

Appendix E



REPORT

Delburn Wind Farm, Gippsland, Victoria

Desktop Assessment of Potential Geotechnical, Contaminated Land and Hydrogeological Impacts

Submitted to:

OSMI Australia

Level 3/150 Chestnut Street
Cremorne VIC 3121

Submitted by:

Golder Associates Pty Ltd

Building 7, Botanicca Corporate Park 570 – 588 Swan Street Richmond, Victoria 3121
Australia

+61 3 8862 3500

19130636-003-Rev0

16 July 2020



Executive Summary

Golder Associates Pty Ltd has been engaged by Delburn Wind Farm Pty. Ltd. (an OSMI Australia Pty Ltd Company) (OSMI) to undertake an assessment of potential geotechnical, contaminated land and hydrogeological impacts associated with the proposed Delburn Wind Farm (DWF) located in the vicinity of Delburn, about 5 km to south east of Moe in Victoria.

Relevant clauses within the state and local government planning policy framework that relate to potential geotechnical, contaminated land and hydrogeological impacts have been identified. These clauses generally relate to impacts of the proposed development to groundwater and surface water, landslide, erosion, acid sulfate soils, salinity and impacts to stone and coal resources. Impacts associated with each of these have been assessed based on a desktop study and site walkover survey.

The proposed wind farm development involves relatively shallow temporary excavations for wind turbine footings and trenches. These excavations will be backfilled in the permanent condition. It also involves the upgrade of existing unsealed tracks (mostly former logging tracks), the construction of some new lengths of access track to wind turbine locations and hardstands to support cranes at wind turbine locations.

The site typically comprises areas that are currently used for forestry purposes. Most of the terrain is an incised plateau, with low angle slopes at higher elevations and relatively steep slopes in the vicinity of water courses. The proposed wind farm straddles a surface water divide, draining towards the north west and south east, although the site itself is not within a designated catchment area.

Published information indicates that the eastern part of the site is underlain by Pliocene to Miocene age dense sands and hard clays of the Latrobe Valley Group with the western (and majority) of the site underlain by weathered Eocene age basalt of the Thorpdale Volcanics. The Thorpdale Volcanics weather to a high plasticity clay, which is expected to be encountered near the ground surface and to be encountered by the relatively shallow excavations proposed. The soils of the Thorpdale Volcanics are susceptible to landslide on slopes steeper than about 20°. However, none of the proposed wind turbines are to be located on ground susceptible to landslide.

The soils have minor susceptibility to erosion. Furthermore, given the long flow paths between wind turbine locations and watercourses, the potential for eroded soil to reach watercourses is low. Notwithstanding this, it is expected that erosion through construction could be managed through normal construction practices including wetting of soil to suppress dust, temporary silt barriers and drains. In the permanent condition, natural soils are expected to be capped with crushed rock or revegetated which will provide protection against erosion.

None of the proposed development is expected to encounter or disturb soils that are prone to salinity or that are potential acid sulfate soils.

Overall, the potential geotechnical, hydrogeological and contaminated land impacts associated with the project are either negligible or are expected to be manageable within the requirements of the relevant planning schemes using typical wind farm construction and operation techniques.

Additional investigation will be required to provide information to inform detailed design of the proposed wind farm. This information should be reviewed to confirm the indications of the desktop study on which this conclusion is based. If information is obtained which is contrary to the expectations arising from the desktop study, there may be a requirement to introduce additional mitigation measures. However, we expect that any measures required would comprise design and construction which is typical for wind farm developments of this type.

Table of Contents

1.0	ENGAGEMENT	1
2.0	BACKGROUND	1
2.1	Site description	1
2.2	Proposed Delburn Wind Farm	1
3.0	PLANNING POLICY FRAMEWORK	2
3.1	State level	2
3.2	Local level	3
3.2.1	Latrobe planning scheme	3
3.2.2	Baw Baw planning scheme	3
3.2.3	South Gippsland planning scheme	3
3.2.4	Summary of planning provisions assessed in this report	3
4.0	AIMS OF THE ASSESSMENT	4
5.0	METHODOLOGY	4
5.1	General	4
5.2	Documents reviewed	4
5.2.1	Historical information	4
5.2.2	Environmental Protection Authority database	4
5.2.3	Published geological information	4
5.3	Site walkover	5
6.0	IMPACT ASSESSMENT	5
6.1	Erosion and landslip	5
6.1.1	Summary of findings	5
6.1.2	Project implications	6
6.2	Surface water including catchments, rivers and waterways	7
6.2.1	Summary of findings	7
6.2.2	Project implications	7
6.3	Groundwater	7
6.3.1	Summary of findings	7
6.3.2	Project implications	8

6.4	Stone resources	8
6.4.1	Summary of findings	8
6.4.2	Implications for project	8
6.5	Natural hazards	8
6.5.1	Summary of findings	8
6.5.2	Implications for project	8
6.6	Dry land salinity	8
6.6.1	Summary of findings	8
6.6.2	Implications for project	10
6.7	Soil and groundwater contamination	10
6.7.1	Summary of findings	10
6.7.2	Implications for project	10
6.8	Acid sulfate soils	11
6.8.1	Summary of findings	11
6.8.2	Implications for project	11
6.9	Other impacts	11
6.9.1	Summary of findings	11
6.9.2	Implications for project	11
6.10	Future investigation	11
7.0	SUMMARY AND CONCLUSIONS	12
8.0	IMPORTANT INFORMATION.....	12

PLATES (in text)

Plate 1: Example of minor surface erosion, near proposed location of WTG T21, view towards east.	6
Plate 2: Moe Basin Salinity Province - Victorian Department of Environment and Primary Industries	10
Plate 3: Acid Sulfate Spoils Probability (CSIRO Australian Soil Resource Information System).....	11

FIGURES (attached)

Figure 1 – Site layout showing proposed turbine locations

Figure 2 – Geological Plan

Figure 3 – Inferred Landslide Susceptibility

Figure 4 – Depth to Groundwater and Registered Wells

Figure 5 – Groundwater Dependent Ecosystems

APPENDICES

APPENDIX A

Results of Desktop Study

APPENDIX B

Historical Aerial Photographs

APPENDIX C

Important Information Relating to This Report

1.0 ENGAGEMENT

Delburn Wind Farm Pty. Ltd. (an OSMI Australia Pty. Ltd. Company) (OSMI) has engaged Golder Associates Pty Ltd (Golder) to undertake an assessment of potential geotechnical, contaminated land and hydrogeological impacts associated with the proposed Delburn Wind Farm (DWF) in the Gippsland region of Victoria. This report specifically addresses impacts relevant to state and local government planning policy frameworks in the areas of geotechnical, contaminated land and hydrogeology. Impacts considered in this report include those associated with erosion, landslip, changes to surface water runoff, groundwater impacts, salinity, natural hazards and impact to known resources.

2.0 BACKGROUND

2.1 Site description

The proposed Delburn Wind Farm project area is located about 5 km to the south of Moe, with the windfarm centred around Delburn as indicated in Figure 1. The site has maximum dimensions of about 16 km (north-south) and 6 km (east-west) with a total area of about 4,900 ha. Most of the terrain on which the wind farm development is proposed is an incised plateau, with low angle slopes at higher elevations and relatively steep slopes in the vicinity of water courses. The proposed wind farm straddles a surface water divide, draining towards the north west and south east.

The project area is mostly used for forestry and comprises a mixture of vegetated and recently cleared forestry areas with some adjacent open paddocks. There is an existing quarry (Kennedy Haulage Quarry) located near the centre of the project area from which basalt materials are mined to produce crushed rock and select fill products. The Strzelecki Highway passes through the site and access within the site is provided by unsealed logging tracks off the Strzelecki Highway. There are several minor water courses within the area, including Silver Creek and Stony Creek which are tributaries to the Morwell River which runs to the east of the site.

2.2 Proposed Delburn Wind Farm

Based on information provided to us via OSMI, 33 wind turbine generators (WTGs) are currently proposed (Version 3.4) at the site along with associated infrastructure including access roads, hardstand areas, batching and laydown areas, monitoring masts, transmission infrastructure and a substation. Access to the site is expected to be via tracks branching off the Strzelecki Highway. The approximate locations of the proposed WTGs and associated infrastructure, based on the information provided to us by OSMI, are shown on Figure 1.

Elements of the construction and operation of the proposed DWF relevant to this assessment are expected to include:

- Wind turbine generator (WTG) foundations, which typically involve excavation to a depth of 2.0 m to 5.0 m below ground level, construction of the WTG footing and backfilling of material over the constructed WTG footing. WTG footing diameters can be up to 25 m in diameter for large turbines. Upon backfilling above the footing, topsoil is typically reinstated.
- The construction of hardstands to allow cranes to be set up for turbine construction. These are typically constructed from compacted crushed rock and remain in place after construction to allow cranes to be set up for undertaking future maintenance.

- The construction of access roads. These are typically unsealed access roads capped with crushed rock and remain in place to allow all weather access to turbine locations. Most of the proposed WTG access roads will be constructed by upgrading existing logging tracks. However, some new sections of track will also be constructed.
- The construction of buried power cables to connect the turbines to the substations. These involve the excavation of trenches, placement of the power cables and backfilling of the trenches.
- The construction of a substation and an operations and maintenance facility which are typically low rise structures supported on shallow foundations.

3.0 PLANNING POLICY FRAMEWORK

We have been provided with a memorandum prepared by Debra Butcher Consulting (DBC) (dated April 28, 2020) which sets out planning controls that are expected to apply to the proposed Wind Farm. The following extracts from the DBC report summarise planning controls relevant to geotechnical, hydrogeological and contaminated land aspects of the proposed development at both state and local government level.

3.1 State level

The following policies within the state level planning policy framework are relevant to geotechnical, hydrogeological and contaminated land aspects:

- Clause 12.03-1S River corridors, waterways, lakes and wetlands. The need to protect the environmental, cultural and landscape values of all water bodies and wetlands is recognised by this clause.
- Clause 13.01-1S Natural hazards and climate change. Seeks to identify at risk areas and consider those risks in planning and management decision making processes.
- Clause 13.04-2S Erosion and landslip. Seeks to prevent inappropriate development in unstable areas or areas prone to erosion.
- Clause 13.04-3S Salinity. Seeks to minimise the impact of salinity and rising water tables on land uses, buildings and infrastructure in rural and urban areas and areas of environmental significance.
- Clause 14.02-1S Catchment planning and management. Seeks to assist the protection and restoration of catchments, water bodies, groundwater and the marine environment including ensuring that development at or near waterways protects the environmental qualities of waterways and their instream uses. This includes the provision of appropriate setbacks to waterways.
- Clause 14.02-2S Water Quality. Seeks to ensure that land use activities are sited and designed to minimise discharge to waterways and to protect the quality of surface water and groundwater.
- Clause 14.03-1S Resource exploration and extraction. Amongst a range of strategies this clause seeks to protect the brown coal resource in Central Gippsland by ensuring that changes in use and development of land overlying coal resources do not compromise the winning or processing of coal.
- Clause 14.03-1R Resource exploration and extraction. This clause seeks to protect the Gippsland brown coal resource and associated buffer areas via a range of strategies including ensuring that development in coal resource areas does not compromise the existing or future use of the resource.

The Department of Environment, Land, Water and Planning (DELWP) has developed policy and planning guidelines for the development of wind energy facilities in Victoria: *Policy and Planning Guidelines for Development of Wind Energy Facilities in Victoria*, (March 2019). These guidelines have little to say regarding the geotechnical, hydrogeological and contaminated land requirements for a wind energy facility but provide that a permit application must be accompanied by a site and context analysis which accurately describes the site and surrounding area including 'any notable features, constraints and characteristics'. The guidelines note some examples of possible constraints 'e.g. acid sulphate soil, highly erodible soils and land instability'.

3.2 Local level

The proposed Delburn Wind Farm covers three local municipalities, Latrobe City, Baw Baw Shire and South Gippsland Shire. Relevant clauses from the local planning policy frameworks which are applicable to geotechnical, hydrogeological and contaminated land issues are set out below.

3.2.1 Latrobe planning scheme

Clause 21.05-17 Stone resources. Seeks to protect significant stone resources to ensure adequate future supplies. The clause refers to protecting areas as required by the Latrobe Area Extractive Industry Interest Areas Strategy 1999 and seeks to protect extractive industry sites by separating incompatible land uses.

3.2.2 Baw Baw planning scheme

Clause 21.06-4 Natural Resource Base. Seeks to ensure development proposals make a positive contribution to the environment in terms of soil stability, erosion, flood and drainage management and the retention of native vegetation.

3.2.3 South Gippsland planning scheme

Clause 21.01-2 Key issues. Amongst a range of key issues, this Clause identifies the need to manage development and land use to ensure that environmental and landscape values are maintained; the incidence of landslip and erosion (particularly within steep areas of the Strzelecki Ranges) flooding and drainage problems affecting parts of the Shire; the need to protect the character and significance of the coast line, and the need to promote and protect the strong agricultural base of the Shire.

3.2.4 Summary of planning provisions assessed in this report

Based on the planning provisions set out above, this report discusses the potential impacts of the proposed DWF and impacts to the proposed DWF from:

- Erosion and landslip.
- Surface water including catchments, rivers and waterways.
- Groundwater.
- Stone resources.
- Natural hazards.
- Dry land salinity.
- Soil and groundwater contamination.
- Acid sulfate soils.

4.0 AIMS OF THE ASSESSMENT

In accordance with our understanding of the state and local level planning provisions, the aims of the assessment are to provide information relevant to the requirements of the applicable planning schemes as follows:

- Assess the surface topography, surrounding land use and likely subsurface conditions at the site, relevant to the proposed DWF.
- Identify potential impacts on erosion and landslip and where appropriate indicate means by which potential impacts could be mitigated.
- Identify potential impacts on surface water, including catchments, rivers and water ways and where appropriate indicate means by which potential impacts could be mitigated.
- Identify potential impacts on groundwater, and where appropriate indicate means by which potential impacts could be mitigated.
- Identify the potential for the project to impact or be impacted by contaminated land, salinity and acid sulfate soils.
- Identify the potential for the project to impact or be impacted by natural hazards, including earthquake and landslide.
- Identify potential impacts on stone resources.

Please note that consideration of cultural heritage and biodiversity protection are outside the scope of this assessment.

5.0 METHODOLOGY

5.1 General

The assessment comprised a desktop study together with a site walkover undertaken by a principal engineering geologist. The results of the desktop study are set out in Appendix A. The information gathered in the desk study is called upon to inform the impact assessments described in Section 6.0.

5.2 Documents reviewed

As part of the desktop study relevant aspects of the following documents were reviewed.

5.2.1 Historical information

- Historical aerial photographs of the site from 1945, 1965 and the 1980s. The historical photographs reviewed are presented in Appendix B.

5.2.2 Environmental Protection Authority database

- EPA Environmental Audit database.
- EPA Priority Sites Register.
- Post Closure Pollution Abatement Notices.
- Victorian Landfill Register.

5.2.3 Published geological information

- Geological Survey of Victoria (GSV) 1:63,360 scale 'Mirboo North' mapsheet.

- CSIRO – ASRIS Acid Sulfate Soils Probability Maps.
- Victorian Salinity Provinces, Victorian Department of Environment and Primary Industries.

We also reviewed information on the Department of Economic Development, Jobs, Transport and Resources (DEDJTR) 'Geovic' and the Visualising Victoria's Groundwater (VVG) websites, and the results of investigations undertaken by the Kennedy Haulage quarry located near the centre of the site.

As part of the desktop study and site visit we spoke to Ross Kennedy of Kennedy Haulage quarries and were taken on a site visit to view rock and soil exposures within existing quarries. We were also provided with the results of boreholes drilled as part of resource exploration for the quarry.

5.3 Site walkover

The site walkover was performed on 22 October 2019 by a principal engineering geologist from Golder accompanied by Mr Peter Marriott of OSMI. During the walkover proposed WTG locations were visited and photographs taken of site features. Proposed WTG locations T02, T07, T21, T19, T27, T29, T30, T32 were visited. In addition, the Kennedy Haulage quarry was visited and a tour provided around the quarry site by the quarry management.

A description of observations made during the site walkover are presented in Appendix A.

6.0 IMPACT ASSESSMENT

Based on the information compiled from the desk study and site walkover (Appendix A), the following discusses the potential impacts associated with the proposed DWF along with measures that may be required to manage impacts and further investigation that is expected to be required to better understand the potential impacts.

6.1 Erosion and landslip

6.1.1 Summary of findings

Figure 2 presents the geological map for the site. Most of the proposed WTG locations are underlain by the Thorpdale Volcanics geological unit. The upper portions of the Thorpdale Volcanics are typically deeply weathered to a red-brown high plasticity clay (residual soils), which is characteristic of the Thorpdale area. This clay is susceptible to volume changes in response to moisture changes. The clay is expected to be underlain by basalt rock, however the depth to basalt can be highly variable.

The residual soils of the Unit 3 Thorpdale Volcanics are prone to landslides. Landslides can occur at relatively shallow slope angles, in some cases as low as 11°, however observations made during the site visit indicate recent landslide activity only on slopes steeper than about 20°, which generally occur in the vicinity of water courses. The Baw Baw Shire erosion management overlay (EMO) does not trigger a permit requirement where the natural slope is less than 1 in 5. One WTG, T24 is within the area subject to the EMO and given it is located on a slope of less than 1 in 5, does not trigger a permit application under the EMO. Figure 3 presents a map indicating areas susceptible to slope instability based on the identification of slopes that have an angle steeper than about 20° and assessment of where landslides have previously occurred.

The landslides identified appear to be relatively subdued and are interpreted not to have been active for hundreds, or perhaps thousands of years. Notwithstanding this, where a landslide has occurred in the past, there is potential for remobilisation if initiated through inappropriate earthworks or drainage management.

The site walkover identified minor evidence of erosion, similar to that indicated in Plate 1. However, this appeared to be an isolated example. The southern part of the area proposed for development (south of WTG T21) is affected by the South Gippsland Shire environmental significance overlay (ESO) which includes provisions to protect areas prone to erosion.



Plate 1: Example of minor surface erosion, near proposed location of WTG T27, view towards east.

6.1.2 Project implications

Based on the WTG layout, Version 3.4, none of the WTG locations currently proposed are within areas that we have identified as susceptible to landslide and there is no evidence to suggest that the proposed layout will change or impact upon the landslide risk in the vicinity of the project.

We recommend that any future revisions of the WTG layout continue to avoid the placement of WTG in landslide susceptible areas. If this cannot be avoided, a site specific study and landslide risk assessment will be required during detailed design of the wind farm to assess landslide risk and to inform the development of risk mitigation measures if appropriate.

Based on the low prevalence of erosion observed across the site, the susceptibility of the Thorpdale Volcanics to erosion is assessed to be low. Furthermore, most of the area is vegetated which significantly reduces the susceptibility to erosion. Where vegetation clearance is required as part of WTG construction, we expect that

erosion can be managed through normal construction and slope maintenance processes implemented in accordance with the following guidelines, noting that implementation of these guidelines is a requirement of the schedule to the South Gippsland environmental significance overlay:

- EPA Victoria Publication – Construction Techniques for Sediment Pollution Control, May 1991.
- Environment Guidelines for Major Construction Sites (EPA Victoria, February 1996).
- Control of Erosion on Construction sites, Soil Conservation Authority)

Relevant measures to manage erosion are likely to include including sheeting of unsealed roads with material of low dispersivity (crushed rock), temporary and permanent drainage temporary and silt barriers where there is a risk of erosion and sediment runoff from exposed soils, mulching and revegetation of areas temporarily cleared for construction purposes.

6.2 Surface water including catchments, rivers and waterways

6.2.1 Summary of findings

The GeoVic website indicates that the site is not located within a declared water supply catchment area. However, the Narracan Creek Catchment area is located within 1.2 km from the western site boundary.

The proposed WTG layout does not appear to directly impact upon surface water drainage courses or declared water supply catchment areas. Furthermore, drainage from the site is towards the north west and south east toward the Morwell River, generally away from the Narracan Creek Catchment.

6.2.2 Project implications

If uncontrolled erosion and sediment run off is allowed to occur at WTG sites, it is conceivable that sediment run off could impact upon surface water. However, the flow length for sediment to reach water courses from the proposed WTG locations is long, typically 100 m or more. With normal erosion control measures implemented in accordance with the guidelines referenced in Section 6.1.2 including capping roads and hardstand areas, the provision of drainage, temporary dust suppression and silt barriers during construction, we expect that erosion can be controlled and sediment retained such that the impact to surface water courses is negligible.

6.3 Groundwater

6.3.1 Summary of findings

Figure 4 presents the estimated depth to groundwater level expected at the proposed WTG locations and indicates that at the proposed WTG locations, the depth to groundwater is expected to generally be more than 10 m below ground surface. Excavations for WTG foundations are expected to be less than about 5.0 m depth and are not expected to encounter groundwater, although borehole investigation will be required at specific WTG locations in order to confirm this. Figure 5 presents groundwater dependent ecosystems. Note that none of the proposed WTG impact upon these areas. The project built elements are therefore not expected to impact groundwater.

There are existing groundwater wells within the vicinity of the project area from which groundwater is extracted, including for agriculture and for quarrying operations at the Kennedy Quarry. It is not known at this stage whether groundwater extraction will be undertaken to provide a source of water for this project.

However, there is precedent in the area for this. If groundwater extraction is proposed, further detailed assessment will be required at the specific well location proposed to assess the groundwater yields that could be achieved and the potential impact to groundwater systems and surface water receptors.

6.3.2 Project implications

The project is not expected to encounter groundwater and therefore not expected to have any influence on groundwater levels or quality.

6.4 Stone resources

6.4.1 Summary of findings

The operations at the Kennedy Quarry (location indicated in Figure 1) extract rock and soil from the Thorpdale Volcanics geological unit. Exploration boreholes provided by the Kennedy Quarry indicate there are potentially stone resources underlying the location of WTG T08. The desk study did not identify stone resources elsewhere within the proposed DWF area.

We have been provided with a proposal from Kennedy Haulage to supply quarry products to the proposed development. This indicates proposed work authority extensions intended to open areas for quarrying in order to source material supply for the proposed wind farm development. It is noted that these areas do not impact on the proposed WTG T08 location, which anecdotally we understand is because investigation has indicated the material expected to be present beneath the WTG T08 location is a lower quality resource compared to other areas.

6.4.2 Implications for project

There is a potential conflict between stone resource and WTG T08, whereby the construction of WTG08 may preclude access to stone resource over the time the WTG is in place.

6.5 Natural hazards

6.5.1 Summary of findings

Other than landslide the only natural hazard identified from the geotechnical desk study that could feasibly impact upon the project is earthquake. The Thorpdale area has a history of low magnitude earthquakes with earthquakes up to Magnitude 5.4 having occurred within about 3 km of the site based on indications of the GeoVic website.

6.5.2 Implications for project

The effects on structures of earthquakes of this magnitude are typically mitigated through engineering design using the methods set out in AS1170.4 – 2007 'Structural design actions Part 4: Earthquake actions in Australia'.

6.6 Dry land salinity

6.6.1 Summary of findings

An increase in the salt content within soils (dry land salinity) affects some areas of Australia. It occurs as a result of groundwater rising to near surface levels. Some soils within Australia have a naturally high salt content and groundwater rise can leach salts from within the soil, depositing them at higher levels in the soil profile causing impact to vegetation. Evaporation of groundwater can occur where groundwater is shallow or

discharging, which can concentrate salt in the soil if groundwater is saline. Groundwater rise can be triggered by the removal of vegetation and typically affects areas of Australia that have been cleared for agricultural purposes.

The proposed DWF area has a very low susceptibility dry land salinity for the following reasons:

- The Thorpdale Volcanics which cover most of the site are derived from volcanic eruption and have a low sodium and potassium content. Soils derived from deposition in saline water have a much higher susceptibility, however soils with this origin are not expected to underlie the proposed DWF.
- The project does not involve widespread vegetation clearance of the type that is known to trigger groundwater rise.
- Measured dissolved salt concentrations within the groundwater wells within the vicinity of the site are typically less than 1,000 mg/L, a level which is generally considered fresh water.
- Groundwater in area where WTGs are proposed is likely to be more than 10 m deep, and construction is not proposed in areas likely to receive groundwater discharge.
- The proposed DWF is not within a designated salinity province, with the nearest salinity province that of the Moe Basin as indicated in Plate 2. Furthermore, based on the Victorian Department of Environment and Primary Industries, there are no recorded instances of land salinity within the Moe Basin Salinity Province.
- No Salinity Management Overlay applies to the site under the planning scheme.

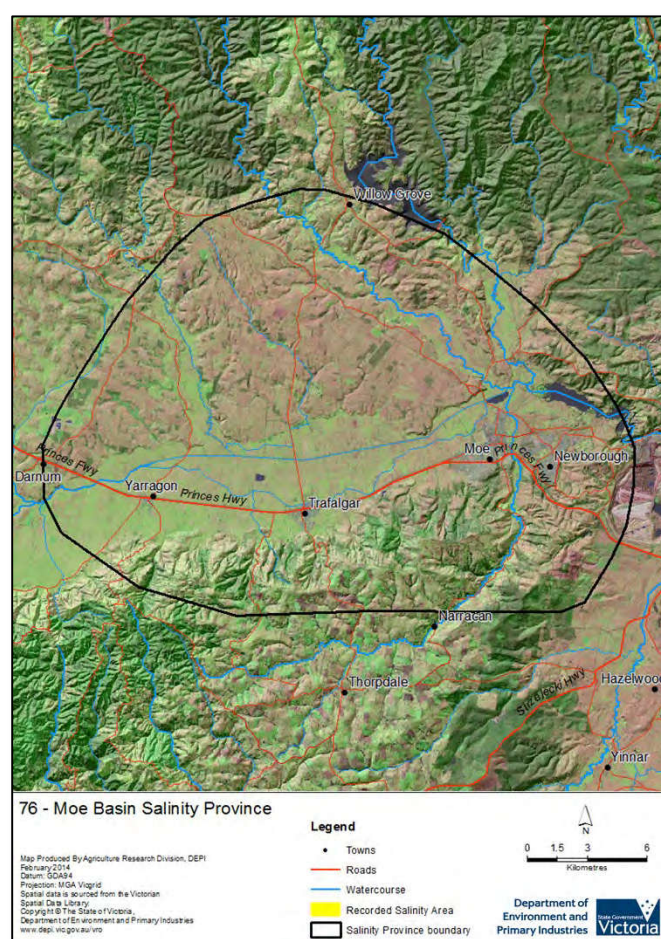


Plate 2: Moe Basin Salinity Province - Victorian Department of Environment and Primary Industries

6.6.2 Implications for project

The project is not expected to be impacted by or have an impact upon dry land salinity.

6.7 Soil and groundwater contamination

6.7.1 Summary of findings

The review of historical information has indicated that the risk of potential contamination of soil is likely to be low with a localised risk in the immediate vicinity of dwellings, farm sheds and disturbed areas. However, it is understood that the DWF development is not expected to involve construction near existing areas of residential or agricultural infrastructure, therefore the overall risk of soil contamination to the project is considered to be low.

6.7.2 Implications for project

Assuming the adoption of good construction practices such as erosion protection of exposed cut and fill batter slopes, drainage controls and the implementation of silt fences where required, erosion of cut and fill batters is not considered to be a significant issue for the proposed DWF taking into account the shallow site slopes. Consequently, the potential for contaminant migration, if contaminants are present at all is very low.

In the unlikely event that contaminated soil is encountered, it may need to be disposed of off-site at a facility licensed to accept the waste.

6.8 Acid sulfate soils

6.8.1 Summary of findings

The CSIRO Acid Sulfate Soils Probability map indicate generally a “low probability of occurrence” to “extremely low probability of occurrence” in the vicinity of the site. Discrete localised areas of “high probability of occurrence” are present in the vicinity of the site, but located near waterbodies outside of the extent of the proposed development. None of the proposed WTG sites are located within potential acid sulfate soils, and no potential acid sulfate soils are expected to be impacted by the project. Volcanic soils such as those of the Thorpdale Volcanics are not expected to be potential acid sulfate soils.

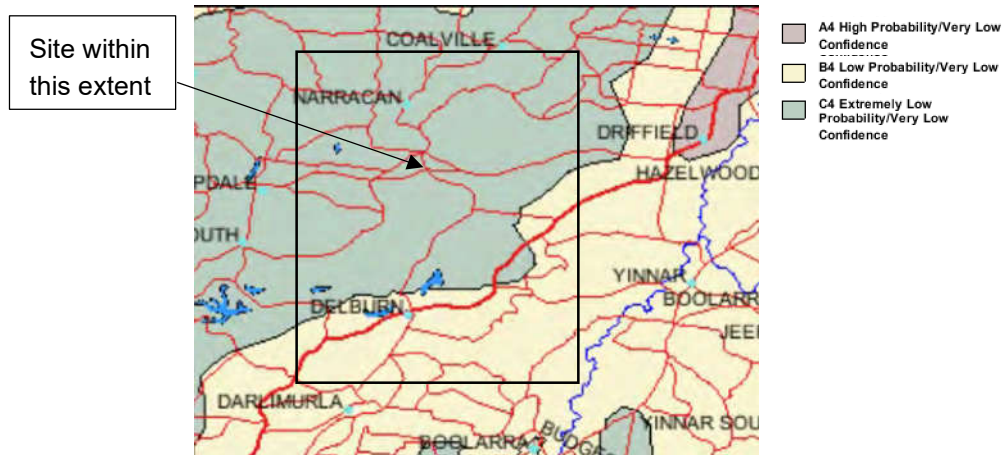


Plate 3: Acid Sulfate Spoils Probability (CSIRO Australian Soil Resource Information System)

6.8.2 Implications for project

No acid sulfate soils are expected to be disturbed by the project.

6.9 Other impacts

6.9.1 Summary of findings

There is expected to be an increase in construction traffic, including heavy vehicles which will need to access sealed and unsealed roads within the area. The existing roads are generally in good condition, servicing heavy vehicles associated with the quarrying and forestry activities in the area, however the increase in construction traffic could increase the rate of dilapidation of existing roads.

6.9.2 Implications for project

We anticipate that maintenance of public roads (e.g. re-grading, and potentially resurfacing of asphalt roads) may need to be undertaken as part of the proposed DWF construction works, in accordance with typical construction practices for wind farms. We consider it would be prudent to perform a dilapidation survey of existing structures and roads prior to construction works commencing so there is a record of the ‘pre-construction’ conditions.

6.10 Future investigation

We recommend that future investigation for proposed wind farm development include a borehole at each proposed WTG location, with boreholes advanced to a depth of 15 m to 25 m. In addition to the boreholes, a series of shallow test pits and geophysical tests would be conducted at wind turbine locations and along proposed access and underground cable routes. The principal objective of the borehole, test pits etc will be to assess the strength and stiffness of the underlying soil and rock to inform foundation and access track design.

However, the boreholes and test pits would also assist in assessing the depth to rock beneath the proposed WTG locations, informing the size and depth of excavation required for the footings, assessing the erosion potential of soil materials, measuring groundwater level and assessing whether the footings could interact with groundwater. This information can be used to further assess potential impacts to groundwater or surface water.

In addition, we recommend the installation of groundwater investigation wells at locations where bore water is expected to be sourced (if any), for the purposes of assessing potential groundwater bore yields and water quality.

Some geophysics surveys will likely be required along proposed underground cable routes in order to provide information on ground electrical and thermal resistivity. Soil samples would also be obtained from test pits and boreholes to allow laboratory testing of electrical and thermal resistivity.

7.0 SUMMARY AND CONCLUSIONS

The proposed DWF development involves temporary excavation to depths of about 5 m for WTG footing construction, the excavation and backfilling of trenches and the construction of unsealed access roads and hard stands. The impact from the development associated with geotechnical, contaminated land and hydrogeological considerations is assessed to be very low for the following reasons:

- Infrastructure is not proposed for construction in areas that are susceptible to landslides.
- Excavation is not expected to extend to sufficient depth such that groundwater is encountered.
- The soils have a low susceptibility to erosion and the WTG locations are a significant distance from surface water courses that could be susceptible to impact from eroded soil. Erosion of exposed soils during construction is expected to be managed using standard construction techniques including dust suppression, silt fences and temporary drainage. Long term, crushed rock materials will be required on roads and hardstands to provide erosion protection. Provided erosion controls are in place and erosion is appropriately managed the impact to surface water is expected to be negligible.
- The area is not susceptible to salinity based on the groundwater level, quality and geological conditions.
- There are no potential acid sulfate soils expected to be encountered at locations where infrastructure is proposed.
- No contaminated land has been identified at the proposed development locations. Although there is some potential for contamination associated with past farming and logging activities, it is expected that contaminated land could be managed through off-site disposal to a facility licensed to receive the waste.

Based on the planning provisions set out in Section 3.0, the potential impacts of the proposed DWF and impacts to the proposed DWF from erosion and landslip; surface water; groundwater; stone resources; natural hazards (e.g. earthquakes); dry land salinity; soil and groundwater contamination; and acid sulfate soils are considered to be low and manageable. This conclusion is subject to the results of the site investigations recommended in Section 6.10.

8.0 IMPORTANT INFORMATION

Your attention is drawn to the document 'Important information relating to this report' which is included in Appendix C of this report. The statements presented in that document are intended to inform a reader of the

report about its proper use. There are important limitations as to who can use the report and how it can be used. It is important that a reader of the report understands and has realistic expectations about those matters. The Important Information document does not alter the obligations Golder Associates has under the contract between it and its client.

Signature Page

Golder Associates Pty Ltd

A handwritten signature in black ink, appearing to read 'Darren Paul', written in a cursive style.

Darren Paul
Principal

DRP-DA/JMW-DLG/drp

Golder and the G logo are trademarks of Golder Associates Corporation

[https://golderassociates.sharepoint.com/sites/115925/project files/6 deliverables/19130636-003-r/19130636-003-r-rev0.docx](https://golderassociates.sharepoint.com/sites/115925/project%20files/6%20deliverables/19130636-003-r/19130636-003-r-rev0.docx)