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Our Ref: PSM5077-002L

7 December 2023

NSW Department of Planning and Environment
4 Parramatta Square
12 Darcy Street
Parramatta, NSW 2150
Anthony.Ko@planning.nsw.gov.au

Attention: Anthony Ko

Dear Anthony

RE: HILLS OF GOLD WIND FARM-INDEPENDENT EXPERT ADVICE ON CONSTRUCTABILITY, SOIL AND WATER

1. Introduction

We are pleased to submit this report which provides independent expert advice to the NSW Department of Planning and Environment **(DPE)** regarding the Constructabilty and Soil and Water Impact of the proposed Hills of Gold Wind Farm development **(the Project)** which is located on the ridge line between Hanging Rock and Crawney Pass approximately 5 km south of Hanging Rock in the Northern Tablelands region of NSW.

The independent review has been completed at the request of the DPE in accordance with our proposal letter PSM5077-001L dated 26 May 2023.

The work has been completed by David Piccolo of PSM assisted by other PSM staff as required.

David Piccolo is a Principal at PSM. He graduated from the University of New South Wales in 2000 obtaining first class honours. David worked at Douglas Partners Sydney office during the first half of 2001. He joined Pells Sullivan Meynink in June 2001. He has completed a Master in Geotechnical Engineering at UNSW.

David has worked on a wide variety of geotechnical projects including the detailed consideration of many aspects of earthworks and their control, rock cuttings, stabilisation works, retaining structures and temporary works. His special fields of competence include site investigations, analysis, and geotechnical advice for civil engineering infrastructure.

David Piccolo's CV is included in Appendix A.

2. Scope of work

2.1 DPE Brief

The scope of work as requested in the DPE Brief is reproduced below:

> *"The expert is required to provide independent expert advice to the Department including the following key deliverables:*
>
> 1. *Attend relevant meetings with the Department to advise on constructability and impact assumptions.*

2. *Review an EIS, including Soil and Water impact assessment (section 6.9.6 of the EIS).*
3. *Review HOGPI peer review of soil and erodibility assumptions, constructability and impacts to local hydrology.*
4. *Identify any gaps in the applicant's Soils and Water impact assessment requiring further information to complete the Department's assessment.*
5. *Prepare a draft and final expert report on the findings and conclusions of the expert review. The report should at a minimum include:*
   a. *Background to the review.*
   b. *Review and comment on the methodology, assumptions and assessment of the area required for construction, and soil and water impacts by **the Applicant**.*
   c. *Comment on the suitability of the proposed mitigation and management measures.*
   d. *Recommendations for additional mitigation measures or design changes to inform the Department's assessment."*

2.2 PSM Approach

In order to address the DPE Brief requirements we have undertaken the following tasks:

1. Reviewed the supplied documents as listed in Section 3.1 of this report.
2. Used the supplied and readily available GIS information as listed in Section 3.2 of this report to examine and interrogate the spatial features of the Project. The aim being to assess the proposed alignment of the Access Tracks including the Transverse Track (TT), turbines (WTGs) and hardstand areas relative to the existing topograghy to better understand the impact of these on the landscape, land stability, surface water hydrology and erosion.
3. Prepared this report which provides:
   a. General commentary on the assessments and recommended mitigation measures by the Applicant as set out in the EIS (refer to Section 4 of this report).
   b. General commentary on the concerns raised by the HOGPI Peer Review Reports (refer to Section 5 of this report).
   c. Results of the independent spatial assessment discussed in point 2 above (refer to Section 6 of this report).
   d. Discussion of on any gaps in the identification of potential soil and water impacts resulting from the constructability of the proposed works and mitigation measures (Section 7 of this report).
   e. Review of additional information provided by the Applicant at PSM and DPE request to fill in the identified gaps (Section 8 of this report).
   f. PSM's concluded opinion regarding the Constructability and Soil and Water Impact of the proposed Hills of Gold Wind Farm development (Section 9 of this report).

3. Supplied Information

3.1 Documents

3.1.1 EIS Documents

We have been provided the following documents associated with the EIS:

- EIS (18 November 2020) by ERM which includes the following specific sections/addendums relating to the Project and the Soil and Water Assessment:
  - EIS Appendix A (1 November 2022) – Updated Project Description
  - EIS Appendix O (11 November 2020) – Soils and Water Assessment
  - EIS Appendix N (21 December 2021) – Soils and Water **Addendum Report.**
- The following geotechnical reports supporting the EIS:

- Tetra Tech Coffey (1 April 2021) – Preliminary Geotechnical & Geophysical Interpretive Report
- WSP Golder (2 May 2022) – Preliminary Geotechnical Investigation.

3.1.2 HOGPI Peer Review Reports

We have been provided the following HOGPI Peer Review Reports:

- M Thoms Report (31 March 2023) - Peer Review Report on the HoG project
- R Banks Report (January 2022) - Review of HOG EIS Appendix N Soils and Water Addendum Report
- G Chapman Report (29 March 2022) - Review of Soil and Land on the HoG project.

3.2 GIS Files

We have been provided and have sourced the following GIS information that we have used to interrogate the Project details independently:

- Provided files:
  - Complete Project Infrastructure_Fixed_V5_1Nov2022.shp.
- Publicly available information:
  - Contours 5m from Elvis – Elevation and Depth – Foundation Spatial Data from ICSM Anzlic Committee on Surveying & Mapping.

4. General Commentary on EIS Assessment and Mitigation Measures

4.1 General and SEARs requirements

We have reviewed the EIS document relating to Soil and Water Impacts. The Water and Soils component of the EIS is meant to address the relevant SEARs requirements reproduced below.

Water & Soils	■ quantify water demand, identify water sources (surface and groundwater), including any licensing requirements, and determine whether an adequate and secure water supply is available for the development;
	■ access potential impacts on the quantity and quality of surface and groundwater resources, including impacts on other water users and watercourses;
	■ where the project involves works within 40 metres of the high bank of any river, lake or wetlands (collectively waterfront land), identify likely impacts to the waterfront land, and how the activities are to be designed and implemented in accordance with *the DPI Water Guidelines for Controlled Activities* (DPI, 2012) and (if necessary) *Why do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings* (DPI, 2003); and
	■ describe the measures to minimise surface and groundwater impacts, including how works on steep gradient land or erodible soil types would be managed and any contingency requirements to address residual impacts;

4.2 Water demand and sources

The EIS provides estimates of water demand and identifies potential sources for the water.

The estimates of water demand look reasonable, and detailed justification of the estimates are provided in the EIS. The estimated volume of water demand is 55 ML over 24 months which is an average of less than 1 l/s.

Potential sources of water are identified and discussed. We agree that these sources are available and given the relatively low volume of water we consider that these sources of water are likely to be able to provide this volume of water subject to appropriate water licencing requirements.

Given the above, we consider that it is appropriate to delay confirmation of the adopted water source to the detailed design stage.

4.3 Soil assessment

An assessment of the soil characteristics was done initially in the EIS by means of reference to maps and database. It concluded:

Soils Summary

Overall, the soil character of the Project Area is identified as having low to moderate erodibility and generally permeable soils which reduces runoff potential. The primary concern for soil management is the disturbance of steep sloped areas. Detailed design has avoided proposed disturbance of steep sloped areas, with the primary ground excavation works associated with work pads located on the ridgeline.

This was in turn supported by observations that no evidence of widespread erosion was observed in the Project area, with some localised erosion visible at locations of concentrated surface water flows.

This was subsequently (in the Addendum Report) supplemented by geotechnical site information (Tetra Tech Coffey Report).

The field data resulted in identification of thicker soil cover over most of the Project Area, identification of shallow landslips in the steeper ground and an assessed increased erodibility of the soils which have also been identified as being dispersive.

On this basis, the Addendum Report provides a number of additional mitigation measures. The more relevant ones being:

- Unsupported cut and fills less than 10 m high to be battered to no steeper than 2H:1V
- Standard suite of erosion and sediment control measures requiring careful design and implementation in relatively flat areas (existing terrain slopes less than 20%) where moderate erosion hazard has been assessed
- Where slopes are greater than 20% (high and very high erosion hazard) or concentrated flows occur, specialised erosion and sediment control measures to be detailed at detailed design. No specific discussion of what these measures would comprise or their locations/proportion of the Project these measures would be applied is provided.

It is our opinion that the assessment completed has correctly assessed that:

- Unsupported batter slopes flatter than 2H:1V are likely to be stable
- Steeper batters will require support
- The soil erodibility is high
- The areas likely to be most affected by erosion are areas where existing terrain slopes are steeper than 20% or flows are concentrated by the Project works
- The standard suite of erosion and sediment controls are suitable for areas where slopes are less than 20% subject to careful design, planning and implementation
- Specialised erosion and sediment control measures will be required where slopes greater than 20% or concentrated flows occur.

The EIS however does not:

- Clearly identify or quantify the areas where 2H:1V batters are unlikely to be able to be constructed and where supported batters (e.g. rock fill batters or retaining walls) are likely to be required
- Clearly identify or at least quantify the areas where the specialised erosion and sediment control measures may be necessary
- Clearly identify the extent of disturbance associated with the tracks, and WTG foundations and hardstand areas located in areas of steep terrain
- Provide conceptual or detailed information on the proposed specialised erosion and sediment control measures.

In Section 6 we present some independent assessments addressing the extents of the features identified in dot points 1 to 3 above.

4.4 Surface water assessment

The EIS assesses that the effects on surface water flows will be primarily due to increased runoff from hardstand areas and concentration of flows into culverts where the access roads intercept and redirect flows from upstream of the tracks.

Drainage measures such as collection systems and designed discharge points including grass swales and level spreaders are proposed to mitigate the effect of the increased runoff from the hardstand areas by reducing velocities and encouraging infiltration.

As the main track is located on the ridge line the effects of this track are assessed as being very minor. The TT on the other hand is located midslope and traverses the upper end of a number of first order ephemeral water courses. EIS indicates that appropriate drainage is required when designing and constructing the TT to transmit surface water downstream of the track. Drainage blankets and culverts are proposed as measures to do this. We consider these to be some of the 'specialised erosion and sediment control measures' as identified in the EIS.

The EIS goes on to indicate that careful design will be required to reduce the effect of concentrating the flows at a few locations in turn resulting in localised changes to stream flow conditions and subsequent erosion.

We consider the above assessment to be an appropriate assessment of the construction and operational stage impacts on the surface water at the Project. The proposed mitigation measures are routinely adopted for road and surface infrastructure design and construction in Australia.

We consider that the key design challenges will be associated with the drainage measures for the TT as this is the feature most likely to intercept surface water that is currently travelling as sheet flow and potentially concentrate discharge. This will result in short and long term changes to the surface water flows down stream of the track. Few details are provided in the EIS for the proposed drainage measures as it is proposed to develop these through the detailed design stage.

5. General commentary on HOGPI Peer Review Reports

We have reviewed the three HOGPI Peer Review Reports and provide below the following generalised comments: The reports are critical of the EIS. We have grouped the criticism into three categories:

- Lack of detail on interaction of works with steep terrain. That is, the HOGPI Peer Review Reports indicate that the EIS:
  - Lacks clear quantification and downplays the extent of disturbance associated with the proposed Access Tracks, WTG foundations and laydown areas and their interaction with the steep and very steep terrain

    The HOGPI Peer Review Reports highlight that the truck gradient, bend and radius and gradient change intolerances mean require large scale land and soil disturbance on steep and very steep ground.
  - This lack of quantification results:
    - The effect of the Project on soil disturbance, runoff and erosion and thus the environment impacts from these being underestimated
    - The ability of the proposed mitigation measures to be applied to the actual site conditions, particularly where specialised measures such as sediment basins are proposed being difficult to assess.

  In Section 6 we have attempted to quantify the extent of disturbance to assist in critically addressing the above concerns.
- Insufficient or incorrect characterisation of the soil types and Land and Soil Capability Classes.

  Whilst there may be some difference of opinion on the methods required to assess the soil types and the erodibility of the soil and landscape, the EIS has ultimately concluded that the soil/landscape has a moderate to very high erodibility depending on the terrain slopes. Thus, we consider that the differences on assessment methodology are largely inconsequential

- Lack of consideration of future effects and their impacts, namely:
  - Effects of future operation including decommissioning on impact assessment
  - Effects of climate change on impact assessment.

  We consider that these criticisms are second order effects unlikely to result in significant changes to the impact assessment.

By examining the interaction between the Project and terrain in Section 6, we have assessed the potential impact of the lack of detail highlighted by the HOGPI Peer Review Reports on the impact assessment and particularly on the ability of the proposed mitigation measures to be implemented within the assessed disturbance footprints.

6. Independent spatial assessment of proposed Project works

6.1 General

In the following sections we have used the supplied and readily available GIS information as listed in Section 3.2 of this report to examine and interrogate the spatial features of the Project. The aim is to assess the proposed location of the Access Tracks (including the TT), WTGs foundations and hardstand areas relative to the existing topograghy to better understand the impact of these on the landscape, land stability, surface water hydrology and erosion.

Figures 1, 2 and 3 present a plan view of the Project showing:

- The proposed locations of the 47 turbines (WTG02 to WTG70). We understand that the exact location will be confirmed during detailed design and will fall within 100 m of the location shown. We have only considered 64 WTG locations as shown on Figures 1 to 3
- The proposed alignments of the Access Tracks. We have separated the Access Tracks into four areas:
  - Western Track – The track running near the crest of the escarpment between WTG02 to WTG18
  - Transverse Track – The track running on the side of the escarpment connecting WTG20 to WTG40
  - Southern Track – The tracks running near the crest of the escarpment and connecting WTG20 to WTG40
  - Eastern Track – The track running near the crest of the escarpment and connecting WTG42 to WTG70.

We have used the topography to categorise the ground at the turbine locations and the access track alignment into three categories:

- Category 1 (Blue): Existing ground slopes less than 20% - Assessed in the EIS as presenting moderate erosion risk and thus requiring typical mitigation measures
- Category 2 (Green): Existing ground slopes between 20% and 30% - Assessed in the EIS as presenting high erosion risk and thus requiring specialised mitigation measures
- Category 3 (Red): Existing ground slopes greater than 30% - Assessed in the EIS as presenting very high erosion risk and thus requiring specialised mitigation measures.

We note that the slope angles represent the average assessed over:

- A circle with a 30 m diameter for the WTGs
- A width of 10 m centred on the access track for the Access Tracks.

Whilst the above approach may not be representative of the terrain at each particular location, we consider that it does provide a useful indication of the slopes of the terrain that will be disturbed by the Project.

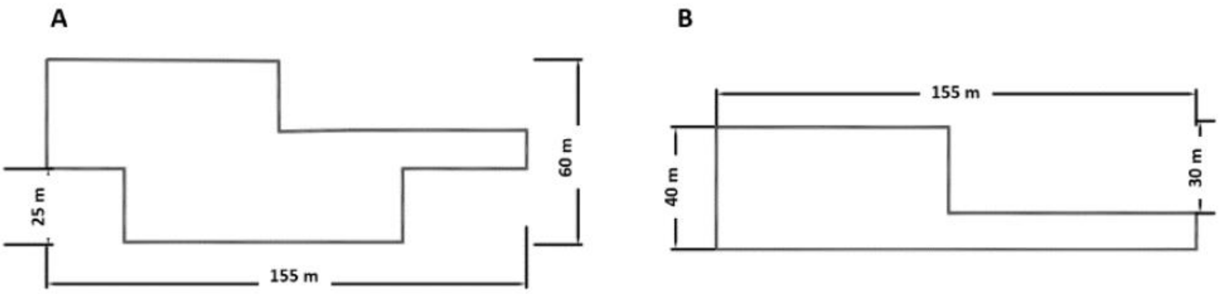
6.2 Turbines foundations

From the EIS we understand that at the turbine locations the following are proposed:

- Turbine foundations comprising a 25 m diameter gravity footing founded some 3 to 5 m below the surface. Refer to the image in Inset 1 below for an example foundation. The excavation for the foundation would generally be temporary with the ground backfilled to match the original ground surface.
- A hardstand area adjacent to the WTG with typical dimensions shown in the EIS to be as shown Inset 2 below. In order to form these hardstand areas localised permanent fill and cut batters will be required. Type A is proposed to be used where the topography permits it. Type B associated with Just in Time (JIT) delivery concept will be used where the local topography is steeper. The EIS indicates that Type B is to be used in 19 of 70 locations. Given the location of these is mostly along relatively thin ridge tops, we assumed that these will be oriented parallel to the ridge line.

Figure 3-9 Typical Gravity Foundation for a Wind Farm (ENGIE Willogoleche Wind Farm in construction)

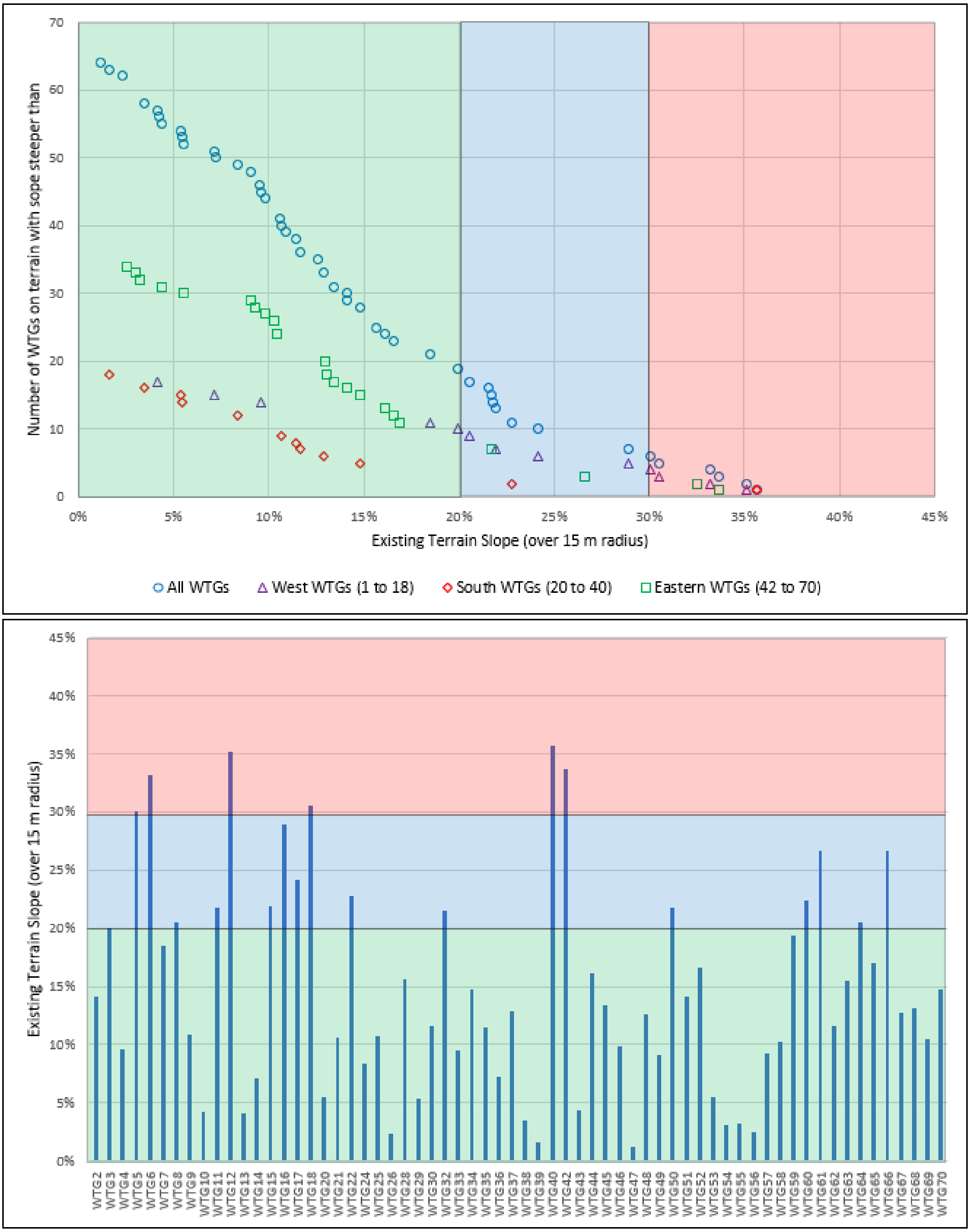
Inset 1: Typical gravity foundation detail for the WTGs



Inset 2: Typical hardstand areas geometry to be adopted near each WTG

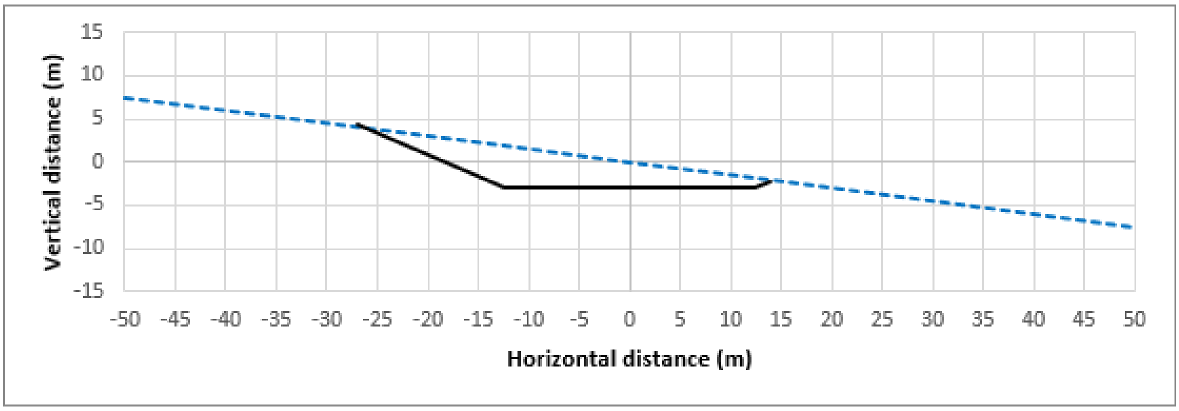
The two charts in the Inset 3 below show the assessed existing slopes for the terrain within 15 m radius of the turbines.

17 of the 64 WTGs (i.e. 27%) occur in terrain with existing slope greater than 20% and 5 of the 64 WTGs (i.e. 8%) occur in terrain steeper than 30%.

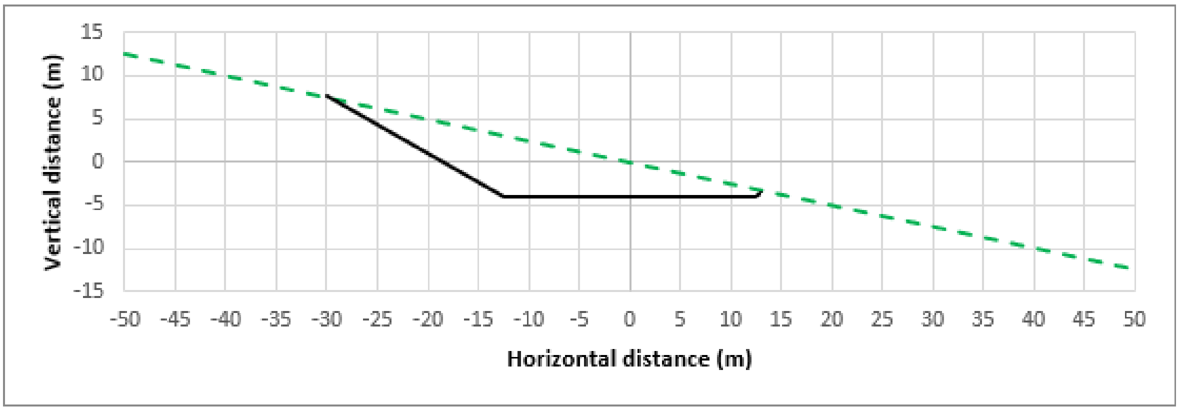


Inset 3: Charts showing assessed existing terrain slopes at the proposed WTG locations

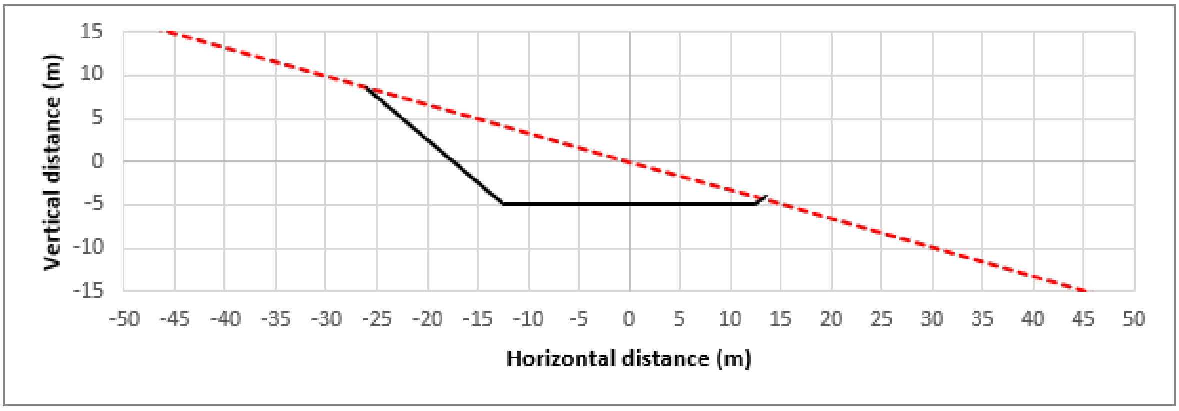
The schematics in Inset 4 and Inset 5 below present a cross section of a 25 wide foundation and a 50 m wide hardstand area for terrains of 15%, 25% and 33% representing each of the three categories of terrains listed in Section 6.1.



Terrain slope	15%	Maximum cut	7 m
Foundation length	25 m	Maximum fill	- m
Batter slope	2H: 1V	Batter length	16 m

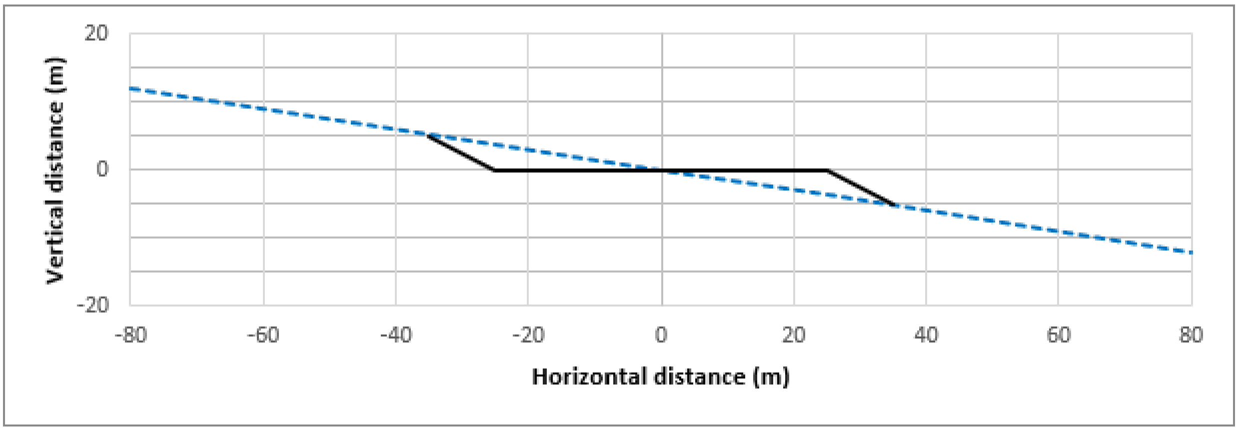


Terrain slope	25%	Maximum cut	8 m
Foundation length	25 m	Maximum fill	- m
Batter slope	1.5H: 1V	Batter length	18 m

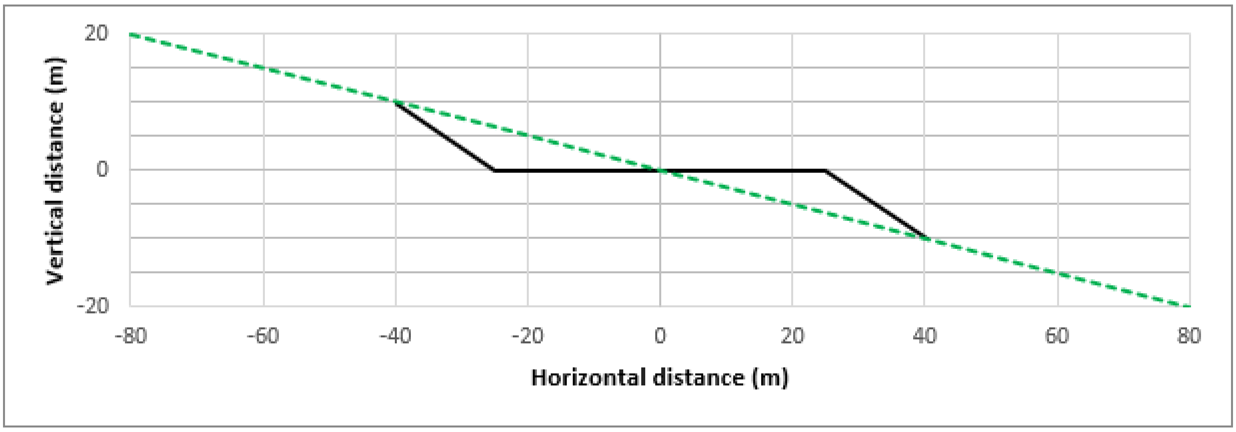


Terrain slope	33%	Maximum cut	10 m
Foundation length	25 m	Maximum fill	- m
Batter slope	1H: 1V	Batter length	20 m

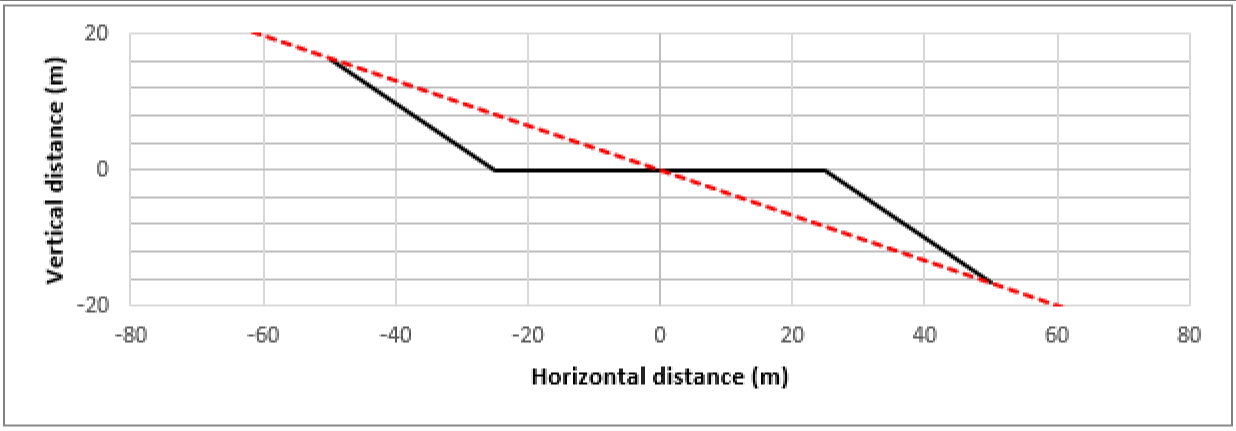
Inset 4: Schematics showing details of WTG foundation excavation geometry for varying slope terrains



Terrain slope	15%	Maximum cut	4 m
Hardstand Width	50 m	Maximum fill	4 m
Batter slope	2H: 1V	Batter length	12 m



Terrain slope	25%	Maximum cut	7 m
Hardstand Width	50 m	Maximum fill	7 m
Batter slope	1.5H: 1V	Batter length	18 m



Terrain slope	33%	Maximum cut	9 m
Hardstand Width	50 m	Maximum fill	9 m
Batter slope	1.5H: 1V	Batter length	30 m

Inset 5: Schematics showing details of WTG hardstand area geometry for varying slope terrains

From these we note that:

- Where terrain slopes are less than 20%:
  - Minor excavation and filling is required for both the foundations and the hardstand areas
  - Typical cut and fill batter heights are less than 5 m
  - Batter slopes of 2H:1V or flatter without support should be stable, with batter lengths typically less than 12 m
  - The proposed erosion mitigation measures, including progressive rehabilitation are expected to work well in these areas.
- Where slopes terrains are greater than 25% (and in some case above 33%):
  - Excavation and filling required to construct the foundation and hardstand areas increase substantially
  - With regards to the WTGs foundations, the cuts are temporary and likely to be in stronger rock. Thus, well designed and constructed works are likely to be able to limit the size of the excavations and to control erosion and runoff during this temporary stage
  - With regards to the hardstand areas, cut and batter slopes steeper than 2H:1V will be required to control the footprint of the works and cut and fill batter heights typically greater than 10 m will be required resulting in slope lengths of 20 m to 30 m. Careful locating of the hardstand area at detailed design stage can be used to mitigate some of these effects
  - The hardstand areas are permanent and the typical erosion mitigation measures described in the EIS are unlikely to work in these areas. The use of retaining structures or select material (e.g. rockfill) is likely to be required to achieve the steeper batter slopes in fill. Progressive rehabilitation of steeper fill slopes will require specialised tools, and larger surface areas are likely to be susceptible to erosion and runoff for longer periods of time until the vegetation is established.

6.3 Access Tracks

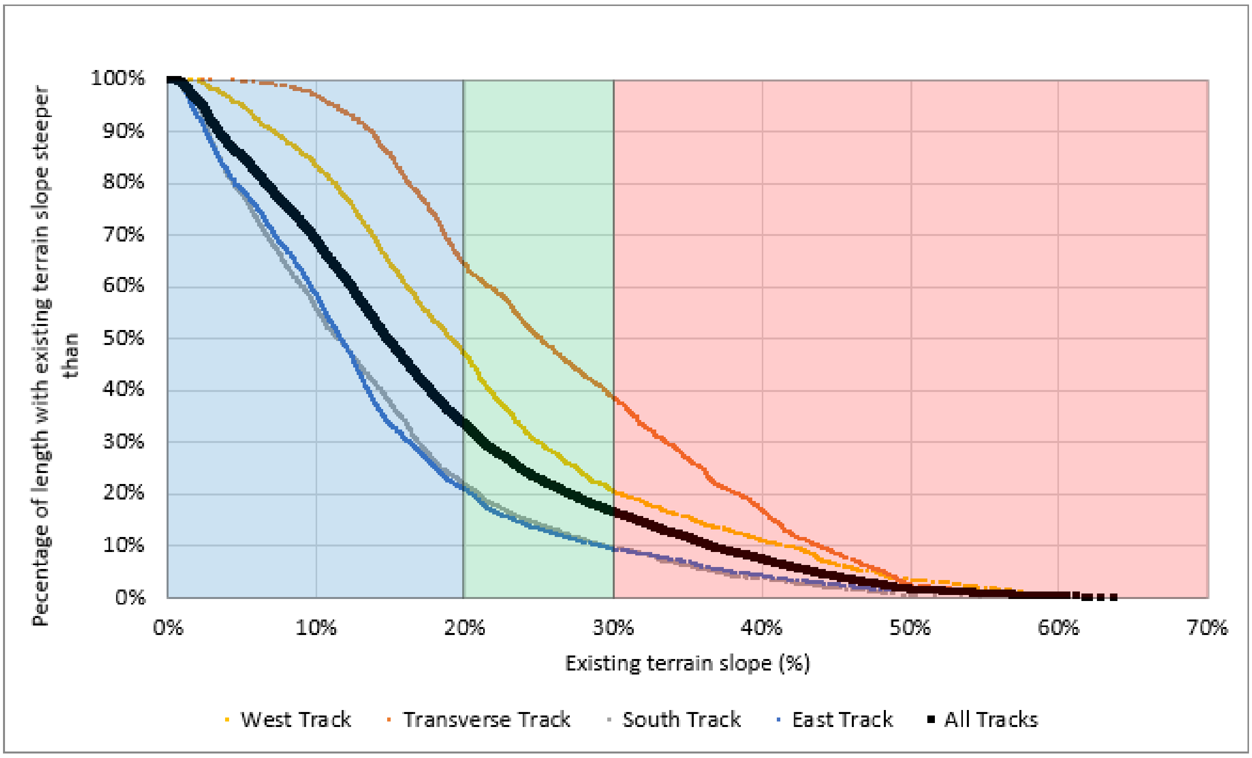
6.3.1 Horizontal and vertical alignment

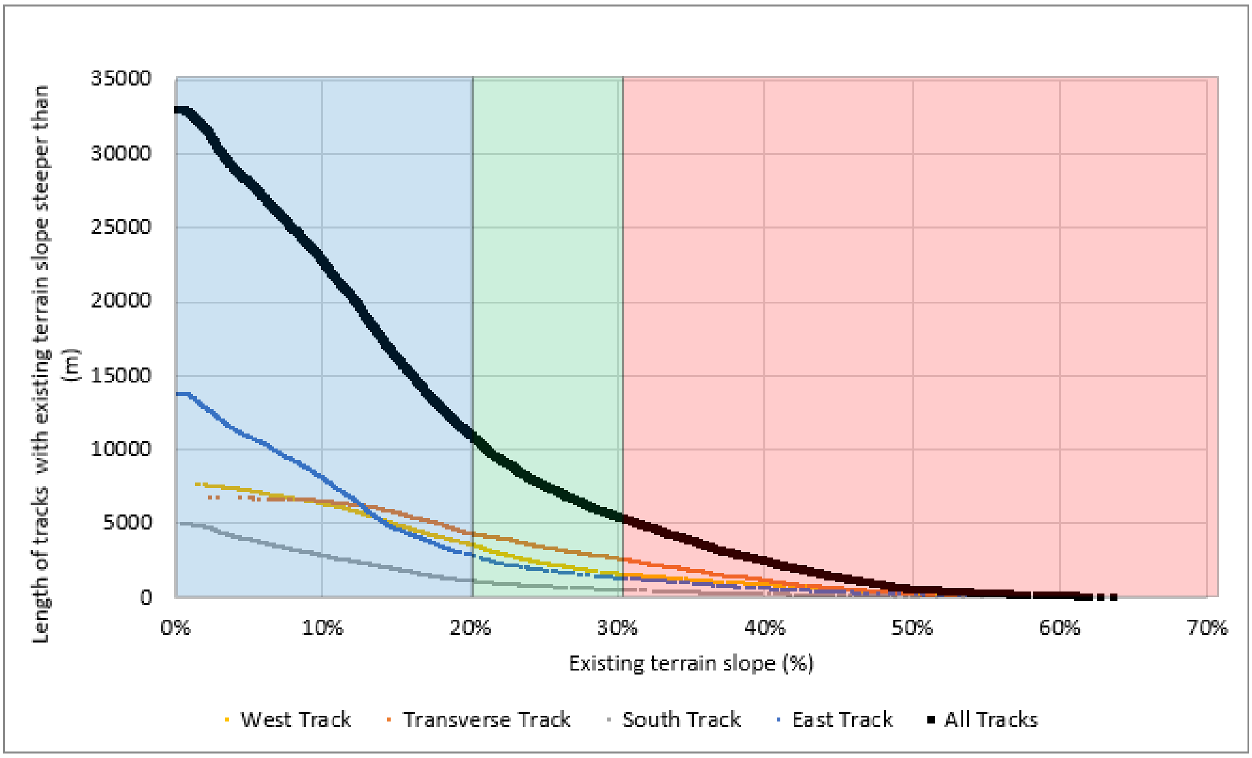
We have analysed the horizontal and vertical alignment as shown in the supplied information. These consider the vertical and horizontal alignment requirements for the large plant required to transport the turbine components. Our checks indicate that with the exception of the TT, tracks constructed at grade (i.e. with at most minor cut and fill) should achieve these requirements.

Whilst the proposed horizontal alignment of the TT meets the requirements for the large plant, some significant filling or cuttings will be required to smooth out the track grades over some of the more steeply incised valleys that the TT traverses.

6.3.2 Interaction with existing terrain

The two charts in Inset 6 below show the assessed existing slopes for the terrain 5 m either side of the Access Tracks. As previously stated, we have divided the Access Tracks into four sections. The upper chart presents the cumulative percentage of each section of track which has terrain slopes steeper than that shown on the x-axis. The lower chart is similar but presents the length of each section of track which has terrain slopes steeper than that shown on the x-axis.





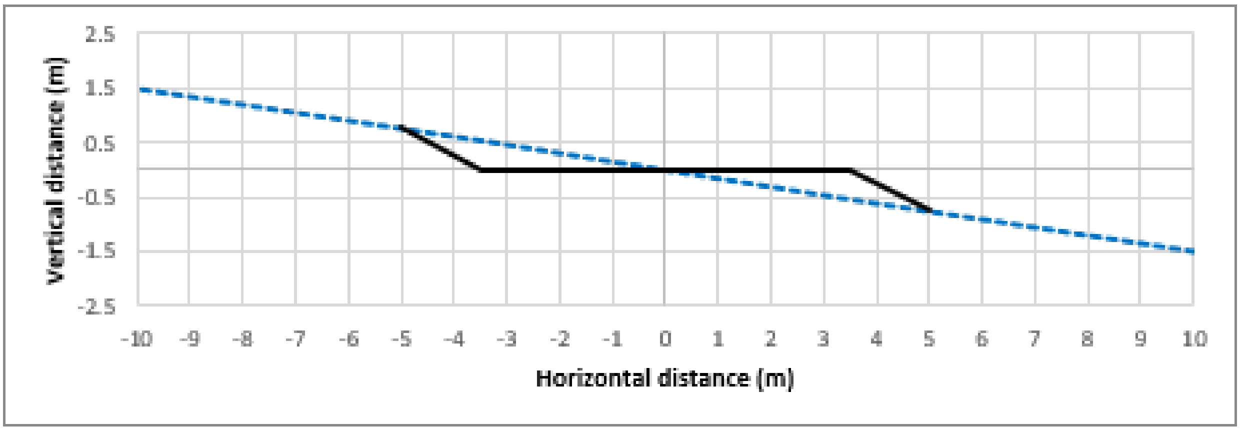
Inset 6: Charts showing assessed existing terrain slopes at Access Track locations

From these we note that:

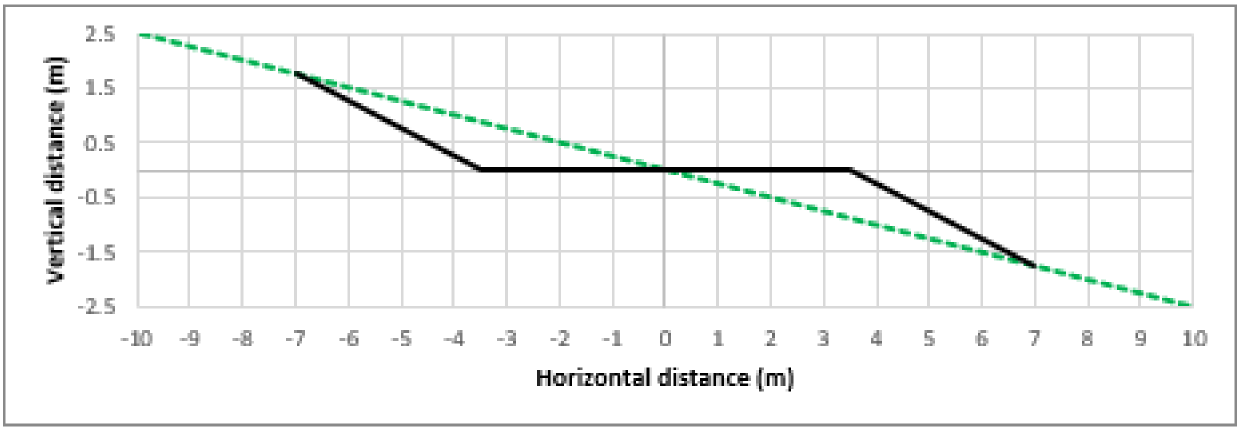
- Approximately 33% of the Access Tracks (equivalent to approximately 10 km) are located in areas where the existing terrain slope is steeper than 20% and present at least high erosion potential as assessed by the EIS
- Approximately 17% of the Access Tracks (equivalent to approximately 5 km) are located in areas where the existing terrain slope is steeper than 30% and present at very high erosion potential as assessed by the EIS

- There is approximately 15 km of Access Tracks that occur in areas where the EIS itself indicates at least high erosion potential requiring specialised erosion and surface water control mitigation measures
- Over 60% of the TT traverses areas where the existing terrain slope is steeper than 20%
- 40% of this track traverses areas where the existing terrain slope is between 30% and 50%
- The TT crosses a number of more deeply incised drainage paths
- The South Track and East Tracks are located along the ridgeline and the terrain slopes are significantly flatter.

The schematics in Inset 7 and Inset 8 present a cross section of 8 wide access track for slopes of 15%, 25%, 33% and 40% representing the range of terrains likely to be encountered.

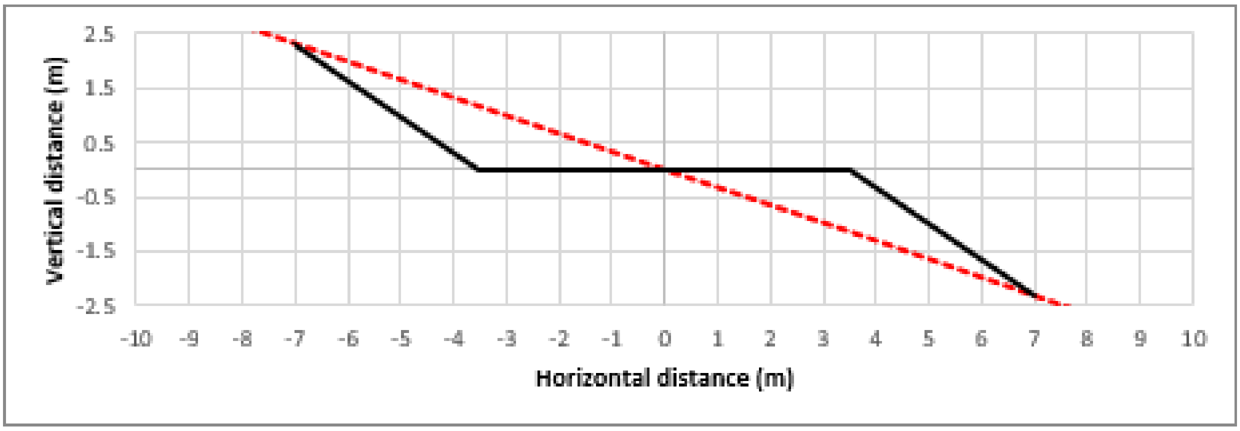


Terrain slope	15%	Maximum cut	1 m
Track width	7 m	Maximum fill	1 m
Batter slope	2H: 1V	Batter length	2 m

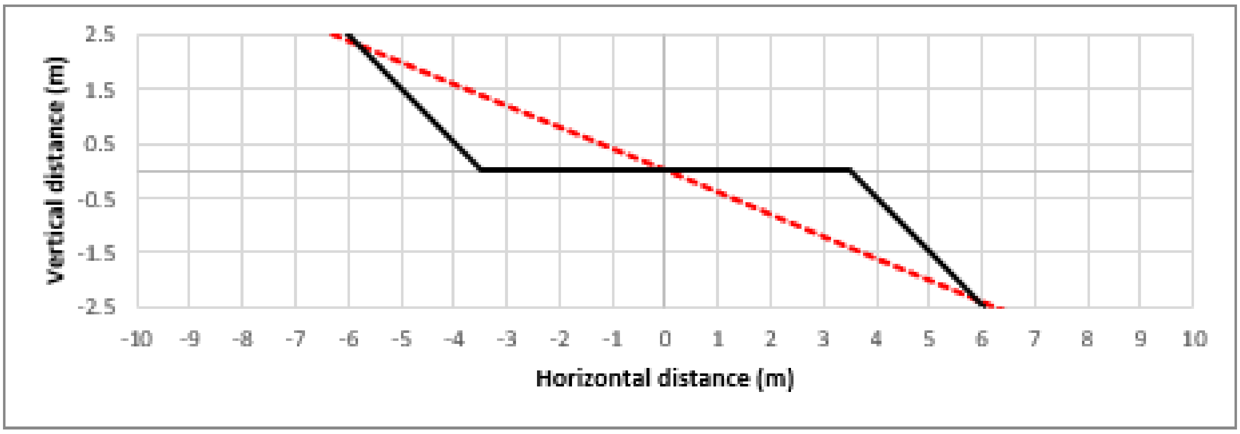


Terrain slope	25%	Maximum cut	1 m
Track width	7 m	Maximum fill	1 m
Batter slope	2H: 1V	Batter length	4 m

Inset 7: Schematics showing details access track cut and fill geometry for varying slope terrains, where roads are constructed at grade (for mild terrain)



Terrain slope	33%	Maximum cut	1.5 m
Track width	7 m	Maximum fill	1.5 m
Batter slope	1.5H: 1V	Batter length	4 m



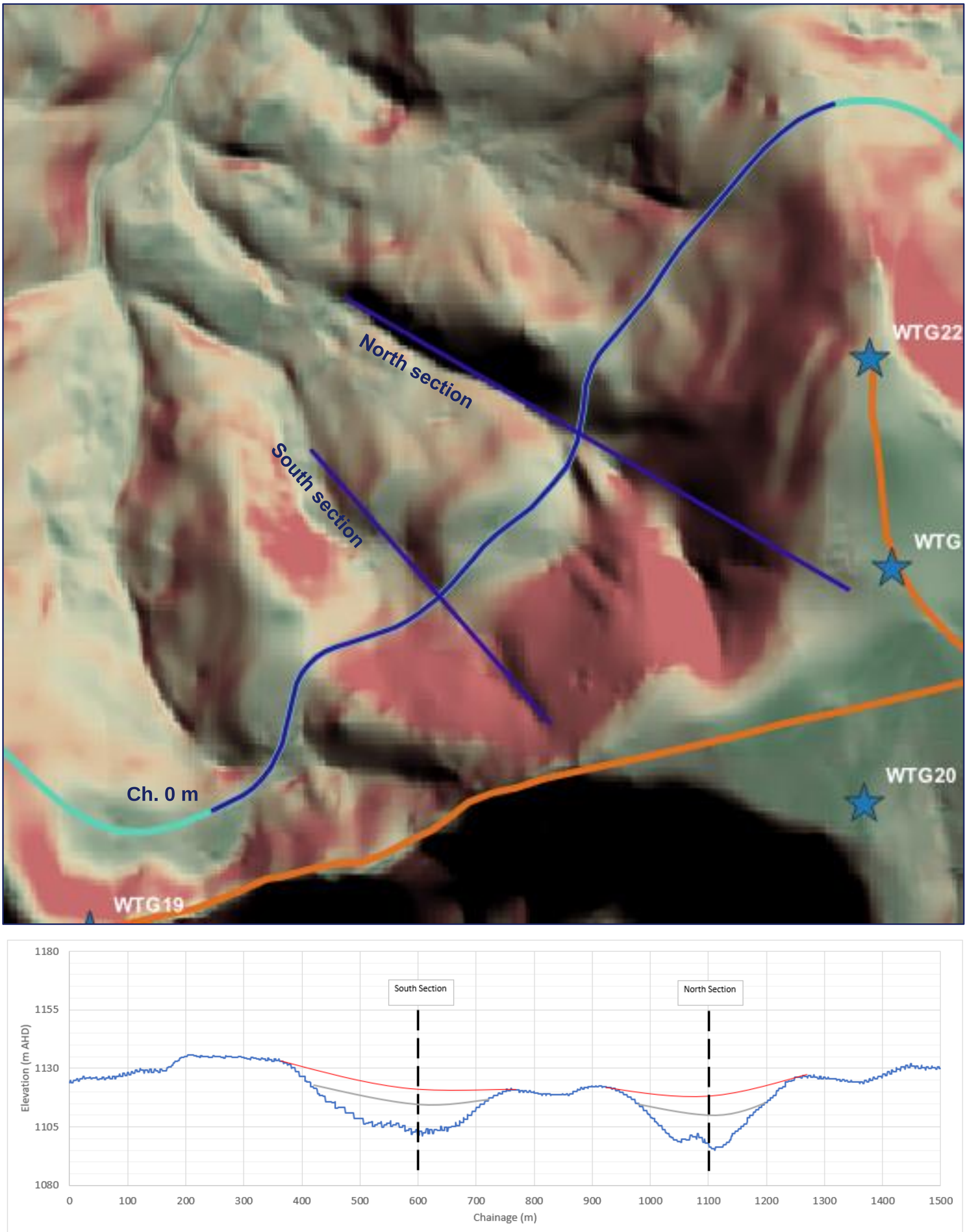
Terrain slope	40%	Maximum cut	1.5 m
Track width	7 m	Maximum fill	1.5 m
Batter slope	1H: 1V	Batter length	3.5 m

Inset 8: Schematics showing details access track cut and fill geometry for varying slope terrains, where roads are constructed at grade (for steep terrain)

From these we note that:

- Where terrain slopes are less than 25%, minor excavation and filling will be required for the Access Tracks. Typical cut and fill batter heights are less than 1.0 m. Batter slopes of 2H:1V or flatter can be made to work, with batter lengths typically less than 2 m. The proposed erosion mitigation measures, including progressive rehabilitation are expected to work well in these areas. This represents over 80% of the Access Tracks alignment
- Where slopes terrains are greater than 25% (and in some case up to 40%), the challenges associated with excavation and filling required to construct the Access Tracks increase, namely:
  - Cut and batter slopes steeper than 2H:1V will be required to control the footprint of the works. The use of retaining structures or select material (e.g. rockfill) is likely to be required to achieve the steeper batter slopes in fill
  - The thickness of the fill and height of the cuts are typically less than 2 m, however, can result in slope length of 3 m to 5 m depending on the adopted batter angles
  - Progressive rehabilitation of steeper fill slopes will require specialised tools, and larger surface areas are likely to be susceptible to erosion and runoff for longer periods of time until the vegetation is established.

In Inset 9, we have looked at more detail at the two locations where the TT crosses the more deeply incised drainage paths. A schematic long section of the TT over two such drainage paths are shown below. We have inferred in the red and the grey two potential road alignment over these drainage paths.



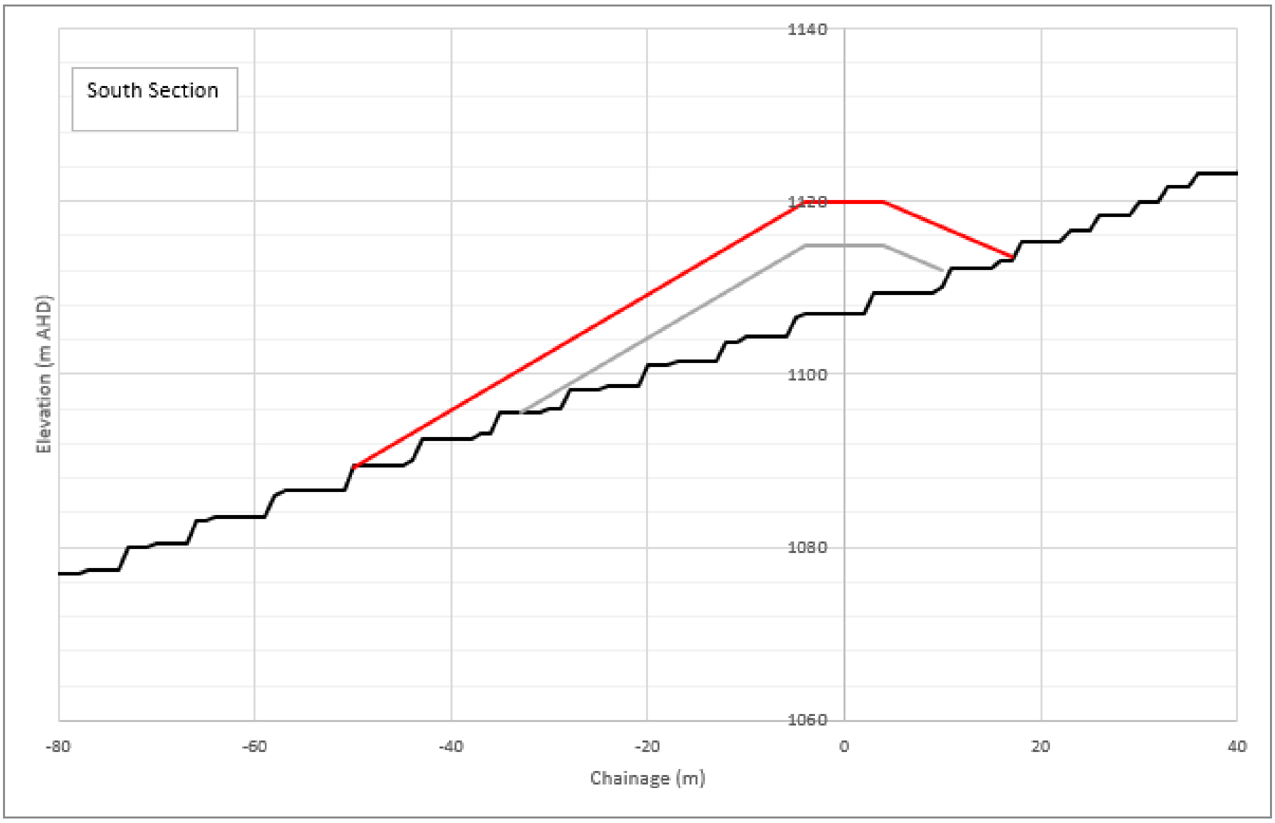
Inset 9: Schematic plan and long section along southern half of TT

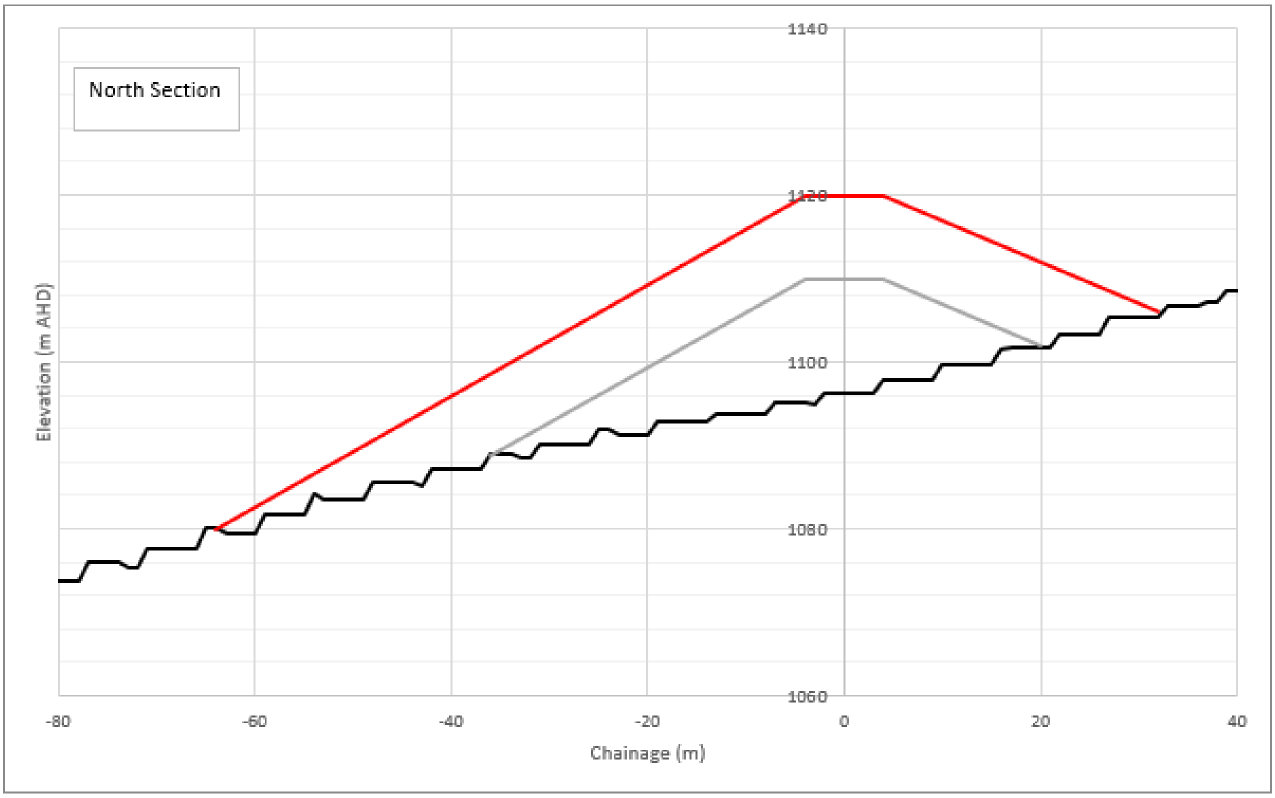
Inset 10 we present two cross sections through these drainage paths. As can be seen a 10 m to 20 m high embankment could be required across these valleys. The valleys themselves are steep with slopes of between 28% and 40%.

The downhill sides of the embankments will thus need to be constructed with batters steeper than the recommended 2H:1V and the use of retaining structures or select material (e.g. rockfill) is thus likely to be required. There are no details with regards the proposed approach to design and construct these steeper batters.

In any case the batters will be steep and potentially over 40 m long and thus present increased risk of erosion upon exposure. Rehabilitation will also be challenging. Should specialised erosion mitigation measures include sediment basins, these themselves would result in embankments with steep batters. It is not clear whether allowances have been made to include these within the disturbance footprint.

Overall, this emphasises the need for further details regarding the proposed earthworks design, erosion mitigation measures and surface water design measures associated with the TT.





Inset 10: **Schematic cross sections through the TT embankment where it crosses the deeply incised drainage paths**

7. Gaps in soil and water impacts and proposed mitigation measures

The EIS lacks detail on measures that are to be adopted in areas of high and very high erosion potential. These are where typical earthworks and associated mitigation measures are identified by the EIS as being insufficient and where specialised erosion and sediment control measures will need to be adopted.

In Section 6 we have identified the areas where specialised erosion and sediment control measures will be required. In summary these represent:

- Approximately 25% of the WTG and associated hardstand locations. Some of these are likely to be resolved by particular site selection
- Close to 33% of the Access Tracks. Approximately half of this length is represented by the steep terrain associated with the TT.

Given the lack of detail regarding the specialised erosion and sediment control measures, and the relatively large extent of the Project to which such measures may apply we consider that this is a meaningful gap in assessing the impact on soil and water resulting from the Project.

Particularly, the EIS provides insufficient details to allow independent confirmation that the assessed disturbance footprint is sufficient to allow for the necessary specialised erosion and sediment control measures to be implemented in the areas of steep ground, and particularly the TT. This is less of an issue at the WTG locations.

We note and agree with the assessment in the EIS that appropriate mitigation measures and strategies can be developed during detailed design.

As described in Section 8, the Applicant has provided additional information which we consider addresses the identified gaps.

8. Review of additional information provided by the Applicant

8.1 Supplied information

At PSM's and DPE's request the Applicant provided additional information regarding the Transverse Track and the WTG foundation and hardstand areas where slopes terrains greater than 25% are present. In particular they have provided:

- A detailed description of the process for design development from EIS to construction. These are discussed in Section 8.2
- Typical sections for embankments and cuttings showing proposed batter treatment. These are included in Appendix B

  For the Transverse Track, plans and sections showing the development of the design alignment from early EIS stage to a more detailed concept stage. These are included in Appendix B.
- For the WTG layout and foundation areas:
  - Plans and sections showing examples of the proposed site preparation works at two locations WTF12 and WTG42 where the terrain is steeper than 30%. These are included in Appendix B
  - Discussion of proposed erosion and water control measures at these locations.

8.2 Results of review

8.2.1 Description of design and construction process

The Applicant has detailed the proposed development of the design and construction of the works (and associated erosion and water control measures) by identifying five stages of development for the works:

1. Concept design – The initial stages of the concept design have been completed and are presented in the provided documentation. Further development is proposed prior to the next stage of design.
2. Detailed design – The Applicant indicates that this design phase includes a more detailed consideration of stormwater design and erosion consideration. Some guiding documents for this stage of the design include:
   a. Managing Urban Stormwater: Soils and Construction, commonly known as "The Blue Book". Unfortunately, this specification is specifically regarding an urban environment and is not entirely appropriate to be implemented in a rural project.
   b. The Best Practice Erosion and Sediment Control (BPESC), more commonly referred to as "the White Book" in many instances, is more appropriate for major rural Greenfield projects and should be consulted for appropriate controls for the relevant environment.

   Site specific designs are also developed where required.
3. Construction Phase – The Applicant considers the Construction Phase as the most critical phase for the water and erosion risk. It proposes development of approaches to control the risks during construction. The approaches are said to include:
   a. Site checks of onsite implemented controls for maintenance and suitability.
   b. Collaboration with the project team to implement appropriate conditions for a changing work front, construction methodology or environmental conditions.
   c. Disturbance monitoring and collaboration with the engineering team to facilitate appropriate controls within the project's planned allowable disturbance boundary.
   d. Water stream quality monitoring to identify increases in sediment content.
   e. Construction front monitoring to implement additional temporary controls and manage changes to the water flows due to construction staging (e.g. scenario - large stripped area through a large striped fill formation would create a vulnerable valley with high erosion risks and flow velocities—temporary control which could be implemented – minor sed basins "turkey nest" with shallow "V" drains direction flows to capture sediment spaced appropriately to contain the sediment contribution, this control would be completely contained within the permanent construction

footprint through the deep fill formation and not detailed in the design documentation outside of the design typical ESC details.

   f. Third-party site condition reviews by experts in the field to monitor and confirm appropriate measures are in place. With the collective collaboration of site teams and third-party reviewers, confirmation that the best project measures are in place, and early identification of potential future concerns can be addressed.

4. Defects and completion inspections - During this step, the project is reviewed at its completion. All defects are identified and determined suitable, or rectification is required based on design specifications and project requirements. This is an important phase of the project as during the construction of the project, damage to the design stormwater can be identified for rectification to return the original design intentions and minimise ESC risk.
5. Operations and maintenance – This phase is dominated by an ongoing observation schedule regarding site conditions, resulting in maintenance and implementation of additional controls if identified as required.

We consider that the above is a sound approach that can be successfully implemented at this Site to control the risks associated with surface water and erosion. In particular we agree with the staging of the works to allow temporary sediment control structures to be incorporated within the development footprint is a useful approach to manage the spatial extent of the works in the steeper ground.

8.2.2 Typical sections

The typical details shown on these sketches present sound engineering approaches to embankment and cuttings. Exposed surfaces are shown landscaped where they comprise erodible materials. Table drains, crest drains and toe drains in combination with cross falls are shown as means of controlling surface water drainage.

8.2.3 Transverse Track sections and plans

The sections and planes provide for the Transverse Track indicate that even at this early stage there has been design development to reduce the disturbance footprint and the volumes of cut and fill associated with the TT.

The proposed development corridor is more than sufficient to allow the final alignment of the TT to be adjusted to allow implementation of water and erosion controls.

The EIS development footprint is assessed as being representative of the likely final disturbance footprint in terms of disturbance area and approximate alignment. However the actual alignment is unlikely to fully coincide with the development footprint.

Siting of the TT at detailed design will be a critical step in controlling the effects of the TT and allowing appropriate design and implementation of the water and erosion controls.

8.2.4 WTG12 and WTG42 sections and plans

These two wind turbines are located on very steep terrain. The sections provided indicate that the approach is likely to comprise changing the vertical alignment to reduce fill embankments and incorporate the foundation and layout areas within a cut area. The cuts are conservatively shown as being laid back at 1H:1V. Even adopting this approach, the disturbance area is reduced relative to trying to use embankments. The exposed fresh rock is likely to be less susceptible to erosion than fill embankments.

A general discussion of the proposed drainage measures has also been provided. It indicates that consideration is being given to how to integrate the required drainage and sediment control measures within the design footprint.

The above approach is considered sound from an engineering perspective. However, the large volume of excavated material will need to be removed from the site and reused as fill in a cut fill balance or disposed of away from the Project. As far as we can tell, there are no allowances for "fill emplacement areas" as part of the application. The presence of fresh rock will also impact the excavation production rates. These are all issues that will need to be addressed by the detailed design stage.

8.3 Summary

We consider that the additional information provides:

1. Additional details of the proposed approach to the areas of high and very high erosion potential.
2. Increased confidence that an approach to design and construction is being proposed that will allow the development of site specific control measures to be appropriately undertaken and developed within the proposed disturbance boundaries.
3. Increased confidence that the whilst the final location of the works may not align everywhere with the EIS development footprint, the final footprint is unlikely to be larger than that assessed during the EIS.
4. Details indicating that sound engineering practices are proposed in addressing the water and soil erosion impacts, including in areas of high and very high erosion potential. This includes the proposal to incorporate temporary measures within the construction footprint.

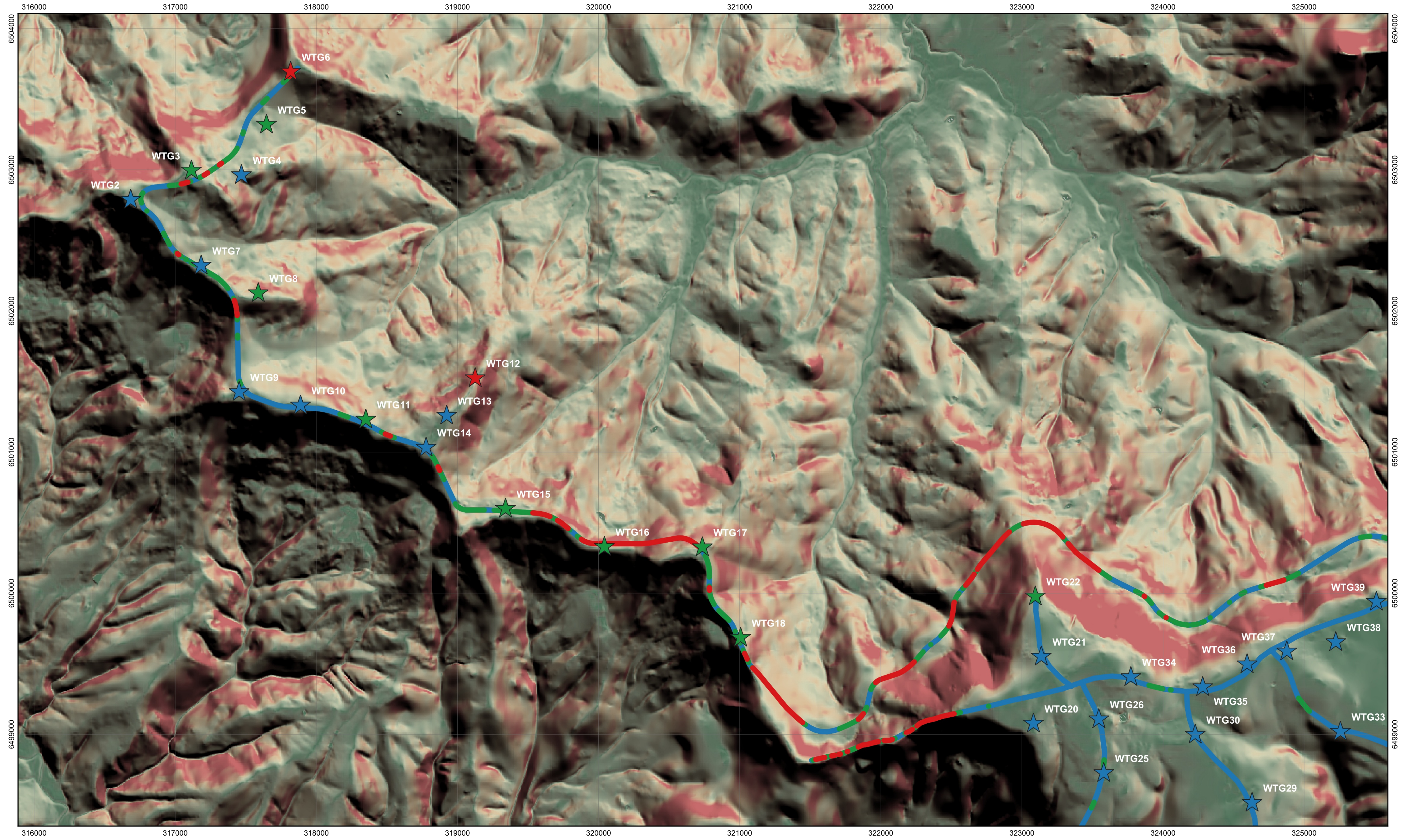
9. Conclusion

In conclusion, it is our opinion that the additional information combined with the information reviewed as part of this report, provide sufficient information with regards soil and water impacts of the Project to allow the next stages of design development and construction, including the specialised mitigation measures, to be appropriately planned and implemented.

Further, it confirms our opinion that appropriate mitigation measures and strategies can be developed during future design and construction stages within the proposed disturbance boundaries and with a footprint similar to that shown as the EIS development footprint.

Yours Sincerely

DAVID PICCOLO
PRINCIPAL



Legend

Slope Average Along the Road (degrees)

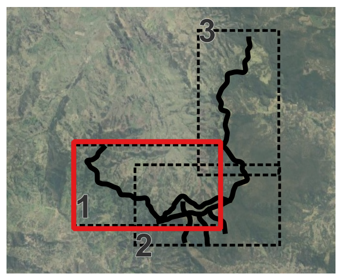
- < 11 deg (< 20%)
- 11 to 17 deg (20% to 30%)
- > 17 deg (> 30%)

Slope Average Within 15 m from Wind Turbines (degrees)

- < 11 deg (20%)
- 11 to 17 deg (20% to 30%)
- > 17 deg (>30 %)

Terrain Slope (degrees)

30
0



Scale 1:25,000

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200 0 200 400 600 800 m

Map Projection:
GDA2020 / MGA zone 56
EPSG:7856

PSM

Created By: PSM

Revision: A

Date: 18 Jul 2023

Paper Size: A3

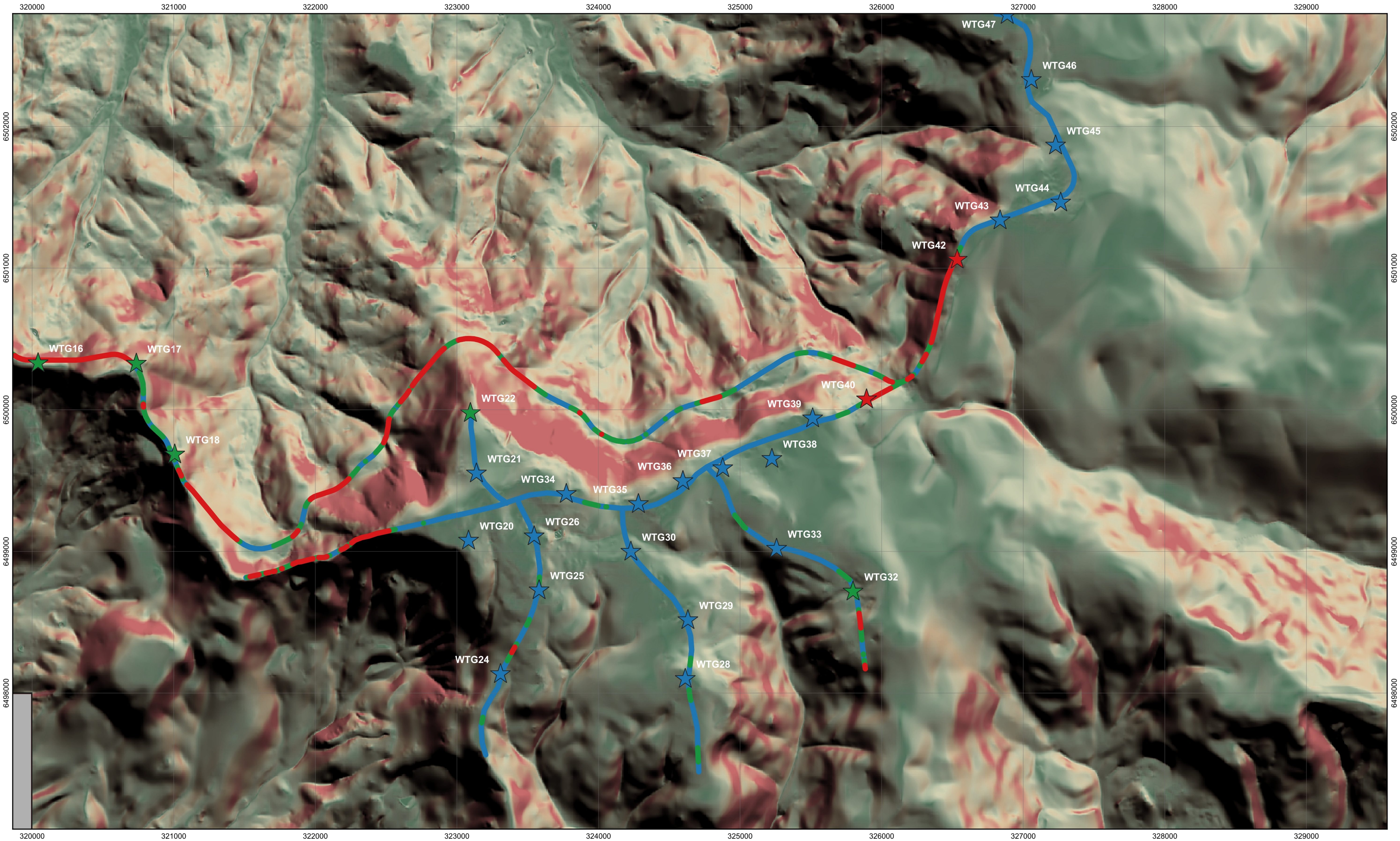
Department of Planning and Environment
Hills of Gold Windfarm

SLOPE AVERAGE AROUND ROAD AND WIND TURBINES

PSM5077

FIGURE 1-1

GIS - PSM5077\08_Figures\2023-07-18_Slope_Around_Turbines_newLocations\PSM5077_Slope_Around_Turbines.qgz Layout: Slope Estimations along Road and around Wind Turbines 15m radius



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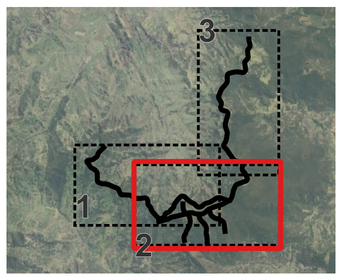

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Map Projection:
GDA2020 / MGA zone 56
EPSG:7856

PSM

Created By: PSM

Revision: A

Date: 18 Jul 2023

Paper Size: A3

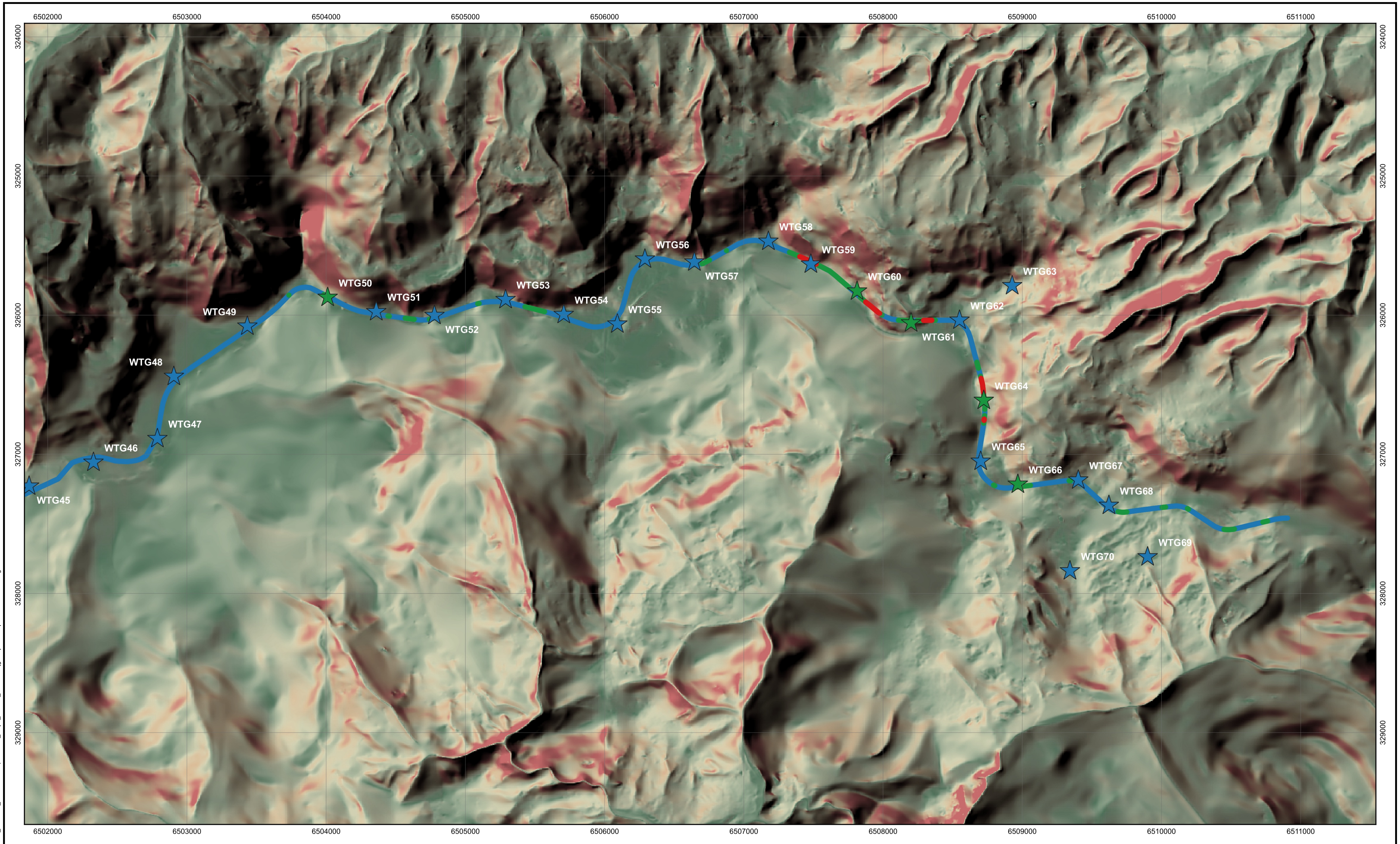
Department of Planning and Environment
Hills of Gold Windfarm

SLOPE AVERAGE AROUND ROAD AND WIND TURBINES

PSM5077

FIGURE 1-2

GIS - PSM5077\08_Figures\2023-07-18_Slope_Around_Turbines_newLocations\PSM5077_Slope_Around_Turbines.qgz Layout: Slope Estimations along Road and around Wind Turbines 15m radius



GIS - PSM5077\08_Figures\2023-07-18_Slope_Around_Turbines_newLocations\PSM5077_Slope_Around_Turbines.qgz Layout: Slope Estimations along Road and around Wind Turbines 15m radius

Legend

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Terrain Slope (degrees)
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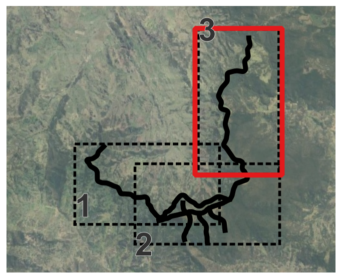
0



Scale 1:25,000

200 0 200 400 600 800 m

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Map Projection:
GDA2020 / MGA zone 56
EPSG:7856

Department of Planning and Environment
Hills of Gold Windfarm

SLOPE AVERAGE AROUND ROAD AND WIND TURBINES

PSM	Created By: PSM	Revision: A
	Date: 18 Jul 2023	Paper Size: A3

PSM5077 | FIGURE 1-3

Appendix A
CVs

Curriculum Vitae

David Piccolo
Principal Geotechnical Engineer

David Piccolo is a Principal at Pells Sullivan Meynink. He graduated from the University of New South Wales in 2000 obtaining first class honours. David worked at Douglas Partners Sydney office during the first half of 2001. He joined Pells Sullivan Meynink in June 2001. He has completed a Master in Geotechnical Engineering at UNSW.

David has worked on a wide variety of geotechnical projects including the detailed consideration of many aspects of earthworks and their control, rock cuttings, stabilisation works, retaining structures and temporary works. His special fields of competence include site investigations, analysis, and geotechnical advice for civil engineering infrastructure.

David is an experienced Expert in geotechnical engineering matters and has prepared numerous expert reports for both legal and peer review matters.

Educational Qualifications:

- Bachelor of Engineering (Civil), First Class Honours, University of New South Wales, 2000
- MEngSc (Geotechnical Engineering), University of New South Wales, 2010

Professional Associations:

- Member Institute of Engineers, Australia
- NER (Civil)
- RPEQ

Experience:

- December 2012 – Present: Principal, Pells Sullivan Meynink
- January 2008 – December 2012: Associate, Pells Sullivan Meynink
- October 2005 – December 2007: Senior Geotechnical Engineer, Pells Sullivan Meynink
- June 2001 – September 2005: Geotechnical Engineer, Pells Sullivan Meynink
- March 2001 – June 2001: Geotechnical Engineer, Douglas Partners Pty Ltd

Field of Competence:

- Site investigations, analysis and geotechnical advice for civil engineering structures including:
  - Residential, commercial and industrial
  - Railways, roads, tunnels and water retaining structures
  - Construction stage presence, inspections and advice
- Site investigations, analysis and geotechnical advice for mining infrastructure, including:
  - Mining plant earthworks and foundations, and tailings dams
  - Water retaining structures and reinforced earth structures; seepage analysis and assessments
  - Construction stage presence, inspections and advice
- Analysis and geotechnical advice regarding slope stability for civil and mining slopes
- Geotechnical advice for quarry and brick pit remediation for reuse as residential and/or industrial/commercial development
- Geotechnical advice for earthworks and quarry and brick pit remediation including, planning stage advice and development of site specific specifications and construction stage implementation of specification; earthwork auditing & certification
- Forensic engineering, including:
  - Detailed post failure investigation and mapping
  - Numerical analysis and reporting
- Expert witness work, including:
  - Preparation of expert reports for civil cases

CIVIL ENGINEERING PROJECTS

Moorebank Interchange, Geotechnical Project Director

Was responsible for all geotechnical aspects of the remediation of the brown field defence site at Moorebank. This included site investigation, preparation of designs, implementation of the design and construction phase services.

Western Sydney Airport, Project Geotechnical Design Lead

Was responsible for the development of the geotechnical model, earthworks design and dam design for this project. In particular this required development of a bespoke specification for placement of over 20 million tonnes of fill to allow future development of the new airport.

M4E, Earthworks and Surface Works, Geotechnical Design Lead

Assisted the design team with the geotechnical inputs for the design of piled walls, cut and cover structures, temporary and permanent retaining walls and ground improvement works as part of the M4E project.

New England Highway Muswellbrook Bypass

Expert advice to TfNSW for the design of the section of the proposed New England Bypass overlying the old coal mine pit. In this area the mine back fill is over 50 m deep. The advice has needed to address the future settlements due to creep, spontaneous combustion and hydroconsolidation.

Pacific Complete, Northern NSW, Geotechnical Advisor

David worked together with Ben Rouvray in developing potential efficiencies for the implementation of TfNSW R44 Earthworks Specification with Pacific Complete to allow a more efficient delivery of that project.

New M5, Review of Effects of Tunnelling on Properties, Lead Investigator

Assisted the Contractor in assessing the effects of the surface and tunnelling works, including vibrations induced by the works on existing properties to allow the Contractor to address queries and manage its risk.

NorthConnex, - Principal Reviewer of Geotechnical Conditions Encountered During Tunnelling

David had a specific short term role in assisting the construction phase services team for this major tunnelling project in developing efficient and safe methods for assessing the ground conditions and required support. This site role included training of mappers to better understand and document the ground conditions.

Transmission Gully, NZ - Lead Earthworks and Ground Treatment Designer

David completed the design of the earthworks and preloading for a 2 km section of the new highway to be constructed on peat foundations. This included design of the preloading, wick drain spacing and monitoring instrumentation; assessment of short and long term stability; design of geogrids for stability purposes; review of monitoring during the works and confirmation of preloading periods.

ETTT Cutting Widening, - Lead Geotechnical Engineer

Assisted the Contractor in developing a sandstone cutting widening solution that allowed the widening whilst maintain live rail services within 5 m of the cutting.

Pacific Highway, Geotechnical Expert for Insurers

Provided expert geotechnical advice regarding failures and disputes for the loss adjuster and insurers associated with Pacific Highway works in Northern NSW. This included advice regarding the new Grafton bridge piles and abutments, instability of cuttings for the new Pacific Highway and culvert and pavement issues associated with the new works.

Investigation of Collapse of Old Pacific Highway, Piles Creek, Somersby, NSW Assistant Investigator

Was part of the geotechnical investigation team for this forensic investigation into the tragic culvert collapse at the Pacific Highway Somersby that resulted in multiple fatalities. The investigation work involved close liaison with other technical disciplines, including hydrology and durability, in assessing the cause of the collapse. The detailed investigations performed were endorsed by the coroner in delivering their findings on this culvert collapse.

Sydney Water Sewers, NSW - Principal Geotechnical Engineer

Performed and led a number of sewer tunnel inspection campaigns throughout Sydney's ageing underground sewer assets for Sydney Water. Work included consideration of tunnel access safety, maintenance, and assessment of remnant asset life.

Greystanes Estate Development - Greystanes, NSW

Undertook detailed quantitative risk analysis of existing rock batter in the vicinity of key Sydney Water infrastructure. He also managed the remediation of this old quarry for re-use as residential development. Three million cubic metres of fill was placed up to 25m depth. Key aspects of the advice included management of quarry batter stabilisation during performance of the earthworks. A significant volume of earthworks was required to be completed in order to satisfy a landform performance criteria.

Currawong Rock Fall - Currawong, NSW

Performed detailed assessment and quantitative risk analysis of the impact of rock falls on proposed development situated below high sandstone faces in Pittwater.

Earthworks for Various Industrial Developments - Western Sydney, NSW

Managed the preparations of earthworks specifications, working with the owners and contractors. This includes instructing and liaising with the geotechnical testing authority with regards to the testing and inspection requirements of the specification; undertaking an ongoing audit role during the earthworks to ensure work was being undertaken as per the specification and providing interim and final certification of the works.

Ancient Landslide - Castle Hill, NSW

Undertook detailed investigation, analysis, and assessment of an ancient landslide in Castle Hill, NSW. The result of the investigation, analysis and assessment was to allow development of the site without significant constraints. The work was peer reviewed by leading geotechnical consultants which agreed with the findings of the investigation.

Parramatta Rail Link, Sydney

Was part of the tunnel geotechnical supervision team that performed regular mapping and interrogation of geotechnical monitoring instrumentation in vicinity of the station cavern excavations.

Burnley Tunnel, Melbourne

Assisted the investigation and remedial design of tunnel wall distress.

Cronulla to Sutherland Rail Line Duplication, Sydney

Investigation and design to support this rail duplication project.

Cross City Tunnel, Sydney

Analysis and tunnel design.

Hanging Rock Power Station, Sutton Forrest

Due diligence geotechnical site investigation and advice.

RailCorp NSW

Site investigations and provision of geotechnical advice.

Bulky Goods Charmhaven Development, Sydney

Design of pile and panel retaining wall.

Meriton Apartments ACI Site Waterloo, Sydney

Site investigation, detailed analysis, and design of site specific raft and grout column solution for eight high rise buildings founded on poor ground.

Downer 275 kV Transmission Line – Blackwall to Belmont, Brisbane

Design of single pile foundations for laterally loaded power poles. Construction stage pile inspections.

Brisbane North South Tunnel, Brisbane

Planning stage design and advice.

Wentworth Road, Vaucluse

Geotechnical and environmental investigation and construction stage inspections and advice for major residential building including excavation works in Sydney eastern suburbs.

Sydney Water Sewers

Performed and led a number of sewer tunnel inspection campaigns throughout Sydney's ageing underground sewer assets for Sydney Water. Includes consideration of tunnel access safety, maintenance and remnant asset life.

Tallong Railway Dam

Geotechnical advice, dam break analysis and development of dam safety and emergency plan for a 100 year old brick dam in southern highlands of NSW.

Woolworths Balgowlah

Advice regarding groundwater inflows into basement below water table.

MINING INFRASTRUCTURE PROJECTS

Yallourn Mine, Morwell River Diversion

Responsible for the feasibility design of the Morwell River Diversion Closure Plan of the Yallourn Coal Mine in Victoria. This 4 km long water carrying infrastructure is built on variable ground impacted by the mining operations.

OTML, Ok Tedi Crusher Replacement Project

Geotechnical design of ground treatment for constructing a new crusher and processing plant on top of the old tailings dam at Ok Tedi mine in PNG.

Brockman 4 Mine, Rio Tinto Iron Ore, Pilbara WA

PSM provide prefeasibility, feasibility and design advice regarding earthworks and foundation associated with mine infrastructure plant such as the primary crusher, the ROM pad, the secondary crusher, the screening plant the stacker reclaimer, and the train load out area.

Griffin Coal Infrastructure and Haul Roads Investigation and Advice, Collie

Led the geotechnical team with the provision of investigations and advice to support the coal infrastructure and haul roads.

Peppertree Hard Rock Quarry, Infrastructure and Civil Works

Lead geotechnical engineer providing advice to this hard rock quarry development for infrastructure and civil works. In particular the development of a site specific earthworks specification enabled the client to maximise site won materials whilst ensuring that the earthworks performance satisfied the requirements of the quarry. This saved the client significant program and cost relative to importation and disposal of site won materials.

Kelian Equatorial Mining, Indonesia

Provision of advice for river diversion associated with mine closure plan for KEM.

Cumbo Creek Diversion, Wilpinjong Mine

Geotechnical advice for proposed creek duplication for coal mine in Upper Hunter.

Kanmantoo Tailings Dam – Tailings Storage Facility

Design of a tailings dam with final storage capacity of 20 million tonnes. Liaison with SA government departments for approval of design. Construction stage presence on site and certification of the works.

Gladstone Ports Corporation Limited

Analysis and geotechnical advice for coal stockpiles on soft ground.

SLOPE STABILITY PROJECTS FOR CIVIL AND MINING

Earnest Henry Mining, Cloncurry, Queensland

Provided mine geotechnical engineering services over an eight week period.

Ancient Landslide, Castle Hill

Undertook detailed investigation, analysis and assessment of an ancient landslide in Castle Hill, NSW. The result of the investigation, analysis and assessment was to allow development of the site without significant constraints. The work was peer reviewed by three (3) leading geotechnical consultants which agreed with the findings of the investigation.

Jacks Gully, Spring Farm

Assessment of slopes and provision of targeted advice for remediation works.

Greystanes SEL, Hard Rock Batters

Details quantitative risk analysis of existing batters including areas directly below major Sydney Water infrastructure with the intention to allow development with minimum requirements for remediation.

Currawong – rock fall

Detailed assessment and quantitative risk analysis of impact of rock falls on proposed development at below high sandstone faces in Pittwater.

Burrinjuck Dam – rock slide assessment

Response to major rock slides following a major storm event. Provision of immediate and long term advice regarding risk to persons and property.

INDUSTRIAL & RESIDENTIAL EARTHWORK PROJECTS

Minto, South Western Sydney

I have worked on multiple investigation and geotechnical design advice projects in the Minto area. This presented specific challenges relating to the presence of firm and soft alluvium in the old creek channels.

Eastern Creek, Sydney; Rydalmere, Sydney; Auburn, Sydney

PSM worked with the owner and contractor preparing a specification for the earthworks; instructing and liaising with the geotechnical testing authority with regards to the testing and inspection requirements of the specification; undertaking an ongoing audit role during the earthworks to ensure work was being undertaken as per the specification and providing interim and final certification of the works.

Winston Hills

Provided advice regarding earthworks specification, design and construction.

Erskine Park Walkers Industrial Development, Sydney

Provided advice regarding earthworks specification, design and construction.

Bakers Lane Industrial Estate

Geotechnical and salinity Investigation.

QUARRY & BRICK PIT REMEDIATION PROJECTS

Enfield Brick Pit

The project comprised filling of a clay and shale quarry with steep batters in the inner western suburbs of Sydney for future residential or light industrial development. The fill depths ranged up to 35 m. Fill placed 600,000 m3.

Boral Moorebank Estate Redevelopment, Sydney

The project comprised the remediation of the old Boral quarries for final use as residential development. Fill depths are up to 25 m. Fill placed 3,000,000 m3.

Boral Southern Employment Lands Greystanes, Sydney

The project comprises the remediation of the quarry for use as industrial/commercial development. Fill placed 3,000,000 m3.

Eastwood Brick Pit, Sydney

PSM completed an internal peer review of the Eastwood Brick Pit earthworks design by Coffey Geotechnics.

Niddrie Quarry, Melbourne

PSM provided expert advice to the contractor for litigation with respect to 2.4 million m3 filling of quarry for residential development.

Whisper Bay Project, Queensland

Dynamic compaction and filling strategy to remediate a backfilled water front quarry for use as prime residential land, Airlie Beach, Queensland.

Boral, Emu Plains Industrial Subdivision, Sydney

Assessment of likely subsurface conditions based on analysis of historical aerial photographs and advice regarding likely remediation requirements for various types of development.

Readymix, Orange Basalt Quarry

Advice regarding remediation for residential development of a basalt quarry, Orange NSW.

Eastwood Brick Pit, Sydney

Part of the team that completed an internal peer review of the Eastwood Brick Pit earthworks design by Coffey Geotechnics.

Niddrie Quarry, Victoria

Part of the team that provided expert advice to the contractor with respect to litigation concerning 2,400,000 m3 filling of a pre-existing quarry for residential development.

Boral, West Burleigh Quarry, NSW North Coast

Provision of planning stage advice regarding end of life quarry use.

Boral, Pine Mountain Quarry, Brisbane, Queensland

Provision of planning stage advice regarding end of life quarry use.

Donaldson Coal, NSW

Feasibility level assessment of the geotechnical issues and potential for future land use of the backfilled open pit mine, Hunter Valley.

Boral, Lawnton Quarry Residential Development, Brisbane, Queensland

Assessment of likely subsurface conditions based on analysis of historical aerial photographs and advice regarding likely remediation requirements for various types of development.

TAHE, Bombo Quarry, Kiama NSW

Advice for planning and rezoning related to the proposed redevelopment of Bombo Qquarry for future residential use.

FORENSIC ENGINEERING & EXPERT WITNESS WORK

Jordan Springs Subdivision

Provided expert advice regarded residential subdivision earthworks and their performance over a period of three years. Included understanding aspects earthworks, site classification, damage to dwellings due to foundation movements.

Hills of Gold, Wind Farm, Tamworth NSW

Expert advice to DPE NSW relating to the geotechnical and construction aspects of the proposed Hills of Gold Wind Farm, near Tamworth NSW.

Warner Lakes Subdivision, Queensland

Proved expert advice regarding earthworks completed at the subdivision and cause and effect of settlements on overlying development.

Moorebank, NSW

Provided expert advice regarding the potential causes of damage to residential dwellings founded on deep fill.

46 Willis St, Kingsford

Provided expert advice regarding the causes of damage to a dwelling due to the effects of piling and excavation in neighbouring lot.

O'Dea Avenue, Waterloo

Forensic investigation and expert advice to insurers regarding a failed retaining sheet pile wall in Botany Sands in Sydney.

Greens Square, NSW

Forensic investigation and expert advice for the City of Sydney relating to damage to their services and footpath caused by piling and excavation works in deep fill and sand.

Sydney Water Acquisition Camellia, NSW

Expert advice regarding geotechnical conditions at a large brownfield subdivision in Western Sydney to inform the land acquisition.

Groundwater Assessment Uhrig Rd, Lidcombe

Expert advice for City of Parramatta relating to the expected groundwater inflows into a deep basement excavation and relation to the approval documentations.

Warehouse Frank St, Wetherill Park

Forensic investigation of a highly deformed industrial warehouse to inform remediation and long term performance.

City of Sydney and Potts Point Development

Advised City of Sydney planners and lawyers with regards to geotechnical aspects of a proposed multistorey development in Potts Point to assist with the LEC proceedings.

Eraring Power Plant

Provided expert advice on excavatability and material reuse as part of a major contractual dispute.

AE&E Aust Pty Ltd vs Sino Iron Pty Ltd

Provided expert advice for contractual dispute on excavation.

Burnley Tunnel, Melbourne

Assisted the investigation and remedial design of tunnel wall distress.

Burnley Tunnel, Melbourne

Assisted the investigation and remedial design of tunnel wall distress.

Darwin East Arm Port – Wharf, Darwin

Assisted the investigations, design and monitoring for rectification works at this port development.

M2 Shaft

Assisted this major investigation into the cause of distress to the cut and cover tunnel located at the TBM launch shaft adjacent to the M2 Motorway. Given the shaft geometry, the tunnel was located at the base of a deep fill placed to backfill the shaft.

Piles Creek, Somersby

Was a member of the geotechnical investigation team for this forensic investigation into the tragic culvert collapse at the Pacific Highway Somersby that resulted in multiple fatalities. The detailed investigations performed were endorsed by the coroner in delivering their findings on this culvert collapse.

Hill Top – Rippability Dispute

Provided advice regarding rippability of sandstone for contractual dispute.

Dungog Hunter Water Reservoir – Rippability Dispute

Geotechnical Investigation of tank base rock conditions.

Karrara Iron Ore Port Train Unloader

Provided advice to the asset owner on a construction stage earthworks failure associated with dewatering and investigations for the development of this train unloader facility.

Port Waratah Train Unloader

Provided expert advice to the asset owner on a construction stage failure associated with jet grout plug construction.

DAM SAFETY

OTML Ok Tedi, PNG

Review of dam design by others at Ok Tedi goldmine in PNG.

Dam safety inspections Illalong Dam, Illalong, NSW

- Mulwaree Ponds, Goulburn, NSW
- Tallong Dam, Southern Highlands, NSW
- Widemere East Detention Basin, Greystanes NSW

Dam safety reviews for referable dams

- Tallong Dam, Southern Highlands, NSW
- Widemere East Detention Basin, Greystanes NSW

Failure Impact Assessments for potentially referable dams

- Tallong Dam, Southern Highlands, NSW

Engineering design and construction services for dams and associated infrastructure

- Tallong Dam, Southern Highlands, NSW
- Widemere East Detention Basin, Greystanes NSW
- Peppertree Quarry Dam, Marulan South, NSW
- Warragamba Dam, PMF Erosion Assessment
- Glennies Creek Dam, NSW, Risk Assessment
- Kanmantoo, Tailings Storage Facility, Design and Construction
- Burrinjuck Dam, Risk Assessment
- Kelian, Dam, Indonesia

Preparation and review of emergency action plans for referable dams

- Tallong Dam, Southern Highlands, NSW

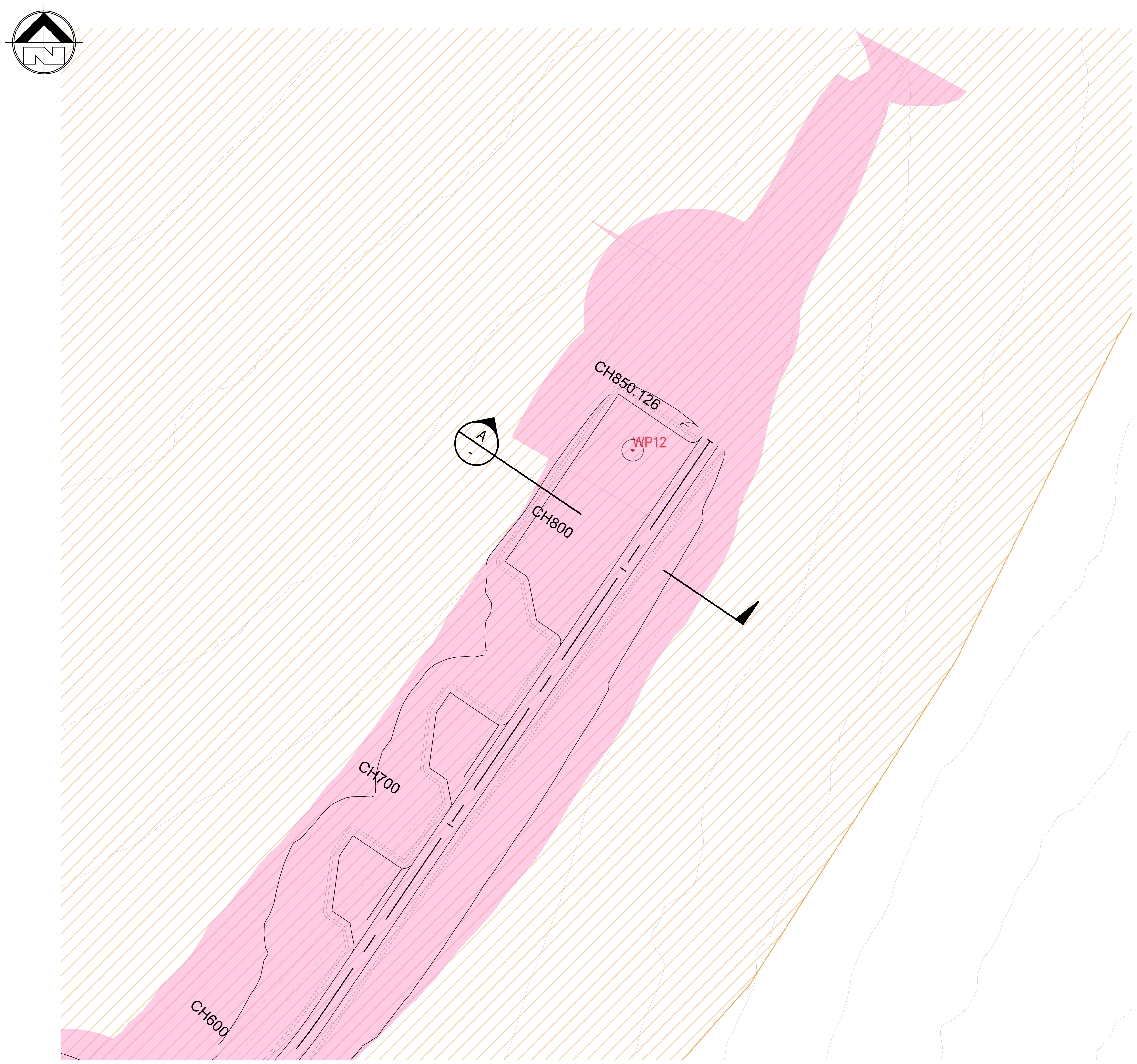
Associated drafting and GIS activities, including inundation mapping

- Tallong Dam, Southern Highlands, NSW
- Widemere East Detention Basin, Greystanes NSW
- Peppertree Quarry Dam, Marulan South, NSW
- Warragamba Dam, PMF Erosion Assessment,
- Glennies Creek Dam, NSW, Risk Assessment
- Kanmantoo, Tailings Storage Facility, Design and Construction

Publications, Articles and Patents

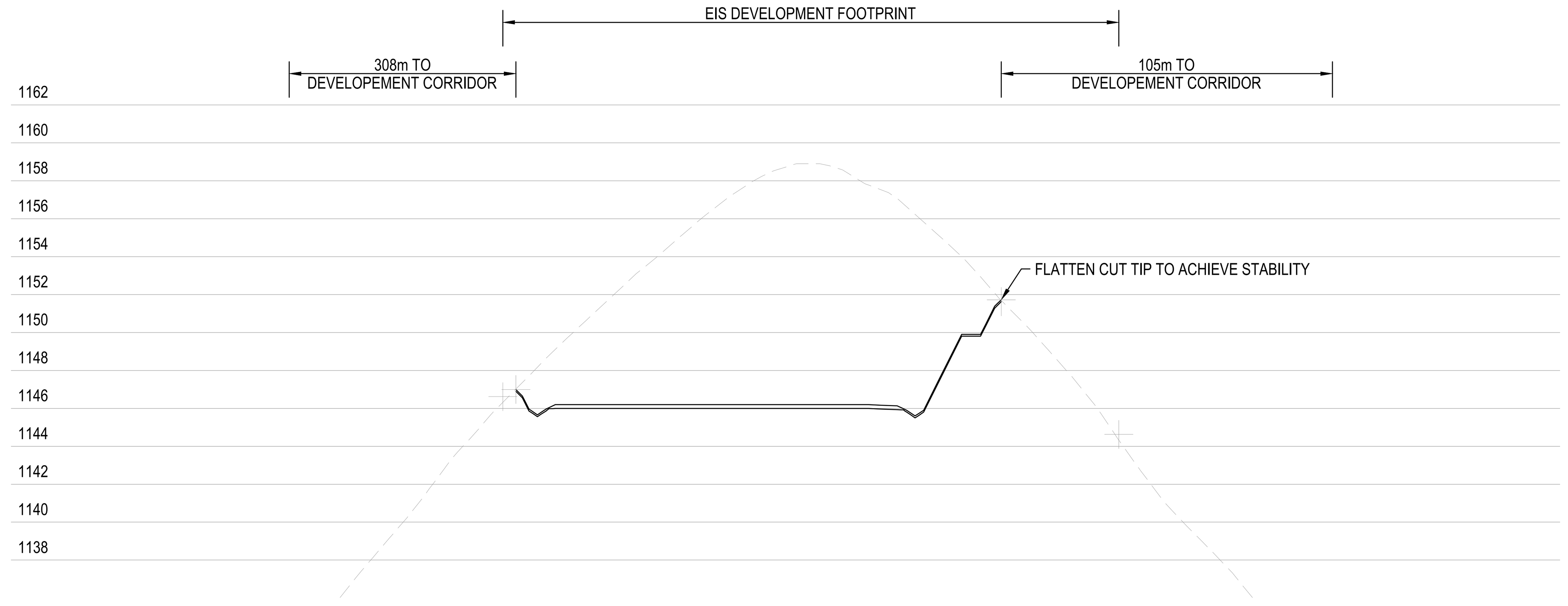
1. PICCOLO, D AND MOSTYN, G. (2006). Engineering Issues relating to filling of deep pits for residential and light industrial development. Australia New Zealand Young Geotechnical Professionals Conference, 18-21 October 2006, Adelaide, South Australia, pp 168-173.
2. B. C. BURMAN, G. MOSTYN AND PICCOLO D. (2008). Experiences with post-construction retesting of engineered clay fills. Australian Geomechanics, No 43, December, 2008, pp 1-29.
3. PICCOLO D. (2009). A new correlation between □’r of soils and index parameters based on multiple non linear regressions. Fourth international Young Geotechnical Engineers Conference, Alexandria, Egypt, Proceedings (2009).
4. PICCOLO, D. AND MOSTYN, G. (2011). Quantitative Risk Assessment for Urban Redevelopment Adjacent to Quarry Slopes. Australian Geomechanics. Landslide Risk Management Roadshow 2011 National Seminar Series. Vol 46 No 2 June 2011, pp 15-40.
5. BISHOP, D.T., FITYUS, S., PICCOLO, D., MOSTYN G. (2014). Rock fall case study: Hawkesbury Sandstone. Australian Geomechanics Vol 49 No 1 Month 2014.
6. PICCOLO, D. & MOSTYN G. (2015). Earthworks: If stiffness is important specify and test for it. Australian Centre for Geomechanics, Perth.
7. PiCCOLO, D., SWARBRICK, G., MOSTYN, G., HUTCHISON, B. BRINKMANN, R. (2016) Kanmantoo Tailings Storage Facility (TSF) – Optimising the design, construction and operation of a fully HDPE lined tailings storage facility. ANCOLD Conference Adelaide 2016.
8. PICCOLO D, NASH T. AND MOSTYN G. (2017). Excavation and rockfall protection adjacent to live rail. Australian Geomechanics V52. No 2, June, pp45-58.
9. ROGAN A. C., PICCOLO D. AND MOSTYN G. (2018). Case Study: Impact of Jet Grouted Column Variability on a Base Block in Sand. Proceedings of the 12th Australian and New Zealand Young Geotechnical Professionals Conference, Hobart, November 2018.
10. PICCOLO, D. AND MOSTYN G. (2019). A cliff regression model to estimate the travel distance distribution of boulder falls and risk to persons and property downslope of the cliff, Sydney, Australia. 13th Australia New Zealand Conference on Geomechanics 2019.
11. PICCOLO D, MOSTYN G., AND SALIM A. (2019). A unified approach to earthworks for residential, industrial and commercial developments consistent with AS3798-2007, Australian Journal of Civil Engineering.

Appendix B
Additional information supplied by Applicant



WTG 12 - LAYOUT PLAN

SCALE 1:1000



WTG 12 - CROSS SECTION A

HORIZ. SCALE 1:500
VERT. SCALE 1:250

LEGEND

EXIST. CONTOURS (25m INTERVAL)

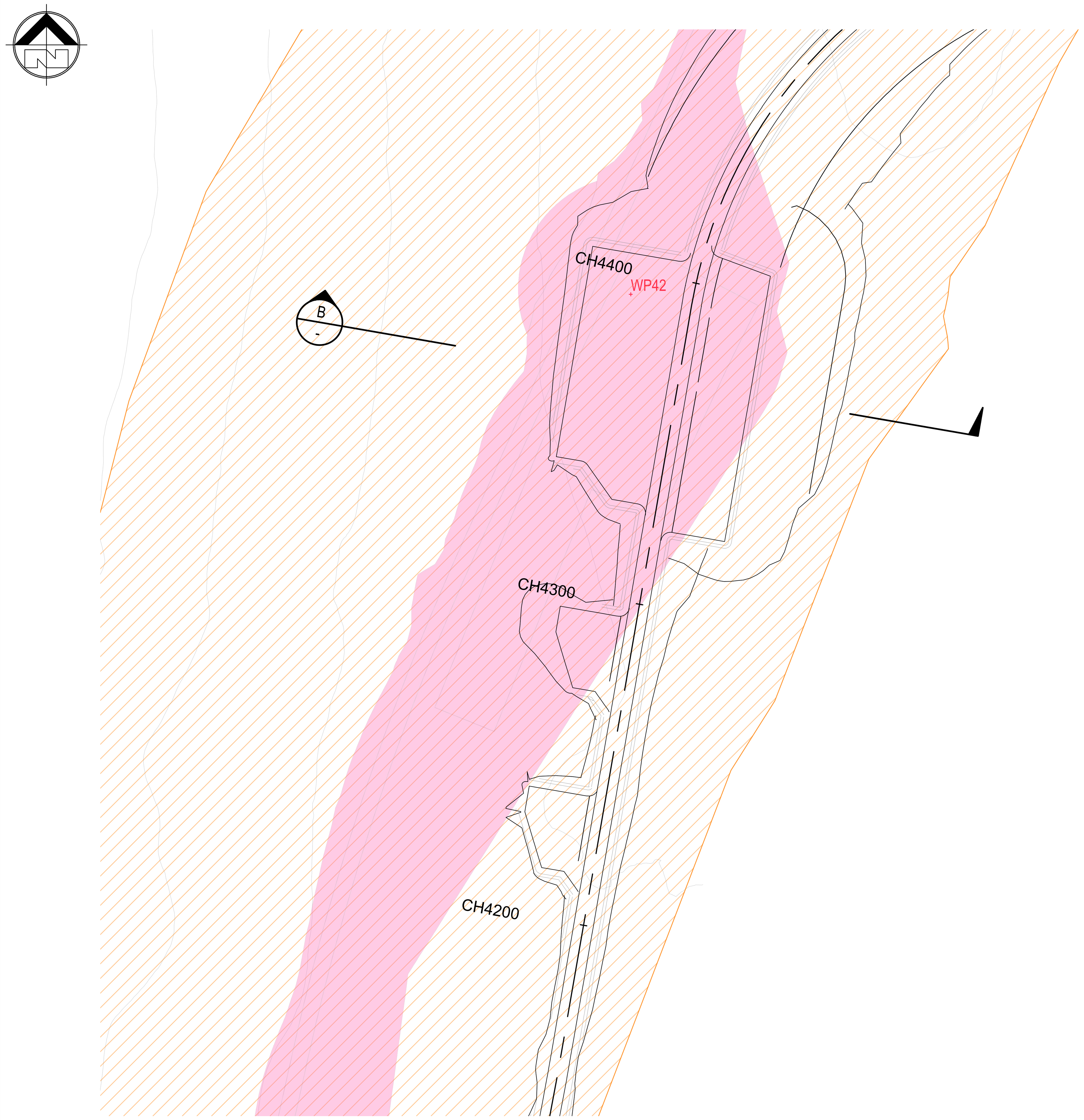
PROPOSED DEVELOPMENT CORRIDOR

EIS DEVELOPMENT FOOTPRINT

CONCEPT FOR INFORMATION ONLY

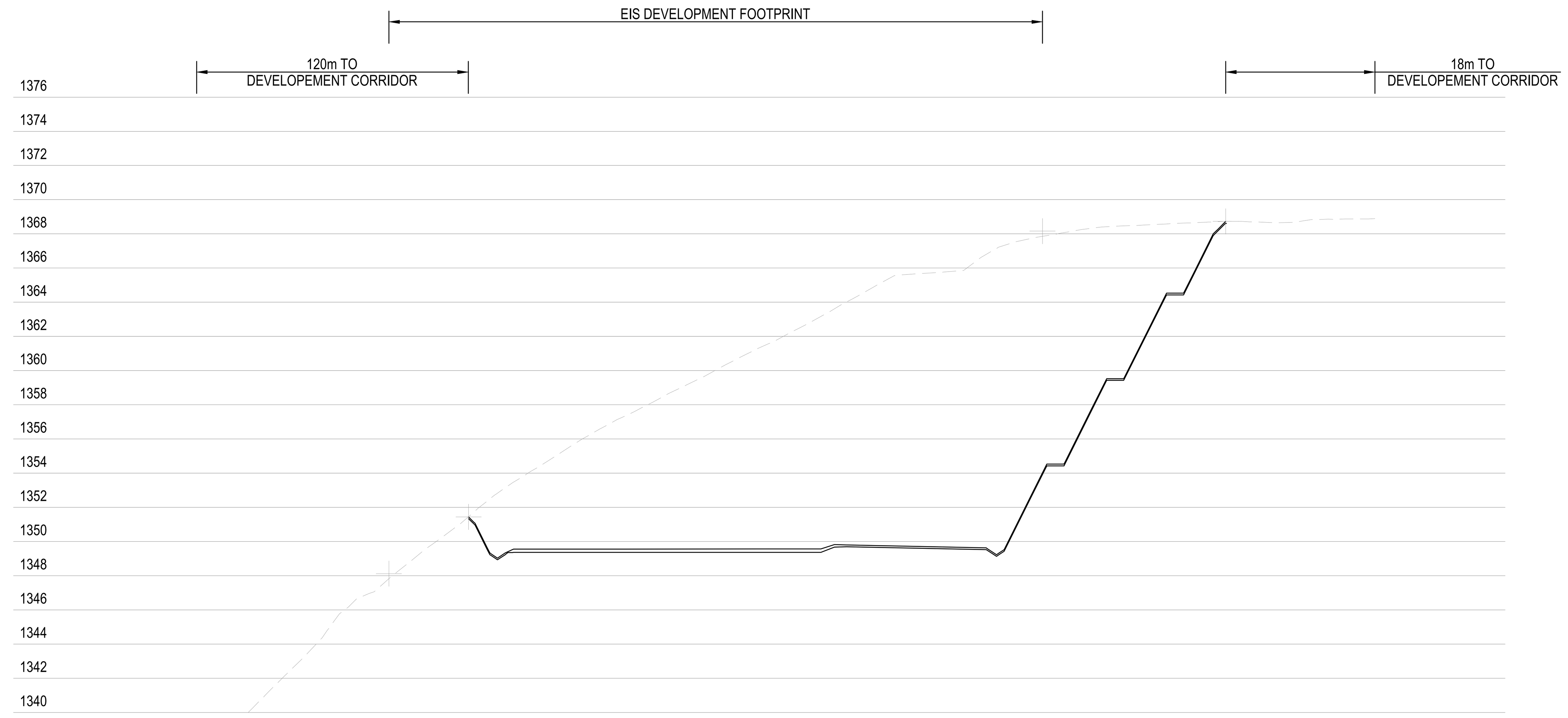
i3 consulting pty ltd
engineering consultants
innovation, ingenuity, inspiration

21-169 HILLS OF GOLD WIND FARM
WTG 12 - CROSS SECTION
30.11.2023 A.P.



WTG 42 - LAYOUT PLAN

SCALE 1:1000



WTG 42 - CROSS SECTION B

HORIZ. SCALE 1:500
VERT. SCALE 1:250

LEGEND

	EXIST. CONTOURS (25m INTERVAL)
	PROPOSED DEVELOPMENT CORRIDOR
	EIS DEVELOPMENT FOOTPRINT

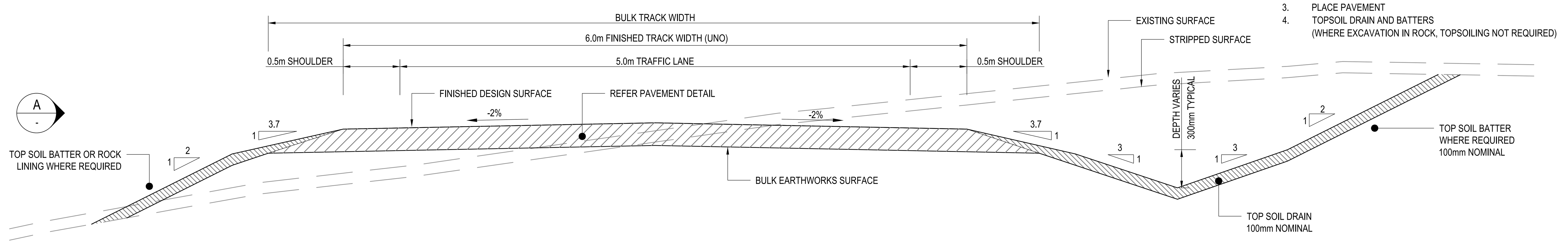
CONCEPT FOR INFORMATION ONLY

i3 consulting pty ltd
engineering consultants
innovation, ingenuity, inspiration

21-169 HILLS OF GOLD WIND FARM
WTG 42 - CROSS SECTION
30.11.2023 A.P.

TOPSOILED DRAIN ORDER

1. STRIP SURFACE
2. CUT BULK EARTHWORKS SURFACE
3. PLACE PAVEMENT
4. TOPSOIL DRAIN AND BATTERS (WHERE EXCAVATION IN ROCK, TOPSOILING NOT REQUIRED)

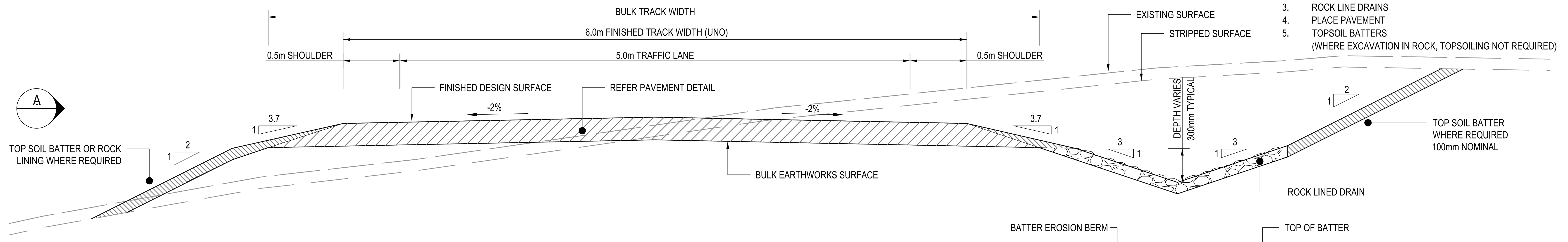


TYPICAL WIND FARM ACCESS TRACK CROSS SECTION - TOP SOIL DRAIN

NTS

ROCK LINED DRAIN ORDER

1. STRIP SURFACE
2. CUT BULK EARTHWORKS SURFACE
3. ROCK LINE DRAINS
4. PLACE PAVEMENT
5. TOPSOIL BATTERS (WHERE EXCAVATION IN ROCK, TOPSOILING NOT REQUIRED)



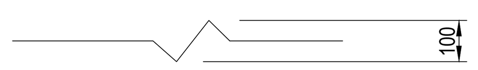
TYPICAL WIND FARM ACCESS TRACK CROSS SECTION - ROCK LINED DRAIN

NTS

ACCESS TRACK NOTES

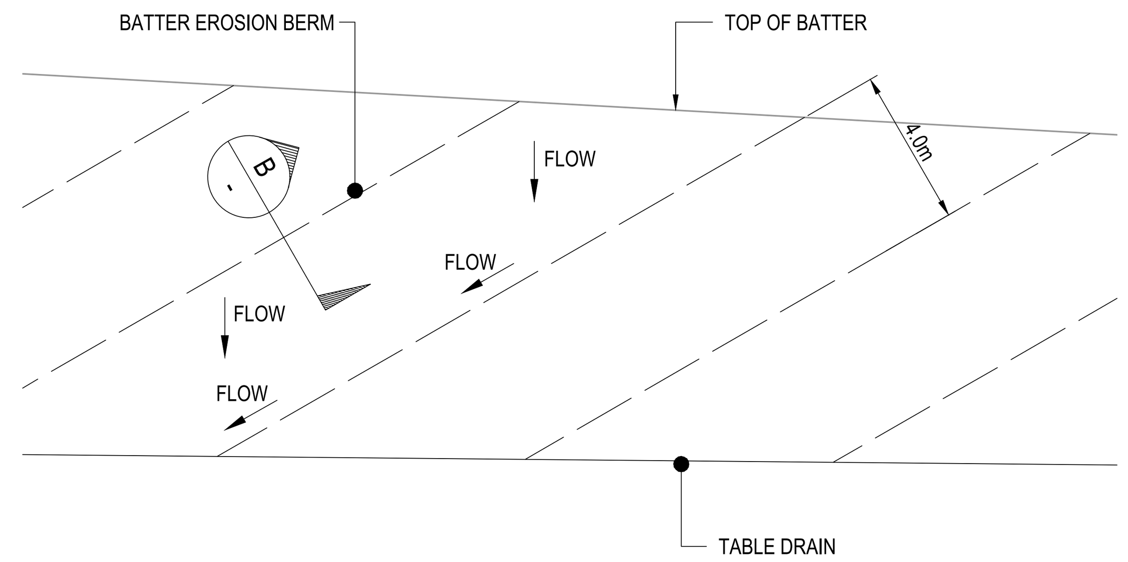
1. DRAIN TO BE TOP SOILED, ROCK LINED OR LEFT UN-TREATED AS REQUIRED. FINAL FINISH TO BE DETERMINED BY CONSULTING ENGINEER FOLLOWING GEOTECHNICAL BATTER STABILITY STUDY.
2. BATTERS TO BE TOP SOILED, ROCK LINED OR LEFT UN-TREATED AS REQUIRED. FINAL FINISH TO BE DETERMINED BY CONSULTING ENGINEER FOLLOWING GEOTECHNICAL BATTER STABILITY STUDY.
3. TRACK WIDTH 6.0m EXCEPT WHERE STRAIGHT SEGMENTS ARE IN A COMPLETE CUT ON BOTH SIDES.
4. CRANE MUST TRAVEL CENTRALLY ALONG TRACK.
5. ACCESS TRACK GEOMETRY ASSUMES LG1750 CRANE.

BATTER EROSION BERMS SHALL BE PROVIDED ON ALL CUT AND FILL BATTER



B BATTER EROSION BERM SECTION

NTS



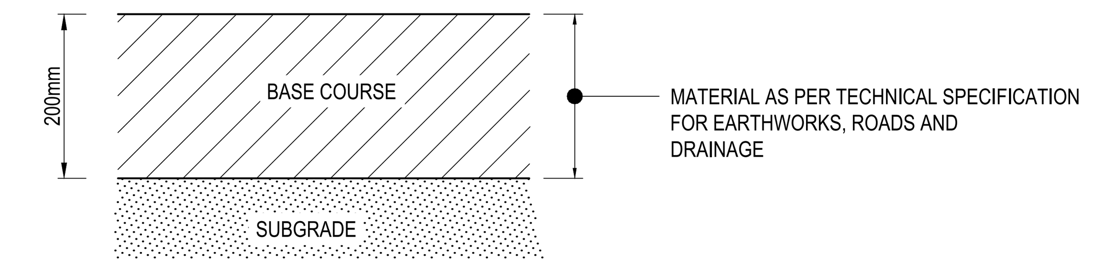
A BATTER EROSION BERM ELEVATION

NTS

PAVEMENT NOTES

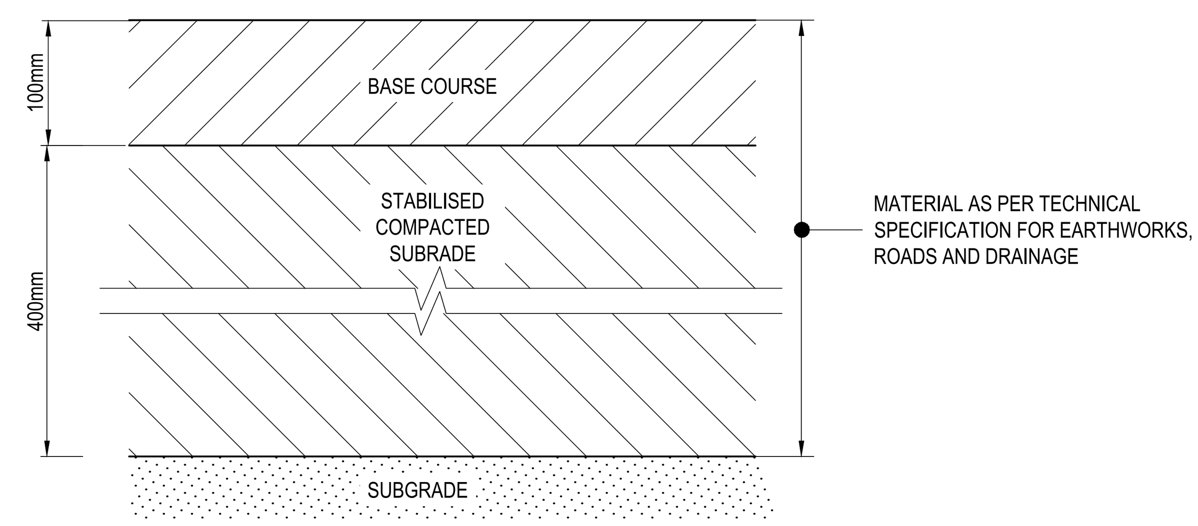
ALL PAVEMENTS ARE BASED ON A SOUND AND TRAFFICABLE SUBGRADE.
WET AND/ OR SOFT AREAS FAILING THE SUBGRADE PROOF ROLL TEST MAY REQUIRE SOME FORM OF SUBGRADE IMPROVEMENT.
THE DESIGN ENGINEER SHALL BE CONSULTED TO ASSESS OPTIONS SUCH AS;
- STABILISATION
- GEOTEXTILE STRENGTHENING
- COARSE ROCKFILL STRENGTHENING
- SUBGRADE REPLACEMENT

OR A COMBINATION OF ALL THESE OPTIONS.
SUBGRADE UNDRAINED SHEAR STRENGTH TO BE TBC OR BETTER.



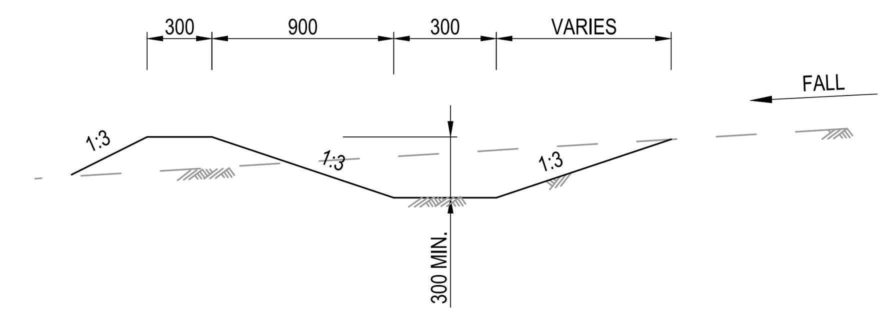
ACCESS TRACK PAVEMENT DETAILS

SUBJECT TO FINAL DESIGN BASED ON INSITU STRENGTH TESTING



ALTERNATIVE PAVEMENTS - STABILISED SUBGRADE DETAILS

SUBJECT TO FINAL DESIGN BASED ON INSITU STRENGTH TESTING



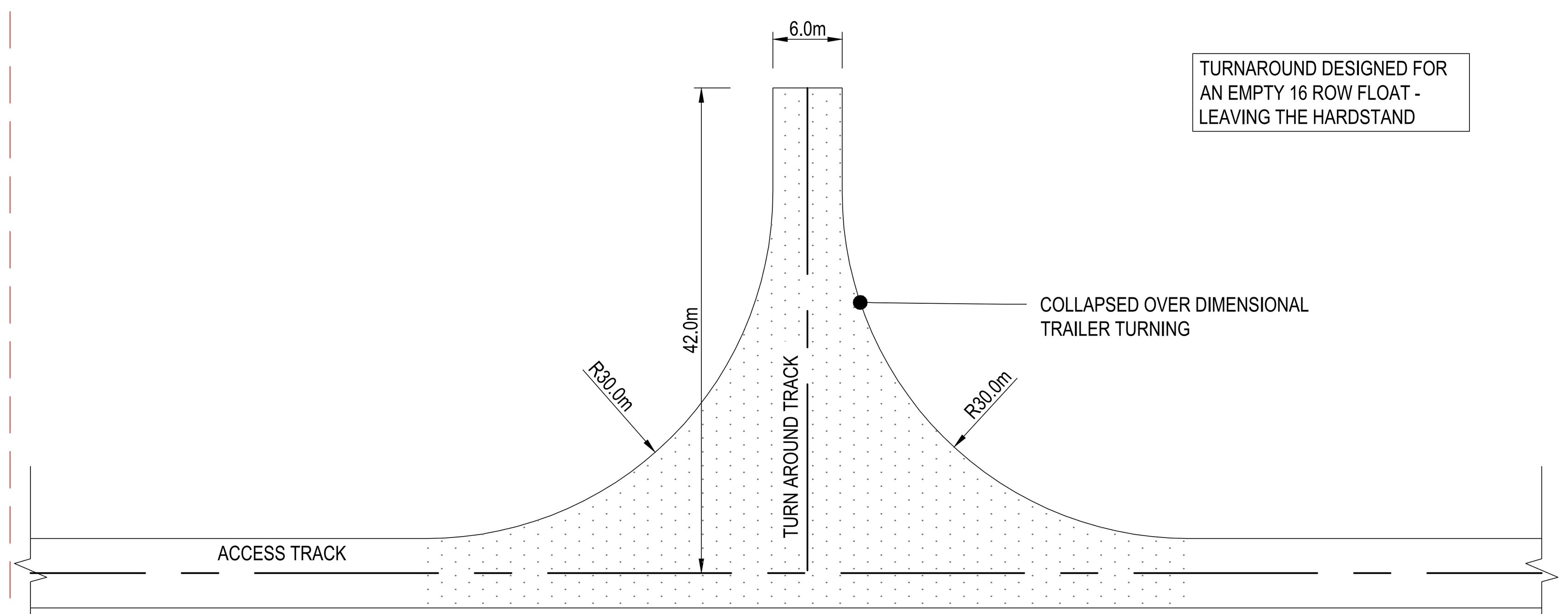
TYPICAL CUTOFF DRAIN DETAIL

NTS

CUTOFF DRAIN NOTE:
CUTOFF DRAINS SHALL BE CONSTRUCTED AT THE TOP OF CUT BATTERS TO DIVERT CLEAN UPSLOPE WATER AWAY FROM CUT BATTERS.

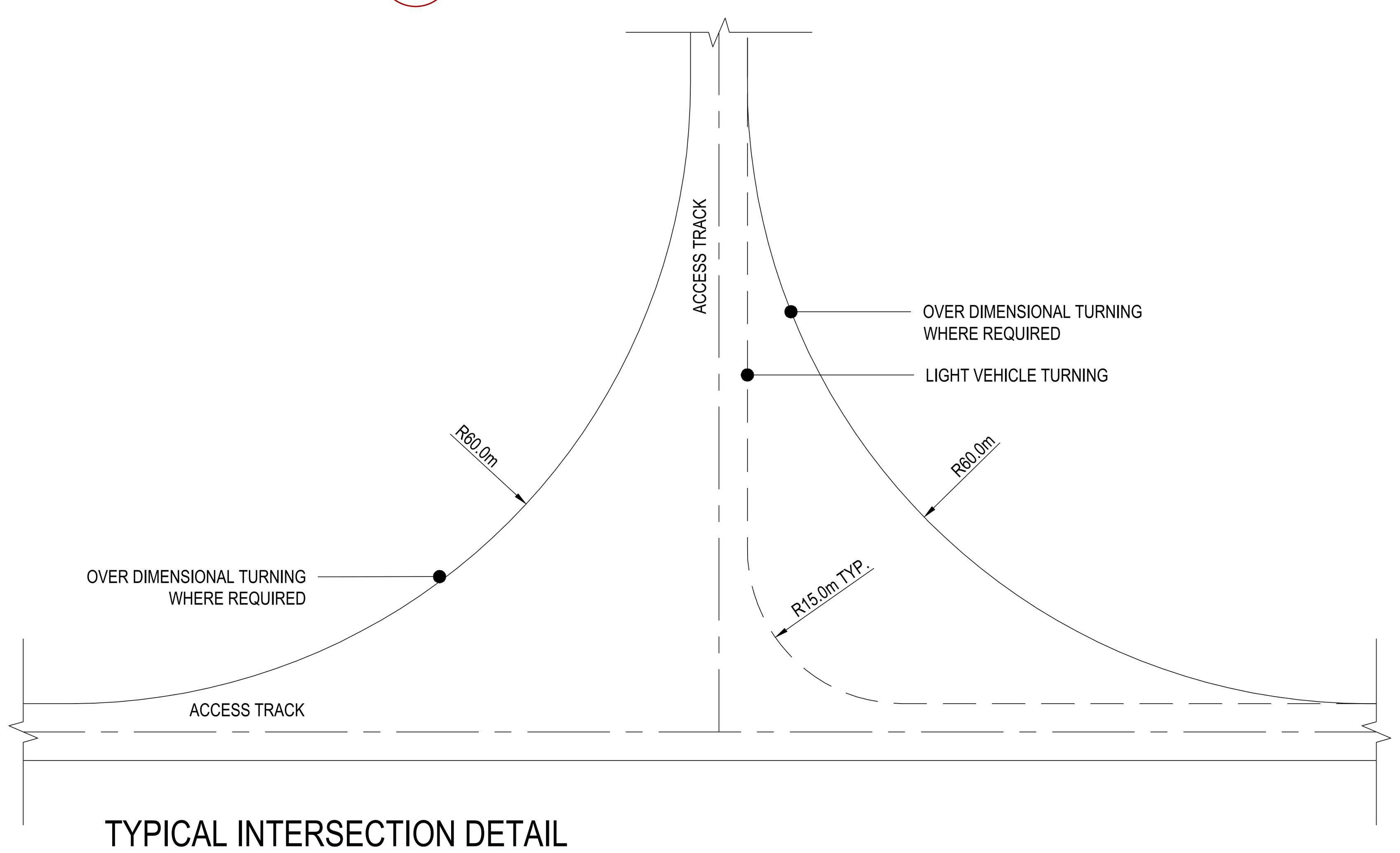
HOLD - PENDING VEHICLE GEOMETRY

TURNAROUND DESIGNED FOR AN EMPTY 16 ROW FLOAT - LEAVING THE HARDSTAND



TYPICAL HARDSTAND TURNAROUND DETAIL

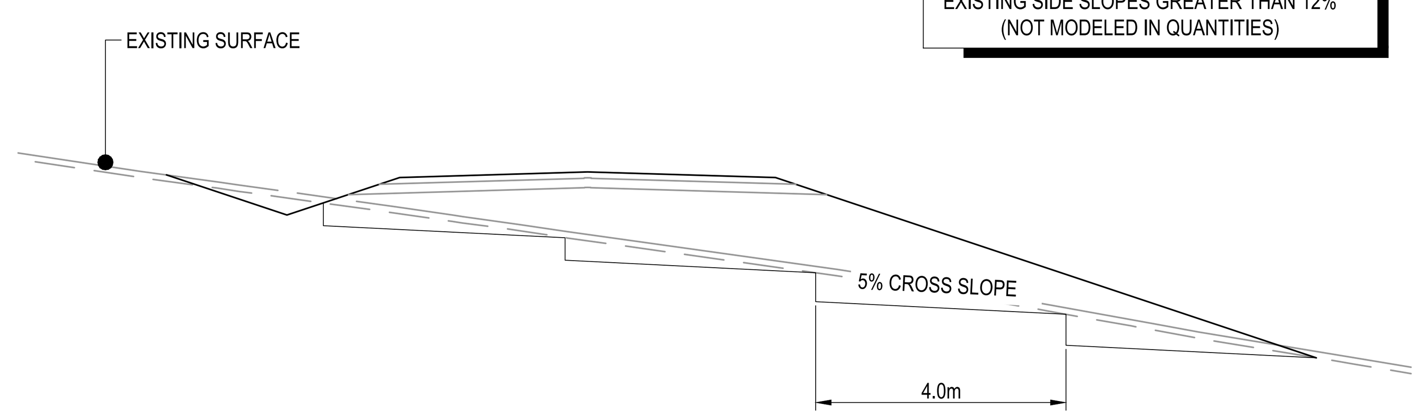
NTS



TYPICAL INTERSECTION DETAIL

NTS

FILL EMBANKMENT KEY IN DETAIL TO BE PROVIDED ON ALL FILL BATTERS WITH EXISTING SIDE SLOPES GREATER THAN 12% (NOT MODELED IN QUANTITIES)



TYPICAL EMBANKMENT FILL KEY DETAIL

NTS

FOR EARLY CONTRACTOR INVOLVEMENT

REFERENCE DRAWINGS		REVISION	DATE	REV	DESCRIPTION	BY	CONTRACTOR
			20.02.23	A.1	FOR REVIEW (TC-00XXXXX) ECI EARLY WORKS	CH	I3
DRAWING TITLE	DRAWING No.						

AusNet services

DRAWN C HAYWOOD
ENDORSED REV A
ENDORSED DATE
ISSUED

HILLS OF GOLD WIND FARM
TYPICAL ACCESS TRACK
LAYOUT, SECTIONS AND DETAILS
SHEET 1

Spec No Spec/Quote | Order No | Legacy No
Contractors No. Manuf No
Drawing No HGWF-SKETCH-1020-1 A

AusNet Services STD A1
561 X 801 A1
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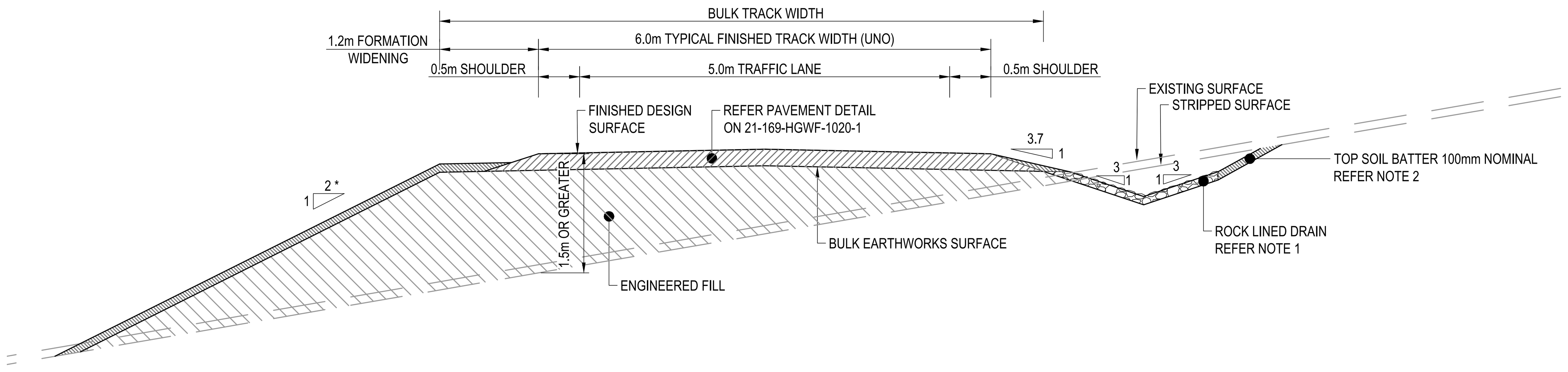
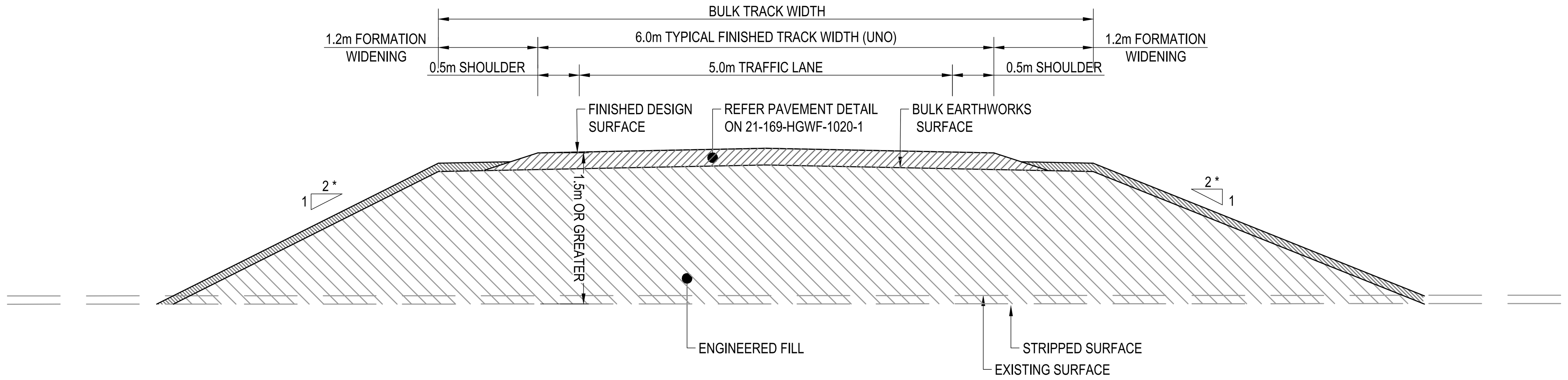
CUT OFF DRAINS TO BE INSTALLED AT THE TOP OF CUT BATTERS AS REQUIRED



TYPICAL WIND FARM ACCESS TRACK WIDENING - CROSS SECTION TYPE 1

NTS



TYPICAL WIND FARM ACCESS TRACK WIDENING - CROSS SECTION TYPE 2

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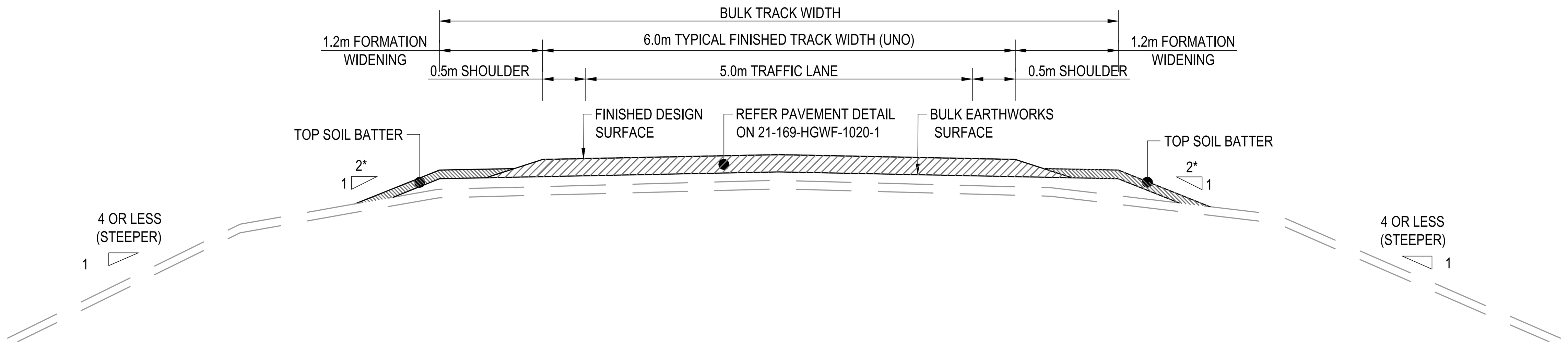

TYPICAL WIND FARM ACCESS TRACK WIDENING - CROSS SECTION TYPE 3

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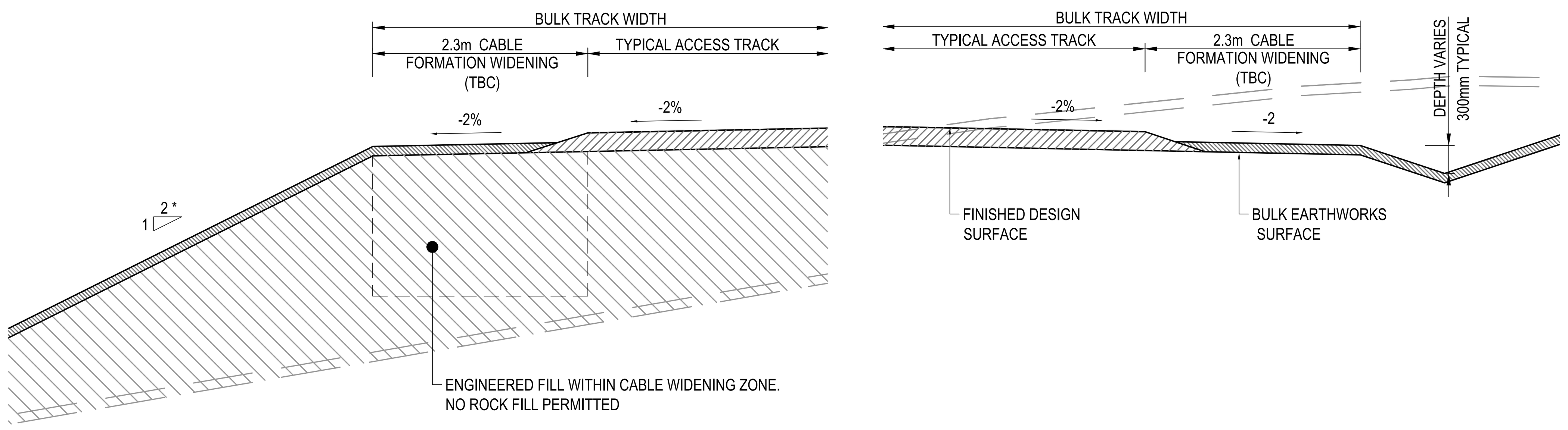
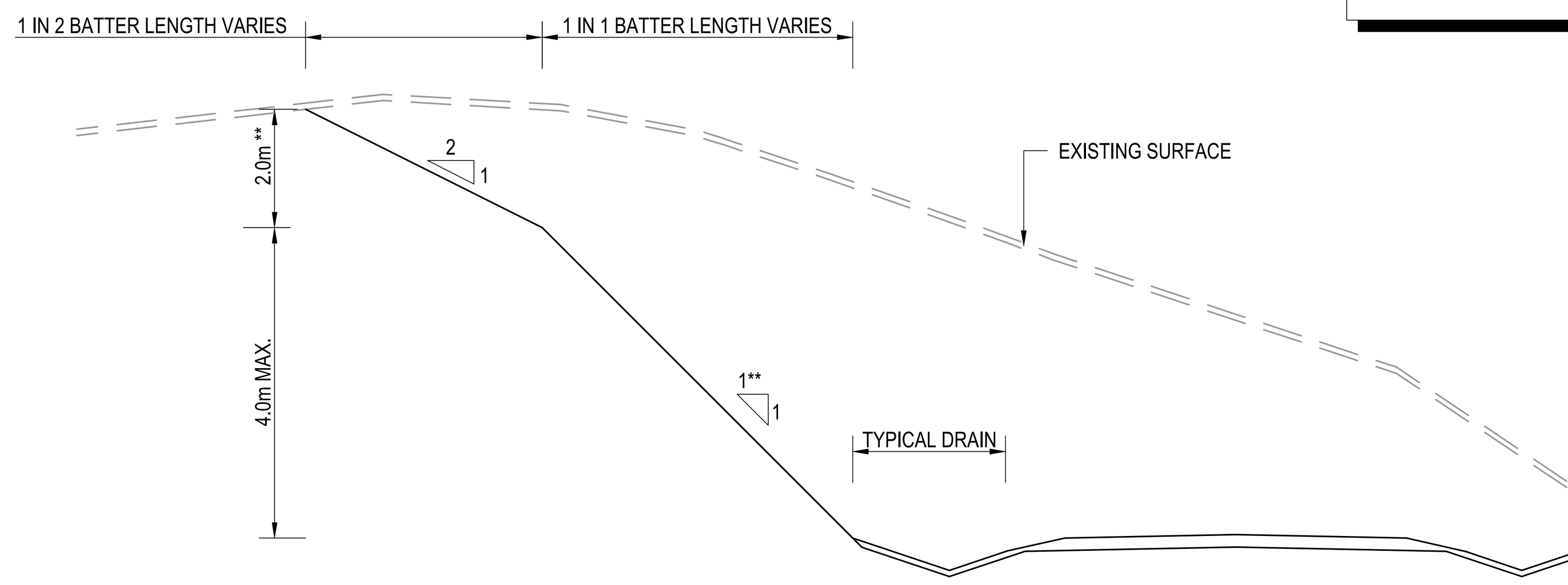


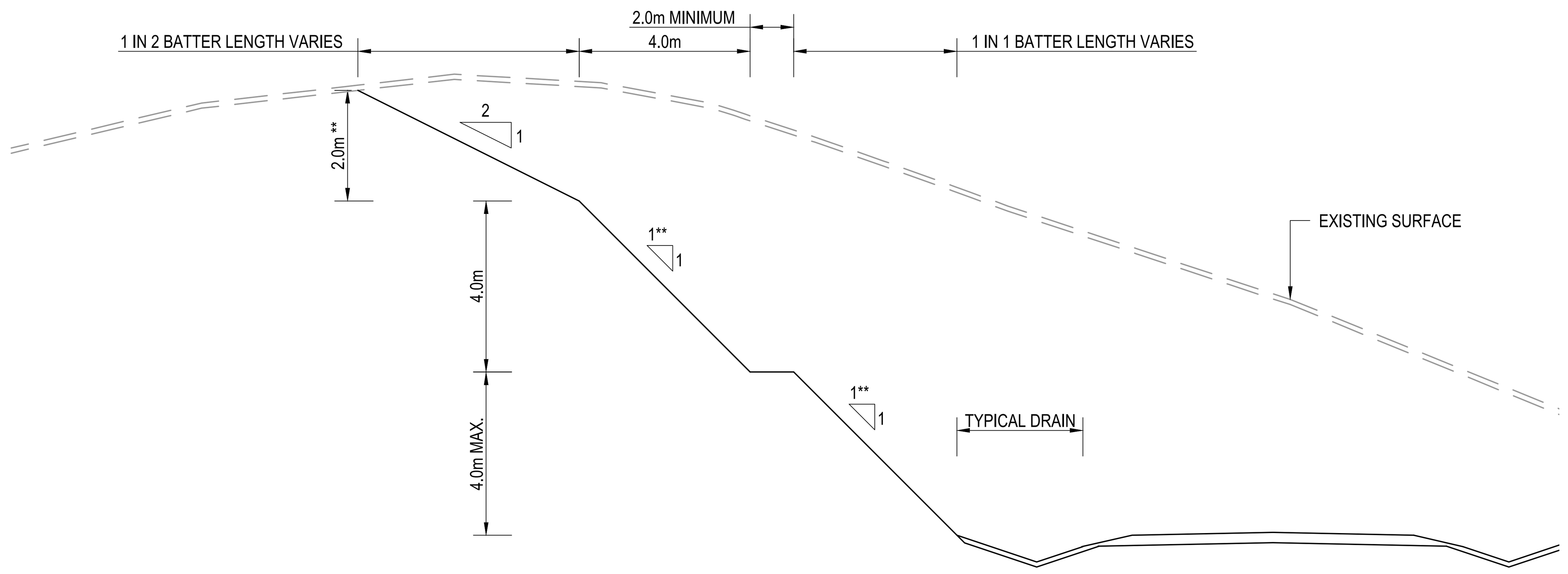
TYPICAL WIND FARM ACCESS TRACK WIDENING - CABLE IN ACCESS TRACK FORMATION

NTS



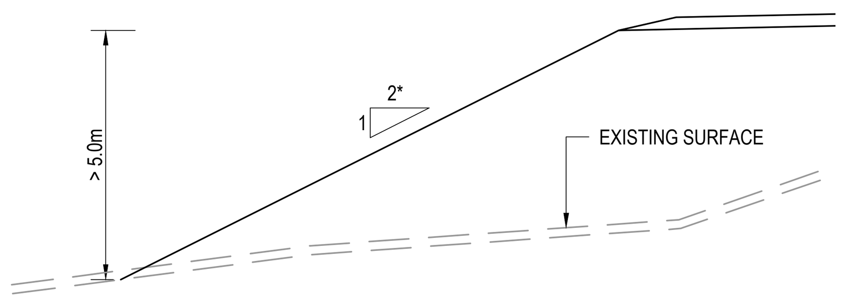
TYPICAL BATTER SECTION - BATTERS IN CUT GREATER THAN 2m DEPTH

NTS



TYPICAL BATTER SECTION - BATTERS IN CUT GREATER THAN 6m DEPTH

NTS



NOTE:
FILL BATTER DESIGN TO BE COMPLETED BY QUALIFIED GEOTECHNICAL PROFESSIONAL.

OPTIONS INCLUDE
1. RETAINING DESIGN
2. MECHANICALLY STABILISED EMBANKMENT
3. FLATTER BATTERS (E.G. 3H:1V)

TYPICAL BATTER SECTION - FILL FORMATION (HEIGHT > 5m)

NTS

ACCESS TRACK NOTES

1. DRAIN TO BE TOP SOILED, ROCK LINED OR LEFT UN-TREATED AS REQUIRED. FINAL FINISH TO BE DETERMINED BY CONSULTING ENGINEER FOLLOWING GEOTECHNICAL BATTER STABILITY STUDY.
2. BATTERS TO BE TOP SOILED, ROCK LINED OR LEFT UN-TREATED AS REQUIRED. FINAL FINISH TO BE DETERMINED BY CONSULTING ENGINEER FOLLOWING GEOTECHNICAL BATTER STABILITY STUDY.
3. TRACK WIDTH 6.0m EXCEPT WHERE STRAIGHT SEGMENTS ARE IN A COMPLETE CUT ON BOTH SIDES.
4. CRANE MUST TRAVEL CENTRALLY ALONG TRACK.
5. PARAMETERS FOR TRACK WIDENING ARE TYPICAL ONLY AND FINAL WIDENING IS AT THE DISCRETION OF THE DESIGNER AND ON SITE CONSULTING ENGINEERS.
6. SUBSOIL DRAINS TO BE INSTALLED ON AN AS NEEDS BASIS.

* FINAL BATTER SLOPE TO BE DETERMINED BY CONSULTING ENGINEER FOLLOWING GEOTECHNICAL BATTER STABILITY STUDY.

** FINAL CHANGE OF BATTER DEPTH TO BE DETERMINED BY CONSULTING ENGINEER FOLLOWING GEOTECHNICAL BATTER STABILITY STUDY.

FOR EARLY CONTRACTOR INVOLVEMENT

REFERENCE DRAWINGS		REVISION					
DRAWING TITLE	DRAWING No.		20.02.23	A.1	FOR REVIEW (TC-00XXXXX) ECI EARLY WORKS	CH	I3
			DATE	REV	DESCRIPTION	BY	CONTRACTOR

AusNet services

DRAWN C HAYWOOD

ENDORSED REV A

ENDORSED DATE

ISSUED

HILLS OF GOLD WIND FARM
TYPICAL ACCESS TRACK
LAYOUT, SECTIONS AND DETAILS
SHEET 2

Spec No / Spec/Quote — Order No. — Legacy No — Contractors No. / Manuf No

Drawing No HGWF-SKETCH-1020-2 A

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561 X 801 A1

[UNCONTROLLED WHEN PRINTED]

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