

Appendix A13.1

Earthwork Design



Table of contents

Chapter	Pages
1. Introduction	1
1.1. The Proposed Scheme	1
1.2. Earthworks Design	1
2. Approach and Methods	3
2.2. Limitations	3
3. Landform Sensitivity	5
3.1. Landform Sensitivity Plans	5
4. Areas of Focused Earthworks Design	9
4.1. Location One: Chainage 320-600 (SB)	9
4.2. Location Two: Ruthven-Tomatin Link Road Chainage 1470-1940 (SB)	10
4.3. Location Three: Chainage 4390-4800 (SB)	11
4.4. Location Four: Chainage 6900-7300 (NB)	12
4.5. Location Five: Chainage 7300-8100 (SB)	13
5. Summary	16
6. References	17

Tables

Table A2.1: Landform Sensitivity: Typical Descriptions	3
Table A5.2: Summary of Locations of Embedded Earthworks Mitigation	16

Figures

Figure 1: Landform Sensitivity - Ch. 0000 - 1750	5
Figure 2: Landform Sensitivity - Ch. 1750 - 3100	6
Figure 3: Landform Sensitivity - Ch. 3100- 4800	6
Figure 4: Landform Sensitivity - Ch. 4800-6800	7
Figure 5: Landform Sensitivity - Ch. 6800-8400	7
Figure 6: Landform Sensitivity - Ch. 8400-9600	8
Figure 7: Landform Sensitivity - Ch. 9600-11100	8
Figure 8: Illustrative Plan – Chainage 320-600	9
Figure 9: Illustrative Section - Chainage 400	9
Figure 10: Open Landscape Adjacent to the A9 near Invereen	10
Figure 11: Illustrative Plan – Tomatin-Ruthven Link Road Chainage 1470-1940	10
Figure 12: Illustrative Section – Mainline Chainage 2400	11
Figure 13: Illustrative Plan - Chainage 4390-4800	12
Figure 14: Illustrative Section - Chainage 4800	12
Figure 15: Illustrative Plan - Chainage 6900-7300	13
Figure 16: Illustrative Section – Chainage 7200	13
Figure 17: Illustrative Plan - Chainage 7300-8100	14
Figure 18: Illustrative Section – Chainage 7400	14
Figure 19: The A9 on the Edge of the Allt Creag Bheithin Floodplain	15

1. Introduction

1.1. The Proposed Scheme

- 1.1.1. The A9 Dualling Tomatin to Moy DMRB Stage 3 engineering design assessed in the Environmental Impact Assessment (EIA) and reported in this ES is hereafter referred to as the Proposed Scheme and is shown in Figure 1.2 in Volume 3.

1.2. Earthworks Design

- 1.2.1. This technical appendix sets out an overview of the process followed and a summary of the outcomes that arose in considering how the Proposed Scheme could achieve 'best landscape fit' with the existing landform through varying earthwork slope profiles.
- 1.2.2. The main objective of this exercise was to slacken slope profiles at locations where this will achieve a more naturalistic and integrated landform to help embed the Proposed Scheme into the existing landscape, or steepen slopes where the safeguarding of existing landscape cover is desirable in order to maintain the pattern of the landscape and/or screening of the A9 to visual receptors in the area.
- 1.2.3. To achieve a best fit within the landscape, in line with the advice provided within Transport Scotland's Fitting Landscapesⁱ document, slope profiles have been steepened or slackened at several specific locations for the reasons noted above from the 1:3 gradient initially proposed within the engineering design. These varied slope profiles have been incorporated into the Proposed Scheme design as embedded landscape mitigation.
- 1.2.4. It should be noted that slope profiles have been steepened or slackened at several other specific locations throughout the scheme for engineering and environmental reasons other than landscape fit. Whilst these areas inevitably have an influence on landscape fit, this was not the primary intention of the change in design and consequently these locations are not included within this technical appendix.
- 1.2.5. This approach has adopted the principles of iterative design, as highlighted below in paragraphs 1.2.6, 1.2.7 and 1.2.8, supported by DMRB Interim Advice Note (IAN) 135/10ⁱⁱ, Guidelines for Landscape and Visual Impact Assessment (GLVIA3)ⁱⁱⁱ and Fitting Landscapes: Securing More Sustainable Landscapesⁱ. All three documents were used to both inform and guide the assessment process.
- 1.2.6. IAN 135/10 states that '*Mitigation should be addressed as an intrinsic part of the assessment process, amending the design wherever possible to avoid or reduce landscape and/or visual impacts as part of an iterative process*'.
- 1.2.7. It is stated within GLVIA3 that '*EIA itself can be an important design tool. It is now usually an iterative process, the stages of which feed into the... design of the project. The iterative design and assessment process has great strength because it links the analysis of environmental issues with steps to improve the... design of a particular scheme*'.
- 1.2.8. The basis for this exercise to be undertaken is outlined within Fitting Landscapes, which encourages designers and managers to promote '*bespoke and locally appropriate solutions [in order to] promote design and place quality*'. Furthermore, it states that '*delivering project outcomes requires landscape architects to assist the design team in*

preparing integrated solutions. This is of particular importance in the engineering and landscape integration of... earthworks and landforms’.

- 1.2.9. A summary of all planning policy considered in relation to the landscape can be found within Chapter 19 (Policies and Plans).

2. Approach and Methods

- 2.1.1. The alignment of the Proposed Scheme and the design of associated earthworks has been developed through an iterative design process involving engineering, environmental and landscape specialists in order to reduce landscape and visual impacts, integrate the road with the surrounding landscape and provide a pleasant experience for travellers. Physical characteristics of the landscape were considered in addition to more perceptual and experiential characteristics.
- 2.1.2. This exercise was informed by both field surveys and desk study, which includes a review of relevant Landscape Character Assessments, discussed in more detail in Chapter 13 (Landscape).
- 2.1.3. The landform sensitivity of the route was determined to identify particular areas which required a more sensitive approach to the earthworks design. The criteria considered includes landscape sensitivity, visual prominence and type of vegetation cover. The scheme was subdivided into smaller sections based on the level of sensitivity that was established for each section based on the typical descriptions described in Table A2.1 below.

Table A2.1: Landform Sensitivity: Typical Descriptions

Level of Sensitivity	Typical Description
Level 1	Small sections of earthworks, where mitigation planting is appropriate and therefore the landform is unlikely to be perceptible.
Level 2	Open landscapes with relatively minor topographic variation that only require specification to ensure that the earthworks are softened and reflect the surrounding landform to some extent. Areas where mitigation planting is limited to scattered or small groups of trees and the landform is consequently more likely to be perceptible.
Level 3	Specific locations that are highly visible, environmentally sensitive and therefore require a detailed specification of slope. Areas where mitigation planting is generally inappropriate and the landform is consequently more perceptible.

- 2.1.4. Identification of landform sensitivity has been considered separately in relation to the northbound (NB) and southbound (SB) A9 carriageways. Mapping of landform sensitivity across the scheme can be found on Figures 1-7 in Section 3.
- 2.1.5. Following this exercise, modifications to the proposed earthwork slope gradient were identified with locations specified by chainage and listed within Section 3 to the nearest 10m. All of the modifications outlined within Section 3 have been included within the Proposed Scheme as specific landscape embedded mitigation.

2.2. Limitations

- 2.2.1. Only a high-level exercise has been conducted to consider the overall gradient of the slope. It is accepted that further measures to integrate the proposed earthworks into the landscape, such as more detailed variation in slope profiling at specific locations to tie-in with the adjacent landscape, are to be considered within detailed design.
- 2.2.2. It is recognised that variation to earthworks could contribute towards mitigating landscape and visual effects around Dalmagarry Farm (approx. chainage 3000-4300

SB). However due to the potential for consequent effects on the floodplain and the realigned Dalmagarry Burn, variations to the earthworks gradient have not been considered at this stage. It is proposed that this area is considered further within detailed design.

- 2.2.3. Slopes steeper than 1:2 have not been considered as part of this exercise due to recognised geotechnical constraints.
- 2.2.4. Despite the recognised benefits of returning land to productive use as identified within Fitting Landscapesⁱ, as this was a high-level exercise, detailed discussions with landowners regarding potential to return slackened slopes were not undertaken at this stage. Consequently, although it is mentioned where there is a possibility to return land to productive use, it was not a material consideration in the decision-making process.
- 2.2.5. Whilst it is recognised that the steepening and slackening of earthworks along the A9 has the potential to bring about the various environmental and financial benefits of a balanced requirement for cut and fill, detailed calculations were not available whilst undertaking this exercise, therefore this has not been a material consideration in the decision-making process.

3. Landform Sensitivity

3.1. Landform Sensitivity Plans

3.1.1. Figures Figure 1 to 7 below illustrate the landform sensitivity of the landscape adjacent to both the NB and SB carriageway as assessed in accordance with the methodology outlined in Table A2.1.

3.1.2. The location of the illustrative sections within Section 4 is also shown on Figures 1 to 7.

Figure 1: Landform Sensitivity - Ch. 0000 - 1750

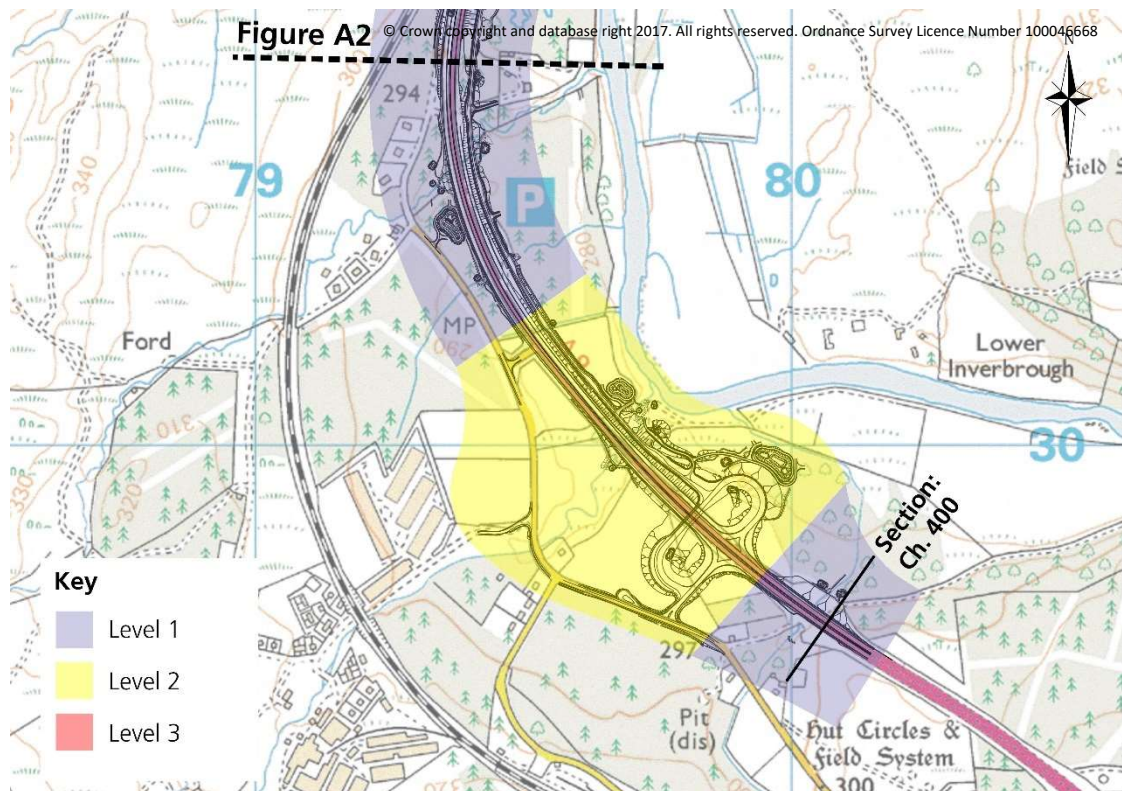


Figure 2: Landform Sensitivity - Ch. 1750 - 3100

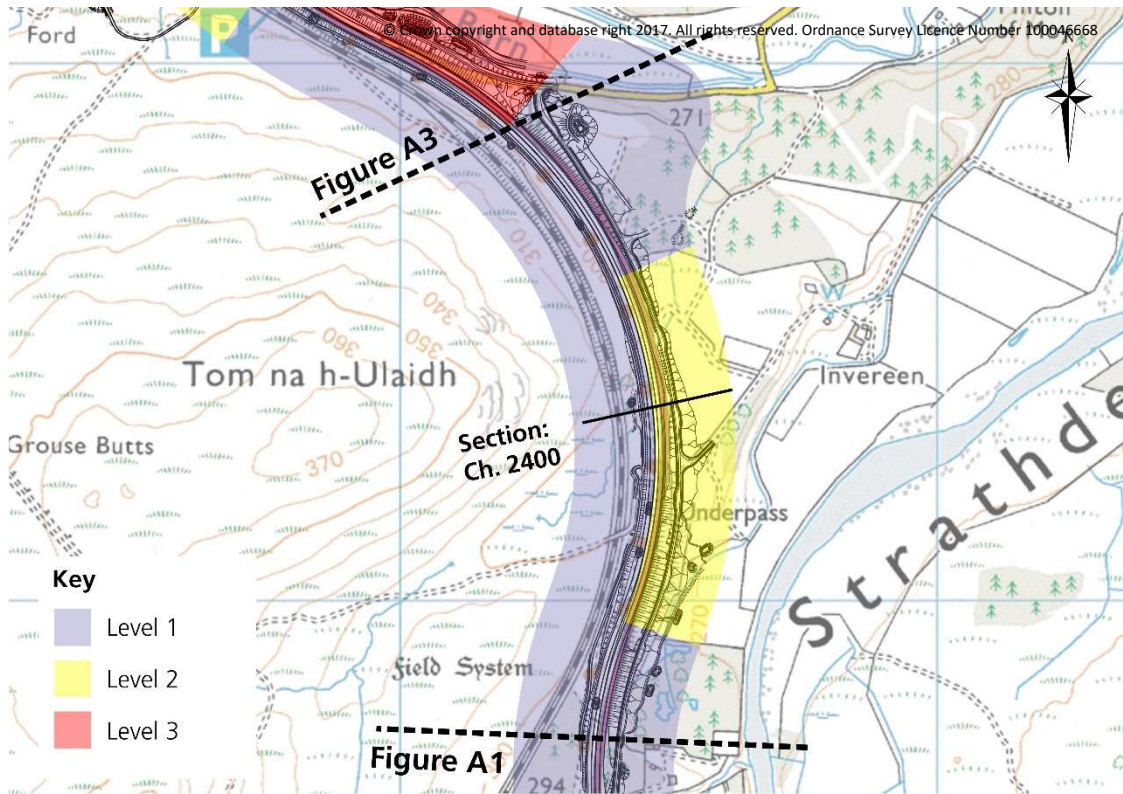


Figure 3: Landform Sensitivity - Ch. 3100- 4800

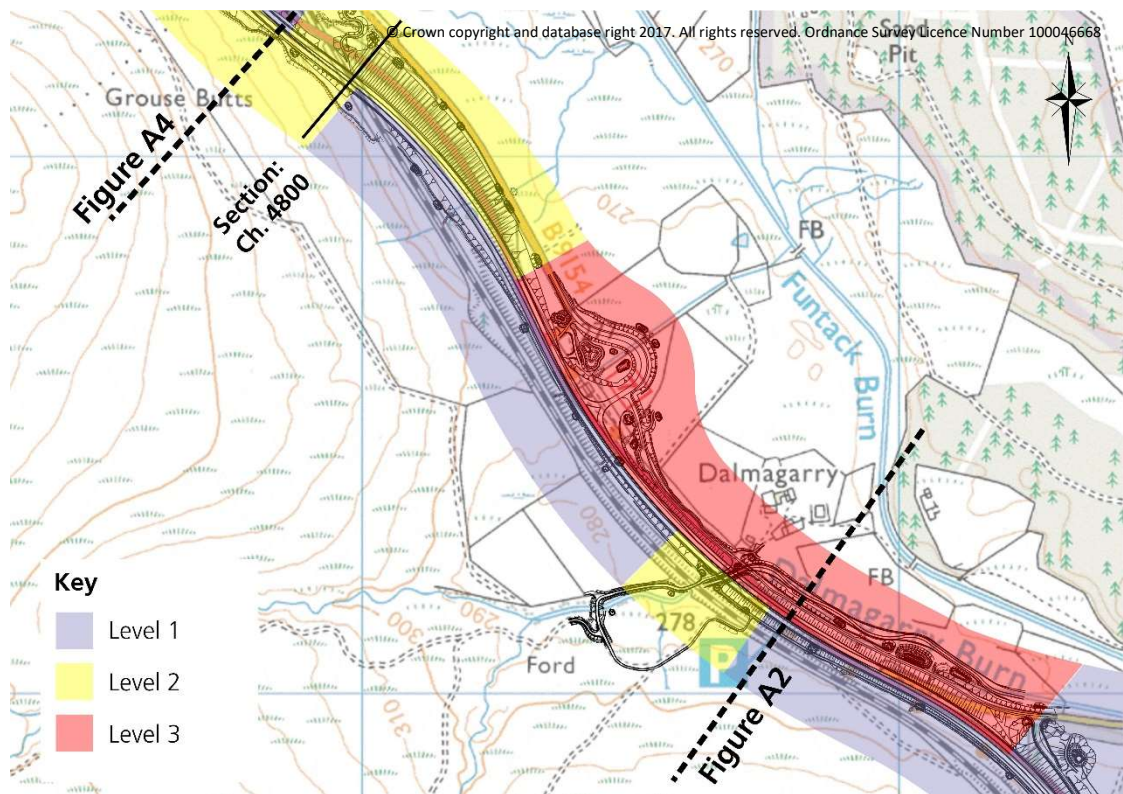


Figure 4: Landform Sensitivity - Ch. 4800-6800

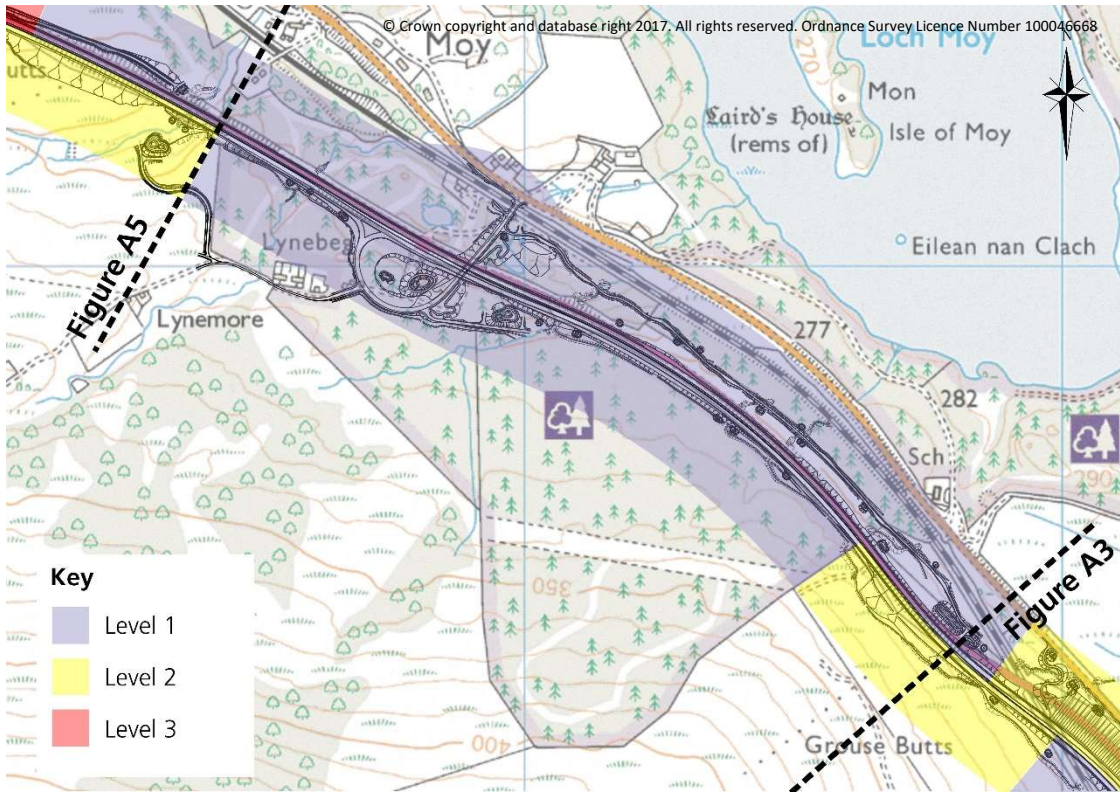


Figure 5: Landform Sensitivity - Ch. 6800-8400

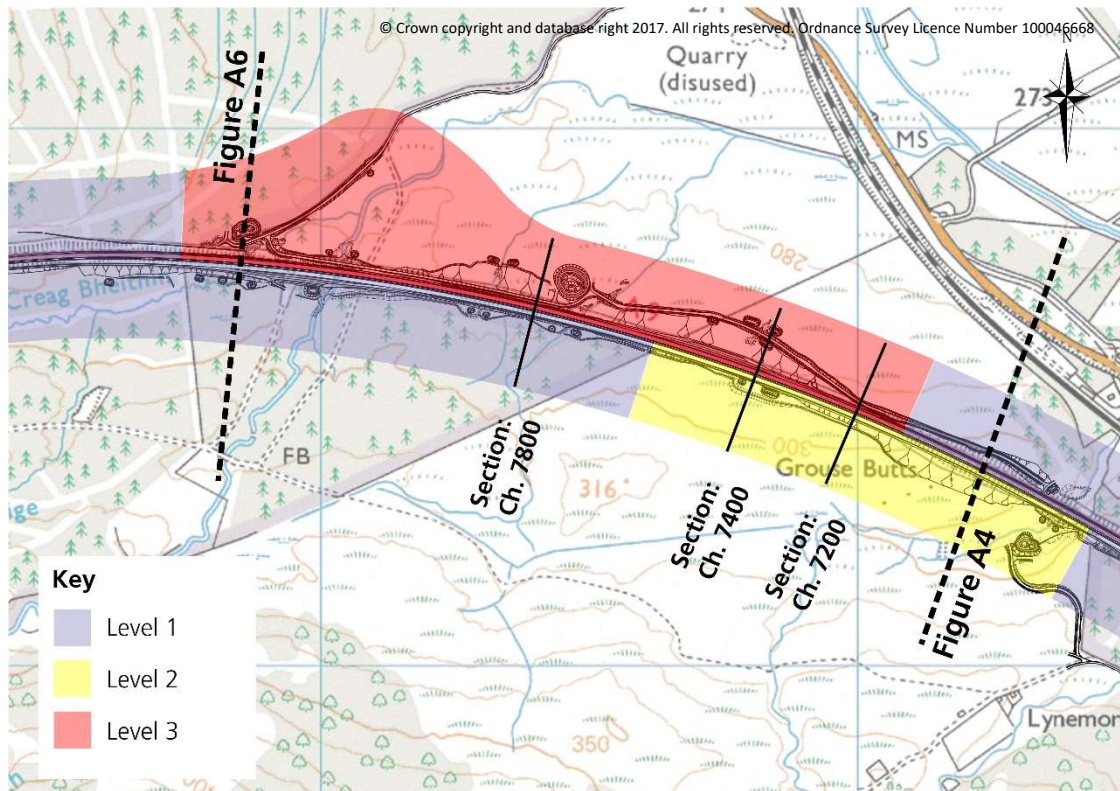




Figure 6: Landform Sensitivity - Ch. 8400-9600

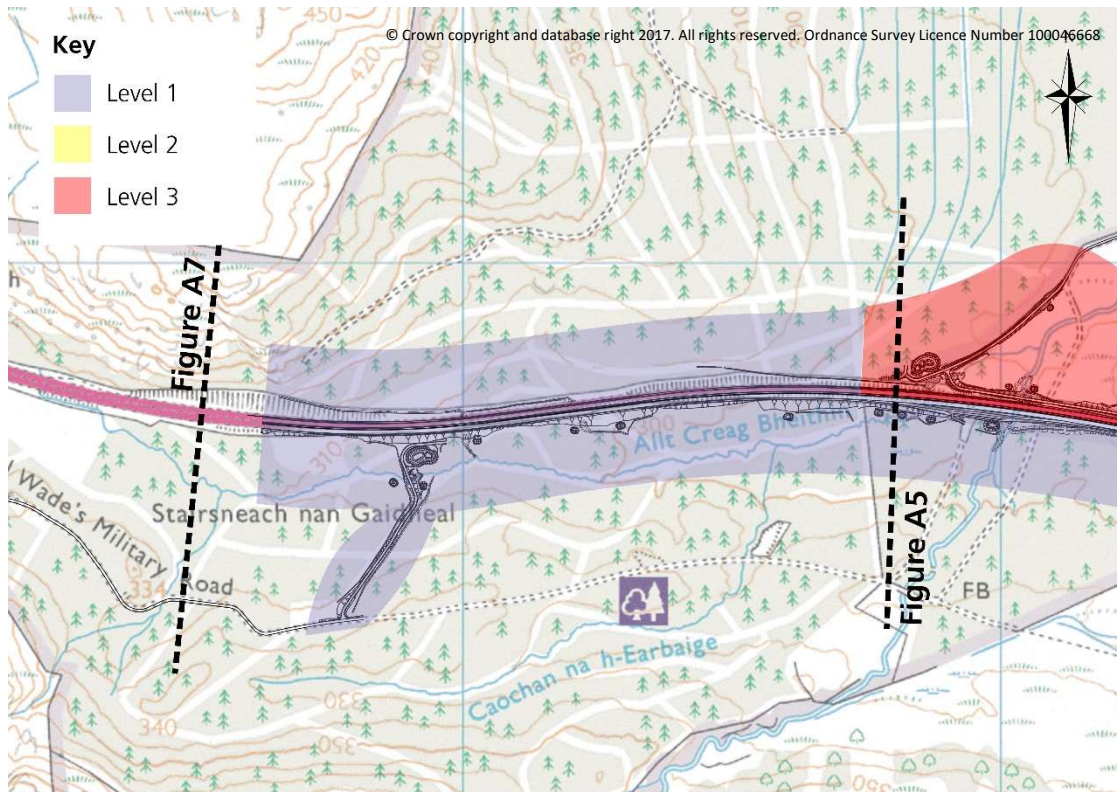
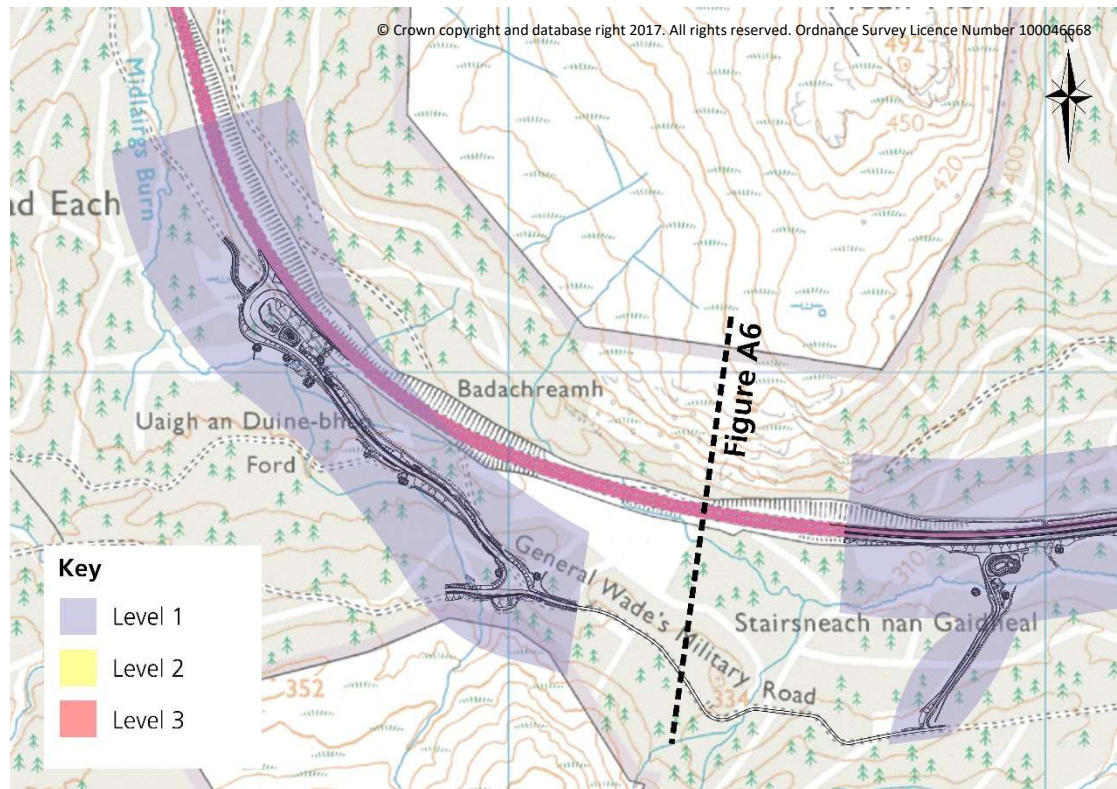


Figure 7: Landform Sensitivity - Ch. 9600-11100



4. Areas of Focused Earthworks Design

4.1. Location One: Chainage 320-600 (SB)

- 4.1.1. At this location, there is a well wooded appearance within the landscape and the A9 is confined by trees on both sides. The landform sensitivity of this section is considered to be Level 1 due to the enclosed nature of the landscape and intention to plant the embankment adjacent to the southbound carriageway of the A9 with coniferous woodland.
- 4.1.2. As illustrated on Figure 9, the embankment adjacent to the southbound carriageway of the A9 has been steepened to a gradient of 1:2 in order to reduce the potential need for felling and maintain the wooded character of the landscape.

Figure 8: Illustrative Plan – Chainage 320-600

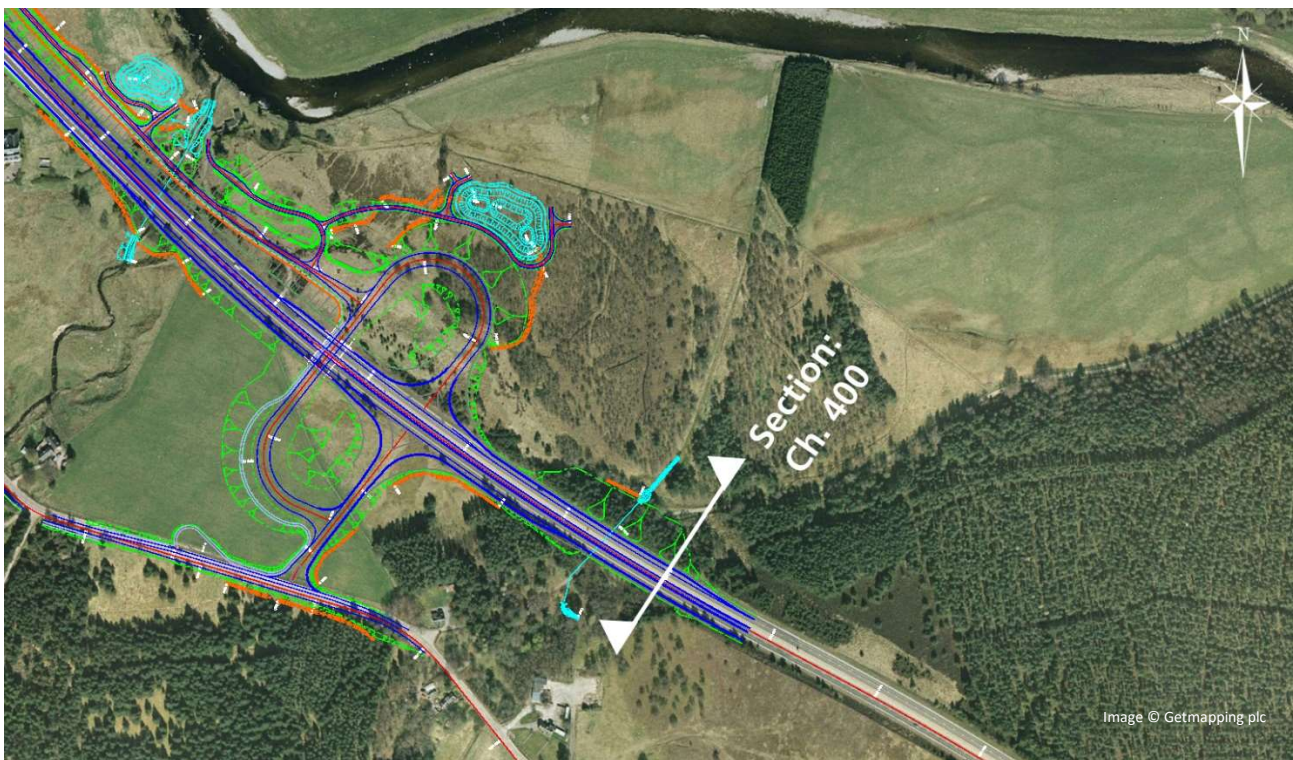
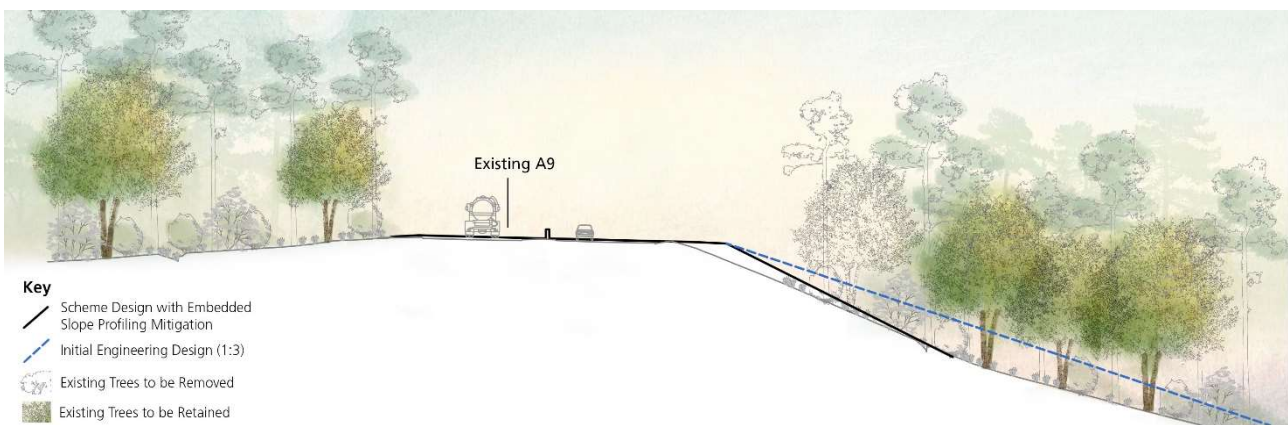


Figure 9: Illustrative Section - Chainage 400



4.2. Location Two: Ruthven-Tomatin Link Road Chainage 1470-1940 (SB)

- 4.2.1. At this location, the A9 is in false cutting and appears at odds with the adjacent landscape. Views from the A9 to the wider landscape are restricted, and vice versa. To the east, the landscape is relatively flat and open, as illustrated by Figure 10 **Error! Reference source not found.**, before it falls away from the A9 and into the broad strath of the River Findhorn. Views towards the Proposed Scheme would mostly be experienced as part of the wider strath landscape, and it is intended that the cutting adjacent to the southbound carriageway of the Ruthven-Tomatin link road would be planted with scattered trees, therefore the landform sensitivity of this section is considered to be Level 2.

Figure 10: Open Landscape Adjacent to the A9 near Invereen



Figure 11: Illustrative Plan – Tomatin-Ruthven Link Road Chainage 1470-1940

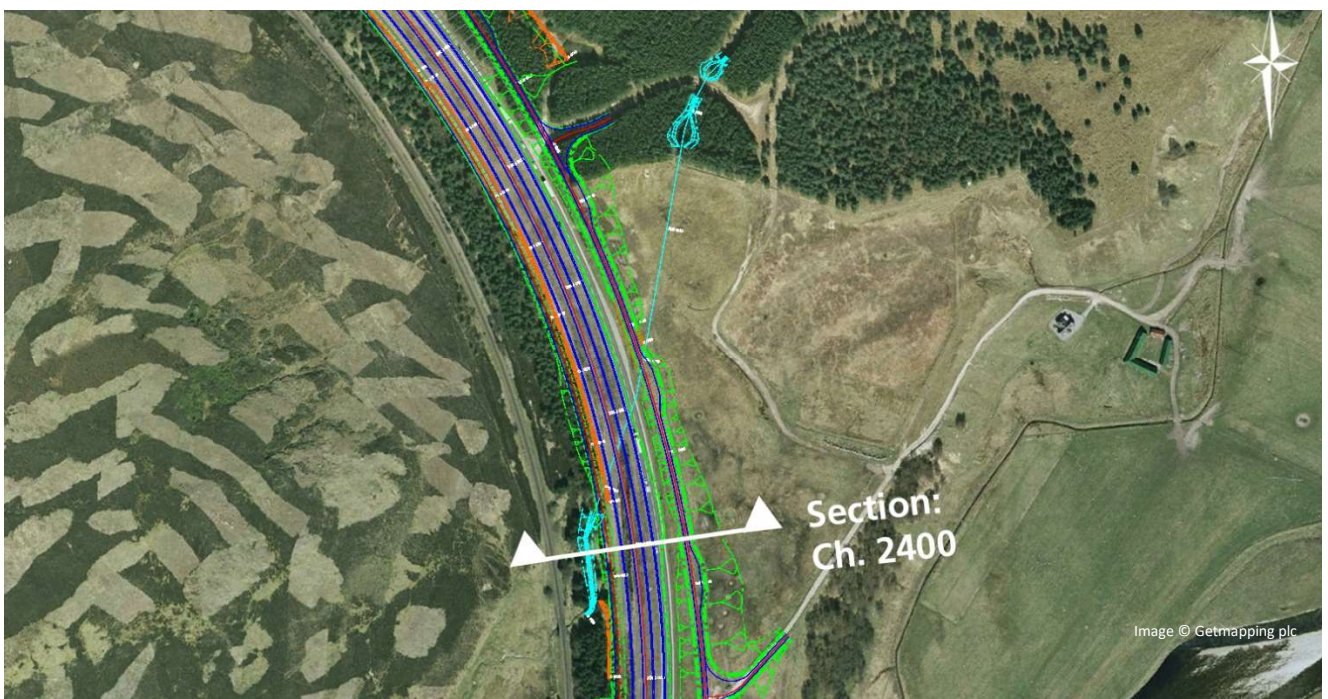
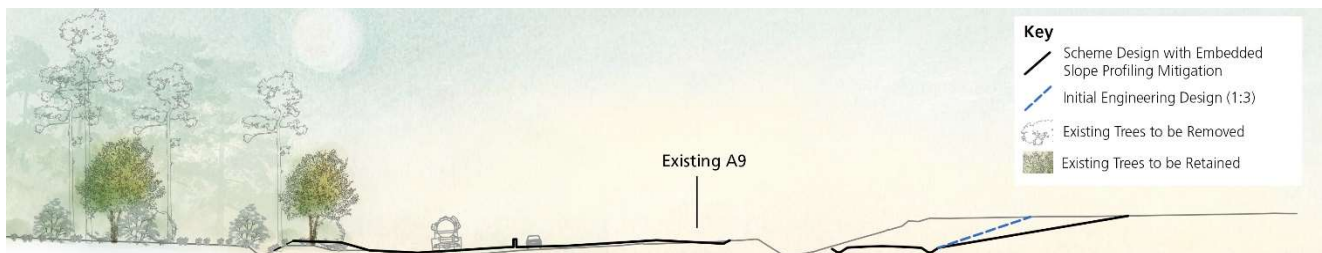


Figure 12: Illustrative Section – Mainline Chainage 2400



4.2.2. As illustrated by Figure 12 the cutting adjacent to the southbound carriageway of the realigned Ruthven-Tomatin link road has been eased out to a gradient of 1:6 in order to better integrate the Proposed Scheme into the adjacent landscape and allow for the potential for the land to be returned for productive use.

4.3. Location Three: Chainage 4390-4800 (SB)

4.3.1. At this location, a new alignment for the A9 is being proposed in close proximity to the existing A9, which would become redundant. This would have resulted in a disjointed landform profile with an unnatural appearance where the embankment for the proposed road meets the existing embankment.

4.3.2. The A9 currently sits on an unnatural looking embankment, softened by areas of woodland, scattered trees and scrub. However, the Proposed Scheme would result in the loss of much of this vegetation, consequently exposing the landform within the context of the narrow valley landscape associated with the floodplain of the Funtack Burn, and to visual receptors using the National Cycle Network (NCN) Route 7 (on the B9154) and at the residential property of Tullochlury. It is intended that the embankment adjacent to the southbound carriageway of the A9 would be planted with a mixture of woodland and scattered trees, however due to its open nature and proximity to visual receptors, the landform sensitivity of this section is considered to be Level 2.

4.3.3. As illustrated by Figure 14, the embankment adjacent to the southbound carriageway of the A9 has been adjusted to a gradient of between 1:2.3 and 1:4.3 as necessary to tie into the existing B9154. Significant peat deposits were identified as a constraint to the south of the B9154, restricting the extent to which this embankment could be slackened.

4.3.4. It is acknowledged that adjusting the earthworks to tie in with the B9154 at this location would result in the loss of some pockets of Annex 1 habitat and an area of Scottish Biodiversity List (SBL) habitat (refer to Chapter for more information). It is proposed that replacement planting would be provided in this location to mitigate for the loss of this habitat.

Figure 13: Illustrative Plan - Chainage 4390-4800

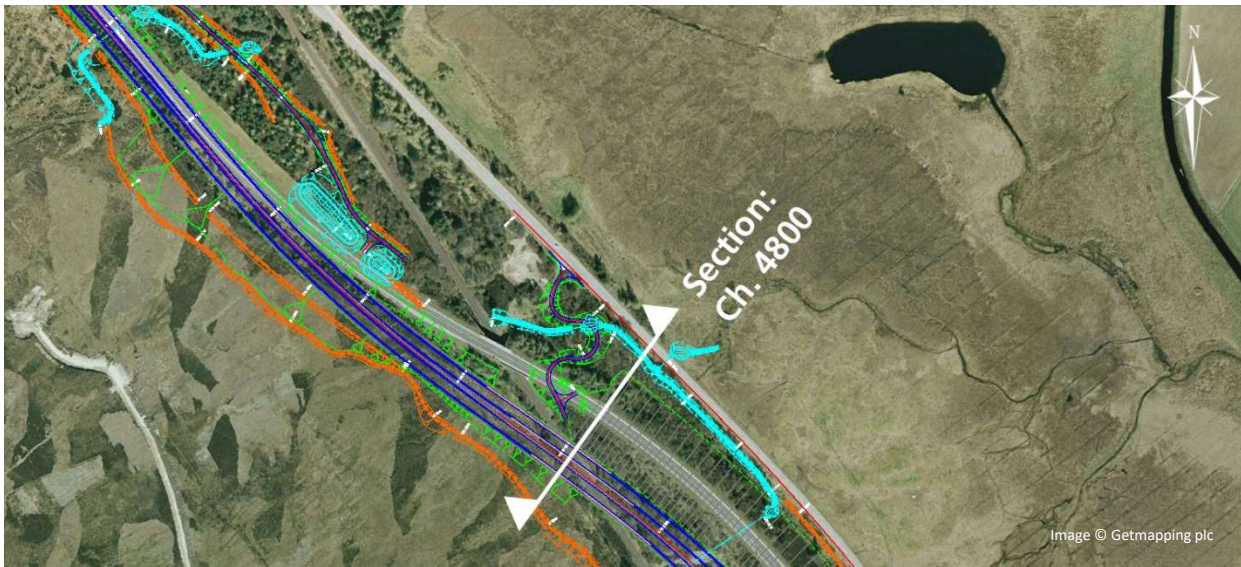
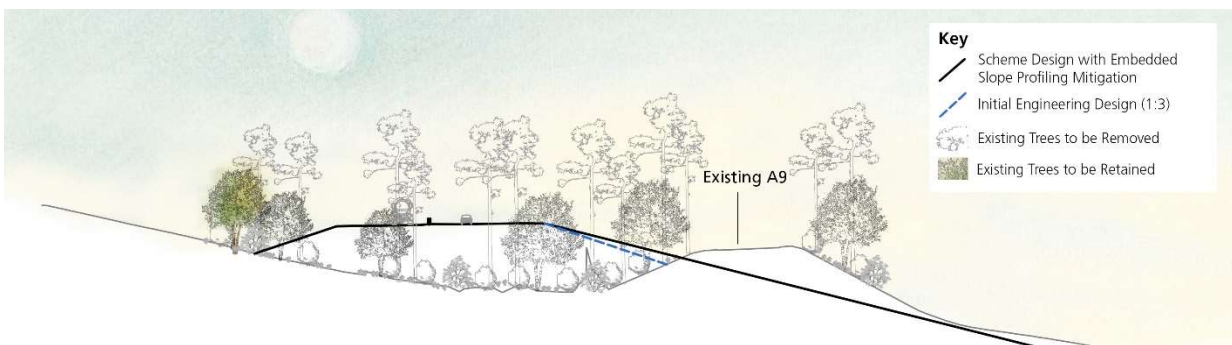


Figure 14: Illustrative Section - Chainage 4800



4.4. Location Four: Chainage 6900-7300 (NB)

- 4.4.1. At this location, the landscape is open and undulating in contrast to the wooded context of Moy to the east. The A9 sits within a cutting and is wooded on both sides. The proposed cutting adjacent to the northbound carriageway sits within the hillside and does not extend into the open landscape to the north, therefore the landform sensitivity of this section is considered to be Level 2.
- 4.4.2. A basin of deep peat was identified as a constraint, restricting the extent to which the earthworks could be slackened at this location. Furthermore, this was identified as part of one of the larger areas of continuous semi-natural habitat within the context of the A9, therefore it was desirable to balance the need for landscape fit with the desire to reduce the potential for loss of habitat.
- 4.4.3. As illustrated by Figure 16, the cutting adjacent to the northbound carriageway has been eased out to a gradient of 1:4 to integrate the Proposed Scheme into the adjacent landscape.

Figure 15: Illustrative Plan - Chainage 6900-7300

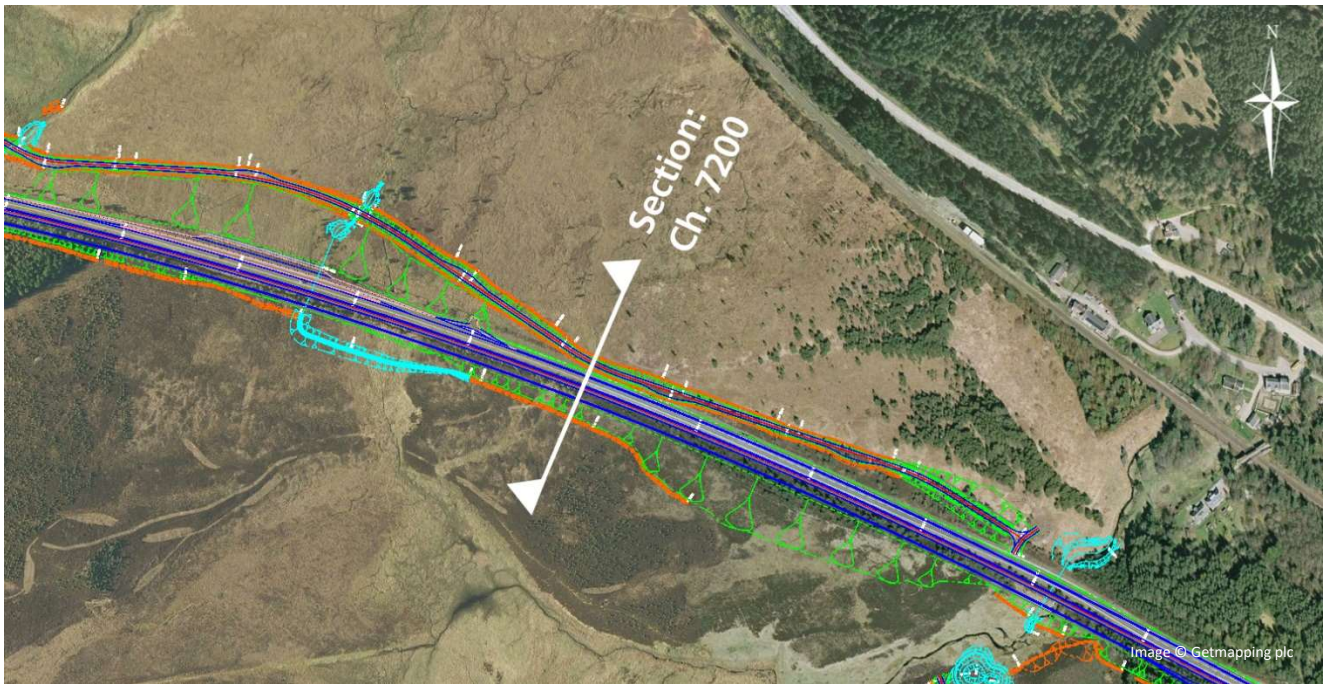


Figure 16: Illustrative Section – Chainage 7200



4.5. Location Five: Chainage 7300-8100 (SB)

- 4.5.1. At this location, the A9 sits at the foot of slopes rising to local summits to the south, on the fringe of the open floodplain of Allt Creag Bheithin as illustrated by Figure 19. Flowing landforms are a characteristic of the area and contrast with the angular shapes associated with plantation woodland. Due to the open nature of the floodplain, the extent to which tree planting can be used to break up the form of the embankment is limited; therefore the landform sensitivity of this section is considered to be Level 1.
- 4.5.2. This location was identified as part of one of the larger areas of continuous semi-natural habitat within the context of the A9, therefore it was desirable to balance the need for landscape fit with the desire to reduce the potential for loss of habitat.
- 4.5.3. As illustrated by Figure 18, the embankment adjacent to the southbound carriageway has been eased out to a gradient of 1:8 to integrate the Proposed Scheme into the adjacent landscape and allow for the potential for the land to be returned to the landowner.

Figure 17: Illustrative Plan - Chainage 7300-8100

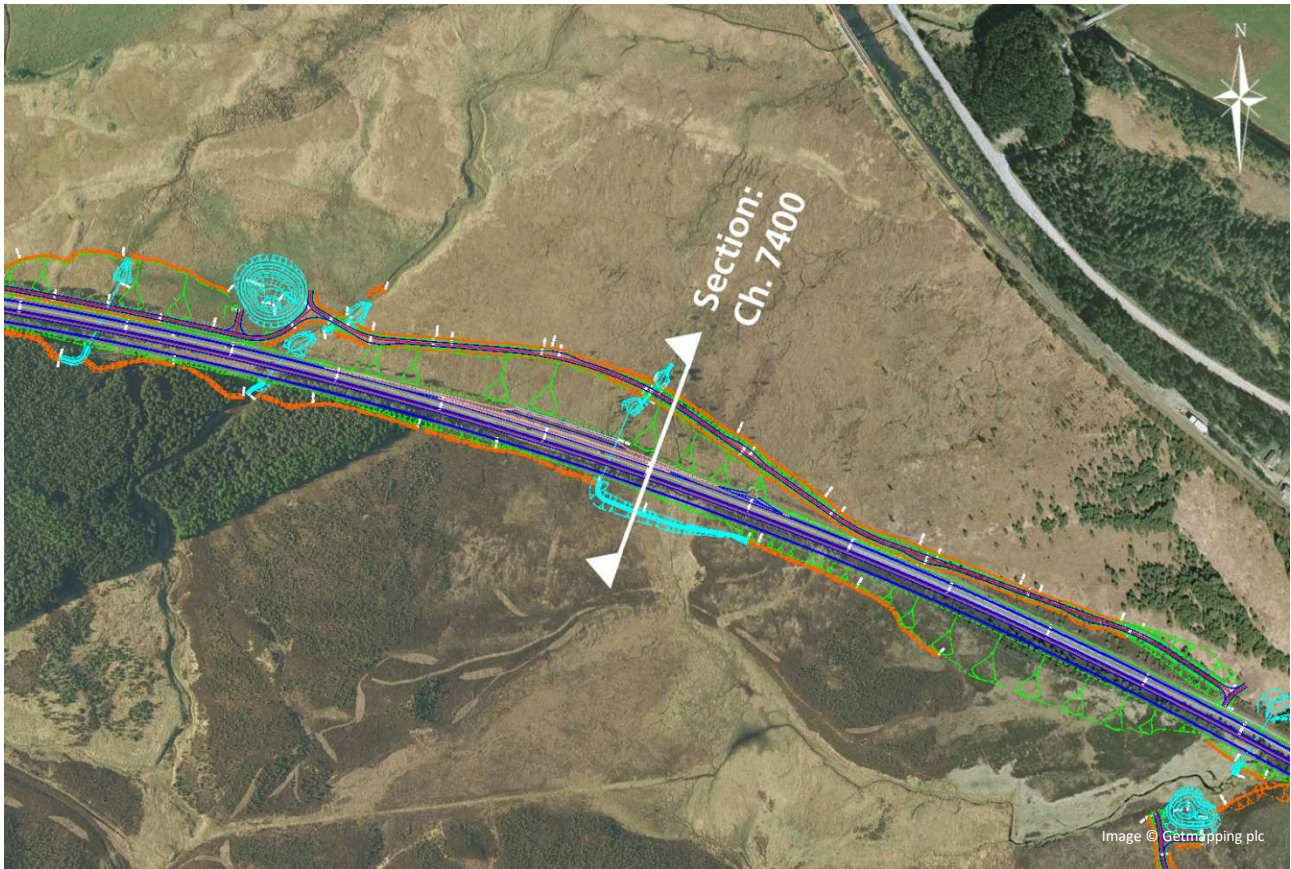


Figure 18: Illustrative Section – Chainage 7400

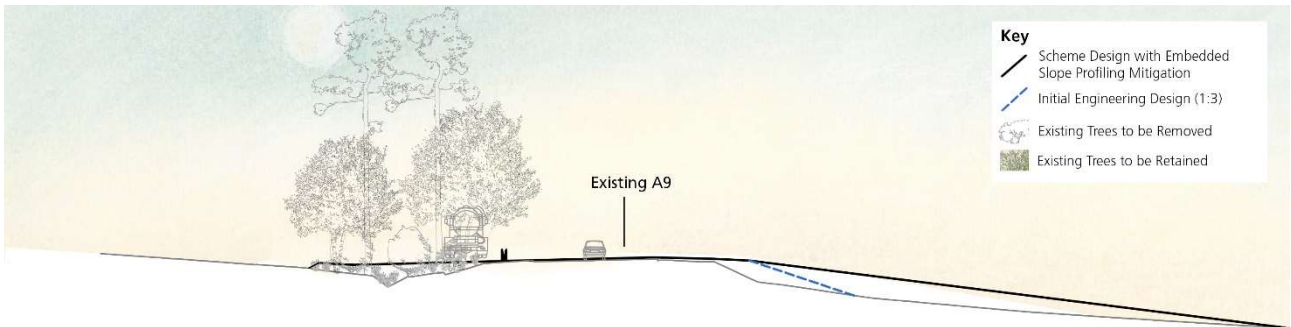


Figure 19: The A9 on the Edge of the Allt Creag Bheithin Floodplain



5. Summary

- 5.1.1. A summary of areas at which the gradient of the earthworks has been adjusted to mitigate landscape and visual effects as part of the iterative design process is provided in Table A5.2 below.

Table A5.2: Summary of Locations of Embedded Earthworks Mitigation

Chainage (NB/SB)	Landform Sensitivity	Proposed Gradient	Justification
320-600 (SB)	Level 1	1:2	Minimise potential loss of woodland
Ruthven-Tomatin Link Road 1470-1940 (SB)	Level 2	1:6	Aid integration with surrounding landform
4390-4800 (SB)	Level 2	1:2-1:4 to tie in with B9154	Aid integration with surrounding landform
6900-7300 (NB)	Level 2	1:4	Aid integration with surrounding landform
7300-8100 (SB)	Level 3	1:8	Aid integration with surrounding landform

- 5.1.2. It is recommended that within detailed design, the design of earthworks associated with the Proposed Scheme is developed to ensure opportunities to mitigate landscape and visual effects are fully realised.

6. References

-
- ⁱ Transport Scotland. (2014). Fitting Landscapes: Securing More Sustainable Landscapes
 - ⁱⁱ Highways Agency. (November 2010). Interim Advice Note 135/10 Landscape and Visual Effects Assessment.
 - ⁱⁱⁱ The Landscape Institute and the Institute of Environmental Management and Assessment. (2013). Guidelines for Landscape and Visual Impact Assessment.