

Appendix A10.4: Surface Water Indirect Dewatering Assessment

- 1.1.1 This appendix provides an assessment of the expected dewatering impacts on surface water features present within the study area, supporting Chapter 10 (Geology, Soils, Contaminated Land and Groundwater).
- 1.1.2 The assessment has been carried out in two stages. The initial assessment considers the potential impacts on all surface water features within the potential zone of influence of dewatering at excavations (including cuttings, widenings and drainage detention basins). A detailed assessment was then carried out for all potential impacts identified as of Moderate significance or larger.
- 1.1.3 The initial assessment was based on simple estimates of the zone of influence of dewatering around each excavation considered likely to intercept groundwater. The outcome of the initial assessment is presented in Table 1. The magnitude of impact has been derived based on the expected groundwater drawdown at the location of the surface water feature and the sensitivity of that surface water feature is based on its ecological sensitivity. The significance of impact was derived based on the methodology described in Chapter 10 (Geology and Soils), Section 10.2 (Approach and Methods), assuming that a degree of hydraulic conductivity exists between groundwater and the surface water receptor.

Table 1: Potential Dewatering Impacts on Surface Water

Cutting ID	Water Feature ID	Sensitivity of Receptor	Magnitude of Impact	Significance of Impact
Basin D	63	Low	Negligible	Neutral
Basin D	64	Low	Negligible	Neutral
CS1	64	Low	Moderate	Slight
CS7	64	Low	Negligible	Neutral
W2	64	Low	Negligible	Neutral
CS1	65	Low	Major	Slight/Moderate
CS7	65	Low	Minor	Neutral
CS1	66	Low	Minor	Neutral
CS7	66	Low	Minor	Neutral
Basin G	70	Very High	Negligible	Neutral
C1	70	Very High	Negligible	Neutral
C3	70	Very High	Major	Very Large
C4	70	Very High	Minor	Moderate/Large
CS1	70	Very High	Negligible	Neutral
CS5	70	Very High	Negligible	Neutral
CS7	70	Very High	Minor	Moderate/Large
Basin G	71	Low	Negligible	Neutral
C1	71	Low	Minor	Neutral
Basin G	72	Low	Negligible	Neutral
C1	72	Low	Major	Slight/Moderate
C3	72	Low	Major	Slight/Moderate
C4	72	Low	Moderate	Slight
C1	73	Low	Minor	Neutral
C3	73	Low	Major	Slight/Moderate
C4	73	Low	Moderate	Slight
C1	74	Low	Negligible	Neutral
C3	74	Low	Major	Slight/Moderate
C4	74	Low	Major	Slight/Moderate
CH4	74	Low	Minor	Neutral
C3	76	Low	Major	Slight/Moderate
C4	76	Low	Major	Slight/Moderate
C3	77	Low	Moderate	Slight

Cutting ID	Water Feature ID	Sensitivity of Receptor	Magnitude of Impact	Significance of Impact
CS10	77	Low	Negligible	Neutral
CS8	78	Low	Negligible	Neutral
CS1	184	Low	Negligible	Neutral
CS7	184	Low	Minor	Neutral
Basin D	191	Low	Negligible	Neutral

1.1.4 The initial assessment identified potential impacts of Moderate or greater significance to the following surface water feature:

- ID 70 (River Tummel/Loch Faskally) – as a result of C3, C4, CS7.

1.1.5 The detailed assessments for each of these cuttings are described below. The assessments aimed to identify whether a significant impact was likely considering the specific local circumstances and a more refined estimate of the potential magnitude of that impact. They were based on consideration of all available relevant information, primarily available GI and groundwater level monitoring data and the local topography. The significance of impact was then predicted based on the methodology described in Chapter 10 (Geology and Soils), Section 10.2 (Approach and Methods).

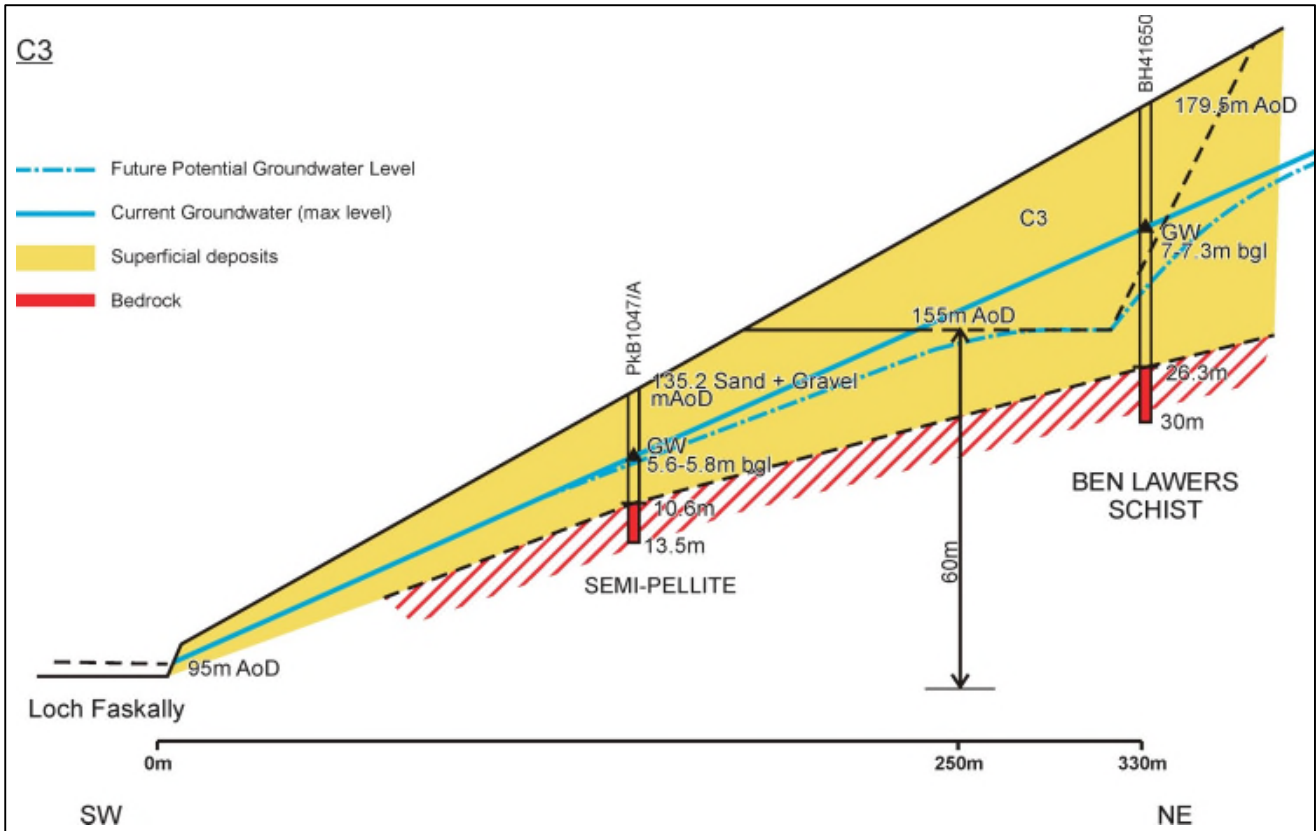
Cutting C3 – Loch Faskally

1.1.6 Cutting C3 is a 24.1m deep cut section that will widen the road platform to the west of the existing A9. It will be excavated in superficial sand and gravel deposits, which are underlain by metamorphic bedrock of anticipated low permeability.

1.1.7 Loch Faskally is located approximately 250m from the edge of C3 and at an elevation approximately 60m below it. The available GI information suggests that the superficial deposits thin towards the loch, but there is no GI information in the immediate vicinity of the loch to confirm this. There is no information available to confirm the degree of groundwater–surface water connectivity in this area, but considering the permeable nature of the superficial deposits groundwater baseflow contribution to the loch is assumed.

1.1.8 Considering the difference in elevation, very limited to no drawdown of groundwater levels at the surface water feature would be expected. However, the groundwater gradient towards the loch and consequently groundwater flow will be reduced. This could potentially result in a slight reduction of baseflow along the section adjacent to the cutting, which would be negligible compared to the volume / flow associated with the loch. In addition, the area of potential effect represents a small proportion of the local river system, therefore the magnitude of impact on this surface water feature is anticipated to be negligible, resulting in a Neutral significance of impact.

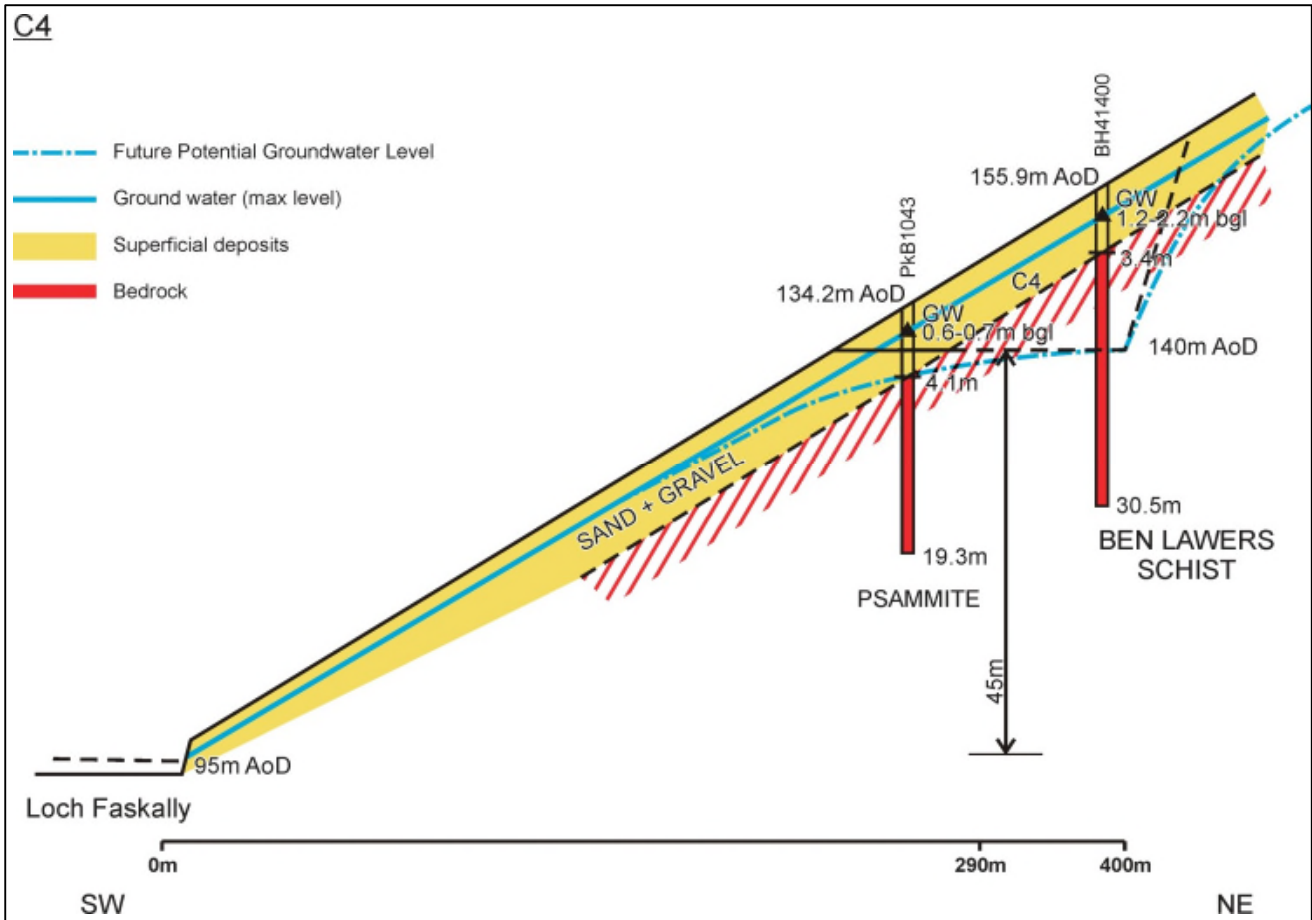
Diagram 1: Cross Section for C3 – Loch Faskally



Cutting C4 – Loch Faskally

- 1.1.9 Cutting C4 is a 15.4m deep cut section that will widen the road platform to the west of the existing A9. It will be excavated in superficial sand and gravel deposits, which are underlain by metamorphic bedrock of anticipated low permeability.
- 1.1.10 Loch Faskally is located approximately 290m from the edge of C4 and at an elevation approximately 45m below it. The available GI information suggests that the superficial deposits thin towards the loch, but there is no GI information in the immediate vicinity of the loch to confirm this. There is no information available to confirm the degree of groundwater–surface water connectivity in this area, but considering the permeable nature of the superficial deposits groundwater baseflow contribution to the loch is assumed.
- 1.1.11 Considering the difference in elevation, very limited to no drawdown of groundwater levels at the surface water feature would be expected. However, the groundwater gradient towards the loch and consequently groundwater flow will be reduced. This could potentially result in a slight reduction of baseflow along the section adjacent to the cutting. This effect is anticipated compared to the volume / flow associated with the loch to be small and the area of potential effect represents a small proportion of the local river system. Consequently the magnitude of impact on this surface water feature is anticipated to be negligible, resulting in a Neutral significance of impact.

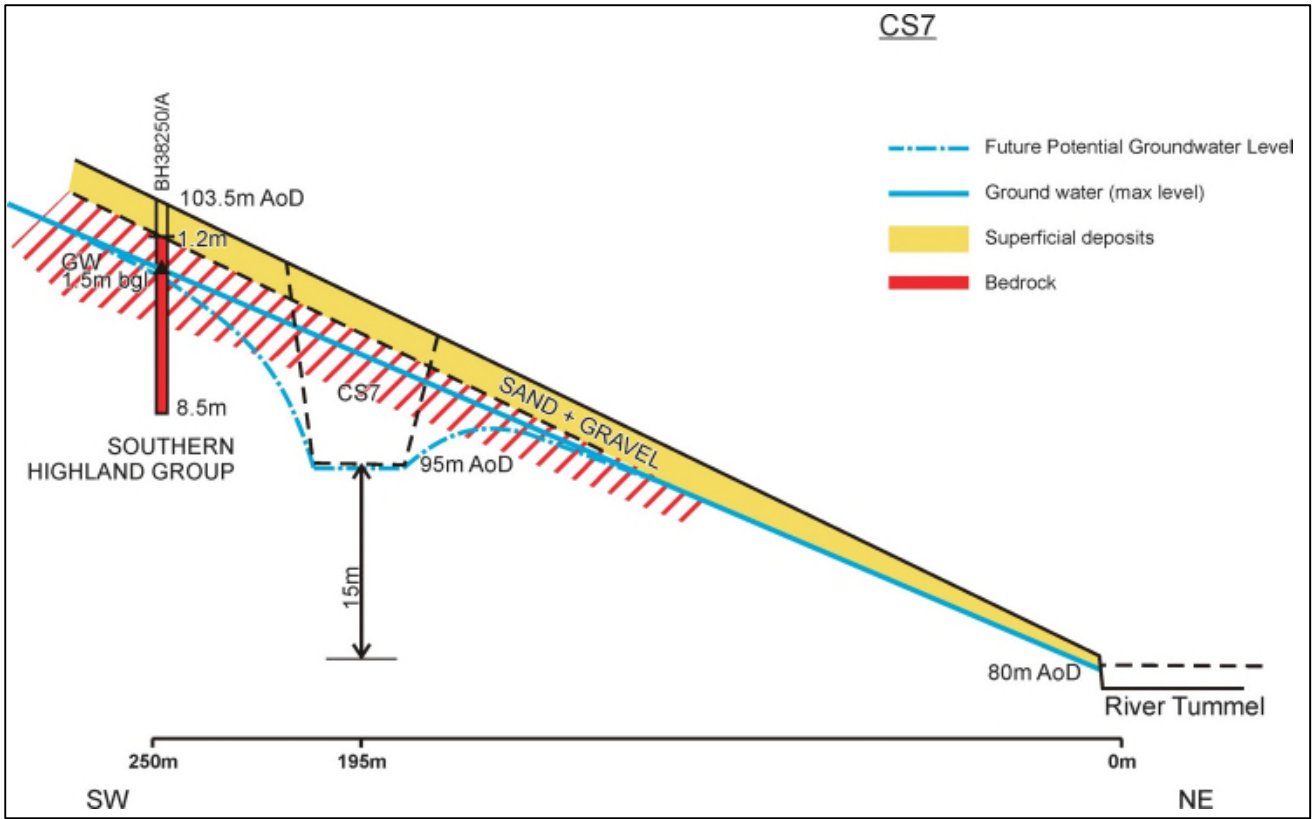
Diagram 2: Cross Section for C4 – Loch Faskally



Cutting CS7 – River Tummel

- 1.1.12 Cutting CS7 is a 9.8m deep cutting associated with a side road to the north of the A9. There is limited GI information available in this area, therefore a conservative approach has been taken to this assessment. Superficial deposits appear to be thin here and the cutting is likely to be excavated in both permeable superficial sand and gravel deposits and metamorphic bedrock of anticipated low permeability.
- 1.1.13 The River Tummel is located approximately 195m from CS7 and at an elevation approximately 15m below it. There is no information available to confirm the degree of groundwater–surface water connectivity in this area. Considering the topography and groundwater elevations indicated by the available GI, a degree of groundwater baseflow contribution to the lock is assumed. However, this may be limited if the superficial deposits are thin and it is dependent on bedrock groundwater flows.
- 1.1.14 Cutting CS7 is relatively small in size and very limited to no reduction in groundwater levels and flows at the surface water feature would be expected. This could potentially result in a slight reduction of baseflow along the river section opposite to the cutting. This effect is anticipated to be small compared to the volume / flow associated with the river and the area of potential effect represents a very small proportion of the local river system. Consequently the magnitude of impact on this surface water feature is anticipated to be negligible, resulting in a Neutral significance of impact.

Diagram 3: Cross Section for CS7 – River Tummel



Summary of Surface Water Indirect Dewatering Assessment

- 1.1.15 Following detailed assessment, no potential impacts of significance are expected on surface water receptors as a result of indirect dewatering effects.