

12. Earthworks

Since the announcement of the preferred route, geotechnical investigations have been carried out along the preferred route corridor.

Further detailed geotechnical investigations will be required during the development of the project towards environmental assessment and detailed design (to be completed by others).

12.1 Risk

The main geotechnical risk within the project is that the design for the Dirty Creek Range cutting has been carried out with limited investigations. Further investigations during the detail design stage are recommended.

Other potential geotechnical issues that may arise in future stages of the project include:

- Buried paleochannels in the Corindi floodplain.
- Excavatability of cutting, quality of material, bridging layers and soft soils in the Corindi Floodplain.

A detailed description of remaining geotechnical risks within the project is provided within Section 8 of the Geotechnical Design Report (GHD Geotechnics, 2007).

12.2 Cuttings

12.2.1 Dirty Creek Range

The main geotechnical feature of the project is a deep cutting at Dirty Creek Range. The cutting has a maximum depth of 45 m, with an average depth of the order of 16m. The geotechnical investigations indicated that material won from the cutting, deeper than 7 m below the existing surface, would be suitable for use as select material during construction. It was also noted that blasting would be required for excavation in rock in the Dirty Creek Range cutting. The batter slope for this cutting has been designed at 2:1 for the first 13 m below existing surface level, then at 0.7:1 until the base of the cutting.

12.2.2 Other cuttings

All other cuttings within the project are less than 14m in depth. Material won from each cutting would be of suitable quality to use as general fill. Batter slopes in all other cuttings would be 3:1 for the first 7 m. Batters higher than 7 m would include a 4.5 m wide bench with a 2:1 batter above the bench.

12.3 Embankments

12.3.1 General embankment design

Based on the review of materials that will be utilised for fill embankments, it is recommended that embankment slopes of no steeper than two (horizontal) to one (vertical) should be considered.

In some area, for example floodplain crossings, a flatter embankment slope may prove beneficial, as this would provide a more stable slope for vegetation and thus better performance for scour erosion.

12.3.2 Dirty Creek Range embankment

The largest embankment for the project is located at the northern end of Section B, around Ch 9500. The embankment would have a total batter slope length of up to 37 m, with a maximum height of 16 m and an average height of approximately 10m. It is recommended that a berm be provided on high fills at slope length intervals of no greater than 22 m. To ensure maintenance of these berms can be undertaken the berms shall be 4.5 m wide with a five (horizontal) to one (vertical) slope back into the batter, with longitudinal drainage to be located within the berm. Longitudinal alignment of berms should be selected to avoid grades of greater than 2 per cent. If grades greater than 2 per cent cannot be avoided, erosion / scour protection should be provided.

12.4 Bridges

Table 12-1 provides a summary of the recommended foundations for the proposed bridge structures throughout the route.

Table 12-1 Summary of preliminary bridge foundation types

Bridge name	Chainage	Potential foundation type		
		Bored piles	Shallow footings	Driven piles
Kangaroo Trail Road	4500	Yes	Yes	No
Corindi River Bridge	5550	Yes	No	Yes
Other Corindi Floodplain	6200	No recommendation – Performance based specification		
Redbank Creek Bridge	7650	No longer required – Culvert proposed in this location		
Pacific Highway Overbridge	11400	Yes	No	No
McPhillips Road Bridge	Not required in arterial road scenario			
Grays Road Bridge	Not required in arterial road scenario			
Lemon Tree Road Bridge	Not required in arterial road scenario			
Halfway Creek Bridge	22700	Yes	No	Yes
Wells Crossing Bridge	24500	Yes	No	Yes

12.5 Quantities

12.5.1 General

The concept design has been developed so that the cut and fill volumes are approximately balanced on the basis of bank volumes.

Overall the volume of cut material is estimated at 2,200,000m³. The total fill volume is expected to be 1,800,000m³.

It is estimated that 200,000 cubic metres of select fill will be required for the project, of which approximately 150,000 cubic metres would be won on site. A total volume of 200,000 cubic metres of fill is expected to be required for topsoiling.

Once allowance is included for topsoiling and use of cut material for select, the overall estimate for earthworks indicates that cut and fill quantities are approximately balanced.

12.5.2 Cutting at Dirty Creek Range

A 45 m deep rock cutting at Dirty Creek Range would provide a significant proportion of the select material required for construction. Overall, approximately 480,000 m³ of select material would be won from the cutting, which would be used throughout the project.

12.6 Soft soils

Preliminary geotechnical investigations undertaken to date indicate that there are no extensive soft soil deposits throughout the length of the project. However, localised surficial soft soil deposits can be expected within the floodplain areas. These areas could be treated during foundation preparations for embankment construction and as such, settlement is expected to be of minor consequence to embankment (pavement) behaviour.

12.7 Acid sulfate soils

Two potential areas of acid sulfate soil risk were identified within the project area. These are:

- Arrawarra Creek – includes Arrawarra Gully sediments and coastal sediments within the eastern portion of the study area. This area is no longer within the project extents.
- Corindi River Floodplain – includes Redbank Creek, Cassons Creek and Blackadder Gully sediments.

The proposed highway upgrade in the Corindi Floodplain areas will require embankment construction with bridge and culvert crossings. This type of construction for the highway upgrade in this area will generally avoid disturbance of potential acid sulfate soils, with the exception of pile and culvert excavations. These excavations may require treatment of spoil material to negate the acid sulfate soil risk.

Similarly, the new road is expected to have negligible impact on groundwater levels within the area of potential acid sulfate soils. Consequently, there is a very low probability that acid water will be generated through in-situ oxidisation of acid sulfate soils due to groundwater lowering. This issue should be reviewed further during the development of the project to detail design stage.

12.8 Contaminated soils

A preliminary contamination assessment was undertaken within the study area to determine potential signification contamination issues that may affect the construction of the proposed highway. The assessment identified 16 sites of potential contamination within the study area, including cattle dips, mechanical workshops, farming activities, a banana plantation, a sawmill, two service stations and a quarry.

Of these sites, only the service stations at Lemon Tree Road and Halfway Creek, and the banana plantation have potential for significant contamination issues. These sites could be remediated if required, and are not expected to impact construction activities. Further investigations would be required to assess the impacts in these areas.