the highways and structures design teams.
  - Flood Compensatory Storage will be sought for all locations where there is floodplain loss,







- Suitable locations for storage will be identified, as close to the source of loss as possible, providing and maintaining connectivity of the floodplains and will seek to achieve level for level storage, where possible.
- Additional topographical survey may be obtained to improve the accuracy of modelling assessments of flood storage loss and mitigation.
- It may be that a combination of storage options and other flood defence measures are considered to mitigate any impacts to third party receptors.
- Sensitivity testing will be undertaken to assess the impact of the scheme on downstream receptors.
- The flood risk impacts related to blockage of the proposed new or replacement watercourse crossing structures will be assessed.

10.7.17. We will ensure the works do not affect sensitive downstream flood receptors (especially if structure sizes are increased thus inadvertently increasing peak flows passing downstream). Our design will be integrated with the ecological, geomorphological, and drainage requirements. It will also consider the long term maintenance and access requirements.

10.7.18. Consultation will be undertaken with the key stakeholders to ensure their concerns are taken into consideration and incorporated into the design approach.

### Loss of Standing Water

10.7.19. Updated ecological data shall be used to determine the sensitivity of the standing water (ponds) located adjacent to the existing A9 and appropriate mitigation or substitution measures.

10.7.20. Water quality monitoring and an investigation of the primary water input type (surface water/groundwater/rainfall) shall be conducted for each pond, using water quality data to confirm details, as required.

### Loss or Change to Water Supplies

10.7.21. There are a small number of properties with unconfirmed private water supply status within the study area. Surveys shall be conducted at DMRB Stage 3 to confirm supply details and linkages with the Proposed Scheme. Water supplies will also be assessed for potential impact upon water quality, yield and flow rates from construction or operation of the Preferred Option at DMRB Stage 3.

10.7.22. Appropriate mitigation measures, including a potential water quality monitoring programme for specific private water supplies and surface watercourses considered at risk of adverse effect from the Proposed Scheme, shall be developed to commence pre-construction.

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<sup>i</sup> The Highways Agency, Scottish Executive, Welsh Assembly Government and The Department Regional Development Northern Ireland (2009). Design Manual for Roads and Bridges, Volume 11, Section 3, Part 10, Road Drainage and the Water Environment.

<sup>ii</sup> Transport Scotland (2013) A9 Dualling Programme Strategic Environmental Assessment (SEA). Transport Scotland.

<sup>iii</sup> Transport Scotland (2014) A9 Dualling Programme Strategic Flood Risk Assessment (SFRA). Transport Scotland.

<sup>iv</sup> The Scottish Government (2014) Scottish Planning Policy (paragraphs 254 – 268). The Scottish Government.

<sup>v</sup> The Highways Agency, Scottish Executive, Welsh Assembly Government and The Department Regional Development Northern Ireland (2009) Design Manual for Roads and Bridges, Volume 11, Section 4, Part 1





HD 44/09 – Assessment of Implications (of Highways and/or Road Projects) on European Sites (Including Appropriate Assessment).

<sup>vi</sup> The Highways Agency, Scottish Executive, Welsh Assembly Government and The Department Regional Development Northern Ireland (2009) Design Manual for Roads and Bridges, Part 7 HA 107\_04 Design of Outfall and Culvert Details.

<sup>vii</sup> Society of Chief Officers of Transportation for Scotland (SCOTS) (2009) SUDS for Roads guidance. SCOTS.

<sup>viii</sup> The Highland Council (2013) Flood Risk & Drainage Impact Assessment: Supplementary Guidance. The Highland Council.

<sup>ix</sup> Scottish Environment Protection Agency (SEPA) (2014) The Water Environmental (Controlled Activities) (Scotland) Regulations 2011 (as amended), A Practical Guide, Version 7.2. March 2015. Scottish Environment Protection Agency.

<sup>x</sup> SEPA (2010) Good Practice – River Crossings. Scottish Environment Protection Agency.

<sup>xi</sup> SEPA (2008) Good Practice – Inlets and Outfalls. Scottish Environment Protection Agency.

<sup>xii</sup> SEPA (2015) Position Statement – Culverts. Scottish Environment Protection Agency.

<sup>xiii</sup> SEPA (2015) Technical Flood Risk Guidance for stakeholders. Scottish Environment Protection Agency.

<sup>xiv</sup> SEPA (2013) Regulatory Method (WAT-RM-02) Regulation of Licence-level Engineering Activities. Scottish Environment Protection Agency.

<sup>xv</sup> SEPA (2014) Regulatory Method (WAT-RM-08) Sustainable Urban Drainage systems (SUDS or SUD Systems). Scottish Environment Protection Agency.

<sup>xvi</sup> CIRIA (2006) Control of Water Pollution from Linear Construction Sites. Technical Manual (C648). Construction Industry Research and Information Association.

<sup>xvii</sup> CIRIA (2010) Culvert design and operation guide (C689). Construction Industry Research and Information Association.

<sup>xviii</sup> CIRIA (2013) Culvert design and operation guide supplementary technical note on understanding blockage risks (C720). Construction Industry Research and Information Association.

<sup>xix</sup> CIRIA (2016) The SuDS Manual (C753). Construction Industry Research and Information Association.

<sup>xx</sup> Scotland & Northern Ireland Forum for Environmental Research (SNIFFER) (2009) A functional wetland typology for Scotland: Field Survey Manual. SNIFFER.

<sup>xxi</sup> Scottish Government (2012) River Crossings and Migratory Fish: Design Guidance. Scottish Government.

<sup>xxii</sup> Ordnance Survey (OS) (2015) Raster mapping on 1:10k, 1:50k, 1:250k scale & Mastermap digital vector mapping. Ordnance Survey.

<sup>xxiii</sup> National Library of Scotland historical mapping (2015) Available at: <http://www.nls.uk/> (Accessed 4 December 2015).

<sup>xxiv</sup> Old Maps historical mapping (2015) Available at: <https://www.oldmaps.co.uk/#/> (Accessed 4 December 2015).

<sup>xxv</sup> Sear, D., Newson, M. & Thorne, C., (2003) Guidebook to Applied Fluvial Geomorphology. Department of Environment, Food and Rural Affairs.

<sup>xxvi</sup> SEPA (2015) WFD Classification Results Webpage Available at: <http://www.sepa.org.uk/environment/water/classification/classification-results/> (Accessed 4 December 2015).

<sup>xxvii</sup> SEPA (2015) Flood Risk Management Maps. Available at: <http://map.sepa.org.uk/floodmap/map.htm>. (Accessed June 2016).

<sup>xxviii</sup> SEPA (2015) The National Flood Risk Assessment. Available at: <http://www.sepa.org.uk/environment/water/flooding/flood-risk-management/national-flood-risk-assessment/>. (Accessed 4 December 2015).

<sup>xxix</sup> SEPA (2015) Technical Flood Risk Guidance for Stakeholders. Scottish Environment Protection Agency.

<sup>xxx</sup> Centre for Ecology and Hydrology (CEH) (2009) Flood Estimation Handbook (FEH) CD ROM (V3) Centre for Ecology and Hydrology, Wallingford.

<sup>xxxi</sup> Macaulay Institute for Soil Research (1982) Soil maps of Scotland (partial coverage) at a scale of 1:250,000. Macaulay Institute for Soil Research.

<sup>xxxii</sup> Soil Survey of Scotland Staff (1970-1987); Soil maps of Scotland (partial coverage) at a scale of 1:25,000. Macaulay Institute for Soil Research, Aberdeen. Available at: <http://www.soils-scotland.gov.uk/data/soil-survey25k> (Accessed June 2016).

<sup>xxxiii</sup> SNH (2015) Carbon-rich soil, deep peat and priority peatland habitats map. Consultation Document. Scottish Natural Heritage. Available at: <http://www.snh.gov.uk/planning-and-development/advice-for-planners-and-developers/soils-and-development/cpp/> (Accessed 20 April 2015).

<sup>xxxiv</sup> The Highways Agency, Scottish Executive, Welsh Assembly Government and The Department Regional Development Northern Ireland (2009). Design Manual for Roads and Bridges, Volume 4, Section 2, Part 3, Design of Highway Drainage Systems.

<sup>xxxv</sup> Sear, D., Newson, M. & Thorne, C., (2003) Guidebook to Applied Fluvial Geomorphology. Department of Environment, Food and Rural Affairs.





<sup>xxxvi</sup> Met. Office (2015) Northern Scotland: climate. Available at: <http://www.metoffice.gov.uk/climate/uk/ns/>. (Accessed 4 December 2015).

<sup>xxxvii</sup> Met Office (2015) UK climate projections. Available at: <http://ukclimateprojections.metoffice.gov.uk/> (Accessed 4 December 2015).

<sup>xxxviii</sup> SNH (2015) SNHi – Information Service, SiteLink. Available at: <http://gateway.snh.gov.uk/sitelink/index.jsp>. (Accessed 4 December 2015).

<sup>xxxix</sup> NRFA (2016) National River Flow Archive. Available at: <http://nrfa.ceh.ac.uk/> (Accessed 4 December 2015).

<sup>xi</sup> SEPA (2010) Land Use Planning System SEPA guidance note 7; Guidance on the Water Framework Directive including river basin planning. Scottish Environment Protection Agency.

<sup>xii</sup> The Highland Council (2010) Construction Environmental Management Process for Large Scale Projects. Planning and Development Service. Available at: [http://www.highland.gov.uk/download/downloads/id/2644/construction\\_environmental\\_management\\_process\\_for\\_large\\_scale\\_projects](http://www.highland.gov.uk/download/downloads/id/2644/construction_environmental_management_process_for_large_scale_projects) (Accessed 16 December 2015).



## 11. Ecology and Nature Conservation

### 11.1. Introduction

- 11.1.1. This chapter presents the results of the Design Manual for Roads and Bridges (DMRB) Stage 2 Ecological Impact Assessment (EclA) for the Proposed Scheme Options. It considers both terrestrial and aquatic ecological receptors, including designated sites, terrestrial and freshwater habitats, plants and species.
- 11.1.2. This DMRB Stage 2 Assessment has been informed by desk study and field survey data. The field surveys for this assessment have focused on identifying areas of suitable habitat, to identify likely impacts and to allow for the design of specific surveys during the DMRB Stage 3 Assessment.
- 11.1.3. The DMRB details that consideration should be given to Special Areas of Conservation (SAC) where bats are the qualifying interest within 30km of the Scheme. There are no SACs designated for bats within Scotland and as such this extent of study area for bats has been scoped out. The 30km study area specifically relates to the distances that the bat species associated with the SAC will travel. These bat species are not present in Scotland and as such effects on bats are considered within 2km of the Scheme.

#### Study Area

- 11.1.4. The Study Areas for the data gathering and field surveys have been determined in accordance with standard best practice and in consultation with Scottish Natural Heritage (SNH) based on site specific approaches required for the scale of the Proposed Scheme. The Study Areas are in accordance with the A9 Dualling Outline Approach to Consistency in A9 Ecology Surveys Extents paper (technical memorandum, CFJV, JUK, AM, 2015'). The ecological Study Areas are as follows:
- Designated Sites – From the Proposed Scheme Options, a 10km Study Area has been used for internationally designated sites, a 2km Study Area for all other statutory designated sites, and a 1km Study Area for non-statutory designated sites and ancient woodland. Ecological functionality and hydrological connectivity between designated sites and the Proposed Scheme Options was also considered and sites outwith the Study Areas but with connectivity to the Scheme have also been included within the assessment. The Study Areas and designated sites are detailed in Table 11.1 and shown on Figure 11.1.
  - Habitat data - A number of data providers were contacted to provide data on protected and notable plant species and habitats (full details provided in paragraph 11.2.6 below). The Study Area ranged from 1km for terrestrial habitats and 2km for aquatic habitats.
  - Species Data – A number of data providers were contacted to provide data on protected and notable species (full details provided in paragraph 11.2.6 below). The Study Area ranged from 500m to 5km from the existing A9 corridor depending on the species. A 5km search area was used due to the mobile nature of some species and the size of their home ranges (for example wildcat) and due to the scale at which data is available.
  - Field surveys – The Study Areas for each receptor varies, and is taken from the footprint of the Proposed Scheme Options, plus appropriate buffers. Specific Study Areas are detailed in Table 11.1 and are shown on Figures 11.2 to 11.11.

## 11.2. Approach and Methods

### Overview

- 11.2.1. The assessment has been undertaken in accordance with DMRB guidance:
- DMRB Volume 11, Section 3, Part 4: Ecology and Nature Conservation<sup>ii</sup>; and
  - DMRB Interim Advice Note (IAN) 130/10 Ecology and Nature Conservation: Criteria for Impact Assessment<sup>iii</sup> (hereafter referenced as IAN 130/10).
- 11.2.2. In addition to DMRB guidance, other policy documents and guidance have been considered during the preparation of this chapter, including:
- Scottish Transport Appraisal Guidance (STAG)<sup>iv</sup>;
  - The Chartered Institute of Ecology and Environmental Management (CIEEM) Guidelines for Ecological Impact Assessment in the United Kingdom<sup>v</sup>;<sup>1</sup> and
  - Scottish Natural Heritage handbook on Environmental Impact Assessment<sup>vi</sup>.
- 11.2.3. Relevant legislation and policy considered as part of this assessment relating to protected species, designated sites and policy is provided in Appendix A11.1. Further details on relevant national and local planning policy are found in Chapter 19 (Policies and Plans).

### Desk Study and Consultation

- 11.2.4. Baseline data relating to the Study Areas has been gathered from a range of sources through data requests, consultation and using online resources as outlined below.
- 11.2.5. The following online resources were accessed:
- SNH Site Link<sup>vii</sup>;
  - Scottish Natural Heritage's Ancient Woodland Inventory (AWI)<sup>viii</sup>;
  - Scotland's Environment website<sup>ix</sup>;
  - Joint Nature Conservation Committee (JNCC) website<sup>x</sup>;
  - Forestry Commission Scotland Native Woodland Survey of Scotland<sup>xi</sup>;
  - SEPA River Basin Management Plans Interactive Map<sup>xii</sup>; and
  - Ordnance Survey (OS) maps and the Where's the Path website<sup>xiii</sup>.
- 11.2.6. The following organisations were contacted to request relevant desk study data, including details of non-statutory designated sites:
- British Trust for Ornithology (BTO);
  - Bat Conservation Trust Scotland (BCT);
  - Cairngorms National Park Authority (CNPA);
  - Fungal Records Database of Britain and Ireland (managed by the British Mycological Society);
  - Forestry Commission Scotland (FCS);

<sup>1</sup> The assessment process commencing prior to the publication of the updated 2016 guidelines and as such the 2006 guidelines were also followed.



- Highland Biological Recording Group Centre (HBRG);
- North East Biodiversity Records Centre (NESBrec);
- Raptor Study Groups;
- Royal Society for the Protection of Birds (RSPB);
- Scottish Badgers;
- Scottish Environment Protection Agency (SEPA);
- Scottish Natural Heritage (SNH);
- Scottish Wildcat Association;
- Scottish Wildlife Trust (SWT);
- Spey Fisheries Board; and
- Findhorn, Nairn and Lossie Fisheries Trust.

11.2.7. In addition, a review of the Preliminary Ecological Appraisal (CH2M 2015)<sup>xiv</sup> has been undertaken.

11.2.8. Consultation was undertaken with the following stakeholders to agree the scope of the surveys and assessment, through the A9 Environmental Steering Group:

- Scottish Natural Heritage (SNH);
- The Highland Council;
- Cairngorms National Park Authority (CNPA); and
- Scottish Environment Protection Agency (SEPA).

### Field Surveys

11.2.9. This DMRB Stage 2 Assessment has been informed by a series of technical field surveys, including updates to the 2014 Phase 1 habitat survey<sup>xiv</sup> and protected and notable species surveys. Surveys are summarised in Table 11.1. Stand-alone technical reports have been prepared and are included in Appendices A11.2 to A11.6. These documents explain the rationale for survey extents which are in accordance with the outline approach to consistency in A9 ecological survey extents.

11.2.10. Habitats within 150m of the existing A9 (distance taken from the edge of the existing road) were subject to a Phase 1 habitat survey<sup>xiv</sup> in 2014 (a full copy of this report is provided in Appendix A11.2). Further field data was collected in 2016 to ensure that coverage of the Phase 1 data extended out to 100m from each route option and each potential junction location.

11.2.11. The Phase 1 habitat data has also been screened to identify likely locations of Ground Water Dependant Terrestrial Ecosystems (GWDTEs). GWDTEs are wetlands that are dependent on groundwater from superficial deposits and as such are recognised within the Water Framework Directive (WFD) as requiring protection. SEPA Guidance Document 31<sup>xv</sup> provides descriptions of wetland types which may qualify as GWDTEs and provides guidance on equivalent JNCC Phase 1 habitat. This screening covers habitats up to 100m from the Proposed Scheme Options and this level of detail is considered sufficient for the assessment of options at Stage 2. At Stage 3, GWDTEs will be reviewed out to 250m from the Proposed Scheme, using the National Vegetation Classification (NVC) survey data which will be collected at Stage 3. The full results of this screening exercise are provided in Appendix A11.2.





**Table 11.1: Extent of Data Gathering and Field Surveys**

(During all site surveys, incidental records were also recorded where any protected species were sighted)

Receptor	Desk Study Search Area	Type of Survey	Survey Dates	Survey Area	Technical Appendix and Figures (where relevant)
International designated sites	10km <sup>2</sup>	n/a	n/a	n/a	A.11.2 Figure 11.1a
Other statutory designated sites	2km	n/a	n/a	n/a	A.11.2 Figure 11.1b
Non statutory designated sites	1km	n/a	n/a	n/a	A.11.2 Figure 11.2
Habitats	1km	Phase 1 habitat survey	2014 and April 2016	Proposed Scheme Options + 100m	A.11.2 Figure 11.4
Aquatic habitats and species <sup>3</sup>	2km <sup>4</sup>	n/a	n/a	n/a	A.11.3 Figure 11.5
Bats	2km	Habitat suitability assessment and review of potential crossing points	October 2015	Proposed Scheme Options + 50m	A.11.4 Figure 11.6
Badger	1km	Detailed badger survey	August 2015	Proposed Scheme Options + 100m	A.11.4a Figure 11.3d
Birds	2km	n/a	n/a	n/a	A.11.5 Figure 11.3b
Fisheries	2km	n/a	n/a	n/a	A.11.3
Fresh water pearl mussel	500m	n/a	n/a	n/a	A.11.3
Great crested newt	1km	Habitat Suitability Index (HSI) and eDNA analysis	April/ May 2016	Proposed Scheme Options + 250m	A.11.4 Figure 11.5
Reptiles	1km	n/a	n/a	n/a	A.11.4
Pine marten	1km	n/a	n/a	n/a	A.11.4
Red squirrel	1km	n/a	n/a	n/a	A.11.4
Otter	1km	n/a	n/a	n/a	A.11.4

<sup>2</sup> There are no Special Areas of Conservation designated for bats in Scotland and as such a 10km search radius is considered appropriate for International designated sites.

<sup>3</sup> SEPA river biological monitoring data sourced which included taxa lists and biological metrics associated with aquatic macroinvertebrate and phytobenthos communities, as well as barriers to fish migration.

<sup>4</sup> A 2km Study Area has been used for data collection to reflect the potential EZoI on watercourses. Watercourses within 150m have been subject to detailed screening as defined in the A9 Dualling Outline Approach to Consistency in A9 Ecology Surveys Extents paper (technical memorandum, CFJV, JUK, AM, 2015<sup>4</sup>)

Receptor	Desk Study Search Area	Type of Survey	Survey Dates	Survey Area	Technical Appendix and Figures (where relevant)
Water vole	1km	n/a	n/a	n/a	A.11.4
Wildcat	5km <sup>5</sup>	n/a	n/a	n/a	A.11.4
Invertebrates	1km	n/a	n/a	n/a	n/a
Fungi	1km	n/a	n/a	n/a	n/a

## Limitations

- 11.2.12. Specific limitations relating to the desk study and field surveys are referred to within the technical appendices (A11.2 to A11.5).

As a Stage 2 Assessment, detailed survey information has yet to be obtained, this will be gathered as part of the Stage 3 Assessment. As a result of this the valuation of receptors has taken a precautionary approach, valuations will be reviewed as part of the Stage 3 Assessment and revised if appropriate.

## Ecological Zone of Influence

- 11.2.13. The Ecological Zone of Influence (EZoI) is an area defined by the assessment in which there may be ecological receptors subject to changes and subsequent effects as a result of the Proposed Scheme. The EZoI takes the Proposed Scheme Options area, which includes all of the route options and their associated earthworks, and then includes a suitable buffer. This was determined through:
- A review of the existing conditions within the Proposed Scheme Options area;
  - Consideration of the activities (during construction and operation phases) associated with the Proposed Scheme Options;
  - The desk study information including an examination of aerial photography and OS mapping;
  - Responses from consultees and records of protected and notable species; and
  - Findings of the field survey work.
- 11.2.14. At this stage of the assessment process, due to the large scale and permanent nature of the proposals and as watercourses pass through the area, it is considered that the effects of the Proposed Scheme on designated sites may extend to 2km beyond Scheme footprint and up to 1km for protected and notable species (although this may be reduced depending on the species). It is noted that the methodology within the DMRB suggests a 30km EZoI for SACs designated for bats, but this EZoI has not been used in this instance as there are no SACs designated for bats within Scotland. These EZoI will be refined during the DMRB Stage 3 Assessment once a more detailed understanding of the impacts is known.

## Temporal Scope

- 11.2.15. Potential impacts on ecological features have been assessed in the context of how the predicted baseline conditions within the EZoI might change between the surveys and the start of construction.

<sup>5</sup> Given the large home ranges of wildcat and their rarity any records received beyond 5km have also been considered.



- 11.2.16. Once construction is complete, the assessment has assumed that the operational phase of the development will last for the foreseeable future.

### Nature Conservation Evaluation

- 11.2.17. A number of criteria have become accepted as a means of assessing the nature conservation value of a defined area of land which are set out in *A Nature Conservation Review*<sup>xvi</sup> and include diversity, rarity and naturalness. The valuation follows IAN 130/10.
- 11.2.18. The nature conservation value or potential value of an ecological feature (statutory and non-statutory designated sites and habitats) is determined within the following geographic context:
- International importance - Special Areas of Conservation (SAC), Special Protection Areas (SPA), Wetlands of International Importance (Ramsar site);
  - National importance - Sites of Special Scientific Interest (SSSI), National Nature Reserves (NNR), and any woodland listed on the Ancient Woodland Inventory (AWI);
  - Regional importance - where a Region is defined by SNH's Landscape Character Areas which divide Scotland into 22 zones. The Proposed Scheme falls into the Inverness and Cairngorm zones<sup>xvii</sup>. Areas may also be identified as being of regional importance where viable areas of priority habitat have been identified which are listed in the Cairngorms National Park BAP and areas that have been identified by regional plans or strategies as areas for restoration or re-creation of priority habitats;
  - County importance- This is defined here as the Council Ward of Badenoch and Strathspey<sup>xviii</sup>, rather than the entire Highland Council Region due to its scale. Sites of County importance include Local Nature Reserves (LNR) designated in the county context<sup>6</sup>, sites of nature conservation value (SNCIs); and
  - Local importance; Local Nature Reserves (LNR) designated in a local context<sup>7</sup>, - undesignated ecological features such as wetlands, woodlands, ponds, trees that are protected by Tree Preservation Orders (TPOs).
  - Site; The Site (Extent of the Proposed Scheme Options)
- 11.2.19. A nature conservation value has been ascribed to protected and notable species populations where available data is of a quality to provide confidence in the assessment of their importance within the geographical context of their distribution and conservation value. No nature conservation value has been given for species populations where there is a lack of data on populations at a national scale on which to base such a valuation. Species that are protected through legislation or notable, i.e., that are listed in any of the following are considered to have an intrinsic nature conservation value: Scottish Biodiversity List (SBL)<sup>xix</sup>; Cairngorms Biodiversity Action Plan<sup>xx</sup>; Birds of Conservation Concern<sup>xxi</sup> and the Red Data Book<sup>xxii</sup>.

### Magnitude and Impact Significance

- 11.2.20. The criteria used in this chapter to assess the significance of environmental effects have taken account of the following guidance:
- DMRB IAN 130/10<sup>iii</sup>; and
  - The Chartered Institute of Ecology and Environmental Management (CIEEM) Guidelines for Ecological Impact Assessment in the United Kingdom<sup>xxiii</sup>.

<sup>6</sup> As per IAN guidance, valuation to be made in consultation with county ecologist or equivalent.

<sup>7</sup> As per IAN guidance, valuation to be made in consultation with county ecologist or equivalent.



- 11.2.21. The assessment of the potential impacts of the Proposed Scheme Options takes into account both on-site effects and those that may occur to adjacent and more distant ecological features. Impacts can be permanent or temporary and can include:
- Direct loss of wildlife habitats;
  - Fragmentation and isolation of habitats;
  - Disturbance to species from noise, light or other visual stimuli;
  - Changes to key habitat features; and,
  - Changes to the local hydrology, water quality and / or air quality.
- 11.2.22. Impacts are unlikely to be significant where features of low value or sensitivity are subject to small or short-term impacts. However, where there is a number of small scale impacts that are not significant alone, the assessor may determine that, cumulatively, these may result in an overall significant effect. Impacts have been assessed as being either negative or positive and significant or not significant.
- 11.2.23. A positive impact is taken to be one that improved the quality of the environment, for example through increasing species diversity, improving water quality or enhancing habitats. A negative impact is taken to be one that reduced the quality of the environment, for example through habitat loss.
- 11.2.24. For designated sites, impacts are considered significant when a project and associated activities is likely to either undermine or support the conservation objectives or condition of the site(s) and its features of interest.
- 11.2.25. For ecosystems, impacts are considered significant when a project and associated activities is likely to result in a change in ecosystem structure and function.
- 11.2.26. Consideration is given to whether:
- Any processes or key characteristics will be removed or changed;
  - There will be an impacts on the nature, extent, structure and function of component habitats; and,
  - There is an impact on the average population size and viability of component species.
- 11.2.27. Functions and processes acting outside the formal boundary of a designated site has also been considered, particularly where a site falls within a wider ecosystem e.g. wetland sites.
- 11.2.28. Some ecosystems can tolerate a degree of minor changes, such as localised or temporary disturbance or changes in physical conditions, without such changes harming their function or value. For this Stage 2 DMRB Assessment, ecological impacts have been considered in the light of any information available about the capacity of ecosystems to accommodate change.
- 11.2.29. For undesignated habitats, impacts are considered significant when impacts are likely to result in a reduction in extent or function would result in a long term effect on a site's integrity. For species, impacts are considered significant where the abundance and distribution within a given geographical area are negatively affected.
- 11.2.30. The conservation status of undesignated habitats and species within a defined geographical area is described as follows and has been used in this assessment to determine whether the impacts of the proposals are likely to be significant:

- For habitats, conservation status is determined by the sum of the influences acting on the habitat that may affect its extent, structure and functions as well as its distribution and its typical species within a given geographical area; and
- For protected and notable species, conservation status is determined by the sum of influences acting on the species concerned that may affect its abundance and distribution within a given geographical area.

11.2.31. When assessing potential impacts on conservation status, the known or likely background trends and variations in status have been taken into account. The level of ecological resilience or likely level of ecological conditions, that would allow the population of a species or area of habitat to continue to exist at a given level, or continue to increase along an existing trend or reduce a decreasing trend, has been estimated where appropriate to do so.

11.2.32. Following the above approach the assessment aims to characterise ecological impacts rather than placing a reliance on impact magnitude. The characteristics of ecological impacts, including magnitude, inform the determination of impact significance. Assessment of impact significance follows the approach detailed in IAN 130/10, as detailed in Table 11.2.

**Table 11.2: Significance of Impacts**

Significance Category	Typical Descriptors of Impact
Very large	An impact on one or more receptor(s) on International, European, UK or National value.
Large	An impact on one or more receptor(s) of Regional value.
Moderate	An impact on one or more receptor(s) of County value.
Slight	An impact on one or more receptor(s) of Local value.
Neutral	No significant impacts on key nature conservation receptors.

### Mitigation Hierarchy

11.2.33. The principles of the mitigation hierarchy<sup>xxiv, xxv</sup> have been applied when considering potential impacts and subsequent effects on ecological receptors within the EZol.

11.2.34. The principles of the mitigation hierarchy are that impacts on biodiversity should be subject to the following sequential mitigation actions:

- Avoidance;
- Mitigation;
- Compensation; and
- Enhancement.

## 11.3. Baseline Conditions

11.3.1. All of the ecological features within the Proposed Scheme Options and EZol of the Proposed Scheme have been valued according to the criteria outlined in Paragraphs 11.2.17 and 11.2.19 above.

## Designated Sites and Ancient Woodland

11.3.2. Table 11.3 summarises the designated sites situated within the EZoI for this DMRB Stage 2 Assessment. Full details on each site are provided in Appendix A11.2. These are shown on Figure 11.1 and 11.2.

**Table 11.3: Designated Sites within the Ecological Zone of Influence**

Site Name and Designation	Location of Site in relation to closest Scheme Options <sup>8</sup>	Closest chainage <sup>9</sup> and Section	Reason for Designation	Nature Conservation Value
Abernethy Forest SPA, SSSI, RSPB Reserve	3.9km to the east	Section 6b CH12500	SPA qualifying features: breeding populations of capercaillie and Scottish crossbill. The SSSI is notified for its native pinewood, basin fen, raised bog, subalpine dry heath and its vascular plant assemblage. It is also notified for its assemblages of fungi, lichen, invertebrates, beetles, dragonflies and birds, particularly capercaillie, Scottish crossbill, crested tit, and osprey.	International
Anagach Wood SPA <sup>10</sup>	14.2km to the east	Section 7 CH15000	SPA qualifying feature: breeding populations of capercaillie.	International
Cairngorms SAC and SPA	957m to the southeast	Section 3a CH4300	SAC qualifying features; Annex I habitats that are a primary reason for selection of this site: Oligotrophic to mesotrophic standing waters with vegetation of the <i>Littorelletea uniflorae</i> and/or of the <i>Isoëto-Nanojuncetea</i> Northern Atlantic wet heaths with <i>Erica tetralix</i> European dry heaths Alpine and boreal heaths <i>Juniperus communis</i> formations on heaths or calcareous grasslands Siliceous alpine and boreal grasslands Species-rich <i>Nardus</i> grasslands, on silicious substrates in mountain areas (and submountain areas in Continental Europe) Blanket bogs Petrifying springs with tufa formation ( <i>Cratoneurion</i> ) Alpine pioneer formations of the <i>Caricion bicoloris-atrofuscae</i> . Siliceous scree of the montane to snow levels ( <i>Androsacetalia alpinae</i> and <i>Galeopsietalia ladani</i> ) Siliceous rocky slopes with chasmophytic vegetation Caledonian forest	International

<sup>8</sup> Where designated sites are situated outside of the Proposed Scheme Options, the distance and direction is given at the closest point to the Proposed Scheme Options.

<sup>9</sup> Chainage references relate to all Options

<sup>10</sup> This site has been included for consideration, as although it falls outside the 10km Study Area for designated sites, it forms an important part of the habitat network for Capercaillie, along with the other SPAs designated for the species within the Study Area.





Site Name and Designation	Location of Site in relation to closest Scheme Options <sup>8</sup>	Closest chainage <sup>9</sup> and Section	Reason for Designation	Nature Conservation Value
			<p>Bog woodland</p> <p>Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site:</p> <p>Natural dystrophic lakes and ponds, sub-Arctic Salix spp. scrub, semi-natural dry grasslands and scrubland facies on calcareous substrates (<i>Festuco-Brometalia</i>)</p> <p>Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels</p> <p>Transition mires and quaking bog and calcareous rocky slopes with chasmophytic vegetation.</p> <p>Annex II species that is a primary reason for selection of this site:</p> <p>Green shield-moss</p> <p>Annex II species present as a qualifying feature, but not a primary reason for site selection:</p> <p>Otter</p> <p>SPA qualifying features: breeding capercaillie, dotterel, golden eagle, merlin, osprey, peregrine and Scottish crossbill.</p>	
Cairngorms Massif SPA	4.9km to the south	Section 2 CH2900	SPA qualifying feature: breeding populations of golden eagle.	International
Carn nan Tri-tighearnan SAC and SSSI	8.0km to the north	Section 11 CH25030	SAC qualifying features: blanket bog. The SSSI is notified for blanket bog and sub-alpine dry heath.	International
Craigmore Woods SPA	9.5km to the east	Section 7 CH13700	SPA qualifying feature: breeding populations of capercaillie.	International
Insh Marshes SAC	2.4km to the south	Section 1 CH0	<p>SAC qualifying features : Annex I habitats that are a primary reason for selection of this site:</p> <p>Oligotrophic to mesotrophic standing waters with vegetation of the <i>Littorelletea uniflorae</i> and / or of the <i>Isoeto-Nanojuncetea</i>.</p> <p>Transition mires and quaking bogs</p> <p>Annex I habitat present as a qualifying feature, but not a primary reason for selection of this site:</p> <p>Alluvial forests with <i>Alnus glutinosa</i> and <i>Fraxinus excelsior</i> (Alno-Padion, Alnion incanae, Salicion albae)</p> <p>Annex II species that are a primary reason for selection of this site:</p> <p>Otter</p> <p>The site overlaps with River Spey – Insh Marshes SPA.</p>	International



Site Name and Designation	Location of Site in relation to closest Scheme Options <sup>8</sup>	Closest chainage <sup>9</sup> and Section	Reason for Designation	Nature Conservation Value
Kinveachy Forest SAC, SPA and SSSI	605m to the west	Section 6b CH12000	SAC qualifying features: Annex I habitat that is a primary reason for selection of this site: Caledonian forest. Annex I habitat present as a qualifying feature, but not a primary reason for selection of this site: bog woodland SPA qualifying features: capercaillie and breeding Scottish crossbill. The SSSI notified natural features include breeding bird assemblage and native pinewood.	International
Loch Vaa SPA and SSSI	76m to the east	Section 6a CH11500	SPA qualifying species: Slavonian grebe. The SSSI is notified for goldeneye, Slavonian grebe and beetles.	International
River Spey SAC and SSSI (the SSSI overlaps part of River Spey SAC)	0m	Section 3a CH3500 Section 8 CH16600 and CH17400	SAC qualifying features: freshwater pearl mussel, sea lamprey, Atlantic salmon and otter.	International
River Spey – Insh Marshes SPA / Ramsar site	2.4km to the south	Section 1 CH0	SPA qualifying features: osprey, spotted crane, and wood sandpiper during the breeding season and hen harrier and whooper swam over winter. The features associated with the Ramsar designation are its breeding bird assemblage and non-breeding whooper swans. The site is also notified for its flood plain fen, mesotrophic loch and its river.	International
Slochd SAC	250m to the north	Section 11 CH25600	SAC qualifying feature: European dry heath.	International
Alvie SSSI	0m	Section 1 CH200, CH300, CH700 and CH1600 Section 2 CH3000	SSSI notified for its upland oak woodland, hydromorphological mire range, invertebrate assemblage and breeding goldeneye	National
Craigellachie SSSI and National Nature Reserve	0m	Sections 3a CH4300 and CH5000	SSSI notified for its upland birch woodland and moth assemblage.	National
North Rothiemurchus Pinewood SSSI	957m to the south-east (overlaps with Cairngorms SAC/SPA).	Section 3a CH4300	SSSI notified for its native pinewood, breeding bird assemblage, capercaillie, crested tit, osprey, Scottish crossbill, fungi assemblage, lichen assemblage, invertebrate assemblage and vascular plant assemblage.	National
River Spey SSSI	125m to the south-east	Section 3a CH3500	SSSI notified for its freshwater pearl mussel, sea lamprey, Atlantic salmon and otter.	National



- 11.3.3. Three watercourses within the Study Area form part of the River Spey SAC: the Allt nan Ceatharnach (Section 8), the River Dulnain (Section 8) and the Allt na Criche (Lynwilg) (Section 3a). A further five watercourses flow into the SAC, but are not formally designated: Aviemore Burn (Section 4), Allt Cnapach (Section 4), two unnamed tributaries (Sections 3a and 4) and Bogbain Burn (Section 9).
- 11.3.4. Within the EZol, a total of 38 woodland stands are listed on the AWI. Of these, 26 fall within the Proposed Scheme Options footprint. This includes 20 stands that are classified as Ancient (1a or 2a<sup>11</sup>) and six that are shown as woodlands on the Roy maps (3<sup>12</sup>). The ancient woodland sites within the EZol identified on the SNH AWI are detailed in Appendix A11.2 and shown on Figure 11.2. For each woodland block an identifier (ID), location information, and a description of the Phase 1 habitat type recorded for the block (where applicable) are detailed within Appendix A11.2.
- 11.3.5. All of the 20 stands marked as Ancient (1a or 2a) support woodland, predominantly comprising semi-natural broad-leaved woodland (predominantly birch species) and coniferous plantation woodland (predominantly Scots pine). However, the majority of these stands do not exhibit the classic features associated with ancient woodland (very old, mature trees, well developed and diverse understorey and ground-flora), with only two of the 20 stands retaining characteristic ancient woodland features. ID areas 14 and 22 (as shown on Figure 11.2) are an exception, as they retain some ancient woodland features and have potential for regeneration. From the Phase 1 survey, a number of areas listed on the AWI were found not to be wooded, instead comprising heathland, grassland, or bare ground. Of the 38 stands, 12 were found to contain a proportion of habitat which was not considered to be ancient woodland. However, this will be fully assessed at Stage 3 to determine if any ancient woodland ground flora remains.
- 11.3.6. For the purposes of the Stage 2 Assessment, all areas listed on the AWI are considered to be of National value. This valuation will be reviewed at Stage 3 following detailed National Vegetation Classification (NVC) surveys at these locations. Ancient woodland may no longer be present at all locations currently shown on the AWI as indicated by the results of the 2014 Phase 1 habitat survey and 2016 updates to the Phase 1 survey.

## Main Habitats

- 11.3.7. The predominant terrestrial habitat types within the Study Area, recorded during the Phase 1 habitat surveys, include woodland, heathland, grassland, and wet modified bog.
- 11.3.8. Woodland, including semi-natural broad-leaved woodland and planted coniferous woodland accounts for approximately half the habitat recorded within the Study Area. Notable examples are located within the vicinity of Aviemore (Section 3) and Kinveachy (Section 6). Dry dwarf shrub heath, unimproved acid grassland, and neutral grassland also cover a substantial proportion of the Study Area, accounting for approximately a quarter of the habitat recorded. The majority of the bog habitat within the Study Area is modified and occurs just south of Slochd Summit (Section 10), to the south of the existing A9. This area constitutes a relatively extensive continuous area of bog within the Study Area. Other notable habitats recorded within the Study Area which are of a more limited extent when compared to the above habitats, include marsh / marshy grassland, wet dwarf shrub heath, unmodified blanket bog, and swamp.
- 11.3.9. Details of the extent of habitats and their nature conservation value are provided in Table 11.4, full details of the rationale for valuation are provided in Appendix A11.2. Habitats of local value include acid/neutral exposure, bare peat, blanket bog, coniferous

<sup>11</sup> Interpreted as semi-natural woodland from maps of 1750 (1a) or 1860 (2a) and continuously wooded to the present day.

<sup>12</sup> Shown as unwooded on the 1st edition maps but as woodland on the Roy maps.



plantation woodland, The Phase 1 habitat mapping is shown on Figure 11.4. Table 11.4 also provides details of which Phase 1 habitats may contain GWDTE habitats and further NVC surveys will be undertaken during the DMRB Stage 3 Assessment to confirm the presence of these habitats. Further details on habitats, including GWDTEs are present in Appendix A11.2.

- 11.3.10. A total of 27 watercourses were identified during the initial screening of aquatic receptors (see Appendix A11.3 which outlines the approach taken). These include 18 watercourses that are crossed by the Proposed Scheme Options and nine within 150m of the Proposed Scheme Options but that are not crossed.
- 11.3.11. The European Union (EU) Water Framework Directive (WFD) established a framework for the protection of all waters including inland surface waters. In practical terms, not every watercourse is classified as a WFD water body for management purposes. Two of the watercourses crossed are classified under the WFD and are defined as having good ecological status: the River Dulnain (Section 8) and the Allt na Fhearna (Section 1). The Proposed Scheme crosses the Allt nan Ceatharnach (Section 8) which flows into the Allt Ruighe Magaig which is classified and defined as having good ecological status.

**Table 11.4: Main Habitats within 100m of the Proposed Scheme Options**

Phase 1 Habitat Type (Where these habitats may support GWDTEs this is identified)	Area of Habitat		Nature Conservation Value
	Hectares (ha)	% EZol	
Acid dry dwarf shrub heath	95.11	12.02	County
Acid neutral flush	0.99	0.13	County
Acid/neutral exposure	3.61	0.46	Local
Amenity grassland	10.91	1.38	Site
Bare ground	13.97	1.77	Site
Bare peat	0.35	0.04	Local
Basin mire fen	0.08	0.01	Local
Blanket bog	1.43	0.18	Local
Broad-leaved plantation woodland	1.40	0.18	Site
Broad-leaved semi-natural woodland	174.06	21.99	Regional
Building	3.39	0.43	Site
Coniferous plantation woodland	175.71	21.20	Local
Coniferous semi-natural woodland	10.45	1.32	Local
Continuous bracken	7.90	1.00	Site
Dense/continuous scrub	4.88	0.62	Site
Dry heath/acid grassland mosaic	1.82	0.23	County
Ephemeral/ short perennial	0.18	0.02	Site
Improved grassland	17.58	2.22	Site
Marsh/marshy grassland	9.65	1.22	County
Mixed plantation woodland	8.18	1.03	Site
Mixed semi-natural woodland	8.16	1.03	Local
Poor semi-improved grassland	12.68	1.60	Site

Phase 1 Habitat Type (Where these habitats may support GWDEs this is identified)	Area of Habitat		Nature Conservation Value
	Hectares (ha)	% EZol	
Quarry	2.23	0.28	Local
Railway	8.02	1.01	Site
Roads Tracks And Paths	44.65	5.64	Site
Running water	2.96	0.37	Up to International
Scattered broad-leaved tree	2.88	0.36	Local
Scattered coniferous tree	0.02	0.00	Local
Scattered scrub	2.44	0.31	Site
Scree - acid/neutral	0.55	0.07	Local
Scree/Acid dry dwarf shrub heath	0.24	0.03	Local
Semi-improved acid grassland	8.82	1.11	Local
Semi-improved calcareous grassland	0.27	0.03	Local
Semi-improved neutral grassland	60.73	7.67	Local
Standing water	2.11	0.27	Up to National
Swamp	1.02	0.13	Local
Tall ruderal vegetation	0.88	0.11	Site
Unimproved acid grassland	32.98	4.17	County
Unimproved calcareous grassland	0.46	0.06	Local
Unimproved neutral grassland	9.28	1.17	Local
Wall	0.27	0.03	Site
Wet dwarf shrub heath	6.99	0.88	County
Wet heath/acid grassland mosaic	1.40	0.18	County
Wet modified bog	23.81	3.01	County

## Protected and Notable Species

- 11.3.12. A summary of those protected and notable species found to be present within the EZol of the Proposed Scheme Options is provided in Table 11.5. Full details of the survey findings can be found in technical appendices A11.13 to A11.15 and on Figures 11.3 to 11.6.
- 11.3.13. The CNPA has provided details of locations where notable species are present that are not legally protected, or where suitable habitat for them may exist. These species are considered important to the Cairngorms National Park as they are scarce and the Cairngorms hold a significant proportion of the UK population. This list contains invertebrates, plants, fungi and lichens. Areas have been identified as red or amber priority for Cairngorm priority species are shown on Figure 11.3c. Red areas have been defined where there are known records of priority species, for example aspen trees or confirmed records of a Cairngorms Nature Action Plan<sup>xxvi</sup> species. Amber locations have no confirmed records but an indication of habitat suitability has been provided by an expert in that particular group, for example grassland habitat which has the potential to provide habitat for waxcap fungi.

**Table 11.5: Protected and Notable Species within EZoI**

Species or Species Group	Desk Study Records <sup>13</sup> , including incidental recordings during 2016 and 2014 Phase 1 Habitat Survey	Summary of 2015/16 field survey records/ habitat assessment	Relevant Figures
Bats	Desk study records received were considered too old to provide any indication of the current bat population in the vicinity of the Proposed Scheme (over ten years old). Trees, buildings, structures and culverts were identified during the Phase 1 habitat survey as having bat roost potential.	Areas with suitability for roosting bats was recorded within trees, rock faces, structures and properties. Of note, five trees, eight woodland blocks, eight properties, one culvert, five bridges and two rock faces were assessed to have high bat roosting potential. 17 areas were also identified that provide suitable commuting routes across the A9, both below the road using structures and above the road following lines of vegetation either side of the carriageway.	Figure 11.6a-b.
Badger	Fifty one records of badger dating from 2005 were received. Data also included fatalities along the A9.	Three main setts and one outlier sett were recorded within the Study Area (details provided in Confidential Appendix A11.4a)	Confidential Figure 11.3d.
Birds	Fifty two records of notable bird species were received, including black grouse, golden eagle and barn owl.	An assessment of habitat types identified suitability for 91 species of breeding bird (26 of which are listed on the SBL) and suitability for 67 species of wintering bird (14 of which are listed on the SBL). 95% of the Study Area is considered suitable for breeding birds while 94% of the Study Area is considered suitable for wintering birds.	Desk study records on Figure 11.3b.
Capercaillie	Thirty five records of capercaillie were received within the Study Area.	Coniferous plantation woodland and semi-natural broad-leaved woodland within the Study Area is suitable for supporting capercaillie. Key areas include woodland to the west of the A9 from Craigellachie (Section 3b) through to the River Dulnain (Section 8) and woodland blocks to the north and south of Carrbridge (Section 7 and 9), and within the Kinveachy area (Section 6a and b).	Desk study records on Figure 11.3b.
Amphibians	Three records of great crested newt: Pond 15 - Section 6b Chainage CH12700, Pond 24 - Section 5 CH10200	eDNA surveys of ponds within the Study Area recorded great crested newt presence in three ponds. Pond 15, located near Kinveachy (Section 6b); Pond 24, located near to Loch Lochan (Section 5), Pond 45, in close proximity to Craigellachie NNR (Section 3a).	Figure 11.3a (amphibian records) and Figure 11.5 (pond locations).

<sup>13</sup> Only recent records of species are provided here, where recent is taken to be in the last 10 years.





Species or Species Group	Desk Study Records <sup>13</sup> , including incidental recordings during 2016 and 2014 Phase 1 Habitat Survey	Summary of 2015/16 field survey records/ habitat assessment	Relevant Figures
	<p>Pond 45 - Section 3a CH5300</p> <p>CNPA have provided details of areas considered likely to support amphibians. Eleven locations have been identified within the Proposed Scheme.</p>		
<p>Fisheries (including salmonids, lamprey and eel)</p>	<p>Salmonid records received for the Bogbain burn (Section 9), Allt nan Ceatharnach (Section 8), River Dulnain (Section 8), Milton Burn (Section 4) and Allt na Criche (Section 3a). Record of European eel on Milton Burn (Section 4).</p>	<p>There are 27 watercourses within Study Area, 18 are crossed by the Proposed Scheme. Thirteen have been identified with potential high ecological value.</p>	<p>Desk study records on Figure 11.3a</p>
<p>Freshwater pearl mussel</p>	<p>No records received within the Study Area.</p>	<p>To be assessed at Stage 3.</p>	<p>n/a</p>
<p>Fungi</p>	<p>CNPA have provided details of areas considered likely to support notable invertebrates. Forty one locations have been identified within the Proposed Scheme.</p>	<p>To be assessed at Stage 3.</p>	<p>Desk study records on Figure 11.3c.</p>
<p>Red squirrel</p>	<p>173 records of red squirrel have been provided within the Study Area. Eight records were also provided in the Preliminary Ecological Appraisal<sup>xiii</sup>.</p>	<p>Suitable habitat is present throughout the Study Area. The surveys focused on mature woodland areas with coning trees.</p>	<p>Desk study records on Figure 11.3a.</p>
<p>Reptiles</p>	<p>Twelve records of reptiles (including common lizard, slow-worm and adder) within the Study Area. Common lizard and slow worm were also recorded during the Preliminary Ecological Appraisal<sup>xiii</sup>.</p>	<p>Suitable habitat is present throughout the Study Area, key habitats present include grassland and heathland.</p>	<p>Desk study records on Figure 11.3a.</p>
<p>Deer</p>	<p>More than 50 records of deer vehicle collisions were received from multiple sources.</p>	<p>To be assessed at Stage 3.</p>	<p>Desk study records on Figure 11.3a.</p>
<p>Otter</p>	<p>Fifteen records of otter were received within the Study Area. One record of otter was also provided in the Preliminary Ecology Appraisal<sup>xiii</sup>.</p>	<p>Suitable habitat is present throughout the Study Area, including watercourses, ditches and water bodies. The woodland areas are also likely to provide cover for resting sites.</p>	<p>Desk study records on Figure 11.3a.</p>





Species or Species Group	Desk Study Records <sup>13</sup> , including incidental recordings during 2016 and 2014 Phase 1 Habitat Survey	Summary of 2015/16 field survey records/ habitat assessment	Relevant Figures
Pine marten	Two records of pine marten were received within the Study Area. One record was also provided in the Preliminary Ecological Appraisal <sup>xiii</sup> .	Suitable habitat is present throughout the Study Area, particularly the large expanses of plantation coniferous woodland and semi-natural broad-leaved woodland. The areas of grassland and heath are also likely to support prey populations.	Desk study records on Figure 11.3a.
Water vole	No records were received.	Suitable habitat is present throughout the Study Area, including watercourses, ditches and water bodies. To be assessed at Stage 3.	n/a
Wildcat	Twenty seven records of wildcat were received within the Study Area.	Suitable habitat is present throughout the Study Area, particularly the large expanses of plantation coniferous woodland and semi-natural broad-leaved woodland. The areas of grassland and heath are also likely to support prey populations.	Desk study records on Figure 11.3a.
Invertebrates	CNPA have provided details of areas considered likely to support notable invertebrates. Sixty locations have been identified within the Proposed Scheme Options. In addition, twelve locations are likely to support notable lepidoptera.  Records of 100 notable invertebrates were received, including mountain bumblebee, hairy wood-ant and harrow-headed ant.	To be assessed at Stage 3.	Details of CNPA areas shown on Figure 11.3c.
Other notable species	Mountain hare – two records received. The closest record 571m (CH19000). Brown hare – two records received The closet record 816m (CH5200). CNPA have provided details of 23 areas considered likely to support lichens within the Proposed Scheme Options, and three locations that are likely to support notable mosses.	To be assessed at Stage 3.	Desk study records on Figure 11.3a. Details of CNPA areas shown on Figure 11.3c.



## 11.4. Potential Impacts

11.4.1. This section characterises the potential impacts and the effects of the Proposed Scheme Options on the ecological features identified. The impacts identified below are relevant to all Proposed Scheme Options, a comparison between the options is provided in Section 11.4.33. Receptors outside the EZoI will not be affected by any activities or processes involved in the Proposed Scheme and are therefore not considered in this impact assessment. For all ecological features identified, construction impacts and operational impacts, where identified, are detailed in tern below.

### Impacts Common to All Mainline Alignment Options

#### Designated Sites

11.4.2. Three sites covered by four statutory designations (Alvie SSSI, Craigellachie SSSI and NNR and the River Spey SAC) fall within all mainline alignment options and may be affected by all alignment options. The degree of impact varies slightly in extent across the options and the relationship of three sites with the Proposed Scheme Options are presented in Table 11.6.

**Table 11.6: Area of Designated Sites that Fall within Mainline Alignment Options**

Mainline Alignment Options	Overlap with designated sites and % of designated site affected (habitat loss calculations allow for direct loss under the scheme footprint, plus a 3m disturbance buffer)					
	Alvie SSSI		Craigellachie SSSI/ NNR*		River Spey SAC	
	Ha	% of SSSI	Ha	% of SSSI/NNR	Ha	% of SAC
Option 1	1.4	0.40	0.10 (0.07)	0.018	0.64	0.011
Option 1A	1.4	0.40	0.10 (0.06)	0.016	0.63	0.011
Option 2	1.42	0.419	2.94 (2.44)	0.642	0.23	0.004

\*The SSSI and NNR boundaries vary slightly. The figures given here represent the total overlap with the SSSI and the overlap for the NNR boundary is shown in brackets.

11.4.3. One site, Loch Vaa SPA and SSSI lies in close proximity (within 100m) of the Proposed Scheme Options and is therefore of greatest risk of indirect impacts from construction, the distances from the Options are detailed in Table 11.7.

**Table 11.7: Designated Sites in Close Proximity to the Proposed Scheme Options**

Mainline Alignment Options	Distance to Mainline Option
	Loch Vaa SPA/SSSI
Option 1	76m
Option 1A	77m
Option 2	78m

11.4.4. In addition to the above sites there are 25 designated sites, which relate to 17 locations because designations overlap (i.e. locations may be covered by multiple designations), which fall within the EZoI (25).

11.4.5. Potential construction and operational impacts relating to all designated sites within the EZoI are assessed in Table 11.8 below. Where sites with multiple designations support the same qualifying features, these features have been grouped and sites discussed in relation to the feature to avoid duplication.

11.4.6. There are no non-statutory designated sites within the EZol.

**Table 11.8: Potential Construction and Operational Impacts of Statutory Designations within the EZol**

A detailed assessment of international designated sites is provided within Appendix A11.6, Habitat Regulations Assessment (HRA) screening. This table provides a summary of the HRA screening and an assessment of the effects on other statutory sites (SSSIs). Sites with the same qualifying interest have been grouped; Capercaillie sites in blue, Scottish crossbill sites in green and golden eagle sites in pink.

Designated Site	Distance to Mainline Alignment Option m/km			Potential Construction Impacts	Potential Operational Impacts	Significant Construction Impact Predicted	Significant Operational Impact Predicted
	1	1A	2				
<b>Capercaillie Sites</b>							
Abernethy Forest SPA, SSSI	3.9km	3.9km	3.9km	<p>Unlikely to disturb SPA qualifying species capercaillie within the SPA due to the distance of the SPAs from the Proposed Scheme Options.</p> <p>The results of the Stage 3 noise modelling will be reviewed to determine if there are likely to be a significant effects from construction noise on areas of functional woodland (areas of woodland outwith the SPA that provide suitable habitat for breeding capercaillie). A review of disturbance distances<sup>xxvii</sup>, <sup>xxviii</sup> suggests that a buffer zone of up to 1km around lek sites and around 100m around nesting sites would be needed to avoid disturbance.</p>	<p>Impacts may arise from disturbance to breeding capercaillie using areas of functional woodland due to human activity within laybys during operation. The locations of laybys in relation to the use of woodland by capercaillie will be considered at Stage 3.</p> <p>The additional width of the A9 as a result of the dualling is not considered to have an impact on capercaillie movement as the species is a strong flier.</p>	Yes	Yes
			<p>No habitat loss from SPA due to the distances from the Proposed Scheme Options. However there may be loss of functional land and this loss may affect the capercaillie population. As such impacts may arise from direct habitat loss.</p> <p>Impacts may arise from visual disturbance during construction on breeding capercaillie using areas of functional woodland.</p>				
Anagach Wood SPA	14.1km	14.1km	14.1km	Impacts as per assessment for Abernethy Forest.		Yes	Yes

Designated Site	Distance to Mainline Alignment Option m/km			Potential Construction Impacts	Potential Operational Impacts	Significant Construction Impact Predicted	Significant Operational Impact Predicted
	1	1A	2				
Craigmore Woods SPA	10km	10km	10km	Impacts as per assessment for Abernethy Forest.		Yes	Yes
Cairngorms SPA	9.6km	9.9km	9.8km	Impacts as per assessment for Abernethy Forest.		Yes (for breeding capercaillie)	Yes (for breeding capercaillie)
Kinveachy Forest SPA and SSSI	6.4km	6.4km	6km	Impacts as per assessment for Abernethy Forest.		Yes (for breeding capercaillie)	Yes (for breeding capercaillie)
<b>Scottish Crossbill</b>							
Kinveachy Forest SPA	6.4km	6.4km	6km	Unlikely to disturb the SPA qualifying species Scottish crossbill within the SPA due to the distance of SPAs from the Proposed Scheme Options.		No	No
				No habitat loss within SPAs due to the distances between Proposed Scheme Options and the designated site. No functional land has been identified that would be affected by the Proposed Scheme Options.	None predicted.		
Cairngorms SPA	9.6km	9.9km	9.8km	As per assessment for Kinveachy Forest above.		No	No
<b>Golden Eagle</b>							
Cairngorms SPA	960m	990m	980m	SNH (Keith Duncan) confirmed that the Cairngorms Massif SPA, which is much larger than the Cairngorms SPA, better represents use of the area by golden eagles, as such golden eagles are only considered under the Cairngorms Massif SPA.		No	No



Designated Site	Distance to Mainline Alignment Option m/km			Potential Construction Impacts	Potential Operational Impacts	Significant Construction Impact Predicted	Significant Operational Impact Predicted
	1	1A	2				
				No habitat loss will occur from this SPA due to the distance from the Proposed Scheme Options.	None predicted.		
Cairngorms Massif SPA	5.3km	5.3km	5.3km	No disturbance of golden eagle due to human activity within the Cairngorm Massif SPA is anticipated from either construction or operation given the distance between the site and the Proposed Scheme Options. The upper limits of disturbance distances, based on expert surveys, have been recorded as between 1 and 1.5km during incubation and 750m and 1km during chick rearing <sup>xxvi</sup> .	None predicted.	No	No
				No habitat loss will occur from this SPA due to the distance from the Proposed Scheme Options.			
Cairngorms SAC	957m	998m	982m	There is no hydrological connectivity between the SAC and the Proposed Scheme; therefore no indirect impacts on habitat from pollution or sedimentation during construction or operation are anticipated.  There is potential for otters associated with the SAC to move into the Proposed Scheme Options footprint and adjacent land; therefore there is potential for disturbance, displacement and/or mortality impacts during both construction and operation.	None predicted.	No	No
				No land take or excavation is required due to the distance from the Proposed Scheme Options.			
Carn nan Trigtighearnan SAC and SSSI	8km	8km	8km	There is no hydrological connectivity; therefore no indirect impacts on blanket bog or sub-alpine dry heath habitats from pollution or sedimentation during construction or operation are anticipated. This site was previously scoped out within the Programme Level Appropriate Assessment <sup>xxix</sup> .	None predicted.	No	No
				No land take or excavation is required due to the distance from the Proposed Scheme Options.			

Designated Site	Distance to Mainline Alignment Option m/km			Potential Construction Impacts	Potential Operational Impacts	Significant Construction Impact Predicted	Significant Operational Impact Predicted
	1	1A	2				
Insh Marshes SAC	2.4km	2.4km	2.4km	<p>The Insh Marches SAC is upstream of the Proposed Scheme Options and as such there will be no indirect impacts on habitats or lochs from water pollution incidents during construction or operation.</p> <p>There is potential for otters associated with the SAC to move into the Proposed Scheme Options footprint and adjacent land; therefore there is potential for disturbance, displacement and/or mortality impacts during both construction and operation.</p>	<p>No impacts are anticipated from operation for dust or vehicle exhaust emissions due to the distance from the Proposed Scheme Options.</p>	No	No
				<p>No land take or excavation is required due to the distance from the Proposed Scheme Options.</p> <p>No impacts in terms of air quality (primarily from dust deposition) during construction due to the distance from the Proposed Scheme Options.</p>			
Kinveachy Forest SAC and SSSI	644m	644m	605m	<p>The woodland habitats of the SAC and SSSI will not be indirectly affected as they are uphill of the Proposed Scheme Options and therefore not hydrological linked and as such there will be no indirect impacts on habitats from water pollution incidents during construction or operation.</p> <p>Pollution of the site as a result of airborne emissions from additional traffic, construction plant / machinery and operational plant (during construction and operation) is not anticipated due to the distance between the site and the Proposed Scheme Options.</p>	<p>None predicted.</p>	No	No
				<p>No land take or excavation is required due to the distance from the Proposed Scheme Options.</p>			
Loch Vaa SPA and SSSI	76m	77m	78m	<p>Noise from both construction and operation could disturb Slavonian grebe and goldeneye. This will depend on the distance of activities from breeding sites and the type of activity being carried out. The results of Stage 3 noise modelling will be used to determine likely significant effects.</p>		Yes	Yes

Designated Site	Distance to Mainline Alignment Option m/km			Potential Construction Impacts	Potential Operational Impacts	Significant Construction Impact Predicted	Significant Operational Impact Predicted
	1	1A	2				
				No land take or excavation is required due to the distance from the Proposed Scheme Options. It is not considered that there is any functional land for Slavonian grebe outwith the SPA and as such there will be no loss of functional land as a result of the Proposed Scheme Options.	Studies indicate that forestry works within 150-300m could result in disturbance to breeding Slavonian grebe. Therefore, until noise modelling has been undertaken, it is not possible to be certain that on-going maintenance would not result in disturbance that would affect the conservation status of the populations of qualifying species.		
River Spey SAC and SSSI	0m	0m	0m	<p>Disturbance from noise, vibration impacts to SAC qualifying species (otter, Atlantic salmon, sea lamprey and freshwater pearl mussel) during construction and operation (and in the case of otter due to human activity).</p> <p>Deterioration in habitat quality during construction and operation of the scheme as a result of changes in the hydrology of the three watercourses that are directly affected, or indirectly as a result of pollution of the River Spey SAC as a result of water and sediment run-off during construction, or as a result of discharges or accidental spills during construction and operation may occur.</p>		Yes	Yes
				<p>The Proposed Scheme Options will cross the SAC in three locations:</p> <ul style="list-style-type: none"> <li>Allt nan Ceatharnach, at Baddengorm, north of Ellan, in section 8;</li> <li>River Dulnain, at Ellan near Carrbridge, in section 8;</li> <li>Allt na Criche, south-west of Inverdrue, in section 3a.</li> </ul> <p>Construction may therefore result in permanent habitat loss if landtake is required from within the SAC at any of these locations. This landtake may also result in direct effects on fresh water pearl</p>	Potential for permanent effects on Atlantic salmon and sea lamprey if there is permanent loss of river bed habitat that provides suitable spawning habitat for Atlantic salmon and sea lamprey and if the structures result in a barrier to movement of fish. This would also result in effects on freshwater pearl mussel as salmonids act as host species.		

Designated Site	Distance to Mainline Alignment Option m/km			Potential Construction Impacts	Potential Operational Impacts	Significant Construction Impact Predicted	Significant Operational Impact Predicted
	1	1A	2				
				<p>mussel if present in these locations (no data was received from desk study to indicate presence in these locations, however detailed surveys will be undertaken at Stage 3).</p> <p>Habitat fragmentation may occur temporarily during construction depending on working methods in these locations.</p> <p>Temporary habitat loss and temporary barriers to fish passage may occur during construction.</p>			
River Spey – Insh Marshes SPA / Ramsar	2.4km	2.4km	2.4km	<p>This designated site is upstream of the Proposed Scheme Options and therefore there no risk of indirect impacts to habitats/species through water pollution.</p> <p>The SPA/ Ramsar is located 2.4km from the Proposed Scheme Options and no construction effects (primarily dust deposition) or operational effects (primarily due to NO<sub>x</sub> emissions) are predicted in terms of air quality or noise disturbance.</p> <p>There is potential for otters to move into the Proposed Scheme Options areas and adjacent land; therefore there is potential for disturbance, displacement and/or mortality impacts during both construction and operation.</p>		Yes (otter only)	Yes (otter only)
				No land take or excavation is required due to the distance from the Proposed Scheme Options.	None predicted.		
Slochd SAC	247m	239m	240m	<p>There will be no indirect impacts due to changes in hydrology and water quality during construction or operation as the SAC is upstream of the Proposed Scheme.</p>		No	No
				No land take or excavation is required due to the distance from the Proposed Scheme Options.	The air quality assessment has concluded that any changes in NO <sub>x</sub> emissions from the dualling will not exceed the most stringent critical loads for the habitats present within the SSSI.		

Designated Site	Distance to Mainline Alignment Option m/km			Potential Construction Impacts	Potential Operational Impacts	Significant Construction Impact Predicted	Significant Operational Impact Predicted
	1	1A	2				
Alvie SSSI	0m	0m	0m	There is potential for indirect habitat loss (though damage and alteration of water chemistry) through changes in hydrology and water quality during construction and operation as four watercourses flow under the A9 and into Loch Alvie. Changes in habitat could in turn alter the invertebrate species assemblage within the SSSI.	Breeding goldeneye may be subject to disturbance during operation due to human activity (if any lay-bys are located in this area) and traffic noise. At its closest point the road is approximately 100m from Loch Alvie. Research suggests that reasonable buffer zone to avoid active responses of birds with broods to pedestrian disturbance would be of the order of 100m to 150m <sup>xxvi</sup> . Detailed bird surveys during the Stage 3 Assessment will identify which areas of Loch Alvie are used by goldeneye to determine if there is a risk of disturbance. The air quality assessment has concluded that any changes in NOx emissions from the dualling will not exceed the most stringent critical loads for the habitats present within the SSSI.	Yes	Yes
				There will be direct habitat loss from the SSSI; this loss represents less than 0.5% of the entire SSSI. Breeding goldeneye may be subject to disturbance during construction due to human activity, noise and vibration. At its closest point the construction footprint is approximately 70m from Loch Alvie. Research suggests that a reasonable buffer zone to avoid active responses of birds with broods to pedestrian disturbance would be of the order of 100m to 150m <sup>xxvi</sup> . Detailed bird surveys during the Stage 3 Assessment will identify which areas of Loch Alvie are used by goldeneye to determine if there is a risk of disturbance.			
Craigellachie NNR and SSSI	0m	0m	0m	The construction phase may result in changes in hydrology and water quality of Loch Puladdern during construction. Option 2 will result in the largest impact as this Option will result in the loss of part of the loch and so risk of an impact on water quality will be greatest for this Option.	The air quality assessment (Chapter 15) has concluded that any changes in NOx emissions from the dualling will not exceed the most stringent critical loads for the habitats present within the SSSI. The water quality assessment (Chapter 10) has concluded that the operational phase will have a neutral effect from pollution as a result of routine run off	Yes	No
				All options will result in landtake from the NNR and SSSI. Option 2 will result in the			

Designated Site	Distance to Mainline Alignment Option m/km			Potential Construction Impacts	Potential Operational Impacts	Significant Construction Impact Predicted	Significant Operational Impact Predicted
	1	1A	2				
				greatest loss, effecting approximately 0.6% of the NNR (see Table 11.5 above). This loss of habitat may also result in the loss of areas which support the notable moth assemblage. The habitat loss as a result of Option 2 will directly result in the loss of part of Loch Puladdern, 27% of the loch's area will be lost.	and accidental spills on Loch Puladdern within the NNR.		
North Rothiemurchus Pinewood SSSI	957m	998m	982m	<p>There is no hydrological connectivity between any of the Proposed Scheme Options and the SSSI therefore no risk of indirect impacts through water pollution during construction or operation. Due to distance between the site and the Proposed Scheme Options there are no anticipated impacts on the invertebrate, lichen, fungi or vascular plant assemblages during construction or operation.</p> <p>The results of the Stage 3 noise modelling will be reviewed to determine if there are likely to be significant effects from construction and operation noise on capercaillie within the designated site. A review of disturbance distances<sup>xxvi</sup>, <sup>xxvii</sup> suggests that a buffer zone of up to 1km around lek sites and around 100m around nesting sites would be needed to avoid disturbance.</p> <p>It is unlikely that Scottish crossbill within the SSSI will be disturbed by the Proposed Scheme Options given distance of Proposed Scheme Options. A review of disturbance<sup>xxvi</sup> caused by human activity suggests that a buffer zone between 150m and 300m would be needed to avoid effects of forestry activities on Scottish crossbill. Given the distance between the sites and Proposed Scheme Options disturbance from construction and operation is considered unlikely. With respect to osprey given the distance between the SSSI and the Proposed Scheme Options, disturbance from construction and operation is considered unlikely. Whilst studies show a wide range in opinion on typical disturbance distances for osprey, with static disturbance ranging from 100m – 150m to 500m - 750m, the upper limit of active disturbance is considered to be 500m - 750m<sup>xxvi</sup>.</p> <p>The SSSI is located 957m from the Proposed Scheme Options and no construction effects (primarily dust deposition) or operational effects (primarily due to NO<sub>x</sub> emissions) are predicted in terms of air quality.</p>		No	No





Designated Site	Distance to Mainline Alignment Option m/km			Potential Construction Impacts	Potential Operational Impacts	Significant Construction Impact Predicted	Significant Operational Impact Predicted
	1	1A	2				
				No land take or excavation is required due to the distance from the Proposed Scheme Options.	None predicted.		
Moray Firth pSPA	25km	25km	25km	No effects during construction due to the distance of the pSPA from the Proposed Scheme Options (25km)	No effects during operation due to the distance of the pSPA from the Proposed Scheme Options (25km)	No	No

- 11.4.7. Direct impacts are predicted from all Proposed Scheme Options on three internationally designated sites; Craigellachie NNR/SSSI, Alvie SSSI and the River Spey SAC, and indirect significant impacts are predicted on thirteen sites internationally designated sites. In summary, the construction of all Options will likely result in significant impacts on receptors of National and International value (Significance Category: Very Large).
- 11.4.8. For all the internationally designated sites, a Habitat Regulations Assessment screening has been undertaken to assess the likely impacts of the Proposed Scheme Options on the qualifying features of these sites. The details of this assessment can be found in Appendix A11.6. This appendix provides an update to the Programme Level Appropriate Assessment<sup>xxviii</sup> and includes an update to Table 11.8 within the programme level assessment and the SNH Habitat Regulations Appraisal Proforma. The HRA concluded likely significant effects on the following sites: Loch Vaa SPA, Cairngorms SAC, Abernethy SPA, Anagach Wood SPA, Craigmore Woods SPA, Kinveachy Forest SPA, River Spey-Insh Marshes Ramsar, Insh Marshes Sac and the River Spey SAC.

#### Ancient Woodland

- 11.4.9. There are 38 areas of ancient woodland present within the Study Area. At 26 locations, these areas of ancient woodland fall within the footprint of the Proposed Scheme Options and as such may be directly affected through habitat loss, which would have a permanent significant impact. Table 11.9 details the areas of ancient woodland and woodland as shown on the Roy Map<sup>14</sup> which falls within each Option. The Option with the greatest area of woodland that will be lost is shown in red and the Option with the least area of woodland that will be lost is shown in green.

**Table 11.9: Area of Ancient Woodland within each Proposed Scheme Option footprint.**

	Option 1	Option 1A	Option 2
Ancient Woodland Overlap (ha)	13.21	13.60	22.23
Woodland shown on the Roy Map (ha)	6.63	6.55	9.73

- 11.4.10. Indirect impacts may occur during construction as a result of sedimentation or pollution inputs to watercourses which flow through ancient woodland that could in turn result in smothering of habitats adjacent to the watercourse, or loss of plants through the uptake of contaminants. These impacts are likely to be small in scale and would be temporary and reversible and as such are not considered to be significant.
- 11.4.11. Indirect impacts could also occur during operation as a result of the sedimentation or pollution of watercourses which flow through ancient woodland. This is considered unlikely to occur as these impacts would only result from an incident such as a major spillage from a vehicle. The risk of this occurrence is not considered to be greater than the current risk from the existing A9 and so is not considered further within this assessment.
- 11.4.12. In summary, the construction of all Options will result in permanent loss of ancient woodland, thus having a significant impact on a receptor of National value. (Significance Category: Very Large).

<sup>14</sup> Shown as unwooded on the 1st edition maps but as woodland on the “Roy” maps (Military Survey of Scotland, compiled by General Roy around 1750).

### Terrestrial Habitats

- 11.4.13. During construction terrestrial habitats could be affected by the following:
- Direct loss of terrestrial habitat as a result of construction footprint;
  - Indirect loss of habitats as a result of sedimentation and pollution, for example areas of marshy grassland and flushes are likely to be affected by changes in water quality;
  - Fragmentation of habitats, this will largely be a result of new junctions and side roads, which may cut through habitats; and
  - Changes to the local hydrology may affect Ground Water Dependent Terrestrial Ecosystems (GWDTE) habitats (these are fully assessed in Chapter 9 (Groundwater, Geology and Soils) and not considered further within Chapter 11).
- 11.4.14. Whilst these impacts will be common to all options, the degree of habitat affected varies across the options. Due to the extent of habitats present, the assessment focuses on the degree of overall habitat loss and the loss of potential Annex 1 habitats based on the Phase 1 habitat survey data, these extents are detailed in Table 11.10. The Option with the greatest area of habitat that will be lost is shown in red and the Option with the least area of habitat that will be lost is shown in green.

**Table 11.10: Area of Habitat Loss from the Proposed Scheme Options**

Notable Habitat	Mainline Alignment Option – Area of loss (ha)		
	1	1A	2
Overall loss of potential Annex 1 habitats	65.23	65.36	73.71
Other habitat loss (all habitats excluding Annex 1)	89.77	88.64	101.29
Breakdown of potential Annex 1 habitat loss			
Blanket bog	0.14	0.14	0.09
Broadleaved woodland – semi-natural	23.50	23.43	25.60
Coniferous woodland – semi-natural	3.27	3.28	3.31
Unimproved acid grassland	11.38	11.40	11.37
Dry dwarf shrub heath	25.92	26.09	29.54
Wet dwarf shrub heath	0.53	0.53	1.20
Wet modified bog	0.49	0.49	2.60

- 11.4.15. In summary, significant impacts are predicted on Annex 1 habitats as a result of the construction. These habitats are valued as being of County and Regional importance. Given the extent of the predicted habitat loss, the likely impacts are considered to be significant at a Regional level for all Options (Significance Category: Large).

### Aquatic Habitats

- 11.4.16. Impacts to the River Spey SAC (including tributaries which fall under the designation), are considered above in Table 11.8.
- 11.4.17. During construction, watercourses and waterbodies could be affected by the following:
- Direct loss of aquatic habitat as a result of construction footprint;
  - Loss of existing watercourse and riparian habitat as a result of the construction of culverts and/or extension to existing crossing footprints. Culverts may affect the

value of a watercourse as a wildlife corridor and alter aquatic and riparian habitat complexity;

- Reduction in watercourse habitat complexity and quality (changes to hydro-morphological character) as a result of the requirement for watercourse diversions and temporary crossings; and
- Deterioration in habitat quality and/or complexity as a result of reduced water quality and changes to flow character (e.g. due to sediment run-off during construction/de-watering activities).

11.4.18. Table 11.11 sets out of the number of watercourse crossings per option.

**Table 11.11: Number of Watercourse Crossings per Option**

Mainline Alignment Option	Number of Watercourse Crossings
1	18
1A	18
2	18

- 11.4.19. Habitat losses described above are considered to be irreversible and therefore significant. The scale of this significance varies across the watercourses affected, ranging from being significant at a National level where the four watercourses which fall within Alvie SSSI are affected, to Local level where minor non priority watercourses are affected. Watercourses will be surveyed during the DMRB Stage 3 Assessment to determine the value of each watercourse present and to assess the impact on these.
- 11.4.20. Whilst the reductions in water quality described have the potential to negatively affect aquatic habitat, these impacts are likely to be short-term and temporary during the construction period and therefore are not considered significant.
- 11.4.21. During the operation of the Proposed Scheme, watercourses and waterbody habitats could all be affected by the following:
- Changes to discharge volume and water quality (i.e. outfalls from new drainage infrastructure);
  - Where new culverts extend the existing carriageway crossing footprint, watercourse habitat may be affected through changes in hydro-morphological character both upstream and downstream of the crossing point. Concomitant alterations to sediment delivery rates and changes in flow character have the potential to reduce morphological diversity and reduce habitat complexity;
  - Conversely, there is also potential for improvement in watercourse habitat connectivity and complexity where replacement of existing culverts/structures, that are currently causing habitat severance, result in a return of more natural hydro-morphological processes; and
  - There are opportunities to improve watercourse habitat complexity through appropriately designed diversion channels (where required).
- 11.4.22. Impacts associated with changes to flow and water quality as a result of new discharges to watercourse will be permanent. However, assuming measures will be included in the design to ensure that negative effects from water quality do not occur. In the event of changes to the hydro-morphological character reducing the habitat complexity, this impact would be permanent and significant. The scale of this significance will vary across the watercourses affected, ranging from being significant at a National level for the four watercourses within Alvie SSSI (Significance Category: Very Large) to being

significant at a Local level where minor, non-priority watercourses are affected (Significance Category: Slight). Once detailed design information is known at DMRB Stage 3 and the scale of impact can be fully assessed and it is likely that the level of significance will be reduced.

Protected and Notable Terrestrial Species

11.4.23. During construction species could be affected by the following:

- Noise disturbance (from machinery, blasting, piling and construction traffic);
- Vibration disturbance (from piling);
- Visual disturbance (from site personnel and lighting);
- Habitat loss, which may result in the loss of areas suitable for resting sites and habitats used for foraging;
- Severance (from haul roads and site access tracks);
- Mortality for collision impacts with construction traffic.

11.4.24. Disturbance and severance will be temporary during the course of construction and impacts are likely to be reversible. In event that any mortality incidents arise during the construction phase, whilst the impact will be permanent, the risk of this occurring is considered to be low and as such is unlikely to have an impact on species at a population level. Habitat loss will be permanent within the footprint of the Proposed Scheme, but may only be temporary where additional landtake is required to accommodate the construction.

11.4.25. During operation species may be affected by severance. Although the existing A9 already severs habitats, severance impacts will be increased through the road widening, as the greater width increases the risk of a collision for any species attempting to cross the road. Table 11.12 details which of the above impacts are relevant to those species which are found (or likely to be found based on the habitats present) within the EZoI. Where impacts have been identified, taking the precautionary principle, it is assumed at this stage that these are significant (as detailed in Section 11.2.19, a nature conservation value has not been assigned to species, due to an absence of population data). Following detailed survey work to be undertaken as part of the DMRB Stage 3 Assessment, it is likely that this will be revised as the impact assessment will be based on a better understanding of species distributions.

**Table 11.12: Potential Impacts on Terrestrial Protected and Notable Species across all Options.**

Receptor	Potential Impacts from Construction (C) and Operation (O)				
	Loss of resting sites (e.g. roost, den, holt, nest)	Disturbance	Severance (e.g. of commuting routes, connections to suitable habitat)	Loss of suitable habitat (e.g. for foraging) – includes direct loss and indirect loss through pollution events	Mortality
Bats	C	C	C/ O	C	C/ O
Badger*	C	C	C/O	C	C/O
Birds <sup>15</sup>	C	C	-	C	C/O

<sup>15</sup> This table focuses on the general breeding bird assemblage, specific bird species associated with the designated sites are considered in Table 11.8

Receptor	Potential Impacts from Construction (C) and Operation (O)				
	Loss of resting sites (e.g. roost, den, holt, nest)	Disturbance	Severance (e.g. of commuting routes, connections to suitable habitat)	Loss of suitable habitat (e.g. for foraging) – includes direct loss and indirect loss through pollution events	Mortality
Great crested newt	C	C		C	C
Red squirrel	C	C	C/ O	C	C/ O
Reptiles		C	C	C	C/O
Deer		C	C/ O	C	C/ O
Otter	C	C	C/ O	C	C/ O
Pine marten	C	C	C/ O	C	C/ O
Water vole	C	C	C/ O	C	C/ O
Wildcat	C	C	C/ O	C	C/ O
Wood ants	C	C		C	C/ O

\*With respect to badgers, the closest sett recorded during the Stage 2 surveys was 50m from the Proposed Scheme Options. It is therefore unlikely that any setts will be lost based on the current distribution of badgers. However, given the presence of badgers within the EZol a precautionary approach has been taken here to account for the risk of new sett construction. This will be revisited during the DMRB Stage 3 Assessment once further design details are known.

### Protected and Notable Aquatic Species

11.4.26. During construction salmonids, lamprey, eel and fresh water pearl mussel could all be affected by the following:

- Acoustic disturbance (e.g. vibration from percussion piling) which may cause physiological damage to fish, deter passage through areas affected and reduce foraging and breeding success;
- Visual disturbance (e.g. movement of construction plant and lighting) which may deter passage of fish through areas affected;
- Pollution events which may result in species mortality. Freshwater pearl mussels are particularly sensitive to heavy metals that may be mobilised during construction activities (e.g. breakup of existing carriageway);
- Sedimentation events (run-off during construction) which may smother habitats resulting in the loss/reduction in quality of fisheries spawning sites and in acute cases may result in species mortality (e.g. smothering of eggs/loss of sediment sensitive aquatic macroinvertebrate species);
- In channel works such as watercourse diversions and temporary crossing may result in temporary loss of habitat of resource value to notable species and/or fragmentation of habitats that affect fish species reaching spawning habitats and/or undertaking daily feeding migrations;
- De-watering activities (temporary discharges to watercourses during construction) that affect water quality and hydro-morphology could cause harm to notable populations and induce behavioural changes in fisheries populations e.g. disruption to seasonal migration of salmon populations;





- Placement of new culverts and/or extension to existing crossing footprints will result in reduced habitat availability for protected and notable species during construction; and
- Loss of riparian habitat structure arising from construction related vegetation clearance may reduce valuable cover and refuge for notable fish populations.

11.4.27. With the exception of direct habitat loss (which may be significant depending on the extent), the impacts described above are likely to be short-term and temporary and not significant. In the case of notable species mortality, incidental individual mortality is likely to be negligible at the population level. However, with respect to fresh water pearl mussels, given their sedentary and complex life cycle, any species mortality is likely to be significant at the local population level.

11.4.28. During operation salmonids, lamprey, eel and fresh water pearl mussel could all be affected by the following:

- Harm to populations/loss of sensitive species reliant on aquatic habitats negatively affected by changes to discharge volume and water quality (i.e. outfalls from new drainage infrastructure, accidental vehicle spillages). This includes the potential for reduction in spawning habitat quality and effects on fish recruitment and loss of sensitive aquatic macroinvertebrate species;
- Reduced morphological diversity and habitat complexity associated with new culverts which could potentially affect resource availability for protected and notable species;
- The presence of new crossings/extended crossings which may create a barrier to species movement and isolate/fragment existing populations (e.g. freshwater pearl mussel) and prevent migratory salmonid fish from undertaking spawning and/or feeding migrations affecting recruitment potential;
- If a barrier to fish species is created then recruitment and distribution of freshwater pearl mussel may be constrained as a result of exclusion of larval host (salmonid fish) from key habitats in the catchment. Movement of lamprey and eel populations may also be affected as a result of any new barrier;
- Conversely, where watercourse severance is reduced (e.g. through the replacement of existing culverts/structures that are acting as barriers) improved connectivity and fish passage may benefit the fishery and freshwater pearl mussel populations; and
- There are opportunities to improve watercourse habitat for protected and notable species through appropriately designed diversion channels (where required). For example provision of resting pools and suitable spawning habitat for salmonid species.

11.4.29. Impacts associated with changes to flow and water quality as a result of new discharges to watercourses are likely to be short term and reversible and therefore not significant. All other positive and negative impacts identified above are likely to be irreversible and significant.

### Impacts Specific to Mainline Alignment Options

11.4.30. There are no specific impacts relating to each alignment Option. The extent of impacts identified from habitat loss (from designated sites, ancient woodland and Annex 1 habitats) does vary between Options and this is detailed in Tables 11.9 and 11.10 above.

11.4.31. In terms of the designated sites, the key differentiator between Options is the proximity to the designated sites, as detailed in Table 11.8.



## Impacts Specific to Junction Options

- 11.4.32. This section focuses on the variation in the degree of habitat loss and impacts on ancient woodland and designated sites (and their associated species). In general there are no significant differences in predicted impacts to protected and notable species across the options and impacts are anticipated to be largely as identified above where suitable habitat is present. However, those options which have the greatest degree of habitat loss are more likely to have a greater impact on protected and notable species because the removal of a larger area of habitat results in a greater risk that suitable habitats for foraging and resting sites will be lost. Where options result in the loss of habitat which is likely to be of value for protected species, for example watercourses and woodland areas, specific details are provided below.

### Impacts Common to Aviemore South Junction Options

- 11.4.33. Junction Option A18 may directly affect a small area of Alvie SSSI where it joins the B9192 road (the overlap with this option may result in a loss of 0.09ha of the SSSI). No other options affect statutory designated sites. All Options will result in habitat loss including loss of ancient woodland, valued as National importance. The other habitats in this location are generally assessed as local value, dominated by improved and semi-improved grassland. A small area of potential Annex 1 habitat is present, this is assessed to be of National value as this is also listed on the AWI, see Figure 11.4b.
- 11.4.34. The degree of the loss of habitats varies between the Options and is detailed in Table 11.13. The Option/s with the greatest area of habitat that will be lost is shown in red and the Option with the least area of habitat that will be lost is shown in green.

**Table 11.13: Area of Habitat Loss from the Aviemore South Junction Options**

Receptor	Nature Conservation Value	Junction Options		
		A02	A09	A18
Loss of ancient woodland as listed on the AWI (of semi-natural origin)	National	0.89ha	1.36ha	2.13ha
Loss of Potential Annex 1 habitat (Broadleaved woodland – semi-natural) – n.b. this woodland is also listed on the AWI and as such is valued as National	National	0.77ha	0.15ha	1.16ha
Other habitat loss <sup>16</sup>	Local	6.23ha	8.85ha	11.84ha
Number of watercourse crossings	n/a	0	0	0

## Impacts Specific to Aviemore South Junction Options

### *Impacts Specific to Junction Option A02*

- 11.4.35. There are no impacts specific to Junction Option A02.

### *Impacts Specific to Junction Option A09*

- 11.4.36. There are no impacts specific to Junction Option A09.

<sup>16</sup> excluding ancient woodland and potential Annex 1 habitat

### Impacts Specific to Junction Option A18

- 11.4.37. Junction Option A18 overlaps with Alvie SSSI where it joins the B9192 road. This SSSI is notified for its upland oak woodland, hydromorphological mire range, invertebrate assemblage and breeding goldeneye. From aerial photography, the area of overlap looks to support an area of broadleaved woodland. A total 0.09ha of the SSSI may be directly affected through habitat loss.

### Impacts Common to Granish Junction Options

- 11.4.38. There are no statutory designated sites affected by these Junction Options. All Options will result in habitat loss including loss of ancient woodland, valued as National importance. An area of potential Annex 1 habitat is present, this is assessed to be of National value as this is also listed on the AWI. The other habitats in this location are generally assessed as local value, dominated by semi-improved grassland.
- 11.4.39. The degree of the loss of habitats varies between the Options and is detailed in Table 11.14 and is shown on Figures 11.4a and 11.4b. The Option with the greatest area of habitat that will be lost is shown in red and the Option with the least area of habitat that will be lost is shown in green.

**Table 11.14: Area of Habitat Loss (ha) from the Granish Junction Options**

Receptor	Nature Conservation Value	Junction Options			
		C18	C21	C31	C34
Loss of ancient woodland (including Roy map)	National	6.96	6.19	6.52	5.36
Total loss of potential Annex 1 habitat <sup>17</sup> (n.b. broadleaved woodland – semi-natural woodland is also listed on the AWI and as such is valued as National)	National	7.10	6.01	7.07	5.95
Number of watercourse crossings	Local	4	4	5	4
Other habitat loss <sup>18</sup>	Local	2.52	2.77	2.61	2.71
Breakdown of potential Annex 1 habitat loss					
Broadleaved woodland – semi-natural		5.97	5.80	6.36	5.94
Wet dwarf shrub heath		0.92	0.21	0.70	0.01
Dry dwarf shrub heath		0.21	0.00	0.02	0.00

### Impacts Specific to Junction Option C18

- 11.4.40. There are no specific impacts relating to Junction Option C18.

### Impacts Specific to Junction Option C21

- 11.4.41. There are no specific impacts relating to Junction Option C21.

<sup>17</sup> Excluding Annex 1 habitats where the total loss is less than 0.01ha

<sup>18</sup> Excluding ancient woodland and potential Annex 1 habitats

### Impacts Specific to Junction Option C31

11.4.42. There are no specific impacts relating to Junction Option C31.

### Impacts Specific to Junction Option C34

11.4.43. This Junction Option is likely to have the greatest impact on the Allt na Criche burn due to the degree of landtake required for the earthworks, the footprint of which covers a 100m length of the burn (as shown on Figure 11.5, sheet 7). This will result in loss of aquatic habitat and may affect species movement along the watercourse. In terms of species, Junction Option C34 may have a greater effect on otter, water vole, fisheries interest, fresh water pearl mussel and bats compared with Junction Options C18, C21 and C31.

### Impacts Common to Black Mount Junction Options

11.4.44. There are no statutory designated sites or watercourses affected by these Junction Options. All Options will result in habitat loss including loss of ancient woodland, valued at National importance. The other habitats in this location are generally assessed as local value, dominated by improved and semi-improved grassland. An area of potential Annex 1 habitat is present (as shown on Figure 11.4b), this is assessed to be of National value for the areas of woodland which fall within the area listed on the AWI and Regional for the other habitats present. The other habitats in this location are generally assessed as local value, dominated by improved and semi-improved grassland.

11.4.45. The degree of the loss of habitats varies between the Options and is detailed in Table 11.15. The Option with the greatest area of habitat that will be lost is shown in red and the Option with the least area of habitat that will be lost is shown in green.

**Table 11.15: Area of Habitat Loss (ha) from the Black Mount Junction Options**

Receptor	Nature Conservation Value	Junction Options					
		D02	D03	D07	D12	D13	D51
Loss of ancient woodland (including Roy map)	National	1.29	0.37	1.16	1.57	0.31	1.94
Total loss of potential Annex 1 habitat	Regional and National	5.33	2.19	5.05	5.38	2.51	4.86
Number of watercourse crossings	n/a	0	0	0	0	0	0
Other habitat loss <sup>19</sup>	Local	5.01	3.16	5.43	5.29	2.53	7.08
Breakdown of potential Annex 1 habitat loss							
Broadleaved woodland – semi-natural		0.23	0.06	0.10	0.25	0.08	0.21
Coniferous woodland – semi-natural		0.96	0.52	0.66	0.77	0.69	0.65
Dry dwarf shrub heath		0.89	0.68	0.69	1.83	0.42	0.96
Unimproved acid grassland		0.95	0.38	0.86	0.70	0.47	0.67
Wet modified bog		2.30	0.55	2.74	1.83	0.85	2.37

<sup>19</sup> Habitat loss excluding AWI and potential Annex 1 habitats

## Impacts Specific to Black Mount Junction Options

11.4.46. There are no specific impacts relating to these six Junction Options.

## 11.5. Potential Mitigation

### Overview

- 11.5.1. Mitigation for the preferred option will be developed during the DMRB Stage 3 Assessment, in line with the mitigation hierarchy detailed in Section 2. The mitigation below has been identified following good practice guidelines. The key aspects considered will include measures to reduce collision risks for wildlife and to improve the permeability of the road for species movement and habitat linkages. The design will seek to minimise impacts on ancient woodland, to avoid severance of woodland habitats and to incorporate the concept of no net loss of biodiversity.
- 11.5.2. The contractor will be required to develop a Construction Environmental Management Plan (CEMP), which will include measures for the protection of ecological species and habitats throughout the construction of the scheme such as:
- General measures to avoid or alleviate negative impacts upon ecological receptors including following pollution prevention guidelines<sup>xxx</sup> in relation to avoidance of pollution;
  - Measures to protect trees within and adjacent to the Proposed Scheme boundary<sup>xxxi</sup>;
  - An Ecological Clerk of Works (ECoW) to be employed for the duration of construction of the Proposed Scheme and for pre-construction site clearance works to ensure that measures to avoid or alleviate impacts on nature conservation receptors are implemented;
  - Further ecological surveys are scheduled prior to construction of the Proposed Scheme in order to update information relating to habitats and protected species and ensure the most up-to-date data is available to input into applications for protected species mitigation licences and to inform precautionary methods of working;
  - Any excavations or ground investigations to be covered at night to prevent animals falling in and becoming trapped or a means of escape to be provided e.g. a plank being placed into the excavation;
  - All rubbish and construction materials to be collected and removed from site on a regular basis to prevent trapping or injury to individual animals; and
  - Tree felling and vegetation clearance to be minimised and undertaken outside the core bird nesting season (1st March and 31st August) to avoid damage or destruction of occupied nests or harm to breeding birds. If this cannot be achieved, works within the core bird nesting season will require an inspection of vegetation to be cleared for nesting birds by a suitably qualified ecologist no more than 24 hours prior to any works being undertaken. If any nesting birds are identified during the survey, they will be left *in situ* for their entire nesting period until the young birds have fledged. Alternative approaches to the work will need be proposed e.g. leaving an exclusion zone around the nest to avoid disturbance.
- 11.5.3. Specific mitigation measures in relation to the design, construction and operation of the scheme will be developed during the DMRB Stage 3 Assessment and possible mitigation measures are outlined below.

## General Design Measures

- 11.5.4. Design of culverts and structures will look to mitigate negative impacts on the connectivity between populations of animals and plants on either side of the Proposed Scheme. Where possible, opportunities for enhancements to the connectivity for biodiversity will be explored. Specific species protection plans will be developed at Stage 3 in consultation with the ESG.

## Designated Sites

- 11.5.5. With respect to the internationally designated sites, mitigation is detailed within Appendix A11.6, Habitat Regulations Assessment (HRA) screening. Tables 11.16 to 11.18 detail the proposed mitigation. This will be developed at Stage 3 once further Scheme details are known.

*Capercaillie Sites (Abernethy Forest SPA, Anagach Wood SPA, Craigmore Woods SPA, Cairngorms SPA and Kinveachy Forest SPA)*

**Table 11.16 Mitigation for Capercaillie Sites**

Mitigation	Rationale
Identify favourable habitats to be avoided and feed into final design.	Avoid permanent loss of functional land.
In consultation with the SNH Capercaillie Project Officer, identify unfavourable habitat in suitable locations which can be enhanced to provide habitat improvements to benefit capercaillie, in terms of reducing current severance between existing habitats and providing additional breeding habitat.	Mitigate permanent loss of favourable habitat.
Where there is breeding habitat that could be disturbed by construction, identify suitable seasonal working windows and/or use sound barriers to reduce noise to an acceptable level.	Avoid disturbance at sensitive sites during construction.
Identify areas where construction compounds should not be located	Avoid disturbance during construction.
Review all layby locations between chainages 3,000+000 to 17,000+000 and relocate as necessary. SNH recommends that one layby location near Carrbridge is not progressed any further due to the potential for disturbance to capercaillie.	Avoid disturbance during operation.



*River Spey*

**Table 11.17 Mitigation for River Spey**

<b>Mitigation</b>	<b>Rationale</b>
Identify favourable habitats to be avoided and feed into final design.	Avoid permanent loss of functional land.
Adapt detailed bridge design to take results of fish habitat surveys and freshwater pearl mussel into account.	Avoid permanent habitat loss of salmon and lamprey spawning habitat and freshwater pearl mussel habitat and avoid the need to translocate freshwater pearl mussel.
Adapt detailed bridge design to ensure continuity of habitat for fish, including during periods of low flow.	To avoid permanent effects of habitat severance on fish.
Ensure implementation of best practice construction site environmental management measures, including appropriate construction stage SuDS controls/ interceptors, in line with PPG.	To avoid and minimise risk of sediment release from construction works; thereby minimising risk to water quality and associated freshwater pearl mussel, juvenile salmon, sea lamprey and other habitats.
Ensure provision of suitable otter escape pathways through construction sites, e.g. provision of ramps/ mammal ladders to enable egress from construction SuDS features, excavations etc.	To minimise risks to otters during construction.
Implementation of Species Protection Plans (SPP) to manage construction stage risks, including requirements for preconstruction surveys by qualified ecologists.	To avoid and minimise construction stage risks to all River Spey SAC qualifying species whilst maintaining a proportionate response to required construction activity.
The construction programme for the Spey crossings will seek to avoid construction happening concurrently with each other.	To avoid effects on otter.
Avoid percussive construction works (e.g. piling/ blasting) in proximity to the river during sensitive salmon and sea lamprey migration and spawning periods.	Percussive works in proximity to the SAC could affect fish swim bladders, presenting risk of disturbance and injury during upstream migration (adults), downstream migration (juveniles), or potentially to relatively static salmon/ sea lamprey in juvenile habitat (if in proximity) – mitigation is to avoid and minimise such risks.
Where in-channel works are required, avoid sensitive migration, spawning and breeding seasons and ensure pre-works survey to confirm absence of freshwater pearl mussel in proximity.	To avoid and minimise risks to habitat substrates, to avoid pearl mussel sedimentation and to avoid disturbance of fish species, e.g. in proximity to bankside works should they be required.
Where in-channel works are required, strict adherence to the staged assessment process described in Scottish Government guidance 'River	To follow best practice guidelines to minimise risk of disturbance of fish species.

Crossings and Migratory Fish: Design Guidance’.	
Implement suitable exclusion zones and time periods (to be agreed with SNH) for works that have to be undertaken during sensitive migration, spawning and breeding seasons. Avoid work during hours of darkness (from half an hour before sunset to half an hour after sunrise) and agree lighting arrangements with SNH where required.	To avoid and minimise construction disturbance risk via inclusion of appropriate exclusion zones and time periods.
Consider including spillage containment into the SuDS design.	To minimise risks to the receiving water environment and receptors in the event of a polluting spillage
Ensure DMRB Stage 3 design includes provision of suitable mammal passes at regular intervals to provide opportunities for wildlife to pass under, rather than over, the surface of the route.	To provide opportunities for otter passage (and other species) during flood events to reduce barrier effect and minimise collision risk with vehicles.
Avoid SuDS outfalls in upstream proximity to freshwater pearl mussel beds (seek advice from SNH on suitable clearances where freshwater pearl mussel are identified).	To avoid and minimise any associated risks to freshwater pearl mussels.
Avoid permanent in-channel structures and works where possible.	To minimise substrate disturbance and avoid introduction of in-channel barriers for fish passage.
Consider retro-fitting baffles (or other measures) to the concrete bed of the existing structure at Baddengorm.	To mitigate the existing habitat severance at this location.

### Loch Vaa SPA

**Table 11.18 Mitigation for Loch Vaa**

Mitigation	Rationale
Where there is breeding habitat that could be disturbed by construction, identify suitable seasonal working windows and/or use sound barriers to reduce noise to an acceptable level, as indicated by the results of the noise modelling.	Avoid disturbance at sensitive sites during construction
Identify areas where construction compounds should not be located	Avoid disturbance during construction
Identify suitable seasonal working windows for standard maintenance	Avoid disturbance during operation

measures and a suitable design for sound barriers for maintenance works that have to be undertaken during the breeding season.	
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## Ancient Woodland

- 11.5.6. During the Stage 2 Assessment, the locations of ancient woodlands were considered and, where possible, options developed to avoid/reduce loss of ancient woodland. All of the proposed options will result in some loss of ancient woodland because of the proximity and extent of ancient woodland on either side of the existing A9. Negative impacts on ancient woodland or other notable habitats (e.g. GWTDEs and Annex 1 habitats) identified at Stage 3 will require appropriate compensation approaches to be explored. In the event that loss of ancient woodland cannot be avoided, then woodland habitat creation, along with retention and relocation of ancient woodland topsoils will be considered.

## Birds

- 11.5.7. A number of designated sites within the EZol have qualifying features for bird species, for which specific mitigation measures may be required. With respect to capercaillie, the location of laybys will be designed to avoid locations which could result in disturbance to functional land (areas of woodland outwith the SPA that provide suitable habitat for capercaillie).
- 11.5.8. With respect to capercaillie and Slavonian grebe, construction compounds will be planned to avoid locations which could result in disturbance to functional land for capercaillie or Loch Vaa. If breeding habitat for capercaillie, Slavonian grebe or golden eagle is identified which could be disturbed by construction, appropriate seasonal working windows or sound barriers or other appropriate mitigation measures will be used to reduce the noise to an acceptable level.
- 11.5.9. If the DMRB Stage 3 surveys locate suitable capercaillie habitat within the Scheme footprint, areas which can be enhanced to provide habitat improvements to benefit capercaillie will be identified, in consultation with the SNH Capercaillie Project Officer.

## Bats

- 11.5.10. The final scheme design should allow for retention of mature trees and suitable commuting corridors (e.g. woodland edges) wherever possible.
- 11.5.11. In the event that bats are found to be roosting within the trees or structures to be affected by the Proposed Scheme, then a European Protected Species (EPS) licence will be required from SNH to destroy any roosts present. Suitable alternative roosts should be provided as compensation. The type of roost to be provided will depend on the species and numbers of bats present and may include bat boxes placed within woodland areas. Where culverts are to be replaced or extended, consideration should be given to installing bat bricks and boxes within the structures.
- 11.5.12. Following the results of the Stage 3 surveys, where important bat commuting corridors and foraging habitats are located in proximity to the Proposed Scheme, consideration will be given to lighting in general and specifically in proximity to watercourses and planting requirements will be considered in terms of commuting routes and foraging.

## Aquatic Receptors

- 11.5.13. Specific mitigation measures for aquatic receptors will be developed during the Stage 3 Assessment. The following broad principles for mitigation will be applied:

### *Watercourse crossing structures*

- 11.5.14. Watercourse crossing structures will be designed to minimise negative impacts on habitats and species following current good practice guidance.
- 11.5.15. Site specific culvert design will incorporate measures to ensure the provision of adequate depth of flow (nominally no less than 200mm) and velocities to reduce impacts associated with habitat severance and associated impacts on migratory fish (e.g. through the incorporation of fish pass baffles/ 2-stage culvert design). A smooth transition of flow to and from the culvert will be maintained which may require the construction of outlet pools.

### *Watercourse realignment and diversions*

- 11.5.16. Realignment of channels up and/or downstream of watercourse crossing structures would seek to reduce and minimise:
- The degree of habitat severance created by a culvert;
  - The risk of creating a barrier to aquatic plants and animals;
  - Negative impacts on upstream and downstream habitat and aquatic communities; and
  - The risk of blockage.
- 11.5.17. Any watercourse diversion works (including realignments at watercourse crossings) will incorporate design measures that enhance both in-channel and riparian habitat quality e.g. provision of resting pools and spawning habitats for salmonids.

### *Discharge and drainage*

- 11.5.18. All road run-off drainage will be attenuated and associated pollutants treated, ideally through the use of SuDS, in order to address any flood risk issues and to protect water quality. Where possible, SuDS will also be designed to maximise their ecological value.

### *Timing of works*

- 11.5.19. Construction activities affecting the water environment (e.g. temporary watercourse diversions) will be programmed to avoid key fish spawning and migration periods, such as the main salmonid migration and spawning period in October-December. Liaison with the Spey Fishery Board will be undertaken to ascertain additional site-specific constraints based on local knowledge of key run times.

## Badgers

- 11.5.20. In the event that a badger sett is found within 50m of the Proposed Scheme during pre-construction surveys, a licence will be required from SNH to disturb or destroy the sett. It may be necessary to provide an alternative sett as compensation.
- 11.5.21. Where badger activity or suitability for badgers is recorded, crossing points (culverts and underpasses) should be designed to allow passage by badgers.

- 11.5.22. In locations where badger activity has been identified, consideration should be given to permanent fencing, following DMRB specifications.

### Otters

- 11.5.23. No night working (defined as works during the hours of dusk and dawn, i.e. 30 minutes before dusk to 30 minutes after dawn) will be undertaken within 50m of watercourses during the construction phase.
- 11.5.24. In the event that otter resting sites are found within 50m of the Proposed Scheme (or 200m if a breeding holt) then an EPS licence will be required from SNH to disturb or destroy the site. It may be necessary to provide suitable alternative resting sites as mitigation depending on the availability of habitat in the wider area.
- 11.5.25. During operation there will be no lighting in proximity to watercourses to avoid disturbance to potential commuting and foraging corridors (exceptions to this where there is a health and safety requirement for road users).

### Water Voles

- 11.5.26. In the event that burrows are found within 50m of the Proposed Scheme, a licence will be required from SNH to disturb or destroy the site. It may be necessary to provide suitable alternative habitat for water voles as mitigation depending on the availability of habitat in the wider area.

### Red Squirrel, Pine Marten and Wildcat

- 11.5.27. In the event that dens or dreys are found within 50m of the Proposed Scheme, a disturbance licence (red squirrel and pine marten) or EPS licence (wildcat) will be required from SNH to disturb or destroy the site. It may be necessary to provide suitable alternative den/drey sites as mitigation depending on the availability of cover in the wider area. With respect to wildcat the 200m study area will be used to inform mitigation requirements.

### Deer

- 11.5.28. At Stage 3, an assessment will be made of the requirement for deer fencing, based on the identification and evaluation of 'hot spots' for deer collisions.

## 11.6. Summary of Route Option Impacts

- 11.6.1. Table 11.19 provides a summary of the significant impacts, assuming the application of the mitigation measures identified in Section 11.5.
- 11.6.2. For legally protected species, it is considered that the mitigation measures identified above will remove significant impacts from the construction and operation phases. The need for these mitigation measures and the detail of these measures will be reviewed at DMRB Stage 3 once detailed survey data has been collected and specific design details are known. The only exception to this is for fresh water pearl mussel if it is present within the Scheme footprint; in this case, there is a risk of loss of the species and mitigation for this loss may not be possible. Species which are qualifying features for designated sites are considered within the impacts affecting the designated sites, as summarised in Table 11.16 and detailed in the sections above.



**Table 11.19: Summary of Impacts – Mainline Alignment Options**

Sub-topic	Receptor	Potential Impact	Significant Impact Identified/ Category Mainline Alignment Options			Comparative Appraisal of Options
			Option 1	Option 1A	Option 2	
<b>Construction Phase Impacts</b>						
Designated Site	Abernethy Forest SPA/ SSSI/ RSPB reserve	Loss of functional land for capercaillie, noise disturbance (capercaillie)	Yes – Very Large			No differentiator
Designated Site	Craigmore SPA	Loss of functional land for capercaillie, noise disturbance (capercaillie)	Yes – Very Large			No differentiator
Designated Site	Cairngorms SPA	Loss of functional land for capercaillie, noise disturbance (capercaillie)	Yes – Very Large			No differentiator
Designated Site	Kinveachy Forest SPA	Loss of functional land for capercaillie, noise disturbance (capercaillie)	Yes – Very Large			No differentiator
Designated Site	Loch Vaa SPA/SSSI	Noise disturbance (Slavonian grebe)	Yes – Very Large			No differentiator
Designated Site	River Spey SAC/ SSSI	Noise and vibration, pollution and sedimentation, habitat loss	Yes – Very Large			Option 2 is wider at the Allt na Criche and at the River Dulnain crossings and the impacts may be greater than with Options 1 and 1A. At the Allt nan Ceatharnach crossing, landtake is lowest for Option 2.
Designated Site	Alvie SSSI	Habitat loss, noise disturbance	Yes – Very Large			No differentiator
Designated Site	Craigellachie NNR/ SSSI	Habitat loss	Yes – Very Large			Option 2 results in the loss of 2.9ha of SSSI of which 2.4ha is also NNR. This compares with a loss of 0.1ha for Options 1 and 1A.
Notable habitats	Ancient woodland (including Roy map woodland)	Habitat loss	Yes – Very Large			Option 2 results in the loss of 32ha of ancient woodland. This compares with a loss of 20ha for Options 1 and 1A.







Sub-topic	Receptor	Potential Impact	Significant Impact Identified/ Category Mainline Alignment Options			Comparative Appraisal of Options
			Option 1	Option 1A	Option 2	
Notable habitats	Potential Annex 1 habitats	Habitat loss	Yes - Regional			Option 2 results in the loss of 74ha of potential Annex 1 habitat, compared with 65ha for Options 1 and 1A.
Habitats (other)	Habitats	Habitat loss (wider effects on species, i.e. loss of resting sites, foraging habitats)	Yes - Regional			Option 2 results in the loss of 101ha of habitats, compared to 90ha for Options 1 and 89ha for 1A.
Protected Species	Fresh water pearl mussel	Habitat loss	Yes- If found to be present during Stage 3 surveys.			No differentiator
<b>Operational Phase Impacts</b>						
Designated Site	Loch Vaa SPA/SSSI	Noise disturbance	Yes – Very Large			No differentiator
Designated Site	River Spey SAC/ SSSI	Pollution and sedimentation	Yes – Very Large			No differentiator
Designated Site	Alvie SSSI	Noise disturbance	Yes – Very Large			No differentiator

**Table 11.20: Summary of Impacts – Aviemore South Junction Options**

Sub-topic	Receptor	Potential Impact	Significant Impact Identified / Category			Comparative Appraisal of Options
			Aviemore South Junction Options (Route Sections 1 & 2)			
			Option A02	Option A09	Option A18	
<b>Construction Phase Impacts</b>						
Designated Site	Alvie SSSI	Habitat loss	No	No	Yes – Very large	Option A18 will result in the loss of 0.09ha of SSSI.
Notable habitats	Ancient woodland (including Roy map woodland)	Habitat loss	Yes – Very Large			Option A18 will result in the largest loss of ancient woodland with 2ha (compared to 1.4ha with Option A09 and 0.9ha with Option A02).
Notable habitats	Potential Annex 1 habitats	Habitat loss	Yes - Large	No	Yes - Large (1.16ha of loss)	Option A18 will result in over 1.16ha of loss, compared to 0.77ha for Option A02 and 0.15ha for Option A18. Option A18 is not considered due to the





Sub-topic	Receptor	Potential Impact	Significant Impact Identified / Category			Comparative Appraisal of Options
			Aviemore South Junction Options (Route Sections 1 & 2)			
			Option A02	Option A09	Option A18	
						area of loss being below 0.5ha.
Habitats (other)	Habitats (other than Annex 1)	Habitat loss (wider impacts on species, i.e. loss of resting sites, foraging habitats)	Yes - Slight			Option A18 has the largest loss of other habitats with 10.82ha of loss, compared with 8.85 for Option A09 and 6.28ha for Option A02.
<b>Operational Phase Impacts</b>						
None identified for these three Junction Options.						

**Table 11.21: Summary of Impacts – Granish Junction Options**

Sub-topic	Receptor	Potential Impact	Significant Impact Identified/ Category				Comparative Appraisal of Options
			Granish Junction Options (Route Section 5)				
			Option C18	Option C21	Option C31	Option C34	
<b>Construction Phase Impacts</b>							
Notable habitats	Ancient woodland (including Roy map woodland)	Habitat loss	Yes – Very Large				Option C18 will result in the greatest loss of ancient woodland (7ha). Option C34 will result in the least loss of ancient woodland (5.4ha).
Notable habitats	Potential Annex 1 habitats	Habitat loss	Yes - Large				Option C31 will result in the greatest loss of Annex 1 habitats (7ha) and C34 the least loss of Annex 1 habitats (6ha).
Habitats	Habitats (other than Annex 1)	Habitat loss (wider impacts on species, i.e. loss of resting sites, foraging habitats)	Yes- Slight				Options C18 will result in the greatest loss of habitat with 3.13ha. Option C34 will result in the least loss, 1.71ha.  Option C21 will have the greatest impact on the Allt na Criche burn, effecting a 100m stretch.
<b>Operational Phase Impacts</b>							
None identified for these four Junction Options.							



**Table 11.22: Summary of Impacts – Black Mount Junction Options**

Sub-topic	Receptor	Potential Impact	Significant Impact Identified/ Category						Comparative Appraisal of Options
			Black Mount Junction Options (Route Section 9)						
			Option D02	Option D03	Option D07	Option D12	Option D13	Option D51	
<b>Construction Phase Impacts</b>									
Notable habitats	Ancient woodland (including Roy map woodland)	Habitat loss	Yes – Very Large						Option D51 will result in the greatest loss of ancient woodland (1.9ha) compared to Option D13 (0.3ha).
Notable habitats	Potential Annex 1 habitats	Habitat loss	Yes - Large						Option D03 will result in the lowest loss (1.64) of Annex 1 habitat compared to the other Options. Option D12 will result in the greatest loss of 3.55ha.
Habitats	Habitats (other than Annex 1)	Habitat loss (wider impacts on species, i.e. loss of resting sites, foraging habitats)	Yes - Slight						Option D51 will result in greatest loss of other habitat (8.51ha) and Option D03 has the lowest loss of habitat (3.07ha).
<b>Operational Phase Impacts</b>									
None identified for these six Junction Options.									

## 11.7. Scope of DMRB Stage 3 Assessment

11.7.1. The DMRB Stage 3 Assessment for Ecology and Nature Conservation will be undertaken in accordance with DMRB Volume 11, Section 3, Part 4.

11.7.2. Detailed field surveys will be undertaken to identify the presence or likely absence of protected and notable species. This survey approach has been informed by the outline approach to consistency in the A9 ecology survey extents<sup>xxxii</sup>. The surveys will include the following:

- Habitats - NVC surveys of all notable habitats recorded during Phase 1 habitat survey (i.e. where Annex 1 or GWDTE habitats may be present) will cover 250m from the Proposed Scheme's earthworks extent (this survey will allow for the identification of



GWDTEs). Where considered appropriate, further targeted searches for protected and priority plants will be undertaken, to be informed by the results of the NVC surveys;

- River Habitat Surveys (RHS), covering 250m up and downstream of where the A9 crosses watercourses;
- Aquatic river macroinvertebrate surveys (undertaken in conjunction with the RHS);
- Fresh water pearl mussel surveys (if required following river habitat assessment);
- Fish habitat assessments (undertaken in conjunction with the RHS);
- National Pond Survey<sup>xxxiii</sup> surveys for waterbodies within 150m of Proposed Scheme earthworks extent;
- Great crested newt population assessments for ponds where positive eDNA results were located. These surveys will comprise six survey visits to each water body between March and June, inclusive. Further eDNA surveys will be undertaken in 2017 on all ponds within 250m of the Proposed Scheme earthworks extent which were not subject to eDNA survey at DMRB Stage 2 Assessment (where access permits);
- Emergence and return bat surveys will be undertaken for areas of woodland, individual trees, housing, culverts and bridges identified with bat roost potential that are at risk of disturbance or will be directly affected as a result of the Proposed Scheme (within 50m of the Proposed Scheme earthworks extent). Trees and rock faces will be subject to climb and inspect surveys to confirm if bat roosts are present, where safe to do so.
- Bat hibernation surveys will be undertaken on features identified as being suitable for hibernation that are at risk of disturbance or will be directly affected as a result of the Proposed Scheme (within 50m of the Proposed Scheme earthworks extent).
- Bat transect surveys at locations identified as potentially suitable for bats to cross the Proposed Scheme; Otter surveys, covering all watercourses crossed by the Proposed Scheme, extending out to 100m from Proposed Scheme earthworks extent, extending to 250m if considered necessary by the ecological surveyor;
- Water vole surveys, covering all watercourses crossed by the Proposed Scheme, extending out to 100m from Proposed Scheme earthworks extent. Two surveys to be undertaken in all locations where suitable habitat identified.
- Bird surveys, including pinewood winter surveys focusing on capercaillie and crossbills, Wetland Birds Surveys (WeBS), Breeding Bird Survey (BBS) and Common Bird Census (CBC), covering 250m from Proposed Scheme earthwork extents, extending to 1km for capercaillie;
- Red squirrel (transect surveys and drey counts) within suitable habitat within 50m of the Proposed Scheme earthworks extent;
- Pine marten (den searches and use of DNA ID for potential scats) within suitable habitat within 50m of the Proposed Scheme earthworks extent;
- Wildcat (incidental observations to be made during other ecological surveys (furthest extent of these will extend out to 250m of the Proposed Scheme earthwork extent), use of DNA ID for potential scats) within suitable habitat; and
- Consideration will also be given to detailed reptile, invertebrate and fungi surveys once the Preferred Scheme is selected and it is known what habitats will be affected.

11.7.3. Data will also be collected and reviewed on deer activity to assess likely 'hotspots' for collisions and to identify mitigation requirements at these locations.



11.7.4. The DMRB Stage 3 Assessment will review the impacts of the Proposed Scheme and identify the significant impacts on ecological receptors, following which appropriate mitigation will be developed in line with good practice. The impact assessment will be undertaken in accordance with DMRB guidelines and CIEEM guidance and following IAN 130/10 the significance of effects will be determined for those impacts that are significant taking account of the value of the feature. Mitigation will be developed taking account of the mitigation hierarchy and of standard good practice approaches and in consultation with relevant statutory bodies.

<sup>i</sup> CFJV, JUK, AM (2015) Technical memorandum, Outline approach to consistency in A9 survey extents

<sup>ii</sup> Design Manual for Roads & Bridges (1993) Ecology and Nature Conservation - Volume 11, Section 3, Part 4.

<sup>iii</sup> Design Manual for Roads & Bridges (2010) Interim Advice Note (IAN) 130/10 - Ecology and Nature Conservation: Criteria for Impact Assessment.

<sup>iv</sup> Transport Scotland (2014) Scottish Transport Appraisal Guidance (STAG). The Scottish Government, Edinburgh.

<sup>v</sup> The Chartered Institute of Ecology and Environmental Management (2016) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal, Second Edition, January 2016.

<sup>vi</sup> Scottish Natural Heritage (2013) A handbook on Environmental Impact Assessment. Natural Heritage Management, 4th Edition.

<sup>vii</sup> Scottish Natural Heritage (2016) Site Link. Available at: <http://gateway.snh.gov.uk/sitelink/index.jsp> (Accessed: 14/06/2016).

<sup>viii</sup> Scottish Natural Heritage (2016) SNHi – Information Service > Natural Spaces. Available at: <http://gateway.snh.gov.uk/natural-spaces/index.jsp> (Accessed 14/06/2016).

<sup>ix</sup> Scotland's Environment (2016) Available at: <http://www.environment.scotland.gov.uk/> (Accessed 14/06/2016).

<sup>x</sup> Joint Nature Conservation Committee (2016) Available at: [www.jncc.gov.uk](http://www.jncc.gov.uk) (Accessed 14/06/2016).

<sup>xi</sup> Forestry Commission Scotland (2016) Native Woodland Survey of Scotland. Available at: <http://scotland.forestry.gov.uk/supporting/strategy-policy-guidance/native-woodland-survey-of-scotland-nwss> (Accessed 14/06/2016).

<sup>xii</sup> Scottish Environment Protection Agency (2016) River Basin Management Plans Interactive Map. Available at: <http://gis.sepa.org.uk/rbmp/> (Accessed 14/06/2016)

<sup>xiii</sup> Where's the Path 3 (2016) Available at: <http://wtp2.appspot.com/wheresthepath.htm> (Accessed 14/06/2016).

<sup>xiv</sup> CH2MHill (2015) Preliminary Ecological Appraisal. North Scheme – Dalraddy to Moy.

<sup>xv</sup> SEPA (2014) Land Use Planning System SEPA Guidance Note 31

<sup>xvi</sup> Ratcliffe, D.A. (1977) A Nature Conservation Review. Cambridge University Press, Cambridge, England (on behalf of the Nature Conservancy Council and the Natural Environment Research Council): Vol. 1.

<sup>xvii</sup> Scottish Natural Heritage (2016) Landscape Character Assessment (LCA). Available at: <http://www.snh.gov.uk/protecting-scotlands-nature/looking-after-landscapes/lca/> (Accessed 14/06/2016).

<sup>xviii</sup> The Highland Council (2016) Council Wards. Available at: [http://www.highland.gov.uk/info/772/politicians\\_elections\\_and\\_democracy/504/council\\_wards](http://www.highland.gov.uk/info/772/politicians_elections_and_democracy/504/council_wards) (Accessed 04/07/2016)

<sup>xix</sup> Scottish Biodiversity List (2013) Available at: <http://www.gov.scot/Topics/Environment/Wildlife-Habitats/16118/Biodiversitylist/SBL> (Accessed 14/06/2016).

<sup>xx</sup> Cosgrove, P. and the Cairngorms Local Biodiversity Action Plan Steering Group (2002) The Cairngorms Local Biodiversity Action Plan.

<sup>xxi</sup> Eaton, M.A., Brown, A.F., Noble, D.G., Musgrove, A.J., Hearn, R.D., Aebischer, N.J., Gibbons, D.W., Evans, A. and Gregory, R.D. (2009) Birds of Conservation Concern 3 – The population status of birds in the United Kingdom, Channel Islands and Isle of Man. *British Birds*, 102: 296-341.

<sup>xxii</sup> International Union for Conservation of Nature (2015) The IUCN Red List of Threatened Species. Available at: <http://www.iucnredlist.org/> (Accessed 14/06/2016).

<sup>xxiii</sup> The Chartered Institute of Ecology and Environmental Management (2016) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal, Second Edition, January 2016.

<sup>xxiv</sup> Department for Communities and Local Development (2012). National Planning Policy Framework, paragraph 118. Available at: <https://www.gov.uk/government/publications/national-planning-policy-framework--2> (Accessed 14/06/2016).



<sup>xxv</sup> Chartered Institute of Ecology and Environmental Management (2006). Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal, Second Edition, January 2016, paragraph 1.16.

<sup>xxvi</sup> CNPA (2013) Cairngorms Nature Action Plan 2013-2018.

<sup>xxvii</sup> Ruddock, M. & Whitfield, D.P. (2007) A Review of Disturbance Distances in Selected Bird Species. A report from Natural Research (Projects) Ltd to Scottish Natural Heritage

<sup>xxviii</sup> Marshall, K. (2005) Capercaillie and Recreational Disturbance Study. For CNPA, FCS and SNH.

<sup>xxix</sup> Transport Scotland (2015) A9 Dualling Programme, Habitats Regulation Appraisal (HRA). Programme Level Appropriate Assessment (AA).

<sup>xxx</sup> National Archives – Environment Agency (2014) Pollution Prevention Guidance (PPG). Available at: <http://webarchive.nationalarchives.gov.uk/20140328084622/http://www.environment-agency.gov.uk/business/topics/pollution/39083.aspx> (Accessed 14/06/2016).

<sup>xxxi</sup> British Standards Institution (2012). Guide for Trees in relation to design, demolition and construction: recommendations. BS 5837:2012.

<sup>xxxii</sup> CFJV, JUK, AM (2015) Technical memorandum, Outline approach to consistency in A9 survey extents

<sup>xxxiii</sup> Biggs, J. Fox, G., Nicolet, P. Walker, D., Whitfield, M. & Williams, P. (1998) A guide to the methods of the National Pond Survey. Pond Action, Oxford Brookes University. Available at:

<http://freshwaterhabitats.org.uk/wp-content/uploads/2013/09/National-Pond-Survey-Methods.pdf>

