3. Geotechnical Assessment

HARDROCK GEOTECHNICAL
CONSULTING GEOTECHNICAL ENGINEERS

Geotechnical Desktop Study

Wimmera Plain Energy Facility

Henty Highway, Jung VIC

File No: 191537/1

Date: 14 April 2020

Client: BayWa r.e
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Distribution: - BayWa r.e

Introduction

A desktop study was undertaken to provide an initial geotechnical assessment of the proposed Wimmera Plain Energy Facility site. Relevant geological maps were examined with the purpose of providing feasibility foundation and pavement advice for the proposed construction of the proposed 54 wind turbines.

Scope of the Study

The study is limited to a desk top review only.

The scope of this report is to provide comments on the anticipated foundation systems and pavement options, based on experience in the region and its geology, as interpreted from appropriate maps.

Site investigation work will be required to confirm the assumptions made in this report and for any design purpose.

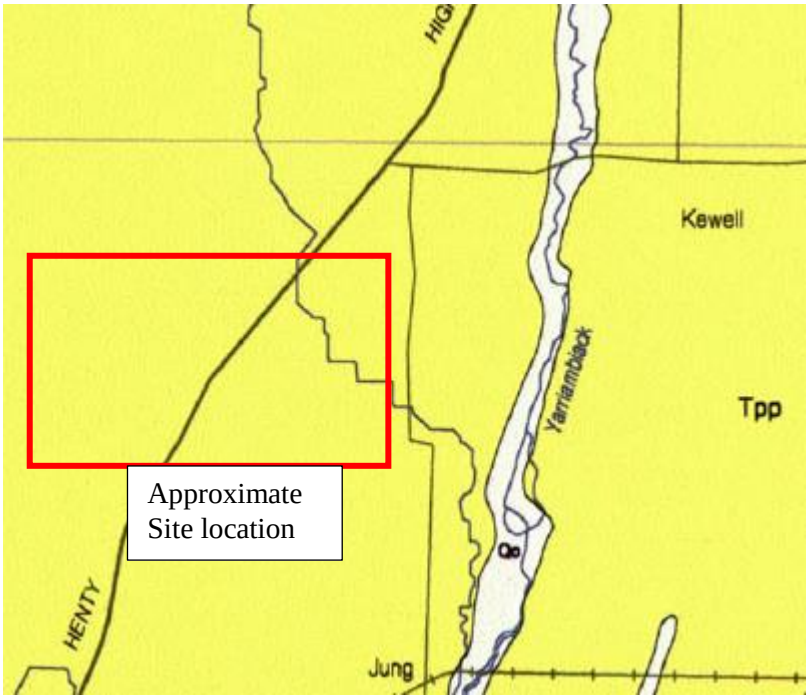
Site Description

The site is located along the Henty Highway approximately 20km north-north east of Horsham, and approximately 7.50km west of Yarriambiack Creek. The site is currently used for agricultural purposes. Aerial images suggest the site has a ground cover of grasses.

Subsurface Conditions

Regional geology

The area of the proposed wind turbine development lies within the 'Geological Survey of Victoria' Horsham Sheet (1:250,000). The geology of the turbine site is identified on the geological map as lying within the Tertiary 'Parilla Sand' formation and comprises marine sands and silts.



Discussion

Anticipated subsurface conditions

The Tertiary 'Parilla Sand' formation is expected to be characterised by:

- Top soils comprising SILT and SAND to limited depths, underlain by;
- Moderately reactive CLAY grading to clayey SAND soils at depth.

The subsurface geology will need to be confirmed through direct sampling methods.

The regional groundwater table appears to be located at depths of between 20m to 50m with reference to Visualising Victoria's Groundwater (VVG), reference (1). Transient perched groundwater may form within the upper topsoils at shallow depths during the wetter months.

The regional groundwater regime would be investigated during a detailed geotechnical investigation, as necessary.

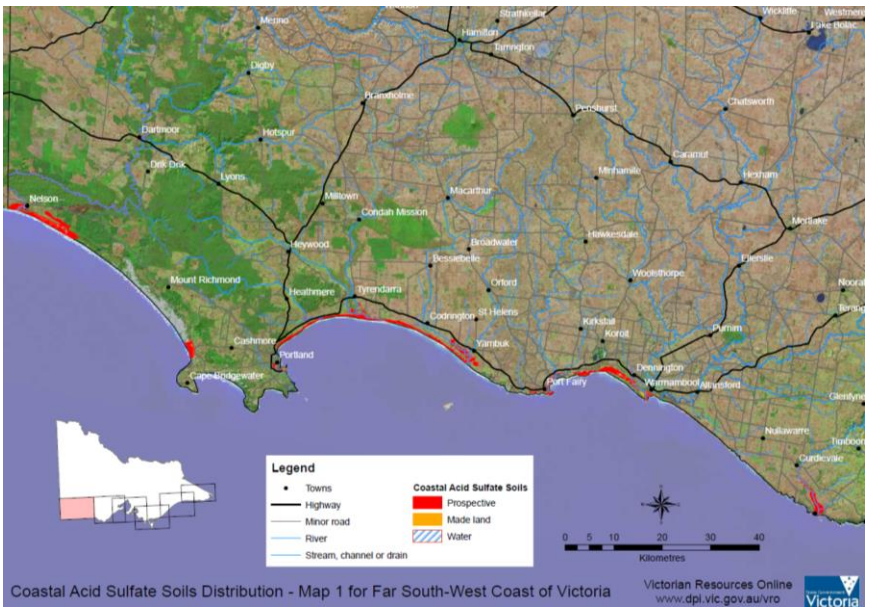
The geological setting is favourable in terms of interaction between the soil mass and groundwater regime.

Land Stability:

The site of the proposed windfarm within the Wimmera Plain. The wind farm is situated in an area of low relief will not have any effects on land stability.

Potential for acid sulphate soils:

Acid sulphate soils are naturally occurring soils which form under water logged conditions. Typically these occur on coastal margins. Distribution of coastal acid sulphate soils in south West Victoria is shown below. The proposed wind farm is located well outside the zone of coastal deposits.



Inland acid sulphate soils are much less common. An inland occurrence has been recorded to the west of Grampians National Park (referenced 1). No records were identified to be associated with Jung.

Potential for highly erodible soils.

Highly erodible soils are typically very fine grained and are characterised with high dispersivity. The site is within the geologic setting of the Tertiary 'Parilla Sand' formation comprising of marine sand and silt soils. These soils are too coarse grained to be dispersive.

Wind can cause soil erosion. Good construction practices can eliminate any risk of wind erosion and is common practice.

Foundation options

It is understood that loading conditions are relatively light for wind turbine structures, with overturning movements usually the critical loading condition in the order of 200kPa (peak edge pressures). The natural CLAY or clayey SAND soils should readily accommodate such loads.

It is expected that a mass pad footing will provide the most practicable foundation type for the structure.

Piled foundations would provide further alternatives to a conventional pad type footing, however the final foundation design will be based on economics with all alternatives providing a stable foundation.

At this stage, it is expected that no unusual difficulties will be associated with the construction of the wind turbine foundation.

Pavements

It is anticipated that access roads will be required for the construction of the wind farm facility and future maintenance.

Heavy construction vehicles and large cranes may be required during the construction period. Traffic frequency and loading conditions on access roads during construction may be high. However, post-construction traffic is likely to be low and comprise light vehicles for maintenance purposes only.

Subgrade properties within the region may range from poor to good. Some form of subgrade improvement or geo-reinforcement may be required. This could include in situ lime/cement stabilisation upon which the pavement is constructed or placement of a geo-fabric on the stripped surface upon which the pavement is constructed.

Conventional construction practices should be able to accommodate the ground conditions on site (evidenced by existing roads and pavements).

Report notes

This report contains information for the feasibility stage of the proposed development. Detailed geotechnical site investigation and reporting will be required for design purposes.

During the construction period, land may be disturbed and exposed to erosion. Erosion and sediment runoff can be minimised/controlled by adopting good construction practices referenced below (2), (3) and (4). Further information regarding geotechnical site investigation reports is referenced below (6).

Please contact us if you have further queries.

Yours faithfully,
Hard Rock Geotechnical Pty Ltd

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References

(1) Fawcett Jon, Rob Fitzpatrick, Rob Norton 2008. Inland Acid Sulfate Soils of The Spring Zones Across the Eastern Dundas Tableland, South Eastern Australia. In *Inland Acid Sulfate Soil Systems Across Australia* (Eds. Rob Fitzpatrick and Paul Shand). pp 268-280. CRC LEME Open File Report No. 249. (Thematic Volume) CRC LEME, Perth, Australia.

(2) Centre for eResearch and Digital Innovation, Federation University Australia, 2016. Visualising Victoria's Groundwater, http://www.vvg.org.au/, viewed 31 August 2016.

(3) Environment Protection Authority. 1996 *Environmental Guidelines for Major Construction Sites.* Best Practice Environmental Management.

(4) Environment Protection Authority. 1991 *Construction Techniques for Sediment Control.* Publication 275.

(5) Ransom, M.J., 1987: *Control of erosion on construction sites*. Department of Conservation Forests and Lands, Victoria

(6) Institution of Engineers, Australia. 1987. *Guidelines for the Provision of Geotechnical Information in Construction Contracts*, Institution of Engineers, Australia, 1987.