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NEOEN

CONCEPTUAL EROSION AND SEDIMENT CONTROL PLAN

Mount Hopeful Wind Farm

FINAL - ATTACHMENT H

August 2023

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Prepared by
Umwelt (Australia) Pty Limited
on behalf of
Neoen Australia Pty Ltd

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1.0 Introduction

Umwelt was commissioned by Neoen Australia Pty Ltd (Neoen) to complete a conceptual Erosion and Sediment Control Plan (ESCP) for the Mount Hopeful Wind Farm (the Project). The conceptual ESCP is a high-level document to establish a framework for the management of drainage, erosion, and sedimentation through the development of the Project's detailed design, and subsequent construction and operational phases of the Project. In particular, this report responds to the requirements of State Code 23: Wind farm development (DSDILGP, 2022) and associated Planning guidance (DSDILGP, 2022) and draws from best practice guidance and associated documentation established by the International Erosion Control Association (IECA).

The Project is located approximately 45 kilometres (km) south of Rockhampton and 65 km west of Gladstone within the Central Queensland Region.

1.1 Study Area

The Study Area refers to the boundaries of the 17 freehold land parcels which encompass the infrastructure that has been designed for the proposed wind farm, as well as the boundary of the access road corridor (inclusive of the local road reserve for Glengowan Road, Playfields Rd and McDonalds Rd and small area of one additional adjacent land parcel). The area covers approximately 16,975.8 hectares (ha) and extends approximately 25 km north-south at the longest point and 42 km east-west at the widest point (this includes approximately 30 km of access road). The Study Area represents the limit of the vegetation and habitat mapped for the Project. It should be noted however, that this boundary does not represent the spatial bounds in which all Project field surveys have been conducted (this area being larger and including areas outside of the Study Area).

Lot and plans relevant to the Study Area include:

- Those relevant to the proposed wind farm:
    - 148/DS151, 2420/DT4077, 21/RN46, 30/RN72, 50/DT40144, 1933/RAG4058, 21/RN1345, 100/SP289441, 33/DT40123, 2039/RAG4056, 23/RN25, 38/DT40131, 2057/RAG4059, 24/RN34, 25/RN25, 15/RN1089 and 2345/DT4077.
- That relevant to the access road corridor:
    - 17/RAG4094.

The Study Area is within the Rockhampton Regional Council and Banana Shire Council Local Government Areas (LGA). The predominant land use in both LGAs is rural agriculture comprising mostly beef cattle grazing and farmland cropping including cotton and lucerne. Some forestry, coal mining and power generation also occur. Elevations within the Study Area ranges from approximately 500 m Australian Height Datum (AHD) to 120 m AHD, characterised by varying landform within the Study Area that comprises of peaks and valleys, with areas of lower, generally flatter topography surrounding the Study Area to the east and west.

1.2 Development Corridor

The Development Corridor represents the maximum spatial extent in which Project infrastructure may be positioned. The Development Corridor includes a micro-siting zone, which incorporates a buffer around Project infrastructure to allow for the optimal placement and arrangement of individual turbines. The total area of the Development Corridor is 1,555.1 ha.

1.3 Disturbance Footprint

The Disturbance Footprint represents the maximum extent of direct impacts and indicative location of proposed Project infrastructure. The total area of the Disturbance Footprint is 883.4 ha. The Disturbance Footprint will be used when discussing impacts, avoidance and mitigation measures pertaining to threatened species and vegetation.

1.4 Aims and Objectives

The aim of this conceptual ESCP is to provide an initial indication of the potential erosion and sedimentation risks of the Project, and to establish a framework for the management of erosion and sedimentation as the Project progresses. This will be achieved through a desktop review of the existing environment as well as potential hazards and risks that may arise as a combination of the environmental conditions and planned Project activities. The objective of the conceptual ESCP is to propose suitable erosion and sediment controls and determine erosion and control maintenance and monitoring requirements that may need to be adopted.

This document complements the preliminary Construction Environmental Management Plan (CEMP), and together will support the development application requirements of the Project. This conceptual ESCP will be used as a foundation for the detailed ESCP which will be developed later as the Project progresses into the detailed design phase. The IECA *Best Practice Sediment and erosion Control Guidelines* (2008) (herein referred to as the 'IECA Guidelines') have been considered in the preparation of this document.

This conceptual ESCP serves to demonstrate that Neoen is committed to managing sediment and erosion hazards and risks for the Project and meeting relevant regulatory requirements.

1.5 Scope

The scope for this conceptual ESCP is to establish site-specific environmental conditions and develop a framework for the management of erosion and sedimentation hazards relevant to the Project as the Project design progresses.

As this conceptual ESCP has been completed before site layout and Project design is finalised, it should not be considered the final ESCP, which will be prepared and certified by a Registered Professional Engineer of Queensland (RPEQ) prior to the commencement of construction activities. Accordingly, this document does not include detailed engineering design of controls and structures and it does not provide plans showing the layout of all erosion controls across the site.

2.0 Sediment and Erosion Control Framework

2.1 Regulatory Framework and Relevant Guidelines

The regulatory framework and relevant regulatory guidelines applicable for the Project are as follows:

- *Environmental Protection Act 1994* (EP Act)
- Environmental Protection (Water and Wetland Biodiversity) Policy 2019
- *Water Act 2000* and relevant Water Resources Plans
- *Vegetation Management Act 1999* and Vegetation Management Regulation 2000
- *Soil Conservation Act 1986* and Soil Conservation Regulation 1998
- Department of State Development, Infrastructure, Local Government and Planning (DSDILGP) State Development Assessment Provisions (SDAP) Guidance Material – State Code 16: Native Vegetation Clearing Version 3.0
- DSDILGP SDAP Guidance Material – State Code 23: Wind Farm Development Version 3.0
- Soil Erosion and Sediment Guidelines for Queensland Construction Sites
- IECA Best Practice Erosion and Sediment Control Books 1 – 8.

2.2 Content and Approach

In accordance with the IECA Guidelines, the content included within this conceptual ESCP includes:

- The identification of environmental values within and surrounding the Development Corridor.
- The identification of risks to the environment due to erosion and sediment such as dispersive or acid sulphate soils or potential mass movement.
- Outline the relevant erosion and sediment control principles and measures.
- Confirm the standard of controls that will be required to manage erosion and sediment risks on identified environmental values.

To achieve a successful erosion and sediment control program, control needs should be assessed and implemented during the planning and design phase, construction phase and operational phase. This conceptual ESCP has been prepared for the initial planning and design phase. When the Project progresses to the detailed planning phase and into construction, a detailed ESCP will need to be developed.

This plan is intended to present an overview of potential erosion and sedimentation risks. While this plan does not include specific revegetation details, standard control measures are provided, and the described techniques are relevant to the Project. Additional guidance should be sought as to the best techniques to adopt when undertaking revegetation of the areas.

3.0 Erosion and Sediment Control Principles

3.1 Overview

This conceptual ESCP was developed to guide the management, reduction and mitigation of erosion and sediment transport in the planning phase of the Project. This plan is generally in accordance with industry standards and based on the following basic principles and hierarchy of control measures:

- Drainage control:
  - Prevent or reduce soil erosion caused by concentrated flows.
  - Manage surface water runoff through the Project site and separate “clean” and “dirty” surface water.
- Erosion control:
  - Prevent or minimise soil erosion caused by rain drop impact and/or overland flow on disturbed surfaces, which can be dispersive, non-dispersive or competent.
- Sediment control:
  - Trap or retain sediment that may be generated on site through wind or water erosion.

It is preferable to control or minimise erosion through drainage control and erosion control as this will prevent or minimise the generation of dislodged sediments. Sediment control measures aim at trapping occurring sediments to prevent them from leaving the Development Corridor. Therefore, the most efficient and cost-effective way at minimising sedimentation is to minimise the extent, duration, and severity of soil erosion as this will reduce the amount of sediment control measures required.

For erosion and sediment control to be effective the following is required:

- Ensure sediment and erosion measures are designed and constructed effectively.
- Ensure that erosion and sediment control techniques are site specific and take into account local soils, weather and construction conditions.
- Minimise soil erosion wherever possible instead of relying on down-slope sediment control methods.
- Control water movement through the Development Corridor.
- Minimise the duration and extent of bare soil exposure through prompt stabilisation of disturbed areas and implementation of groundcover as soon as practicable.
- Utilise existing topography and adopt construction practices that minimise soil sediment and erosion discharge from the Development Corridor.
- Maximise sediment retention on site.
- Integrate sediment and erosion control issues/measures into the planning phases for the Project.

- Maintain all sediment and erosion measures in proper working order at all times.
- Monitor the Development Corridor and adjust sediment and erosion practices to maintain the required performance standard.

3.2 Erosion and Sediment Control Decision Process

When assessing the need of an erosion and sediment control program and selecting the appropriate control techniques, the following steps should be taken:

1. Assess the need for erosion and sediment control measures.
2. Identify the disturbance type and location of the disturbance.
3. Identify the soil type in the disturbance area.
4. Define the disturbance potential, taking into consideration hazards associated with soil type, slope, relief, local climate etc.
5. Determine which sediment and erosion control techniques are applicable/most suitable.
6. Assess the technical requirements of the potential erosion and sediment control techniques to select the most appropriate erosion or sediment control technique.
7. Implement a monitoring and maintenance program for the erosion and sediment control structures.

3.3 Sediment and Erosion Control Criteria

The selection of the suitable control measures should be made by the site supervisor with input from a suitably qualified environmental team member. Appropriate control measures:

- Should be applicable to all stages of a project.
- May be constructed from materials on site.
- Should be durable.
- Should perform to the required standard.

When deciding on a control measure, it is also important to consider site specific aspects such as:

- The site topography.
- The properties of the surface where the control measures will be implemented, as well as the material downstream of the control measure.
- Type of disturbance.
- Length of disturbance.
- Site specific constraints (e.g., proximity of a local watercourse).
- Overall purpose of implementing sediment and erosion control at a particular location.

4.0 Existing Environment

4.1 Climate

The climate of the Study Area is classed as Humid subtropical climate (Cfa) in the Köppen-Geiger classification. This climate zone is characterised through hot summers and the absence of a dry season (Kottek *et al.*, 2006).

Excluding the access road corridor associated with Playfields Road, McDonalds Road and Glengowan Road, most of the Study Area is mapped as having a very high or high potential bushfire intensity on the State Planning Policy Interactive Mapping System (DSDILGP, 2022). The access road corridor is mapped as a mixture of medium potential bushfire intensity and areas not mapped as bushfire prone.

The closest Bureau of Meteorology (BoM) weather station which records monthly rainfall averages is the Bajool Post Office (39002)[1]. This station is located approximately 20 km north-east of the centre of the Project site, and has an elevation of 16 m. The mean annual precipitation for this station is 785 millimetres (mm) for years 1913 - 2020. There is high variability in rainfall across this time period, with the lowest annual rainfall 241 mm (in 2019), and the highest 1,558 mm (in 2013). While rainfall occurs all year round, precipitation between December and March is markedly higher than the remainder of the year, with highest mean rainfall occurring in January and February (each 140 mm).

The Bajool Post Office station does not provide any other climate statistics. The closest BoM weather station which records monthly temperature averages is the Rockhampton Aero (039083)[2]. This station is located approximately 50 km north-east of the centre of the Project site, and has an elevation of 10 m. It has been operational from 1940 to 2020. Mean maximum temperatures at the Rockhampton Aero station range from 24 C° in July to 32 C° in December/January. Mean minimum temperatures range from 10 C° in July to 22 C° in January/February.

The mean monthly rainfall at the Bajool Post Office station is sometimes higher and sometimes lower than at the Rockhampton Aero station, with the higher mean rainfall of the month at each station displayed in bold in **Table 4.1**. Overall, the Bajool Post Office station has a lower annual mean than at the Rockhampton Aero station, but the annual rainfall pattern (i.e. wetter summers, drier winters) remains the same.

Therefore, it is reasonable to use the Rockhampton Aero station as an indication of temperatures at Bajool.

Table 4.1 Mean rainfall (mm) at Bajool Post Office v Rockhampton Aero

Months	Bajool Post Office (39002)	Rockhampton Aero (039083)
January	**140 mm**	129 mm
February	140 mm	**145mm**
March	90 mm	**105 mm**

[1] http://www.bom.gov.au/jsp/ncc/cdio/weatherData/av?p_nccObsCode=139&p_display_type=dataFile&p_startYear=&p_c=&p_stn_num=039002, accessed 20/01/2021

[2] http://www.bom.gov.au/jsp/ncc/cdio/weatherData/av?p_nccObsCode=38&p_display_type=dataFile&p_startYear=&p_c=&p_stn_num=039083, accessed 20/01/2021

Months	Bajool Post Office (39002)	Rockhampton Aero (039083)
April	41 mm	**43 mm**
May	39 mm	**45 mm**
June	**40 mm**	37 mm
July	**34 mm**	32 mm
August	24 mm	**27 mm**
September	22 mm	**24 mm**
October	**52 mm**	50 mm
November	**71 mm**	66 mm
December	**107 mm**	103 mm
Annual	**785 mm**	**814 mm**

4.2 Geology

Regional Geological Mapping of the Bowen Basin (1:500k; 1:1m) shows that the following rock units are present across the Study Area:

- Capella Creek Group (Dc) which underlies most of the wind farm area:
  - Lithological Summary: Basaltic to rhyolitic volcaniclastic sandstone and conglomerate (and minor lavas), siltstone, mudstone, chert, jasper and fossiliferous limestone
  - Dominant Rock: mixed volcanic and sedimentary rocks.
- Dee Volcanics (DuD) in the west of the wind farm area:
  - Lithological Summary: Andesitic agglomerate, tuff and flows, rhyolite, sandstone, mudstone, conglomerate, limestone
  - Dominant Rock: mafites (lavas, clastics and high-level intrusives).
- Pond Formation (Cp) in the south-west of the wind farm area and east of the access road corridor:
  - Lithological Summary: Acid tuff, sandstone, conglomerate, mudstone
  - Dominant Rock: sedimentary rock.
- A small section of Mount Morgan Trondhjemite (Dgmo) in the south-west of the wind farm area:
  - Lithological Summary: Biotite-hornblende tonalite, biotite granodiorite, hornblende quartz diorite
  - Dominant Rock: granitoid.
- Db-BBG (Db) in the south of the wind farm area:
  - Lithological Summary: Sandstone, conglomerate, tuff
  - Dominant Rock: arenite-rudite.

- Db-BBG (Du) in the east of the access road corridor:
  - Lithological Summary: Andesitic tuff, agglomerate and flows, tuffaceous sandstone and conglomerate, siltstone, mudstone
  - Dominant Rock: mixed sedimentary rocks and mafites.
- Biloela Formation (To) in the west of the access road corridor:
  - Lithological Summary: Mudstone, siltstone, oil shale, carbonaceous mudstone and sandstone; minor lignite, coal and limestone
  - Dominant Rock: arenite-mudrock.

4.3 Soils

The Study Area is mapped as Sodosols, Rudosols and Chromosols under the Australian Soil Classification3.

Sodosols are texture-contrast soils with impermeable subsoils due to the concentration of sodium. These soils occupy a large area of inland Queensland. Generally, Sodosols have a low-nutrient status and are very vulnerable to erosion and dryland salinity when vegetation is removed.

The general soil qualities of Sodosols are:

- Clear boundary between the sandy to loamy surface soil and the clay subsoil.
- The surface is generally hardsetting and brown to dark grey in colour.
- There is likely to be a pale subsurface layer directly overlying the clay subsoil. The clay subsoil has a coarse structure and ranges in colour from red brown through yellow to grey.
- Subsoils may be mottled and may contain manganese (black) nodules.
- The pH in the surface can range from neutral to strongly acid, while the subsoil is usually strongly alkaline.
- Subsoils are often dispersive and/or salty.
- Plant available water content is low due to sodic and/or salty subsoils restricting rooting depth.
- Fertility ranges from very low to moderate.

Rudosols are a widespread and diverse group of young, stony soils found on steeper slopes where much of the soil has eroded away. The soil material does not occur in individual, natural soil aggregates (peds) and therefore usually has no soil structure, or sometimes only a weak structure in the A1 horizon. There is little or no texture or colour change with depth unless stratified or buried soils are present.

The general soil qualities of Rudosols are:

- Fertility is generally low.

[3] This is a 'best of' dataset of dominant soil order according to the Australian Soil Classification. ASRIS level 5, level 4, level 3 and the Digital Atlas of Australian Soils vector datasets are combined (stated order is the order of preference) to produce a composite soil attribute raster dataset (250m).

- Low water water-holding capacity due to the coarse texture.
- High infiltration rates.
- High permeability.
- Saturate rapidly in heavy rain, leading to early runoff.
- Susceptible to sheet, rill and streambank erosion.
- Highly erodible, particularly on slopes where there is minimal vegetation.
- Nutrient availability is variable but can be high depending on the nature and origin of the sedimentary layers.
- No physical root limitations.
- No likely toxicities.

Chromosols have a strong contrasting texture. These soils may be located both on flat alluvial areas and on sloping land. They are not strongly acidic or sodic in the upper B horizon. The parent material of Chromosols ranges from highly siliceous, siliceous to intermediate in composition.

The general soil qualities of Chromosols are:

- The surface condition ranges from loose to hardsetting and is dark brown to dark grey in colour. There may be a pale layer directly overlying the clay subsoil.
- Subsoils are generally slightly acidic to slightly alkaline (commonly neutral pH).
- Subsoil colours range from red, brown, black to grey. Mottling often occurs in the imperfectly drained subsoil, particularly in heavier clays.
- The subsoil is non-sodic and as a result is generally not dispersive.
- Salt levels in the subsoil can be very high, depending on parent material and landscape position.
- Fertility is generally low to moderate.

Soil mapping site CQM 68 is located along the access road corridor, which has an Australian Soil Classification of Dermosol Black Eutrophic Melanic. This soil material is described as non-gravelly, clay-loamy, clayey and very deep. The soil material is moderately permeable (50-500mm/day), well-drained and hard setting.

Under a different soil classification (the Atlas of Australian Soils – Queensland coverage) published by the Bioregional Assessment Program (2019), the soil types in the Study Area are:

- **LK20** in the north of the wind farm area (described as mountainous to steep hilly lands with steep scarps, some mesa- and cuesta-like areas; very narrow valleys; rock outcrop is common):
  - Main soils are shallow stony loams (Um4.1, Um4.2, Um1.4, and Um2.12).
  - With sands or sandy loams (Uc1.2 and Uc2.12).

- And pockets of many other soils, which are mostly stony or loamy duplex soils.

- **Fz10** in the south of the wind farm area (described as steep hilly to mountainous country with some small plateau remnants narrow valleys, many rock outcrops):
  - Main soils are firm shallow siliceous loams (Um1.41).
  - With loamy sands (Dr2.12) on slopes.
  - And medium to heavy clays on lower slopes (Ug5.14), and in the narrow valley floors (Ug5.34 and Ug5.15).
- **Sk17** in the east of the wind farm area (described as undulating terrain of colluvial foot-slopes low hills and extensive alluvial plains):
  - Main soils are neutral yellow and yellow mottled soils (Dy2.42), (Dy2.32), (Dy3.32), and (Dy3.42).
  - Associated soils are Dy2.21, Dy2.41, and Dy3.41 with Um soils on the foot-slopes and the more hilly portions; Dy3.33 and Dy3.43 soils in lower sites generally; and Dy2.43 soils on terraces.
  - Minor soil occurrences include Ug5.16 and Ug5.2, with gilgais on the main alluvial areas.
- **Qa6** in the east of the access road corridor (described as low hilly to gently rolling country with very narrow valley plains):
  - Main soils are hard neutral red soils (Dr2.12) in association with cracking clays (Ug5.13 and Ug5.14) showing linear gilgai formation, or with (Ug5.3) on most slopes.
  - Other soil occurrences include: Um4 and Uf6, including Uf6.31 soils on crests; Dy2.43 and Dd1.33 on slopes; and Dd1.43 in valley plains.
  - Small areas of unit Fz9 (strongly undulating or low hilly areas, the hills mostly of mesa- or cuesta-like form with steep-scarped dissected margins) are included in places.
- **KF5** in the west of the access road corridor (described as valley plains with numerous channels):
  - Main soils are dark clays (Ug5.16) on the more level situations. There is some slight gilgai microrelief.
  - Minor soils include various Uc1, Um1, and Uf1 soils in the channels; Dy3.33 on rises in the plain; and Dy2.43 on terraces.

4.4 Topography and Land Use

As the Study Area runs along the western edge of Dee Range and Ulam Range and extends west to valleys, the general topography is rugged with elevation ranging from 500 m Australian Height Datum (AHD) to 120 m AHD. There are several prominent hills and mountains within the Study Area, namely Mt Helen at 633 m (east), Mt Isabel at 508 m (east), Mt Gelobera / Reilly's Hill at 539 m (west), and North Pimple at 454 m (centre). The land surrounding the Study Area is also steep, with several other prominent mountains nearby including Mt Hopeful at 634 m to the north.

The Study Area is in a largely rural and sparsely settled landscape that is mostly used for grazing and livestock production. The closest localities are Fletcher Creek and Nine Mile Creek. The closest towns are Hamilton Creek (13 km north-west), Mount Morgan town (19 km north-west), and Bajool (15 km north-east).

There are no protected areas within the Study Area, however there several adjacent to or in the surrounding areas, including Gelobera State Forest, Ulam Range State Forest, Don River State Forest, and Mount Hopeful Conservation Park.

4.5 Hydrology and Drainage

The Study Area is on the border of catchment areas, and in some cases in the northern and southern parts of the Study Area are in different catchment areas. **Table 4.2** provides a summary of catchment and drainage information for the Study Area.

Table 4.2 Summary of Catchment and Drainage Information for Study Area

Catchment / Drainage Feature	Northern section of the main Study Area	Southern section of the main Study Area	Electrical infrastructure corridor east to transmission line
Basin	Fitzroy Basin	Fitzroy Basin	Fitzroy Basin
Drainage sub-basin	Dawson River	Dawson River	Fitzroy River
Water Plan area	Fitzroy Basin water plan	Fitzroy Basin water plan	Nil
Water Plan sub-catchment under Water Plan (Fitzroy Basin) 2011	Lower Dawson	Lower Dawson	Downstream of Fitzroy Barrage
Catchment	Callide Creek Catchment	Callide Creek Catchment	Downstream of Fitzroy Barrage
Sub-catchment	Dee River and tributaries	Don River and tributaries	Raglan Creek and tributaries
Groundwater Management Area	Fitzroy Groundwater Management Area	Callide Groundwater Management Area	Nil
Groundwater Notification Area	Nil	Callide Groundwater Notification Area	Nil
Surface Water Management Area	Don and Dee Rivers and Alma Creek Surface Water Management Area	Don and Dee Rivers and Alma Creek Surface Water Management Area	Nil

There are no defined watercourses or drainage features listed under the *Water Act 2000* in the wind farm area, however there are defined watercourses intersected by the access road corridor (Centre Creek and Don River).

There are a number of groundwater registered water bores throughout the Study Area, held privately or by the Department of Regional Development, Manufacturing, and Water. Groundwater monitoring point RN13030332 is located along the road access corridor. There are also three active surface water gauging stations in proximity to the Project, to the north-west (130335A), south-west (130349A), and east (130004A). There are eight mapped dams in the south-west of the wind farm area.

There are numerous watercourses across the Study Area, including many that have Matters of State Environmental Significance (MSES) regulated vegetation associated with them. Many of the watercourses are ephemeral, unnamed streams. Some of the named watercourses, and their relative location within the Study Area, are:

- Capella Creek (north-west of the wind farm area) which is non-perennial and stream order 3. Draining the majority of the northern portion of the wind farm area in both a southerly and a northerly direction before heading west from the western boundary of the wind farm area, joining Fletcher Creek downstream before flowing into the Dee River.
- Ginger Creek (centre of the wind farm area) which is non-perennial and stream order 1-2. A tributary of Centre Creek draining from the north-west to the south-east within the centre of the wind farm area.
- Centre Creek (centre and south of the wind farm area and east of the access road corridor) which is non-perennial and stream order 2-3. Runs in a south-westerly direction draining the majority of the southern portion of the wind farm area and then intersects the east of the access road corridor. Centre Creek is a tributary of the Don River, which then flows into Callide Creek.
- Don River (west of the access road corridor) which is non-perennial (major) and stream order 2. Don River flows into Callide Creek.
- Pomegranate Creek (south-west of the wind farm area) which is non-perennial and stream order 2-3. Runs from the north to the south of Lot 21 RN1345 where it flows into Centre Creek.

The proposed electrical infrastructure corridor which runs east of the wind farm area to the existing high voltage transmission line also traverses several tributaries of Eight Mile Creek which drains northwards to Inkerman Creek and then into Raglan Creek. The road access corridor also intersects an existing high voltage transmission line (Powerlink's 275kV transmission line between exiting Calvale Substation and Stanwell Substation). Named watercourses in proximity to, but not intersecting, the Study Area include:

- Raspberry Creek and Little Raspberry Creek (north of the wind farm area).
- Mckinlay Creek (south-west of the wind farm area).
- Manton Creek (along the southern boundary of the wind farm area).
- Bloodwood Creek (south of the wind farm area and east of the access road corridor).
- Branch Creek (east of the wind farm area and east of the access road corridor).
- Eight Mile Creek (north-east of the wind farm area).

4.6 Vegetation

The Study Area is located within the Brigalow Belt South Interim Biogeographic Regionalisation for Australia (IBRA) bioregion. This bioregion is predominantly characterised by mixed eucalypt woodland with areas of brigalow (*Acacia harpophylla*) scrubs and open Mitchell grasslands, with cattle grazing being the major land use (Bastin & ACRIS Management Committee 2008).

The Study Area is located across three subregions of the Brigalow Belt bioregion:

- The Mount Morgan Ranges subregion covers much of the mountainous parts of the Study Area;
- The Marlborough Plains subregion covers only the north-eastern corner of the Study Area; and
- The Callide Creek Downs subregion covers only the western extent of the access road corridor.

The Mount Morgan Ranges subregion is a rugged and hilly region formed on the Paleozoic rocks of the coastal ranges. The vegetation is dominated by narrow-leaved ironbark (*Eucalyptus crebra*), with red bloodwood (*Corymbia erythrophloia*) and lemon-scented gum (*Corymbia citriodora*) on the rugged slopes, silver-leaved ironbark (*Eucalyptus melanophloia*) on erosional lower slopes, gum-topped box (*Eucalyptus moluccana*) on the colluvial slopes and forest red gum (*Eucalyptus tereticornis*) and Moreton Bay ash (*Corymbia tessellaris*) on the alluvial soils (Sattler & Williams 1999).

The Marlborough Plains subregion is an undulating hilly province with complex geology. The subregion is dominated by alluvial plains and colluvial slopes, usually with a woodland of poplar gum (*Eucalyptus platyphylla*), ghost gum (*Corymbia dallachiana*), forest red gum (*Eucalyptus tereticornis*) and tea tree (*Melaleuca* spp.). Low rises have *E. crebra* and hillier areas with open forest or woodland of *Corymbia citriodora*, *Corymbia* spp. and *Eucalyptus crebra* (Sattler & Williams 1999).

The Callide Creek Downs subregion is an undulating river valley dominated by lower catena Tertiary deposits, with extensive areas of outcrop of underlying argillaceous rocks and smaller areas of low dissected tablelands of upper catena Tertiary deposits. Brigalow (*Acacia harpophylla*) communities are dominant, with areas of soft-wood scrub. Shrubby woodlands dominated by narrow-leaved ironbark (*Eucalyptus crebra*) occur on the dissected tablelands and the alluvial areas are dominated by forest red gum (*Eucalyptus tereticronis*) (Sattler & Williams 1999).

The Regulated Vegetation Management (RVM) map identifies three vegetation management categories occurring within the Study Area:

- Category B area (remnant vegetation)
- Category R area (reef regrowth watercourse vegetation)
- Category X area (exempt clearing work on freehold, Indigenous and leasehold land).

Category B vegetation is mapped across approximately half of the Study Area (in the north, central and south-east and western extent of the access road corridor) with small areas of Category R vegetation occurring around the creek lines in the north-east, south and along the access road corridor. Category X vegetation covers the half of the Study Area not mapped as Category B and is generally not managed under the Vegetation Management laws. There is no mapped Category A (vegetation offsets, compliance notices) or Category C (high value regrowth) vegetation in the Study Area.

There is one patch of mapped essential habitat (regulated vegetation Category A or B) in the very north-east corner across the top of three properties (15RN1089, 2057RAG4059, 15RN1089), in which there are three proposed turbines. The area surrounding this patch of essential habitat is also mapped as a high-risk area for protected plants. Other mapped high-risk areas for protected plants cover a large part of the central and south-east Study Area.

Desktop searches of the Study Area also show an abundance of mapped regulated vegetation (defined watercourse) throughout the Study Area.

Flora field surveys were undertaken by two ecologists across numerous survey seasons including August 2019, June 2020, November 2020, January 2021, October 2022 and February 2023. These field surveys identified that *Cycas megacarpa*, listed as Endangered under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), is abundant throughout the Study Area, with some areas having a high density of the species.

The dominant communities recorded across the site were eucalypt woodlands dominated by *Eucalyptus crebra, Corymbia citriodora* on the upper slopes and hills occurring on moderately deformed sedimentary rocks (land zone 11) and volcanic geologies (land zone 12).

No threatened ecological communities (TECs) were confirmed within the Study Area as part of the field surveys. Two REs (RE 11.3.2 and 11.3.3), analogous to Poplar Box, Weeping Myall and Coolibah TECs, were identified in the State vegetation mapping and confirmed during field surveys. However, the condition of these vegetation communities did not meet TEC status when assessed against the condition thresholds and diagnostic criteria.

4.7 Potential Pollutant Sources

Searches of the Queensland Contaminated Land Register (CLR) and Environmental Management Register (EMR) have not been conducted in the draft design phase and will be undertaken during the detailed design phase as part of geotechnical investigations.

It is expected that the only chemicals or oils to be used on site will be diesel for backup generator use. However, during the construction and operation phases, the potential for additional pollutants should be monitored and documented within the construction environmental management plan (CEMP). Appropriate handling procedures for chemicals should also be developed and implemented on site.

4.8 Erosion Potential

To understand the requirement for erosion and sediment control measures, the erosion potential for an area needs to be assessed through a hazard assessment process. For this assessment, the following six aspects, which all influence the erosion potential of a site and the appropriate management practices, should be included.

- Soil classification (refer to **Section 4.3**).
- Average slope of disturbance area (refer to **Section 4.4**).
- Location within the catchment (refer to **Section 4.5**).
- Proximity to waterways (refer to **Section 4.5**).
- Extent and duration of soil disturbance.
- Can run-off from upslope areas be controlled.

The extent and duration of soil disturbance across the entire Study Area is not known, however given that the entire Study Area is classified as grazing land, apart from two small residential land uses, it is likely that there has been at least some disturbance across most of the area.

As described in **Section 4.3**, Rudosols which cover the Study Area saturate rapidly in heavy rain and are susceptible to sheet, rill and streambank erosion, particularly on slopes where there is minimal vegetation. These soils are best left under natural cover to reduce the erosion hazard.

Despite these factors, the Study Area has not been identified as ‘erosion prone’ in the State Planning Policy Mapping system (DSDILGP 2022). However, areas mapped as ‘erosion prone’ under this system are all located in the coastal regions of Queensland, to the east of the Bruce Highway.

The Project is located in the eastern part of the Fitzroy Basin Association Natural Resource Management (NRM) region, and therefore the assessment of soil erodibility undertaken in 2017 by the Department of Science, Information Technology and Innovation (Zund, 2017) is applicable. A site-specific report for the Study Area using this assessment process was obtained in the form of a FORAGE Erodible Soils report (Queensland Government 2021). This included mapping to a sub-catchment scale of 1:250,000 (refer to **Figure 4.1**).

This inherent soil erodibility classification is created by combining surface soil stability and subsoil dispersiveness. Surface soil stability is affected by surface cover, which is a function of climate, soil fertility, rockiness and land management. Subsoil dispersiveness is affected by subsoil attributes such as cation balance, clay type and salinity. Inherent soil erodibility refers to the likelihood that a particular soil is susceptible to erosion by water and wind.

Based on this report and map (**Figure 4.1**), the three categories of inherent soil erodibility across the Study Area are:

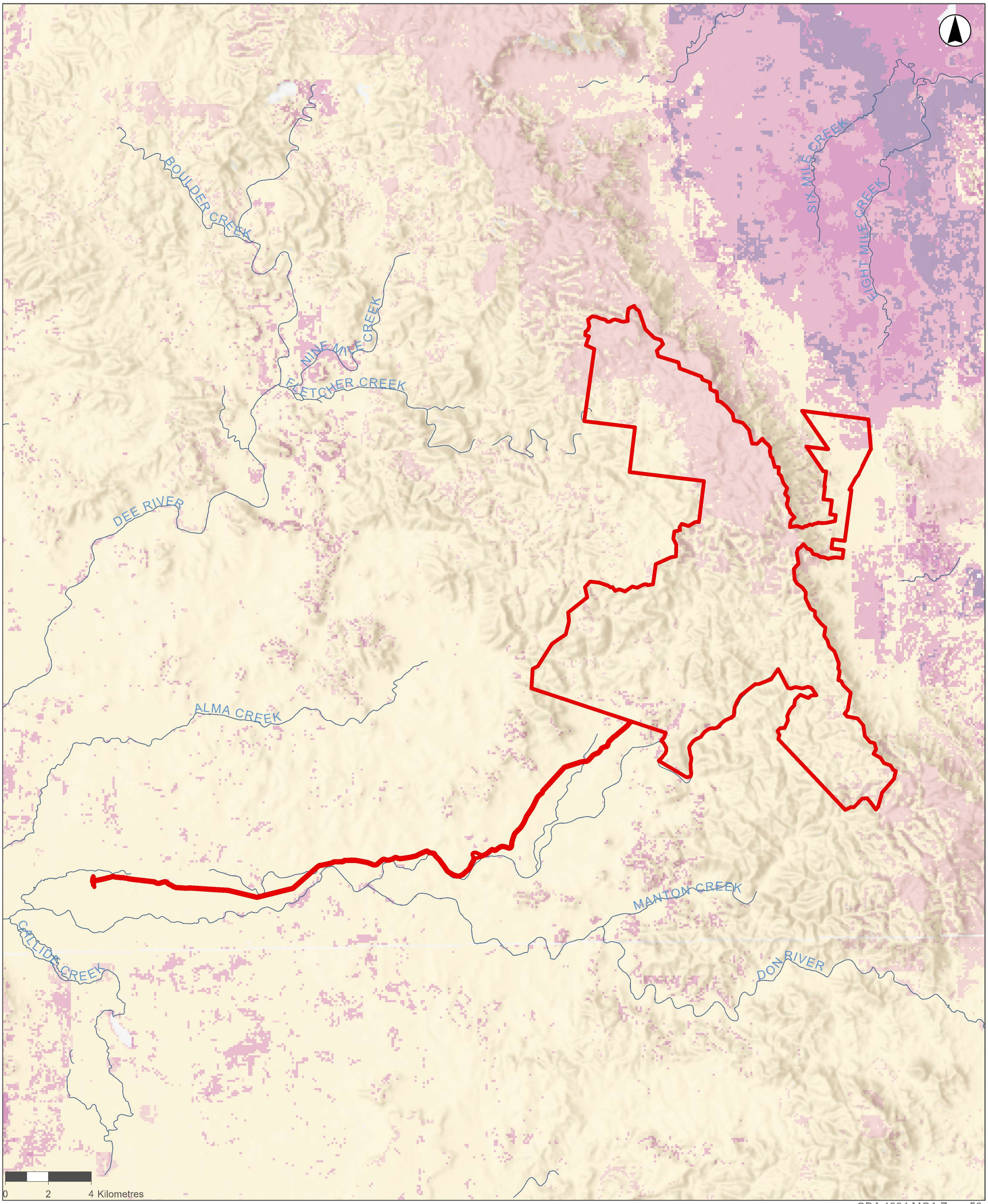
- Northern section (along the ridge of Dee Range):
  - Surface soil: non-cohesive (i.e., non-structured and easily eroded)
  - Subsoil: approximately one-quarter of the area is rock, and three-quarters of the area is non-dispersive subsoil
  - Overall: low erosion vulnerability
  - Soils: shallow sandy massive soils.
- Southern section:
  - Surface soil: moderately stable (i.e., unlikely to be dispersive as usually well-structured and resilient to degradation)
  - Subsoil: approximately half of the area is rock, and half is non-dispersive subsoil
  - Overall: very low erosion vulnerability
  - Soils: loamy or clayey soils.

- Small patches in the south-west corner:
    - Surface soil: moderately stable
    - Subsoil: highly dispersive
    - Overall: moderate erosion vulnerability
    - Loamy or clayey soils.

The purpose of the soil erodibility dataset is to assist with the identification of soils that are vulnerable to gully and stream bank erosion. Gullies generally form when the protective surface soil is disturbed and erosive forces encounter subsoil, particularly those that are dispersive.

Whether soil erosion actually occurs depends on soil properties, topography, land use, rainfall intensity, surface cover and land management practices. The external factors that influence how much erosion actually occurs were not taken into account in the above assessment and therefore the information presented is not an erosion hazard / risk map or an assessment of actual eroded areas.

For example, areas with high soil erodibility are unlikely to be eroded if they have low grazing pressures and consistently high ground cover, whereas areas of low soil erodibility can still erode under sufficient grazing pressure. Therefore, inherent soil erodibility does not necessarily match erosion outcome.



Scale at A4
1:250,000

GDA 1994 MGA Zone 56

Legend

- Roads
- Railway
- Watercourses
- Local Government Area (LGA)
- Study Area

FIGURE 4.1

OVERALL SOIL ERODIBILITY RANKING FOR THE STUDY AREA

Image Source: ESRI Basemap (2022) **Data source:** Department of Resources (2022)

5.0 Project Activities

This section details the potential hazards that may be associated with the activities that are likely to occur throughout the lifecycle of the Project. The assessment of these hazards and their associated controls is provided in **Section 6.0**.

5.1 Design

A draft design for the Project has been developed. The detailed design for the Project will take into consideration geotechnical investigations, ecological constraints and further environmental aspects as they become apparent during more detailed investigations. Erosion and sediment control hazards will be taken into consideration when developing the detailed design.

5.2 Construction

Construction will include earth works, civil works, construction activities and commissioning. Activities which are likely to occur during the construction of the wind farm and which may influence the potential for erosion and sedimentation to occur include:

- detailed planning of construction activities
- vegetation clearance
- earthworks, including but not limited to bulk movement, grading and levelling
- creating and managing soil stockpiles
- creating and managing access roads
- use and storage of fuels
- trenching, including excavation, filling, and/or directional drilling
- establishing a construction site
- carrying out stabilisation and rehabilitation activities
- revegetation.

5.3 Operation and Maintenance

Erosion and sedimentation impact during the operation and maintenance of the Project are likely to be limited. The dominant activity which may impact erosion and sedimentation is the use and maintenance of unsealed access roads.

5.4 Project Decommissioning and Rehabilitation

The anticipated lifespan of the Project is approximately 30 years. Activities which may occur during decommissioning and rehabilitation phase and affect erosion and sedimentation are:

- removal of infrastructure
- road use and maintenance
- use and storage of fuels
- carrying out stabilisation and rehabilitation activities
- revegetation.

6.0 Erosion Hazard Assessment

A high-level erosion hazard assessment has been carried out to assess the hazards stemming from proposed activities required for the construction and operation of the Project. At a high level, the assessment considered the temporal and spatial erosion hazards that may occur, and likely mitigation of those hazards achieved through control measures and design criteria.

A summary of the assessment is presented in **Table 6.1**. The table includes likely control options, which will be amended or confirmed in a detailed ESCP prior to construction taking place. Additional details for some of the proposed erosion and sediment control measures are provided in **Section 7.0**.

Table 6.1 Erosion Hazard Assessment

Activity	Hazard	Potential control measure
Developing project design	Poor project design may cause: • Soil degradation or erosion • Sedimentation of creeklines • Degradation of vegetation.	• Detailed geotechnical and soil investigations would confirm the presence or absence of erosive soils • A detailed project design should take into consideration this conceptual ESCP
Construction planning and site preparation	Poor planning and site preparation may cause: • Soil degradation or erosion • Sedimentation of creeklines • Degradation of vegetation.	• Prepare a detailed ESCP and CEMP to be implemented at the start of the construction phase • Define entry and exit points and pathways to the site • Erect no-go zones for sensitive areas, high risk areas and areas which do not need to be disturbed • Maintain maximum soil cover at all times (undisturbed and disturbed areas) • Install upslope stormwater diversion drains with stabilised outlets to reduce overland flow across the disturbed areas • Install sediment traps or sediment basins with stabilised outlets as required • Install earth banks or catch drains to divert runoff from construction areas to sediment traps • Strip and stockpile topsoil and subsoil separately • Store weed infested topsoil separately • Cover or vegetate soil stockpiles if they will be in place for more than 20 days or prior to a forecasted rain event • Install sediment fence downslope of stockpiled soil • Treat or ameliorate soil as required • Keep unsealed roads moist (not wet) during windy weather by sprinkling with water to reduce wind erosion • Regularly maintain erosion and sediment control structures • Install new control structures as required • After construction, rehabilitate the site to ensure that permanent stabilisation is achieved • Remove all control structures after areas are stabilised.
Vegetation clearance	Removing vegetation can: • Accelerate soil erosion (gully, rill, sheet, wind and scalding)	• Vegetation clearance will be staged and minimal clearing undertaken for the relevant construction phase only • Clearance will only occur once required prior works are in place

Activity	Hazard	Potential control measure
	• Reduce the soil's water holding capacity • Damage soil structure • Degrade soil organic matter • Degrade soil biology.	• Clearing will only occur after erosion and sediment control measures are in place • A vegetation management plan will be in place prior to commencement of any on-site works, if required • Establish tree protection zones around retained vegetation • Undertake revegetation as soon as reasonably practicable.
Stormwater management	If stormwater is inappropriately managed it can cause: • Gully erosion • Rill erosion • Stream bank erosion.	• Site-specific measures to convey stormwater (e.g. swales) to an appropriate discharge point should be investigated • Use earth banks or catch drains to divert upslope stormwater from undisturbed areas (clean water) away from disturbed areas to minimise overland flow in these areas • Permanent diversion banks which are to be sized by a suitably qualified person • If applicable, clean water diversions should be in place before disturbance occurs • Runoff from disturbed areas (dirty water) should be diverted to sediment basins or traps • Slope length in disturbed areas should not exceed 80 m • Temporary earth diversion banks may be installed to mitigate against unforeseen erosion hazards, particularly when rain is forecast • Temporary diversions can be used to shorten slope lengths or to divert localised runoff away from high hazard areas • To reduce erosion in drains and diversion channels, check dams may be installed. When installing these, it has to be ensured that a spillway is in place which allows flows to be retained in the diversion channel ensuring that scouring and/or flooding of adjacent lands is not caused through spillage out of the drain.
Undertaking earthworks	Earthworks can: • Increase soil erosion • Cause mass movement (soil and/or rocks) • Degrade soil structure.	• Limit disturbance to areas essential for construction activities only • Plan and stage construction works to minimise exposed soil at any given construction phase • Establish a stabilised site access point to each key construction area • Limit vehicle access to the site and establish a stabilised car park for workers • Define essential construction areas and establish no-go zones for vehicles and pedestrians • Install clean water diversions upslope of the disturbance area • Use energy dissipaters or level spreaders at clean water diversion outlets, as appropriate, to discharge stormwater in safe areas, avoiding erosion and flooding hazards

Activity	Hazard	Potential control measure
		• Strip and stockpile topsoil and subsoil separately • Store weed infested topsoil separately • Cover or vegetate soil stockpiles if they will be in place for more than 20 days or if rain is forecast • Stripping of vegetation and topsoils will be undertaken as close as possible to commencement of bulk earthworks • Plan work schedule to minimise downtime and exposure time of disturbed soil • Areas with concentrated water flow will be designed by a suitably qualified person • Regularly inspect and maintain all installed control measures • Update control measures as required • Undertake revegetation as soon as reasonably practicable.
Stockpiling soil	Soil that is not stockpiled correctly can increase erosion.	• Cover or vegetate soil stockpiles if they will be in place for more than 20 days or if rain is forecast • Stockpile topsoil and subsoil separately • Stockpile weed infested topsoil separately • Ameliorate stockpiled soil as required • Install sediment traps downslope of the stockpiles • Do not stockpile soil in drainage lines.
Road formation and use	Unsealed road can accelerate all types of erosion.	• Where possible locate roads in areas without large upslope catchments • Limit road width to the minimum practicable • Strip and stockpile topsoil separately • Ensure the road surface has a cross-sectional grade to allow free surface drainage • Employ outfall drainage where practicable • Avoid the formation of windrows along road shoulders • Stabilise road batters using a combination of rolled erosion control products.
Trenching	Trenching can cause: • Accelerated soil erosion • Mass movement • Degradation of soil structure.	• Avoid trenching in water flow areas whenever possible • Limit the time trenches are open to less than three days where possible • Avoid trenching when wet weather is forecast • Strip and stockpile topsoil separately

Activity	Hazard	Potential control measure
		• Ensure trench widths are the minimum required • Organise service installations to enable progressive backfilling • Trenches dug parallel to the contour should have excavated material placed upslope of the trench and compacted to function as a diversion • Trenches dug along the slope should use sandbags across the trench to shorten the slope length. Provide cross banks at regular intervals to prevent concentrated water flows along the finished (backfilled) trenchline • Ensure plugs, collars or trench stops are installed to control tunnel erosion after backfilling is complete.
Chemical use, waste and storage	A chemical or oil spill can: • Damage soil structure • Pollute soil • Pollute waterways • Kill soil biology.	• If required, bulk storage areas for fuels, oils and chemicals will be contained within an impervious bund to retain any spills of more than 110% of the volume of the largest container in the bunded area • Storage areas will be constructed in accordance with relevant standards • Spills will be immediately contained and absorbed with suitable material from a spill kit • Spill kits will be located in agreed areas and maintained. Workers will be trained in using these kits • Contaminated soil will be excavated and disposed of in a suitable manner by a suitably qualified contractor • Material Safety Data Sheets (MSDS) for all chemicals stored on-site will be maintained by the Site Safety Officer and made available to site personnel • Refuelling or other activities that could result in a spill are undertaken away from watercourses and drainage lines • A designated refuelling area and procedures shall be established with drip trays and spill kits • Refuelling on-site will require absorptive mats and drip trays.
Establishing construction sites	Wrongly established construction sites can: • Increase erosion • Cause mass movement • Decrease soil water holding capacity.	• Construction areas will be established as stabilised hardstand / laydown sites • The ground surface will be laid over non-erodible base material such as compacted crushed sandstone, and overlain by durable aggregate • Erosion and sediment control measures will be in place as described for the site preparation, undertaking earthworks and stormwater management activities.

Activity	Hazard	Potential control measure
Site stabilisation and rehabilitation	Inexpertly carried out site stabilisation may: • Cause mass movement • Accelerate all types of erosion • decrease soil water holding capacity • Damage soil structure • Damage soil biology.	• Site stabilisation will be carried out with vegetation, rock armouring, paving, concrete or any other cover that is suitable to the site and protects the ground surface against erosion • The preferred site stabilisation method will be included within the detailed ESCP once final details of the site layout and infrastructure are known • Stabilisation methods will be tailored to the location of the site and water flow patterns • Hard armouring and use of geofabrics may be required on steep batters • Revegetation is often the preferred stabilisation method. Annual cover crops may be used to provide temporary cover and sown with the desired mix of perennial species • Revegetated sites will be monitored and repaired as required • Revegetation details will be provided in the detailed ESCP and CEMP.

7.0 Control Measures

Control measures should be specific to the site location and the phase of the Project and be planned and installed by a suitably qualified person, following best practice guidelines and industry standards.

7.1 Drainage Control Measures

7.1.1 Drainage Channels

There are different types of drainage control measures depending on the drainage channel that will be constructed.

Temporary drainage channels will be designed and constructed with a grade that generates flow velocities not exceeding the maximum allowable flow velocity for the given surface material. If the flow velocity is above the speed which a surface material can sustain, the drainage channel may erode, often along the invert of the drain, and result in bank slumping and widening of the channel.

Measures that may be implemented to decrease flow velocities are:

- increasing the channel width
- reducing the channel slope
- reducing the catchment area
- increasing channel roughness
- installing rock check dams in the channel.

The scour resistance of a drainage channel may also be increased through a channel liner.

As the preliminary design does not include permanent drainage lines or diversion channels, controls relating to these have not been discussed in this conceptual ESCP. If the detailed design phase of the Project determines that permanent drainage lines or diversion channels are necessary, controls for these will be outlined in the detailed ESCP.

7.1.2 Drainage Control for Unsealed Roads

To reduce the erosion risk of an unsealed road, the following practises may be applicable:

- Stormwater runoff should be allowed to shed in regular intervals. Depending on the road material and surrounding environment, runoff can either be discharged into a sediment trap or via a level spreader into adjacent vegetation.
- Stormwater collected in table drains should be discharged in regular intervals. This may not always be possible, and some environments may require different control measures.
- Table drains should be constructed in a U shape rather than a V shape.

- If road construction is required across a slope, the road should be positioned as close as possible to the contour of the land as this will avoid concentrated flows.
- If road construction is required diagonally across a slope, it is likely that upslope stormwater runoff will be collected as concentrated flow. The collected runoff will need to be shed at regular intervals using a level spreader or drainage channels constructed.

7.2 Erosion Control Measures

On a construction site the most common forms of water erosion are splash erosion, sheet erosion, rill erosion and gully erosion.

Several erosion control measures are available to minimise erosion. The appropriate erosion control method will vary from site to site as well as within a Project site. Factors that will be considered are the upstream catchment, slope, topography, climate, soil type, underlying geology, disturbance type and the receiving environment.

While the physical methods may vary, all erosion control measures generally aim at providing ground cover to the disturbed land. A brief overview of some erosion control measures that may be adopted for the Project are provided below.

7.2.1 Cellular Confinement Systems

This system is typically used to hold topsoil and for revegetation of steep batters, for erosion control of non-vegetated bridge abutments, and for the stabilisation of road embankments in arid and semi-arid regions.

7.2.2 Compost Blanket

Compost blankets are often used for rehabilitation of steep slopes, where topsoil cannot be placed due to steepness, for sites with insufficient topsoil or where topsoil cannot be used due to excessive weed content.

7.2.3 Gravelling

Gravelling is used to control raindrop impact for areas such as temporary carparks. Gravelling may also be used to increase the durability of geotextiles by forming a protective layer on top of the fabric. Furthermore, it can be used to stabilise long term maintenance roads after the construction phase is finished.

7.2.4 Mulching

Mulching is primarily used in combination with temporary grass seeding. It can also be used as an alternative to temporary grass seeding in times of water restrictions or severe drought. Mulching is a common form of batter stabilisation, both for short term and long term stabilisation.

7.2.5 Hydromulching

Hydromulching is best used for slopes under 10% and slopes with a vertical fall of less than 3 m. It can be used for establishing grass or to protect newly seeded areas.

7.2.6 Soil Binders

Soil binders can be used for dust suppression on unsealed roads. They may also provide a cover for stockpiles of non-dispersive soils and as temporary batter stabilisation.

7.2.7 Revegetation

Revegetation can be used for temporary and long-term stabilisation of soil and soil stockpiles.

Vegetation types will be selected taking into consideration their growth form and the use of the stabilised area as well as surrounding infrastructure.

7.3 Sediment Control Measures

Sediment control measures should not solely be relied on and should always be used in combination with drainage control and erosion control measures. Priority will be placed on erosion and drainage control measures to prevent dislocation of soil and generation of sediments.

Some sediment control measures trap the coarser sediment fractions but smaller sediments such as silts and clays are not retained. Sediment basins are designed to collect runoff still laden with finer sediments. These sediments settle out in the sediment basin. If dispersive soils are present, a flocculation agent is required to settle sediments. A brief overview of some sediment control techniques that the Project may adopt are provided below.

7.3.1 Sediment Basin

Sediment basins can collect a wide range of sediment particles down to less than 0.045 mm. There are four different types of sediment basins: Type A, Type B, Type C and Type D. The selection of basin types is determined through a site’s location, soil properties and disturbance timeframe.

Type A basins are best suited for sites where the soil disturbance in the drainage catchment exceeds 12 months. Type B basis are for sites where the soil disturbance in the drainage catchment does not exceed 12 months. Type C basins are for sites where less than 33% of the soil is finer than 0.02 mm (clay fraction) and less than 10% of the soil is dispersive. Type D basins are an alternative for Type A or Type B basins if it can be demonstrated that automatic flocculation is not reasonable or practicable.

7.3.2 Rock Filter Dam

Rock filter dams are designed to trap sediments down to a particle size of between 0.045 mm and 0.14 mm. They can be used as sediment traps connected to the outlets of mulch berms and topsoil windrows. Rock filter dams may be used in combination with geotextile or aggregate filters.

7.3.3 Check Dam

Check dams are a supplementary sediment trap and suitable for minor concentrated flow. They are primarily used to control flow velocity but can also be used as minor sediment traps within table drains. Check dams can be constructed from rock, sandbags, or geo-logs. They are designed to trap coarse-grained particles larger than 0.14 mm.

7.3.4 Sediment Fence

Sediment fences can be used in areas with sheet flow conditions. Support posts must be placed at intervals of no more than 2 m, and the fence must have regular returns. They are designed to trap coarse-grained particles larger than 0.14 mm.

7.3.5 Grass Filter Strips

Grass filter strips have a very limited efficiency as a sediment trap and should only be used in combination with other sediment traps. Grass filter strips can be placed at a spacing of no more than 2 m vertical fall. They must always be planted along the contour.

8.0 Monitoring and Reporting

For an erosion and sediment control system to work effectively, it is essential that regular inspections are undertaken, and that maintenance is carried out when required. Inspections will be undertaken:

- At least daily during rain periods.
- Within 24 hours before an expected rain event.
- Within 18 hours after a rainfall event of an intensity and/or duration expected to generate run-off.
- At least weekly for all other times.

Inspections of the erosion and sediment control measures will be carried out by a suitably qualified person. The inspector will:

- Ensure that barrier fences are in place and no-go zones are observed.
- Ensure existing erosion and sediment control measures are still adequate for the phase of construction.
- Identify areas where maintenance is required, carry out maintenance on the spot if possible and safe to do so or notify the site supervisor of areas requiring major interventions.
- Identify areas ready to be rehabilitated and ensure that progressive rehabilitation is carried out.
- Inspect existing rehabilitation areas for rehabilitation success, failure, or signs of erosion.
- Ensure that waste receptacles are emptied regularly in a manner approved by the site superintendent.

If a site inspection identifies failures in the control measures, the reason of the failure will be investigated and appropriate changes to the erosion and sediment control measures will be carried out.

Detailed reporting requirements will be defined in the detailed ESCP. Generally, reporting procedures will address:

- Internal recording and filing requirements.
- Chain of responsibility.
- Reporting frequency.
- Procedures for reporting areas with non-compliances.
- Procedures for reporting corrective actions.

9.0 Conclusion and Recommendations

This conceptual ESCP provides an initial indication of the potential erosion and sedimentation risks of the Project, and proposed erosion and sediment controls and monitoring requirements that may need to be adopted during the detailed design, construction, operation and maintenance and decommissioning and rehabilitation phases of the Project.

As the Project continues through its design and development stages and details are finalised, erosion and sediment control requirements will be reviewed and a detailed ESCP will be prepared by a suitably qualified person prior to the commencement of any construction activities. The detailed ESCP will consider the measures put forward in this conceptual ESCP, and any conditions of approval applied to the Project.

Going forward, it is recommended that:

- Detailed geotechnical investigations are carried out (as required) to determine site characteristics prior to construction (including EMR / CLR searches).
- Site specific soil information should be collected and assessed by a suitably qualified person.
- A detailed Construction ESCP plan is prepared and certified by an RPEQ in accordance with relevant guidelines such as the Best Practice Erosion and Sediment Control Guidelines (IECA, 2008) and Queensland Urban Drainage Manual (DEWS, 2013).
- A CEMP is prepared which integrates requirements of the Construction ESCP and stormwater management plan where appropriate.

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umwelt

Environmental & Social Consultants

Umwelt (Australia) Pty Limited

T| 1300 793 267 E| info@umwelt.com.au www.umwelt.com.au