Paling Yards Development Pty Ltd

Paling Yards Wind Farm

Hydrology Assessment

25 November 2022

Project No.: 0578575

The business of sustainability

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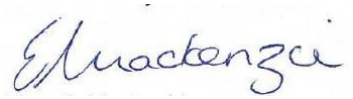
25 November 2022

Paling Yards Wind Farm

Hydrology Assessment



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Acronyms and Abbreviations

Name	Description
ASC	Australia Soil Classification
BLR	Basic Landholder Rights
BoM	Bureau of Meteorology
BSAL	Biophysical Strategic Agricultural Land
CEC	Cation Exchange Capacity
DPE	Department of Planning And Environment
DPI	Department of Primary Industries
EC	Electrical Conductivity
EIS	Environmental Impact Statement
EP&A Act	Environmental Planning and Assessment Act 1979
EPA	Environment Protection Authority
ESCP	Erosion and Sediment Control Plan
ESP	Exchangeable Sodium Percentage
GL	Gigalitre
GPG	Global Power Generation Australia
ha	Hectare
IBRA	Interim Biogeographic Regionalisation for Australia
KFH	Key Fish Habitat
km	Kilometre
kV	Kilovolt
LGA	Local Government Area
LSC	Land And Soil Capability
MHRDC	Maximum Harvestable Rights Dam Capacity
ML	Mega Litres
MW	Megawatts
SEARS	Secretary's Environmental Assessment Requirements
SEED	Sharing and Enabling Environmental Data
SRLUP	Strategic Regional Land Use Policy

Name	Description
SSD	State Significant Development
SWMP	Soil And Water Management Plan
WAL	Water Access Licence
WM Act	Water Management Act 2000
WQO	Water Quality Objectives
WSP	Water Sharing Plan
WTG	Wind Turbine Generator

EXECUTIVE SUMMARY

Environmental Resources Management Australia Pty Ltd (ERM) was engaged by Global Power Generation Australia to undertake a Hydrology Assessment for the proposed Paling Yards Wind Farm, located on approximately 45km south of Oberon and 25km north-west of Taralga in the Central Tablelands region of New South Wales (NSW).

The proposed wind farm will comprise of a maximum of 47 wind generation turbines, with an approximate capacity up to 287 megawatts (MW) to supply the national energy market (NEM). The proposal includes ancillary infrastructure including internal access tracks, road upgrades, internal electrical reticulation network, two on-site substations, three meteorological masts, a temporary concrete batching plant, operation and maintenance buildings and grid connection to the existing Mt Piper to Bannaby 500 kilovolt (kV) transmission line.

The Hydrology Assessment identifies the existing soils and water environment of the Project Area, identifies impacts, describes mitigation measures to be implemented, quantifies the required water supply and details available water supply options.

The Project will require an estimated 40 ML of water during the 22-month construction period. Water supply options are available to meet the needs of the construction phase, which include:

- council water supply, in agreement with the relevant Council(s);
- extraction of water collected from existing (or new) dams using landowner harvestable rights or from an existing nearby landowner bore, in agreement to use their allocation;
- extraction from a new groundwater bore, which will require a WAL in consultation with WaterNSW; and
- extraction from a surface water source (e.g. Abercrombie River), which will require a WAL in consultation with WaterNSW

Water access licensing would need to be addressed depending on the preferred option, and should be discussed with WaterNSW.

Overall potential soil and water impacts are relatively minor due to the low erosion hazard over the majority of the Project Area to be impacted by construction. A number of mitigation measures are proposed for the Project to address potential soil and water impacts, including the preparation of progressive Erosion and Sediment Control Plans to address management requirements at individual work sites.

A detailed Soil and Water Management Plan will be prepared for the project prior to construction commencing that incorporates the measures identified within this assessment.

1. INTRODUCTION

1.1 Background

The Proponent, Global Power Generation Australia (GPG), is seeking approval to construct and operate the Paling Yards Wind Farm, located approximately 45km south of Oberon and 25km north west of Taralga in the Central Tablelands region of New South Wales (NSW) and within the Oberon local government (the Project). A regional locality plan is provided in Figure 1-1. The Project would supply up to 287 megawatts (MW) of installed capacity renewable energy directly into the national electricity grid by connecting to the existing Mt Piper to Bannaby 500 kilovolt (kV) transmission line to the north east via a proposed 9 kilometre (km) transmission line and switching station. 8 km of the transmission line would be 132 kV and the remaining 1 km of transmission line would be 500 kV

The proposed development involves the construction and operation of:

- 47 wind turbine generators (WTG) with maximum height of 240 metres (m) (to blade tip); and
- ancillary infrastructure including internal access tracks, road upgrades, internal electrical reticulation network (both overhead and underground), two on-site substations, three meteorological masts, and operation and maintenance buildings.

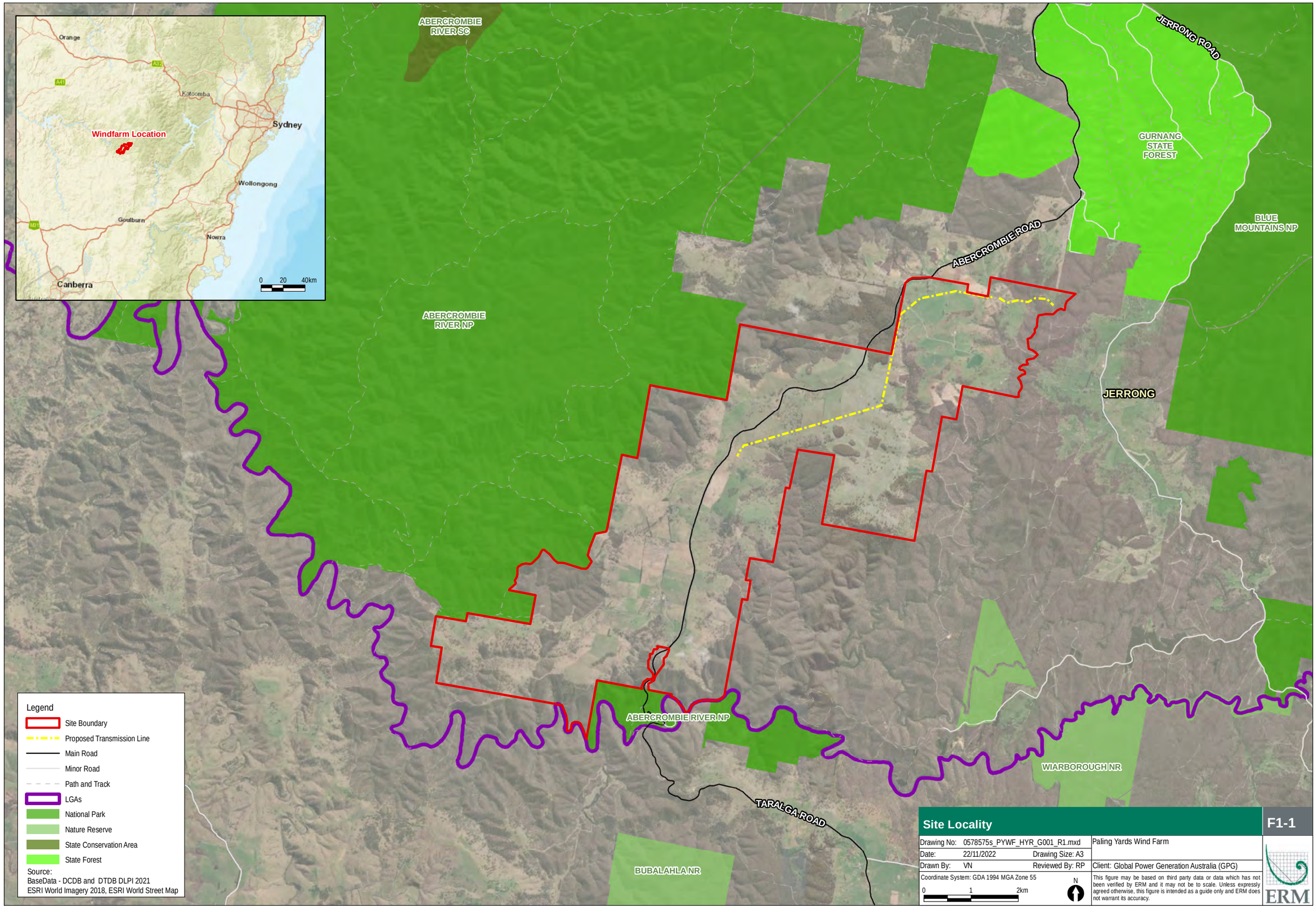
The Project encompasses approximately 4,600 hectares (ha) (the 'Project Area') as outlined by the Project boundary in Figure 1-1.

This hydrological technical assessment has been prepared for input into the Environmental Impact Statement (EIS) for the Project being prepared by Tract.

1.2 Objectives

The Hydrology Assessment has been prepared to:

- address the Secretary's Environmental Assessment Requirements (SEARs) issued;
- describe the existing soil and water conditions across the Project Area ;
- provide details of waterway crossings;
- identify likely impacts at water crossing locations and measures to minimise these impacts;
- identify the key potential soil and water impacts and assess associated risks;
- identify appropriate management and mitigation measures to ensure that construction and operation of the proposed wind farm would result in an acceptable level of environmental impact, pursuant to the *Environmental Planning and Assessment Act 1979* (EP&A Act) and other relevant legalisation. A Conceptual Soil and Water Management Plan will been provided to support this;
- analyse water demands and supply options to determine whether an adequate and secure water supply is available for the life of the Project;
- determine the balance of water supply based on expected construction and operation water requirements;
- assess potential environmental impacts associated with the identified sources, including impacts on groundwater and implications for existing licensed users/basic landholder rights;
- identify the statutory (licensing) context of the water supply sources; and
- discuss management of chemicals/hydrocarbons to prevent soil and water impacts.



Site Locality

F1-1

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Date:	22/11/2022	Drawing Size: A3	
Drawn By:	VN	Reviewed By: RP	Client: Global Power Generation Australia (GPG)

Coordinate System: GDA 1994 MGA Zone 55

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1.3 Secretary's Environmental Assessment Requirements

The Proposal was determined to be State Significant Development with approval under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). SEARs were issued for the Proposal on 9 March 2022 by the Department of Planning and Environment (DPE). The SEARs relevant to hydrology are presented in Table 1.1

Table 1.1 Secretary's Environment Assessment Requirements (SEARs)

Issue	Requirement	Reference
Water & Soils	■ an assessment of the likely impacts of the development (including flooding) on surface water and groundwater resources traversing the site and surrounding watercourses, the Wyangala Dam Water catchment, drainage channels, wetlands, riparian land, farm dams, groundwater dependent ecosystems and acid sulfate soils, related infrastructure, adjacent licensed water users and basic landholder rights, and measures proposed to monitor, reduce and mitigate these impacts; ■ quantify water demand, identify water sources (surface and groundwater), including any licensing requirements, and determine whether an adequate and secure water supply is available for the development; ■ where the project involves works within 40 metres of the high bank of any river, lake or wetlands (collectively waterfront land), identify likely impacts to the waterfront land, and how the activities are to be designed and implemented in accordance with the DPI Guidelines for Controlled Activities on Waterfront Land (2018) and (if necessary) Why Do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings (DPI 2003); and Policy & Guidelines for Fish Habitat Conservation & Management (DPI, 2013); ■ a description of the measures to minimise surface and groundwater impacts, including how works on erodible soil types would be managed and any contingency requirements to address residual impacts in accordance with the Managing Urban Stormwater: Soils and Construction series of guidelines; ■ an assessment of risks of dust generation and propose mitigation measures designed in accordance with the Approved Methods and Guidelines for the Modelling and Assessment of Air Pollutants in New South Wales (DECC, 2005);	■ Section 1.7, Section 2 and Section 3 ■ Section 4 ■ Section 4.3 ■ Section 5 and Section 6 ■ Section 5.3.5 and Section 6
Land	■ an assessment of the potential impacts of the development on existing land uses on the site and adjacent land, including: - a soil survey to determine the soil characteristics and consider the potential for erosion to occur.	■ Section 4
Consultation Requirements	During the preparation of the EIS, consultation is required with relevant local, State and Commonwealth Government authorities, service providers, community groups and affected landowners (as relevant to this Hydrology Assessment): ■ Oberon Council ■ DPE Biodiversity and Conservation Division ■ National Parks and Wildlife Services ■ DPIE Water Group ■ WaterNSW ■ Regional NSW – Mining, Exploration & Geoscience (MEG) ■ Department of Primary Industries –Fisheries and Agriculture ■ Transport for NSW ■ Department of Environment - Crown Lands	■ Table 1.2

Consultation has been undertaken with the relevant government departments and agencies throughout the assessment process relevant to hydrology, as outlined in Table 1.2.

Table 1.2 Agency Consultation

Agency	Consultation Description	Comments
Oberon Council	No comments to add to SEARs in relation to soil and water	■ Relates to landholder property
DPE - Biodiversity and Conservation Division	Provided advice for consideration in SEARs	■ Include description of relevant water and soil features ■ Include assessment and mitigation measures for water quality, hydrology and Abercrombie River National Park ■ Include flooding assessment
National Parks and Wildlife Services	Provided advice for consideration in SEARs	■ Apply guideline developments adjacent to National Parks and Wildlife Service lands (NPWS 2020)
DPIE Water Group	Provided advice for consideration in SEARs	■ Include assessment and mitigation measures for watercourses, erosion and water supply
Regional NSW – Mining, Exploration & Geoscience (MEG)	No comments to add to SEARs in relation to soil and water	■ Related to biodiversity offsets
Department of Primary Industries – Agriculture	Provided advice for consideration in SEARs	■ Include measures to address erosion. ■ Detail estimated water demand, availability and sources
Department of Primary Industries –Fisheries	Provided advice for consideration in SEARs	■ Include assessment and mitigation measures for Key Fish Habitats, waterway crossings and riparian zones
WaterNSW	Provided advice for consideration in SEARs	■ Protect water quality monitoring site (412053 - Abercrombie River at Bumaroo) is located within the project area
Transport for NSW	No comments to add to SEARs in relation to soil and water	■ Related to traffic management
Department of Environment - Crown Lands	No comments to add to SEARs in relation to soil and water	■ Related to the use of Crown Lands, if required

1.4 Regional and Local Context

The Project Area is located on the western extent of the Great Dividing Range, 60 km south of Oberon, 60km north of Goulburn in NSW and approximately 140 km west of Sydney (refer to Figure 1.1).

The surrounding area consists predominantly of large rural properties and National Park with the north eastern portion of the Project Area in proximity to the Blue Mountains National Park, and Abercrombie River National Park to the west and south. The Project is situated in the Oberon Local Government Area (LGA).

The area is heavily undulated with some steep slopes. The Project Area is bisected by Abercrombie Road which links the towns of Oberon and Goulburn. The closest towns are Porters Retreat and Curraweela which have township populations of approximately 64 and 67 people respectively, reported in 2021 (Australian Bureau of Statistics (ABS), 2021a).

Several watercourses traverse the area including the Abercrombie River which flows into the Lachlan River. The Abercrombie River forms the southern boundary of the Project Area.

The Project Area is approximately 40km to the north-east of the existing Crookwell 1 Wind Farm and the approved Crookwell 2 and Crookwell 3 Wind Farms.

Land on which the Project is proposed to be located is owned by four separate landholdings. The Development Footprint within the Project Area, being that portion proposed to be disturbed, is predominantly agricultural land that has been cleared of native vegetation and utilised for sheep and cattle grazing.

1.5 Project Description

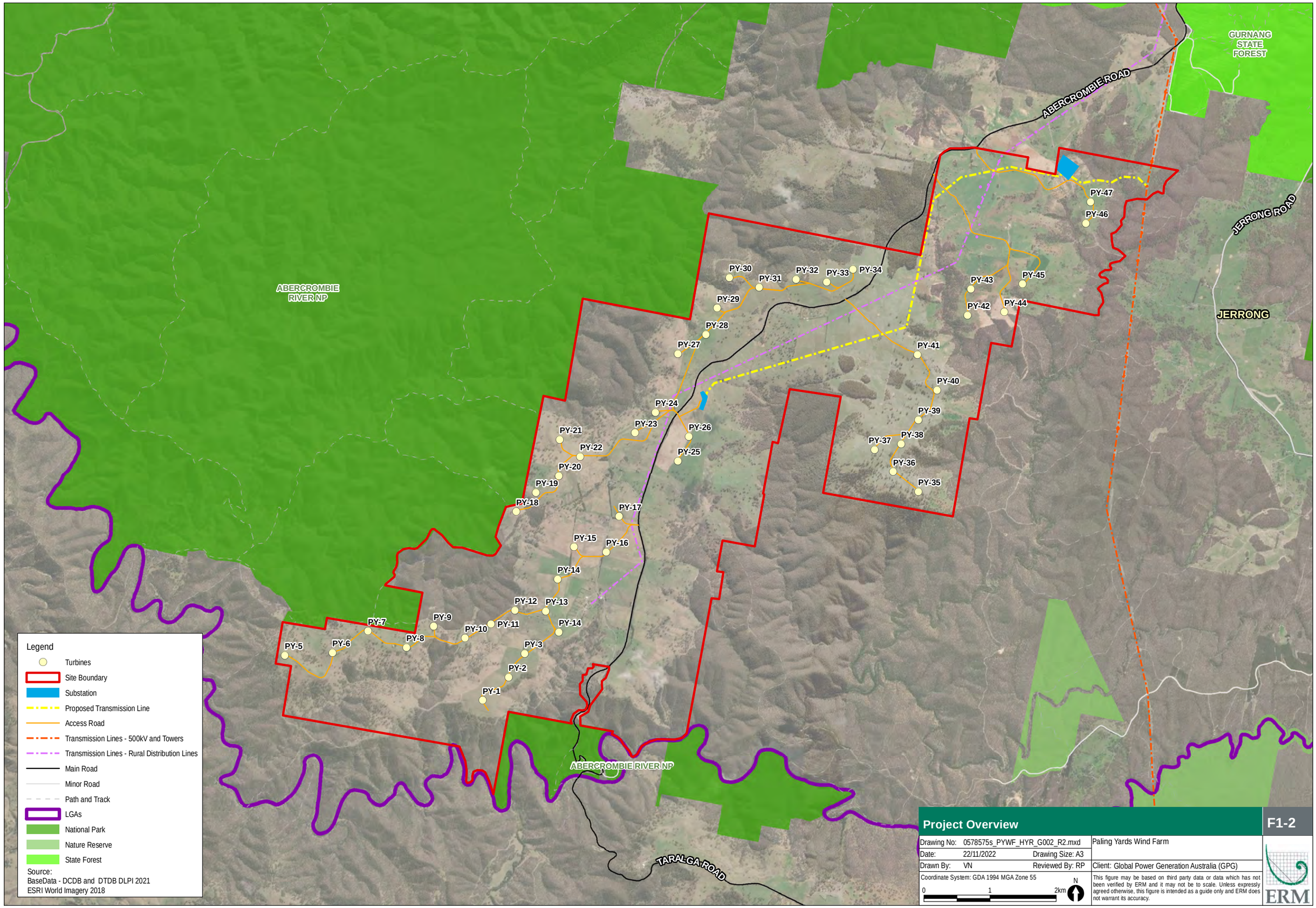
The Project involves the construction, operation and commissioning of a wind farm with up to 47 wind turbine generators (WTG), together with associated and ancillary infrastructure.

The Project has been revised and refined over time in response to design and constructability requirements, and in consideration of environmental constraints and the outcomes of community consultation.

The Project consists of the following key components:

- up to 47 WTGs, each with:
  - a maximum height of 240 m AGL (to the blade tip) with a generating capacity of approximately 6.1 MW;
  - tubular steel tower holding the nacelle;
  - three blades mounted to a rotor hub and the gearbox and generator assembly housed in the nacelle; and
  - adjacent hardstands for use as crane pads and assembly / laydown areas;
- installation of three wind monitoring masts, fitted with various instruments such as anemometers, wind vanes, temperature gauges and other electrical equipment;
- obstacle lighting to selected turbines (if required);
- construction of on-site electrical substations (collector substation and connection substation) with approximately 9 km of overhead power line to connect to a 500 kV transmission line;
- construction of a control room, maintenance buildings, switchgear, and associated control systems in the vicinity of the wind turbine towers.);
- roadworks and upgrades to local road infrastructure at key access points along Abercrombie Road in addition to internal tracks for vehicle access to turbines and infrastructure;
- removal of native vegetation and additional vegetation planting to provide screening (as required);
- temporary site buildings and facilities for construction contractors / equipment, including site offices, car parking and amenities for the construction workforce; and
- a temporary batching plant to supply concrete.

Collectively, these Project elements are referred to throughout this report as the ‘Development Footprint’. The Project layout and key design elements are provided in Figure 1.2.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ABERCROMBIE RIVER NP
TARALGA ROAD
Legend
Turbines
Site Boundary
Substation
Proposed Transmission Line
Access Road
Transmission Lines - 500kV and Towers
Transmission Lines - Rural Distribution Lines
Main Road
Minor Road
Path and Track
LGAs
National Park
Nature Reserve
State Forest
Source:
BaseData - DCDB and DTDB DLPI 2021
ESRI World Imagery 2018
Project Overview
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Drawn By: VN
Reviewed By: RP
Client: Global Power Generation Australia (GPG)
Coordinate System: GDA 1994 MGA Zone 55
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This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.
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1.6 Climate

An understanding of the existing climatic context of the Project Area has been developed through data available from the Australian Governments Bureau of Meteorology (BoM)

Climate data is available from BoM weather stations located at Taralga Post Office (Station No. 070080) which is located approximately 35 km south of the Project Area and Oberon (Station No. 163063) which is located approximately 68 km north of the Project Area.

The Taralga Post Office is located at an elevation of 845 m, whilst the Oberon weather station sits at 1088 m.

1.6.1 Rainfall

Monthly rainfall data from the Taralga Post Office (070080) was used in further assessments as being the closest station to the Project Area.

The mean monthly precipitation is summarised in Table 1.3 below, with the highest and lowest rainfall records highlighted in red and blue respectively.

Table 1.3 Monthly Precipitation Data for 1882[1] – 2022 (mm)

Statistic	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean	73.4	72.2	70.1	58.2	58.8	75.6	66.4	67.9	61.2	69.4	68.7	66.5	804.0
Lowest	6.4	0.0	0.0	0.8	3.1	0.0	4.3	0.5	8.4	0.4	0.5	0.0	360.4
Median	61.0	59.1	54.7	46.4	42.4	58.8	58.7	61.7	57.2	60.2	60.6	56.0	786.0
Highest	296.7	363.2	295.0	248.4	432.2	418.0	256.9	274.8	150.9	197.8	405.2	233.5	1492.7

[1] Taralga Post Office weather station has collected data since August 1882, however some gaps exist in datasets collected for the following years: 2001 and 2021.

Note: Data collected from BoM's climate data online, accessed 2 May 2022 (BOM, 2022).

Figure 1.3 Monthly Precipitation Data for 1881-2022 (mm)

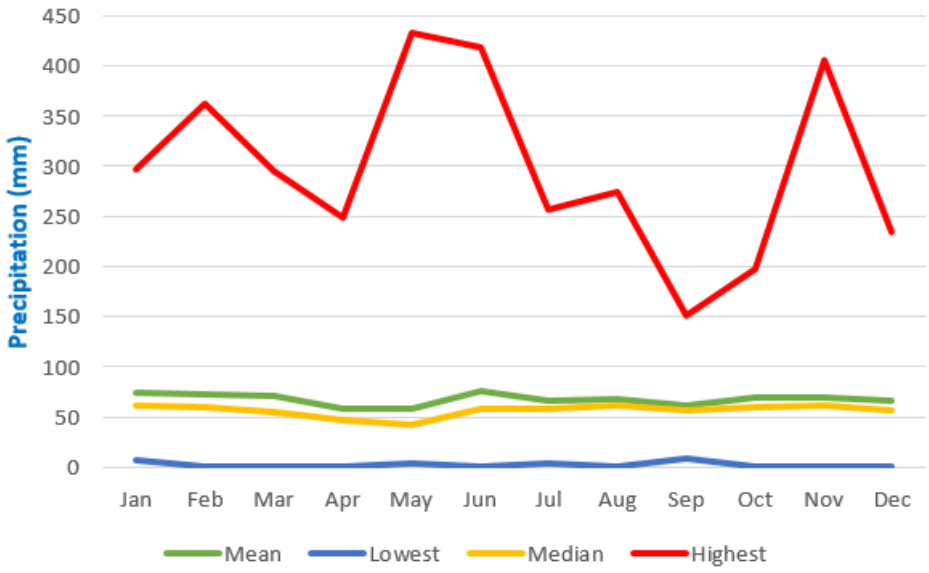
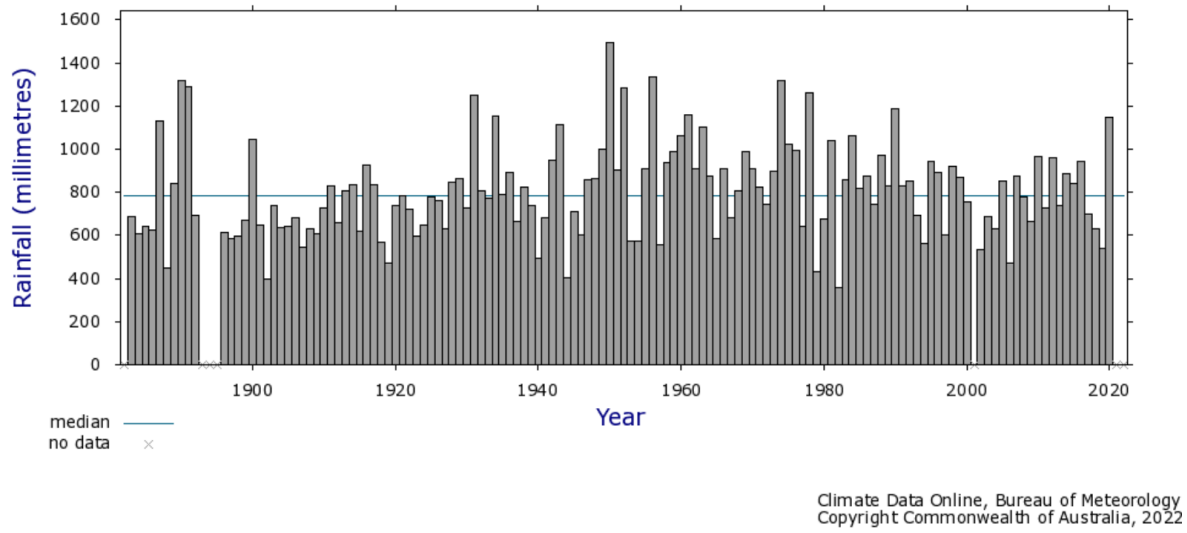


Figure 1.4 Taralga (Post Office) Annual Rainfall



Source: Data collected from BoM's climate data online, accessed 2 May 2022 (BOM, 2022).

1.7 Flood Assessment

A flood assessment was completed by ERM to support the Hydrology Assessment and address the SEARs, it is provided in *Appendix B*.

The flood assessment presents a detailed review of desktop modelling undertaken in the Paling Yards Wind Farm area, using large and extreme flood events. The WTGs have been conceptually placed following the available ridge lines, avoiding areas which potentially function as a drainage line during runoff producing rainfall events. The flood assessment results for the 5% Annual Exceedance Probability (AEP) and 1% AEP indicate that based on available design detail and environmental data, potential impact to the Project is not expected.

2. WATER LICENSING AND STAUATORY MATTERS

2.1 Water Management Act 2000

The objectives of the *Water Management Act 2000* (WM Act) is to provide for the sustainable and integrated management of the water sources of the State. This includes, among other matters; to protect, enhance and restore water sources and their associated ecosystems; to recognise and foster the significant social and economic benefits that result from the sustainable and efficient use of water; to provide for the sharing of water from water sources; and to encourage best practice in water management and use.

Section 4.41 of the EP&A Act confirms that approved State Significant Development (SSD) does not require approvals under WM Act Section 89 (water use), Section 90 (water management work) or Section 91(2) (controlled activity), however Section 91(3) aquifer interference approvals are not exempt (aquifer interference approvals have not been activated).

Given the SSD status, the Project is exempt from a controlled activity approval and does not require the application of the *Guidelines for controlled activities on waterfront land* (Department of Industry (DoI), 2018).

The WM Act regulates the use and interference with surface and groundwater in NSW through 'Water Sharing Plans' (WSPs). Two WSPs intersect with the Proposal area:

- Water Sharing Plan for the Lachlan Unregulated and Alluvial Water Sources 2012; and
- NSW Murray Darling Basin Fractured Rock Groundwater Sources 2020.

Figure 2.1 has been developed to detail the applicable boundaries of the plan in relation to the Project Area. The provisions of the WSPs apply where water supply for the Project is to be accessed via groundwater. Further discussion on how the plan relates to the Project is provided in the following sections and in Table 2.1.

2.1.1 Water Sharing Plans

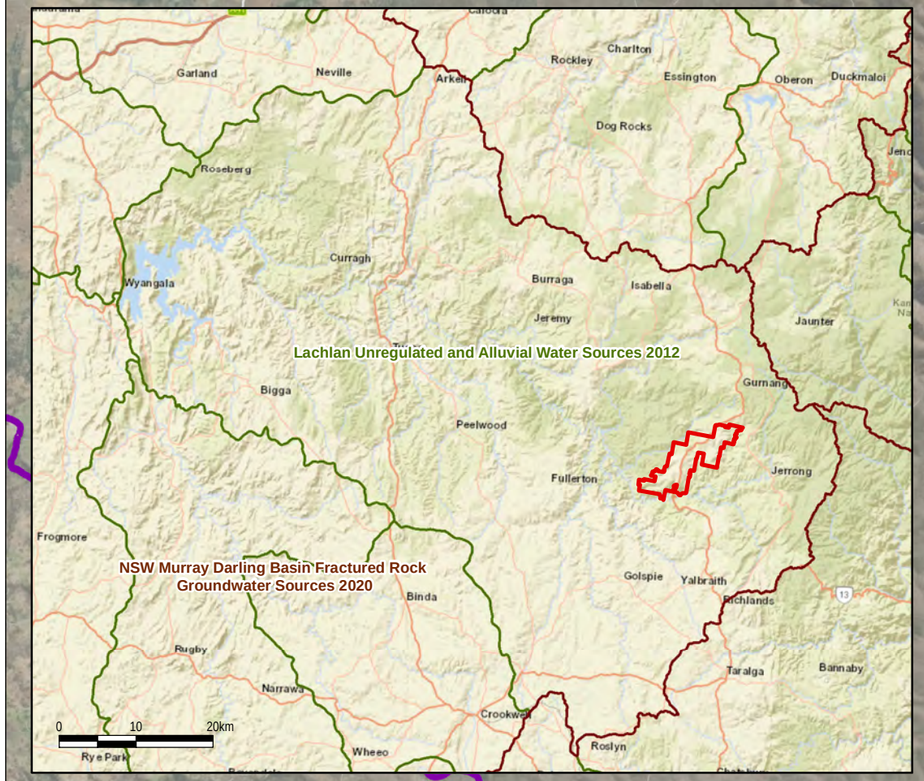
WSPs are established as a statutory obligation under the WM Act developed as a 10 year management plan tailored to the guide water provisions and allocation for a given catchment area. Once a WSP commences, the licencing provisions of the WM Act come into effect in the plan area.

The purpose of WSPs are to:

- provide water users with a clear picture of when and how water will be available for extraction;
- protect the fundamental environmental health of the water source; and
- ensure the water source is sustainable in the long-term.

Table 2.1 Applicable Water Sharing Plans

Water Sharing Plan	GW or SW	Effective Date	WSP Capacity
Lachlan Unregulated and Alluvial Water Sources 2012	SW	September 2012 to July 2023	At the commencement of this Plan, the water requirements of persons entitled to domestic and stock rights are 547 megalitres per year (ML/year), in the Abercrombie River above Wyangala Water Source.
NSW Murray Darling Basin Fractured Rock Groundwater Sources 2020	GW	July 2020 to June 2031	At the commencement of this Plan, the water requirements of persons entitled to domestic and stock rights are 74,311 ML/year in the Lachlan Fold Belt Murray Darling Basin Groundwater Source.



Legend

- Site Boundary
- Proposed Transmission Line
- Water Sharing Plan Surface Water Sources
- Water Sharing Plan Groundwater Sources
- Main Road
- Minor Road
- Path and Track
- LGAs

Source:
BaseData - DCDB and DTDB DLPI 2021
ESRI World Imagery 2018, ESRI World Street Map

Water Sharing Plans

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Drawing No:	0578575s_PYWF_HYR_G003_R1.mxd		Paling Yards Wind Farm
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Drawn By:	VN	Reviewed By: RP	Client: Global Power Generation Australia (GPG)

Coordinate System: GDA 1994 MGA Zone 55

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2.1.2 Basic Landowner Rights

Under the WM Act, extraction of water for basic landholder rights (BLR) does not require a licence, although in the case of accessing groundwater under BLR the bore must still be approved by WaterNSW. Part 1 of the WM Act outlines basic landholder rights that include domestic and stock rights (Section 52 of the Act), harvestable rights (Section 53 of the Act) and native title rights (Section 55 of the Act). In relation to harvestable rights, Section 53 of the WM Act states:

> *'(1) An owner or occupier of a landholding within a harvestable rights area is entitled, without the need for any access licence, water supply work approval or water use approval, to do each of the following in accordance with the harvestable rights order by which the area is constituted:*
>
> > *(a) to construct and use one or more water supply works for the purpose of capturing and storing water of a kind specified by the harvestable rights order,*
> >
> > *(b) to take and use that water.'*

The WM Act establishes basic rights for access to water by rural landowners and outlines several categories of farm dams that do not require a licence. The harvestable rights provisions enable landholders to construct dams, in certain positions (e.g. on hillsides and minor watercourses), that capture up to 10% of the average regional rainfall run-off for their property without requiring a licence. This is known as the maximum harvestable rights dam capacity (MHRDC).

The Project Area is within a harvestable rights area and the harvestable rights are further discussed in Section 3.2.1.

2.1.3 Water Access Licenses

Except for basic landholder rights (discussed in Section 2.1.2), all other water extraction either requires an authorisation under a water access licence (WAL) or some form of exemption. The WM Act establishes categories and sub-categories of access licences.

The most relevant WAL categories for the Project are the 'unregulated river' (for surface water extraction) and aquifer (for groundwater extraction) categories. The total entitlement or share component for each category of access licence that applies at the start of the plan is estimated and is included in the relevant plan.

2.1.3.1 Surface Water Extraction

Extraction from a surface water supply outside the harvestable rights capacity, or from an unregulated water source (i.e. the Abercrombie River) will require a WAL (unregulated river category) under Section 56 of the WM Act in accordance with the annual extraction limits and of the *'Water Sharing Plan for the Lachlan Unregulated and Alluvial Water Sources 2012'* and access rules for the relevant water source (as listed in Table 2.1 above).

2.1.3.2 Groundwater Extraction

It is not expected that wind farm construction activities would intercept groundwater. Excavations would be relatively shallow, with the turbine foundation construction activity at approximately 3 m – 5 m deep, and cuttings in the side of hill slopes, where required, to a depth of approximately 10 m – 15 m.

There is the potential for one or more new groundwater production bores to be installed to supply water for construction (discussed further in Section 3.2.2). If this option is pursued then an application for a WAL under Section 56 of the WA Act will be required, in accordance with annual extraction limits and access rules of the relevant water sharing plan.

2.1.4 Aquifer Interference Policy

The NSW Aquifer Interference Policy (2012) describes the assessment process for protecting and managing potential impacts of aquifer interference activities on the water resources of NSW. The WM Act defines an aquifer interference activity as that which involves either:

- the penetration of an aquifer;
- the interference with water in an aquifer;
- the obstruction of the flow of water in an aquifer;
- the taking of water from an aquifer in the course of carrying out mining or any other activity prescribed by the regulations; or
- the disposal of water taken from an aquifer in the course of carrying out mining or any other activity prescribed by the regulations.

Section 3.3 of the Aquifer Interference Policy identifies activities such as trenching, access tracks, and building and work pads as activities defined as having minimal impact on water dependent assets. The Project works are considered as having minimal impact on water dependent assets with the most significant excavation works being the work pads and associated wind turbine foundations to a depth of approximately 3 m -5 m. Minor cuttings in the sides of hill slopes for the construction and installation of the WTGs may be required at approximately 10 m – 15 m deep, however design has located the WTGS along the elevated ridgeline.

Aquifer interception is not anticipated, noting the estimated depth of the water table is generally greater than 20 m below surface, based on existing recorded bore depths. It is noted that one groundwater bore (GW032488) recorded a groundwater bearing zone at a depth of 7.9 m, however it was installed in 1967 and it is unknown if it is still functioning. GW032488 is located within a low lying depression within the Project Area, in close proximity to an existing dam and the closest WTG is at distance of greater than 600 m. (refer to Section3.2.2).

2.2 Implications for the Project

Given the SSD status of the Project, Section 4.41 of the EP&A Act negates the requirements for relevant approvals otherwise obtained through the WM Act, including a water use approval under Section 89, a water management work approval under Section 90, or an activity approval under Section 91 of the WM Act.

As discussed further in Section 3.2 of this report, the Project has four viable options available to source water, being:

- Council water supply, in agreement with the relevant Council(s);
- extraction of water collected from existing (or new) dams using landowner harvestable rights or from an existing nearby landowner bore, in agreement to use their allocation;
- extraction from a new groundwater bore, which will require a WAL in consultation with WaterNSW; and
- extraction from a surface water source (e.g. the Abercrombie River), which will require a WAL in consultation with WaterNSW.

Confirmation of the proposed source will be determined following detailed design.

3. WATER BALANCE

3.1 Construction Water Demands

During the construction period, water will need to be sourced for the following purposes:

- concrete production (batching plant);
- construction of roads and hardstands; and
- dust suppression.

Based on an understanding of the construction requirements and the construction schedule, estimates have been made on the likely quantities of water required.

Information used to determine likely water requirements included:

- total length of internal unsealed road network (may be either upgraded existing tracks, or new tracks) is approximately 33 km;
- it is assumed that access roads will be constructed to 6-10 m wide and with approximately 0.3-0.4 m depth of onsite and/or imported road base/aggregate that would need to be laid and compacted;
- during track construction water would be added to aid compaction of road base at a rate of approximately 4% by weight. It is noted that this is an average, with lesser quantities likely to be required during wet/cool conditions, and greater quantities during hot/dry conditions. The total water requirement for road construction is approximately 6.1 ML. Allowing a 50% contingency factor results in a total water demand of 9.1ML;
- road construction is likely to occur for about the first six to eight months of the project and spread relatively uniform over this time;
- an additional allowance of 50kL/day is provided for road maintenance, dust suppression and wash down for the 22 month construction period (assume full days on Monday to Friday and half days on Saturdays);
- crane hardstands of approximately 115 m by 60 m will need to be constructed adjacent to the base of the WTGs to enable the erection of the turbine. Each pad will be constructed from cut and fill material and compacted selected aggregates providing a stabilised all-weather surface which will require minimal dust control. Similar to access roads, water demand for compaction is highly variable depending on moisture content of material and antecedent conditions and is estimated at 65 kL/pad; and
- water is required for concrete production for WTG footings. The final footing design is subject to final geotechnical investigations and turbine selection and is expected to be available prior to construction. However, an estimate based on there being 47 footings in total, hexagonal in shape, approximately 17 m in diameter. The volume of concrete is estimated at approximately 560 m^3 per foundation and a total concrete volume of approximately 26,320 m^3. Additional concrete will be required for construction of the substations, and operation and maintenance building foundations, which is estimated at an additional 1,500 m^3.

  Water input estimate is based on a typical cement:sand:aggregate ratio of 1:2:3 and a water:cement ratio of 0.4. The total water estimate to produce 27,820 m^3 of concrete is approximately 1,855 m^3 (volume rounded to 1.9 ML). Concrete production is expected to occur mainly between months six and sixteen and with production at a relatively consistent rate during this time.

Based on a worst-case scenario, the total water demand for non-potable supply over the 22 month construction period is approximately 40 ML would be required during the construction phase, primarily for road works and dust suppression, but also for cleaning, concreting, and on-site amenities. Water for road works and dust suppression can be of lower quality than is required for concrete production. Water from farm dams or potentially from treated wastewater supply can potentially be utilised for dust suppression.

The estimated total construction water demand is summarised in Table 3.1 and is based on the construction of 47 WTGs.

Table 3.1 Water Demands by Activity (ML)

Project Stage	Activity	Water Requirement
Construction	Access track construction	6.1 ML
	Road maintenance, dust suppression and wash down	28.6 ML
	Crane hardstands	3.1 ML
	Concrete production	1.9 ML
	TOTAL	**39.7 ML**

3.2 Water Supply Options

A number of water supply options have been canvassed, the key options being:

- surface water collection from existing (or new) dams;
- groundwater pumping from bores;
- water abstraction from a nearby permanent water source (i.e. Abercrombie River); and
- tanking water to site from Council supply or other local WAL owners.

The Project may utilise a number of existing property dams scattered throughout the Project Area to store water during the construction period. These dams could be topped up with imported water providing an option to stage the water stores in close proximity to earthworks during construction of access tracks and turbine construction pads.

Water storages would be provided at the batching plant sites and for potable water at the site compounds.

3.2.1 Surface Water Collection

The Project Area has numerous dams that supply water for stock and domestic purposes. These dams could be used to supply water for wind farm construction purposes subject to agreement with the relevant landowners. The Project Area encompasses four separate landholdings over 4,600 hectares. The rainfall runoff that may be captured under harvestable rights for the size of the Project Area is 368 ML per year, calculated via the WaterNSW Maximum Harvestable Rights Dam Capacity Calculator tool (WaterNSW, 2022a). This is approximately nine times the estimated total water needs of the Project.

It would be anticipated that during a good rainfall year, runoff yields into dams would be sufficient to fill the dams several times and water could be taken that would be considered unlikely to compromise the ability to supply the existing stock and domestic needs, provided this was carefully managed. Conversely, in a dry year landholders may be keen to preserve available water for existing agricultural operations.

3.2.2 Groundwater

A new bore, or bores, would need to be constructed to allow for groundwater pumping should this be considered a viable option. The bore/s would need to be licenced for industrial purposes. A water entitlement would then likely need to be purchased on the open market.

A search of Water NSW's real time data website (WaterNSW, 2022b) identified eight registered bores within a 5 km radius of the Project Area, with five of these groundwater monitoring bores located within the Project Area (Water NSW, 2022b). The bores are primarily registered for water supply purposes. A summary of bore details is provided in Table 3.2

Table 3.2 Groundwater Bore Details

Bore ID	Location	Status / Use	Total Depth (m)	Groundwater Bearing Zone (m)	Yield (l/s)
GW032489	Within Project Area	Non-functioning	64.2	no details (reconditioned bore)	n/a
GW104075	Within Project Area	Domestic /Stock	48	29-30	4.1
GW701355	Within Project Area	Domestic /Stock	70	20-21; 37-38; 65-66	4.4
GW706553	Within Project Area	Domestic /Stock	90	62- 64; 75-79	1.12
GW032488	Within Project Area	Domestic /Stock	29.3	7.9	0.5
GW023961	Approximately 2 km east of Project Area	Domestic	52.7	43.3-52.7	0.04-0.09
GW702219	Approximately 2 km south of Project Area	Domestic /Stock	100	no details (abandoned bore)	n/a
GW703213	Approximately 4 km south of Project Area	Domestic /Stock	64	45-48	0.44

Groundwater bore (GW032488) recorded a groundwater bearing zone at a depth of 7.9 m, relatively shallower than the other registered groundwater bores identified. It should be noted it is located within a low lying depression within the Project Area, in close proximity to an existing dam and the closest WTG is at distance of greater than 600 m.

It could be reasonably assumed that if additional bores were established within the Project Area a yield of approximately 1.0 l/s could be secured. This amounts to a potential long-term pumping rate during standard construction hours of approximately 40 kL/day, or 1.2 ML/month. Assuming such yields were achieved, this would be capable of supplying a significant proportion of the construction water needs of the Project and hence reducing the demand for importing using water tankers. Consideration would need to be given to water storage and this could be in a new or existing dam or temporary tanks. All work would be subject to agreement with the landholders. It would be possible to on-sell any water entitlement over the new bore to the landholder at the completion of construction. Alternately, the landholder could apply for a new stock and domestic license over the bore.

3.2.3 Surface Water Abstraction

As outlined in Section 2.1 a WAL may be applied to source water from an unregulated water source. A potential water source is the Abercrombie River. Review of online river flow data indicated that the Abercrombie River at Hadley (Station 412066) had a daily flow rate of around 530 ML/day, as recorded on 22 March 2022 (WaterNSW, 2022). Review of water levels at Wyangala Dam on 22 March 2022, identified that the dam is currently at 98.2 % capacity with a current volume of 1,196 gigalites (GL), receiving a net inflow of 1000 ML in the past 24 hours.

Given the total requirement for all Project activities is limited to the 24 month construction period is approximately 40 ML, it could be possible to permit water abstraction for the Project without impacting environmental flows. WALs would have to be purchased to meet the Project needs.

3.2.4 Commercial Water Tanker

Where other resources including onsite dams are exhausted or unavailable, water will be sourced from an offsite source using a commercial water tanker, however this is anticipated to add considerable expense to the construction of the Project.

3.2.5 Water Availability

The Water Allocation Statement published by the DPE, dated 8 March 2022, is a statement of the water availability for the Lachlan Valley. High flows have been receding towards the end of February; however, flows have remained adequate to keep all storages full and surplus resource in the system. There was approximately 53 GL of inflow into Wyangala Dam and from downstream tributaries throughout February. The three months between March to May have been forecasted to indicate rainfall is likely to be above median conditions and temperatures are likely to be around or below average (DPE, 2022a)

3.2.6 Summary

There are feasible options for the supply of water for the 22-month Project construction period. The five viable options available to source the estimated 40 ML of water required for construction include:

- Council water supply, with agreement with the relevant Council(s);
- extraction of surface water from existing or newly constructed dam within the project Area, with agreement from the landowner;
- extraction of water from an existing landowner bore, with agreement from the landowner;
- extraction from a new groundwater bore; and
- extraction from an external surface water source (e.g. Farm Dams, Abercrombie River).

If water is sourced from any bore or surface water source then all required water access licences would be obtained to authorise this.

All options involve different considerations and different water licencing and approval requirements.

Confirmation of the proposed water source will be determined following detailed design, however, it has been confirmed that adequate water supply is available for the development. It is not anticipated that the Project will impact adjacent licensed water users and basic land holder rights. Appropriate consultation with landholders and government agencies will be undertaken following confirmation of the proposed water source.

4. SOILS AND WATER ASSESSMENT

To describe the soil characteristics of the Project Area and assess the potential environmental impacts associated with the Project, a soil and water assessment was completed which comprised a desktop assessment and soil survey, as outlined in the following subsections.

4.1 Desktop Assessment

Information was extracted from the NSW Government Central Resource for Sharing and Enabling Environmental Data (SEED) Portal (NSW DPE, 2022a), including the following datasets:

- the Interim Biogeographic Regionalisation for Australia (IBRA); which provides classification of bioregions and subregions across Australia and its external territories (excluding Antarctica);
- the Land and Soil Capability (LSC) mapping of NSW, which depicts the capability and limitations of land for sustaining certain land uses;
- the Biophysical Strategic Agricultural Land (BSAL), which presents land with high quality soil and water resources for sustaining agriculture;
- the Australia Soil Classification (ASC) Soil Type map of NSW, which provides soil types across NSW using the Australian Soils Classification at Order level; and

A desktop investigation of soil profile, soil map information and watercourses by:

- search of eSPADE data for NSW (NSW DPE, 2022c), including Soil Profiles and Hydrologic Soil Groups;
- search of *Water Management (General) Regulation 2018* Hydro Line spatial data (NSW DPE, 2018), which maps watercourses and waterbodies in NSW; and
- search of WaterNSW data (available at https://realtimedata.waternsw.com.au/), including existing groundwater bores and real-time dams and rivers data

Consideration of the NSW Water Quality Objectives (WQO) as they apply to the Lachlan River catchment area of the Project Area, (refer to Section 4.3.3.2).

4.2 Soil Survey

A soil survey was undertaken to support the soil and water assessment, including the characterisation of the existing soil conditions across the Project Area and to consider the potential for erosion to occur. The soil survey was conducted by SLR Consulting Australia Pty Ltd (SLR) between 21 and 27 July 2022.

Soil samples were collected from nine sampling locations across the Project Area, as presented in Figure 4.1. The sampling locations were selected to be spread across the Project Area and located within the different soil classifications (refer to Section 4.3.2.3), on the basis that they would provide a representative description of soils encountered. At each location a total of two samples were collected, one sample from the A horizon and one sample from the B horizon of the soil profile.

Soil samples were submitted to Eurofins, a National Association of Testing (NATA) accredited laboratory for analysis of the physical and chemical properties listed in Table 4.1. A summary of the results is provided in *Table C1*, *Appendix C* and further discussed in Section 4.3.2

Table 4.1 Laboratory Analysis

Physical Soil Properties	Chemical Analyses
Soil texture	pH
Moisture content	Total nitrogen, nitrate and nitrite
Particle size analysis (50 mm and 2.36 mm)	Sulphate
Emerson Aggregate Test	Ammonia
	Cation exchange capacity
	Exchangeable cations (sodium, magnesium, potassium, calcium)
	Exchangeable sodium percentage
	Total phosphorous and phosphorous (colwell)
	Total carbon
	Chloride

4.3 Existing Environment

4.3.1 Topography and Bioregions

4.3.1.1 Landform and Elevation

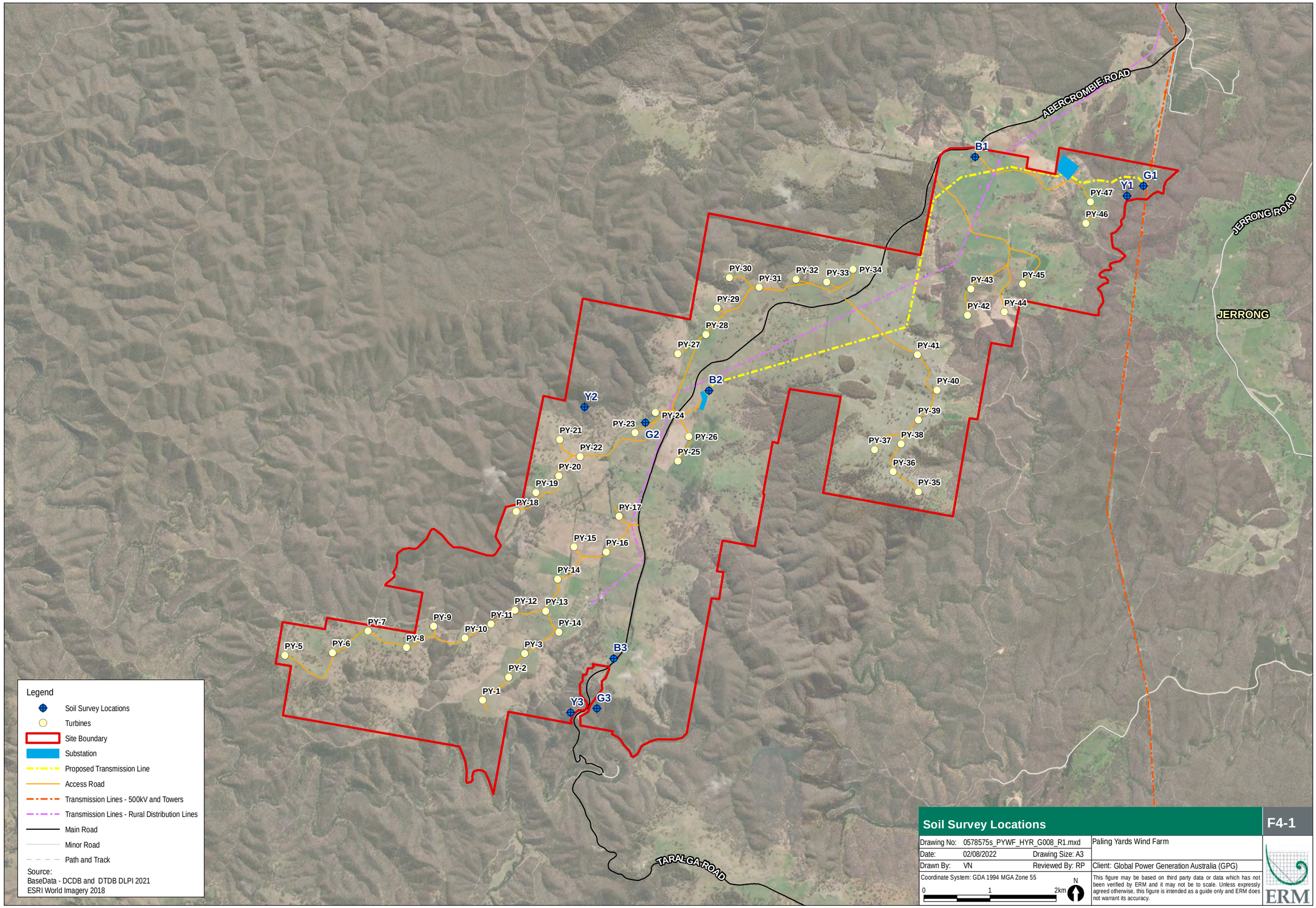
The Project boundary extends around an area of approximately 4,600 hectares of primarily cleared agricultural land over four land holdings, is bound to the south by the Abercrombie River, and shares a boundary to the west and south with Abercrombie River National Park. Abercrombie Road passes through the Project Area and provides access at a number of locations to the wind farm turbines and proposed substation site.

The Project Area ranges in elevation from 900 m to 1065 m above sea level with significant slopes in many areas. It forms part of a prominent elevated plateau landscape dissected by deep valleys. The geology is characterised by tertiary lava flows forming erosion-resistant basalt caps overlying much older Ordovician and Silurian metasediments. Topography of the Project Area is presented in Figure 4-2.

4.3.1.2 Bioregions

The Interim Biogeographic Regionalisation for Australia (IBRA) mapping provides a national and regional framework for understanding bioregions. Bioregions are relatively large land areas characterised by broad, landscape-scale natural features and environmental processes that influence the functions of entire ecosystems. Sub-regions are based on finer differences in geology, vegetation and other biophysical attributes and are the basis for determining the major regional ecosystems (Morgan and Terrey, 1992).

The South Eastern Highlands bioregion lies just inland from the coastal bioregions of the South East Corner and the Sydney Basin, bounded by the Australian Alps and South Western Slopes bioregions to the south and west. The Project Area is situated within the Crookwell IBRA sub-region of the South Eastern Highlands bioregion which is presented in Figure 4-2and described below in Table 4.2.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Legend
Soil Survey Locations
Turbines
Site Boundary
Substation
Proposed Transmission Line
Access Road
Transmission Lines - 500kV and Towers
Transmission Lines - Rural Distribution Lines
Main Road
Minor Road
Path and Track
Source:
BaseData - DCDB and DTDB DLPI 2021
ESRI World Imagery 2018
Soil Survey Locations
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Paling Yards Wind Farm
Date: 02/08/2022
Drawing Size: A3
Drawn By: VN
Reviewed By: RP
Client: Global Power Generation Australia (GPG)
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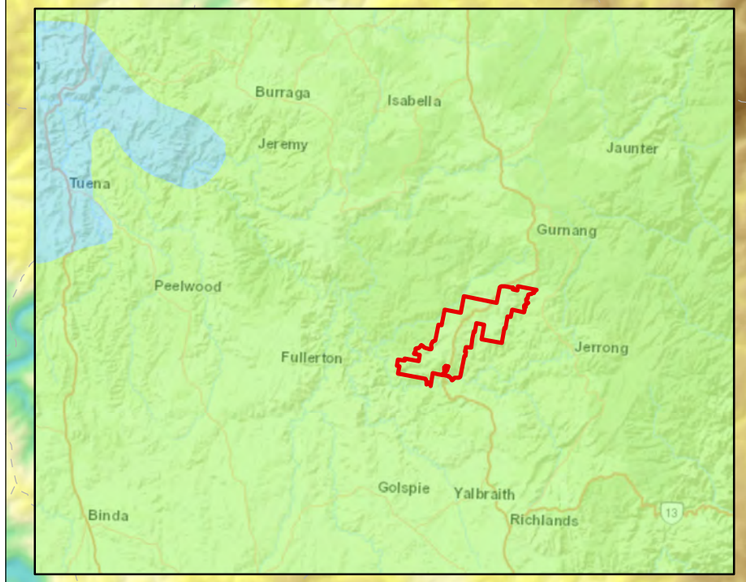

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JERRONG ROAD

JERRONG

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ABERCROMBIE RIVER NP

TARALGA ROAD

Legend

- Turbines
- Site Boundary
- Substation
- Proposed Transmission Line
- Access Road
- Transmission Lines - 500kV and Towers
- Transmission Lines - Rural Distribution Lines
- Main Road
- Minor Road
- Path and Track

IBRA Bioregion

- NSW South Western Slopes
- South Eastern Highlands

Elevation (m)

1272 554

Source:
BaseData - DCDB and DTDB DLPI 2021
ESRI World Imagery 2018

Topography and Bioregions of the Project Area

F4-2

Drawing No:	0578575s_PYWF_HYR_G004_R3.mxd		Paling Yards Wind Farm
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Table 4.2 Crookwell IBRA Sub-region of the South Eastern Highlands Bioregion

Feature	Description
Geology	Fine grained Ordovician and Silurian sedimentary rocks, with some granites. Tertiary basalts with buried river gravels along ridges well above present streams.
Characteristic Landforms	Hilly, with some rugged areas and deep valleys. Hill tops may be small plateaus or capped by basalt and showing inverted relief.
Typical Soils	Red and yellow texture contrast soils, thin and stony on steep slopes. Stony brown structured loams on basalts.
Vegetation	Apple box, mountain gum with Blakely's red gum and yellow box. Red stringybark, white box, broad-leaved peppermint and mottled gum on stony ridges in the north. Small areas of Argyle apple

Source: NSW National Parks and Wildlife Service (2003). The Bioregions of New South Wales.

4.3.2 Soils

4.3.2.1 Land and Soil Capability

Land capability is the inherent physical capacity of the land to sustain a range of land uses and management practices in the long term without degradation to soil, land, air and water resource (OEH, 2012). The NSW land and soil capability assessment scheme (OEH, 2012) describes and maps eight land and soil capability classes. The classification is based on the biophysical features of the land and soil (including landform position, slope gradient, drainage, climate, soil type and soil characteristics) and susceptibility to hazards (including water erosion, wind erosion, soil structure decline, soil acidification, salinity, waterlogging, shallow soils and mass movement).

The mapping is based on an eight class system with values ranging between 1 and 8 which represents a decreasing capability of the land to sustain productive agricultural land use. Class 1 represents land capable of sustaining most land uses including those that have a high impact on soil (e.g. regular cultivation), whilst Class 8 represents land that can only sustain very low impact land uses (e.g. nature conservation), as shown in Table 4.3.

Table 4.3 Land and Soil Capability Scheme Classification (OEH, 2012)

LSC Class	General Definition
Land capable of a wide variety of land uses (cropping, grazing, horticulture, forestry, nature conservation).	
1	**Extremely high capability land**: Land has no limitations. No special land management practices required. Land capable of all rural land uses and land management practices.
2	**Very high capability land**: Land has slight limitations. These can be managed by readily available, easily implemented management practices. Land is capable of most land uses and land management practices, including intensive cropping and cultivation.
3	**High capability land**: Land has moderate limitations and is capable of sustaining high-impact land uses, such as cropping with cultivation, using more intensive, readily available and widely accepted management practices. However, careful management of limitations is required for cropping and intensive grazing to avoid land and environmental degradation.
Land capable of a variety of land uses (cropping with restricted cultivation, pasture cropping, gazing, some horticulture, forestry, nature conservation)	
4	**Moderate capability land**: Land has moderate to high limitations for high-impact land uses. Will restrict land management options for regular high-impact land uses such as cropping, high-intensity grazing and horticulture. These limitations can only be managed by specialised management practices with a high level of knowledge, expertise, inputs, investment and technology.

LSC Class	General Definition
5	**Moderate–low capability land:** Land has high limitations for high-impact land uses. Will largely restrict land use to grazing, some horticulture (orchards), forestry and nature conservation. The limitations need to be carefully managed to prevent long-term degradation.
Land capable for a limited set of land uses (grazing, forestry and nature)	
6	**Low capability land**: Land has very high limitations for high-impact land uses. Land use restricted to low-impact land uses such as grazing, forestry and nature conservation. Careful management of limitations is required to prevent severe land and environmental degradation
Land generally incapable of agricultural land use (selective forestry and nature conservation)	
7	**Very low capability land**: Land has severe limitations that restrict most land uses and generally cannot be overcome. Onsite and offsite impacts of land management practices can be extremely severe if limitations not managed. There should be minimal disturbance of native vegetation.
8	**Extremely low capability land:** Limitations are so severe that the land is incapable of sustaining any land use apart from nature conservation. There should be no disturbance of native vegetation.

The LSC mapping identifies a variation in Classes mapped across the Project Area, as shown in Figure 4-3.

The top of the ridgeline stretches in a north-east to south-west direction predominantly along the centre of the Project Area, has been rated under the LSC scheme as Class 3, high capability land having moderate limitations and is capable of sustaining high-impact land uses. Class 3 land includes sloping lands (3–10%) with slopes longer than 500 m that will require earthworks to control runoff and erosion if used for regular cultivation. Class 3 land is especially widespread on the NSW slopes and in the coastal areas.

It is important to minimise soil disturbance, maintain suitable cover and maintain good organic matter levels. This class includes other soils with acidification and soil structure limitations that are sufficient to require the application of specific management practices. It includes a large proportion of the major agricultural producing areas of the State.

The slopes surrounding the ridgeline have been rated as Class 6, making up the other dominant land class of the Project Area. Class 6 land has very severe limitations for a wide range of land uses and few management practices are available to overcome these limitations. Land generally is suitable only for grazing with limitations and is not suitable for cultivation.

Class 6 land includes steeply sloping lands (20–33% slope) that can erode severely even without cultivation, or land that will be subject to severe wind erosion when cultivated and left exposed. Soil erosion can be very severe without adequate erosion control measures. This land requires careful management to maintain good ground cover.

Aside from the two land classes described above which make up the majority of the Project Area, small pockets of land exist on the boundary of the Project Area rated as Class 7. The Project layout including access tracks, WTG locations and the transmission line occurs on Class 3 and Class 6 land, with the exception of three WTG locations, which are just within Class 7 land in the north eastern portion of the Project Area.

Class 7 is unsuitable for any type of cropping or grazing, as it would result in severe erosion and degradation. The land may be suitable for commercial timber plantations or for native timber on undeveloped land. It includes slopes of 33–50% and also includes areas with extreme soil erodibility (often sodic soils, or prior stream sand dunes), catchments where salinity and recharge are a serious problem, severely scalded areas and where rock outcrop, stoniness and shallow soils are a severe problem.

4.3.2.2 Biophysical Strategic Agricultural Land

Review of the Strategic Regional Land Use Policy (SRLUP) mapping available on the NSW Government SEED website identified that a portion of the Project Area interacts with biophysical strategic agricultural land (BSAL).

BSAL maps identify the inherent land and water resources that are important on a national and state level for agriculture. The lands identified intrinsically have the best quality soil and water resources, topography, and are naturally capable of sustaining high levels of agricultural productivity and require minimal management practices to maintain this. Approximately a total of 1,367 ha of BSAL has been identified within the Project Area (refer to Figure 4-3).

A total of 2.8 million ha of BSAL has been identified and mapped at a regional scale across NSW (NSW DPE, 2020). The Project Area encompasses approximately 0.049% of the total land area mapped as BSAL within NSW. The use of the BSAL mapped area will have limited impacts as the current use of the land for grazing can continue concurrently with the operation of the wind farm.

Once the Project reaches the end of its investment and operational life, the Project infrastructure will be decommissioned and the Development Footprint returned to its pre-existing land use, or other land use in consultation with the landholders, as far as practicable.

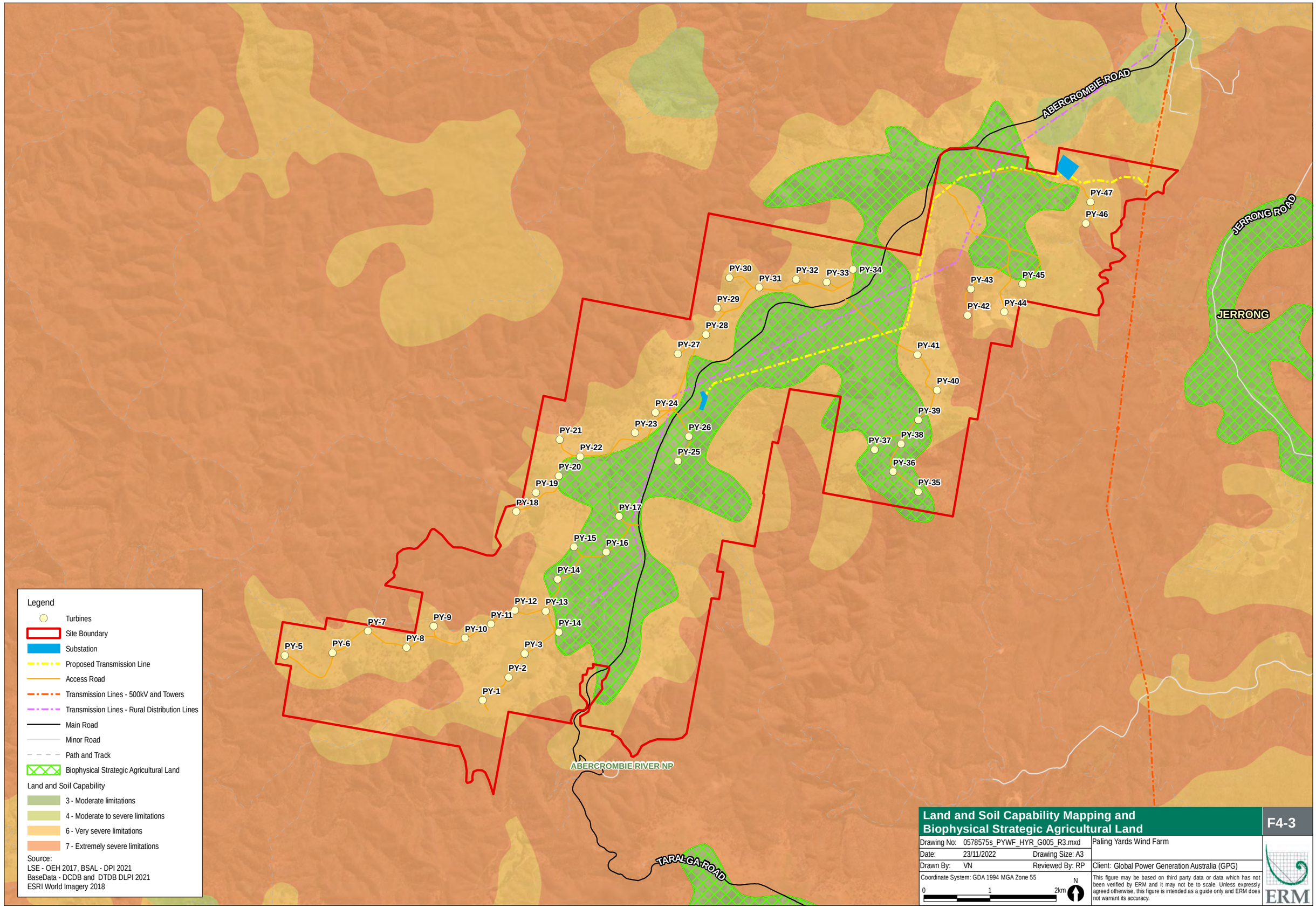
4.3.2.3 Australian Soil Classification

A search of the ASC Soil Type Map of NSW via SEED reveals that Dermosols and Kurosols soil type dominates the Project Area.

Dermosols are moderately deep and well-drained soils of wetter areas in eastern Australia. They occur in the mountainous high rainfall zones of south-eastern Australia and support a wide range of land uses including cattle and sheep grazing of native pastures, forestry and sugarcane.

Kurosols are described as acidic soils with an abrupt increase in clay content and extend from southern Queensland, through coastal and subcoastal New South Wales, to Tasmania. Vegetation is largely dependent on rainfall and ranges from eucalypt woodlands to open forests. Some areas have been cleared and used for dairying on improved pastures. In the higher rainfall areas of New South Wales and Tasmania, Kurosols are used for forestry.

The ASC Soil Type Map of NSW also revealed, to a lesser extent, the presence of Rudosols soil types. The extent of soil types, according to the ASC Soil Type mapping, is shown in Figure 4-4.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Turbines
Site Boundary
Substation
Proposed Transmission Line
Access Road
Transmission Lines - 500kV and Towers
Transmission Lines - Rural Distribution Lines
Main Road
Minor Road
Path and Track
Biophysical Strategic Agricultural Land
Land and Soil Capability
3 - Moderate limitations
4 - Moderate to severe limitations
6 - Very severe limitations
7 - Extremely severe limitations
Source:
LSE - OEH 2017, BSAL - DPI 2021
BaseData - DCDB and DTDB DLPI 2021
ESRI World Imagery 2018
Land and Soil Capability Mapping and Biophysical Strategic Agricultural Land
F4-3
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Paling Yards Wind Farm
Date: 23/11/2022
Drawing Size: A3
Drawn By: VN
Reviewed By: RP
Client: Global Power Generation Australia (GPG)
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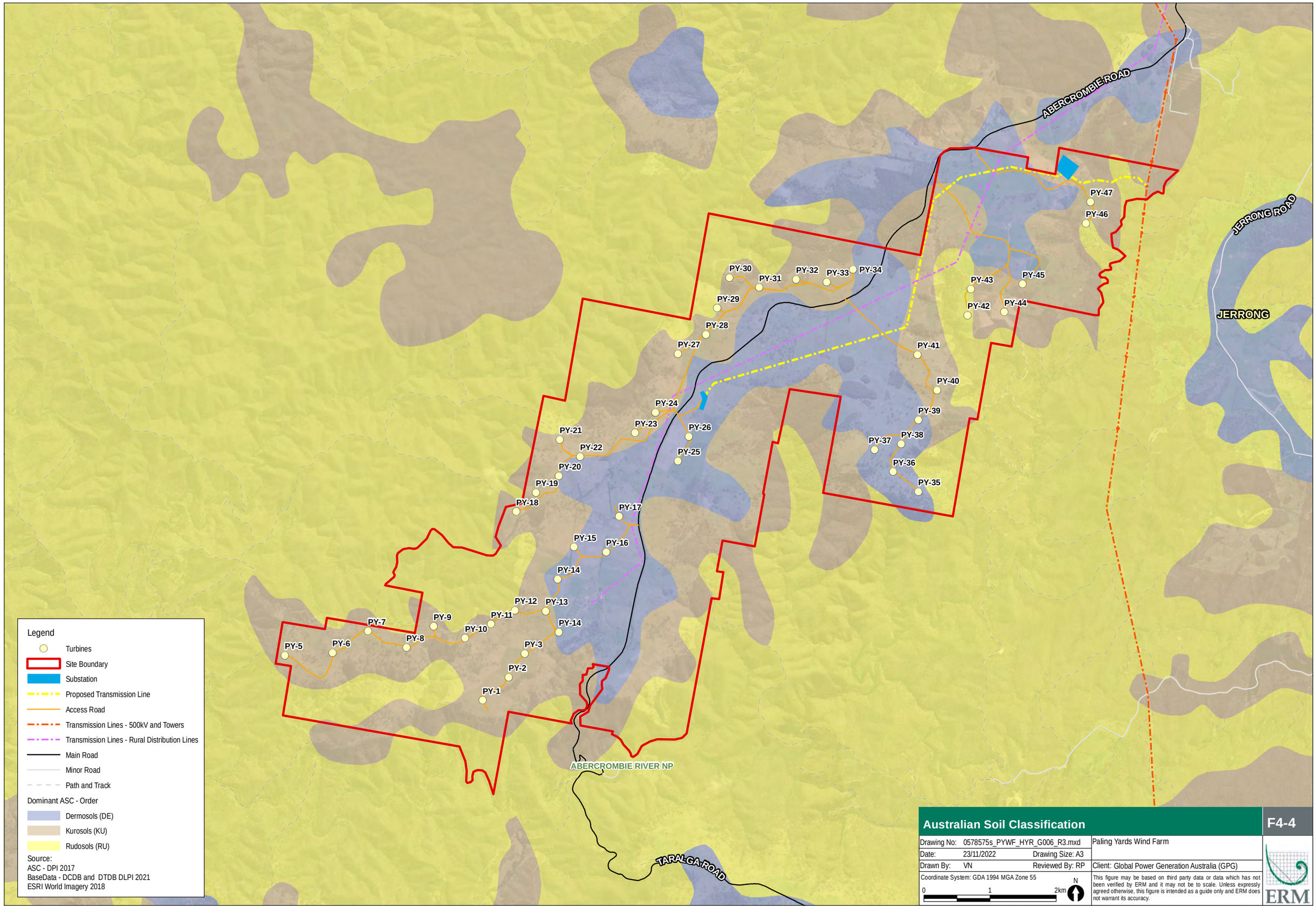
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ABERCROMBIE RIVER NP
TARALGA ROAD
Legend
Turbines
Site Boundary
Substation
Proposed Transmission Line
Access Road
Transmission Lines - 500kV and Towers
Transmission Lines - Rural Distribution Lines
Main Road
Minor Road
Path and Track
Dominant ASC - Order
Dermosols (DE)
Kurosols (KU)
Rudosols (RU)
Source:
ASC - DPI 2017
BaseData - DCDB and DTDB DLPI 2021
ESRI World Imagery 2018
Australian Soil Classification
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Drawing No: 0578575s_PYWF_HYR_G006_R3.mxd
Paling Yards Wind Farm
Date: 23/11/2022
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4.3.2.4 Soil Profiles

A search of eSPADE (DPE, 2022c) identified four soil profiles recorded either within the Project Area, or immediately adjacent to the Site. These four soil profiles are described in Table 4.4.

Table 4.4 Soil projects in Project Area

Soil Profile	Survey Date	Easting	Northing	Horizons	Soil Type	Surface pH
1003658 - 31	04/03/1999	757522	6221624	3	Bleached-Mottled Eutrophic Yellow Chromosol (ASC), Yellow Podzolic Soil (GSG)	5.5
1003658 - 30	04/03/1999	755773	6220134	2	Haplic Epipedal Black Vertosol (ASC), Black Earth (GSG)	6.5
1003658 - 29	04/03/1999	755443	6220074	3	Bleached-Mottled Eutrophic Yellow Chromosol (ASC), Yellow Podzolic Soil (GSG)	6.0
9 - 61	03/06/1985	752113	6212584	3	Lithosol (GSG), Uc1.41 (PPF)	-

4.3.2.5 Soil Regolith Stability

The Soil Regolith Stability classification (aka. soil erodibility) is used in the assessment of soil erosion and water pollution hazards. Regolith includes all soil layers and biological cover above bedrock, with the classification assessed to a depth of one metre. The Project Area contains two classifications, predominately Class R1 with small isolated areas mapped as R3 (DPE, 2022c). These two classifications are described as being:

- Class R1 – High coherence soils with low sediment delivery potential.
- Class R3 – High coherence soils with high sediment delivery potential.

Class R1 are described as stable soils with no appreciable erosion. They are generally well-drained, permeable soils with stable earth batters. They have no or little general evidence of coarse or fine sediment movement. Class R3 are described as clayey and silty soils which are liable to sheet erosion and are typically slowly permeable with drainage generally impeded. Earth batters and exposed surfaces subject to minor to moderately extensive rilling and minor slumping. Minor gully erosion may develop in drainage lines and incision may occur along road drains. Localised films of fine sediment at drain outlets and in drainage lines (Murphy, Fogarty & Ryan, 1998).

4.3.2.6 Soil Landscape Profiles

A search of soil landscape profiles via eSPADE mapping (DPE, 2022c) identified two soil landscapes within the Project Area. The Development Footprint is predominantly located on the Taralga Soil Landscape, which occurs near Crookwell and Taralga on remnants of Tertiary lava flows. It is described as having topsoils and subsoils with low to moderate erodiblity. The Midge Soil Landscape is the second soil landscape within the Project Area, however the majority of the Development Footprint is located outside of this soil landscape. The geology associated with this landscape is undifferentiated Ordovician and Silurian sediments and is described as having topsoils and subsoils with moderate to high erodiblity.

4.3.2.7 Soil Hydrologic Groups

A search of the eSPADE mapping (DPE, 2022c) was utilised to identify the Hydrologic Groups within the Project Area. Hydrological Grouping of soils in NSW is a four class system, which identifies the soils infiltration and permeability characteristics. Across the Project Area, the soils are assigned ratings of B and C, representing the soils having moderate to slow infiltration respectively. These two soil classes are described as:

- B – soils having moderate infiltration rates when thoroughly wetted and consisting chiefly of moderately deep to deep, moderately fine to moderately coarse textures. These soils have a moderate rate of water transmission and low to moderate runoff potential; and
- C - soils having slow infiltration rates when thoroughly wetted and consisting chiefly of soils with a layer that impedes downward movement of water, or soils with moderately fine to fine texture. These soils have a slow rate of water transmission.

The area assigned to the B rating is a narrow section, generally aligning with the ridgeline, and generally surrounding Abercrombie Road in the Project Area, with the remainder mapped as C. A large proportion of the Development Footprint within the Project Area north of Abercrombie Road exists within a land rating of C.

4.3.2.8 Modelled Soil Characteristics – Soil Acidity

eSPADE provides modelled soil properties for the State and has been used to gain a broad understanding of the likely site soil characteristics that will be encountered. Soil acidity modelling demonstrates that across the Project Area, soil acidity ranges between a pH of 4.5 and 6 in the 0-30 cm layer. The soil acidity in the 30-100 cm layer becomes slightly less acidic, still ranging between 4.5 and 6, however the extent of area mapped with a pH between 5 and 6 is greater. These soil pH characteristics are not considered to be restrictive to construction activities or any required revegetation activities that may be required.

4.3.2.9 Acid Sulfate Soils

A review of acid sulfate soil risk mapping has identified that no potential acid sulfate soils (PASS) are expected to occur across the Project Area (Naylor, et al., 1998).

A search for acid sulphate soils was undertaken on the 06 December 2021, via eSPADE. The development footprint is not mapped within a known area of acid sulphate soils. The probability of encountering acid sulphate soils within this locality is extremely low.

4.3.2.10 Naturally Occurring Asbestos

A search for Naturally Occurring Asbestos (NOA) was undertaken on 23 March 2022 via SEED mapping tool. The development footprint contains no mapped areas with geological units containing asbestos. An isolated area with geological units mapped as low asbestos potential is located to the approximately 20 km north east from the Project Area.

4.3.2.11 Laboratory Analysis

Soil samples were collected from nine sampling locations across the Project Area, representative of three sampling locations per ASC soil type, as presented in Figure 4-1. At each location a total of two samples were collected, one sample from the A horizon (representative of the topsoil) and one sample from the underlying B horizon of the soil profile. Soil samples were submitted to NATA accredited laboratory for analysis and laboratory reports are presented in *Appendix C*. The following subsections provide a summary of the results for each soil type, with the summary of the results provided in *Table C1*, *Appendix C*.

Dermosols

Within the dermosol soil type, horizon A and horizon B pH results were classed as 'strongly acid to neutral (Hazelton and Murphy, 2007). Electrical Conductivity (EC) ranged from 21 to 120 µS/m and 15 to 42 µS/m, within topsoil and horizon B samples, respectively and therefore the salinity rating was very low (Agriculture Victoria, 2011).

Cation Exchange Capacity (CEC) of the soils is rated as very low (<6) to low (6 – 12). Exchangeable Sodium Percentage (ESP) were reported below 0.2%. Soils are classified as 'non-sodic' when the ESP is <6%. Phosphorous (Colwell) levels in topsoil was reported as medium to high in the topsoil and medium in horizon B (Hazelton and Murphy, 2007).

Emerson aggregate test results was generally consistent across the soil samples reporting results of Class 3b and Class 5 which indicates slight dispersibility of material. The texture of the soil samples was reported as light clay and light medium clay within the topsoil material, and light medium clay and sandy clay loam in horizon B.

Key elements of the soil analysis are summarised below in Table 4.5.

Table 4.5 Dermosol Soil Analysis Summary

Analysis	Horizon A	Horizon B	Comments
pH	5.3-6.7	5.6-6.7	Strongly acid to neutral
Electrical Conductivity(µS/cm)	21-120	15-42	Very low
Cation Exchange Capacity (meq/100g)	2.4-8	2.6-4.1	Very low to low
Exchangeable Sodium Percentage (%)	<0.1-0.1	<0.1-0.2	Non sodic
Phosphorous (Colwell) (mg/kg)	24.2-140	9.57-27.2	Medium to high (Horizon A); medium (Horizon B)
Texture	LC, LMC	LMC, SCL	Light clay and light medium clay (Horizon A), light medium clay and sandy clay loam (Horizon B)
Emerson Aggregate Test	3b, 5	3b, 5	Slight dispersibility
% Passing 50mm	100	100	-
% Passing 2.36mm	68.7-90.2	52.4-82.1	Some coarse sands and/or gravel

Kurosols

Within the Kurosol soils, pH results were classed as strongly acid to slightly acid (Hazelton and Murphy, 2007). EC within horizon A ranged from 30 to 130 µS/m and the salinity rating was low to very low. EC within horizon B ranged from 15 to 47 µS/m, the salinity rating was low (Agriculture Victoria, 2011).

CEC of the soils was rated as low (6 – 12) within horizon A, and low to moderate (12-25) within horizon B. ESP was reported below 0.2% within both soil horizon A and B. Soils are classified as non-sodic when the ESP is <6%. Phosphorous (Colwell) levels in horizon A was reported as medium to high and ranged from low to high in horizon B (Hazelton and Murphy, 2007).

Emerson aggregate test results was generally consistent across the Kurosols soil samples reporting results of Class 3b and Class 5 which indicates slight dispersibility of material. A variety of soil textures were reported including light clay, light medium clay, loamy sand and sandy clay loam. Key elements of the soil analysis are summarised below in Table 4.6.

Table 4.6 Kurosols Soil Analysis Summary

Analysis	Horizon A	Horizon B	Comments
pH	5.2-6.2	5.3-6.5	Strongly acid to slightly acid
Electrical Conductivity(µS/cm)	30-230	15-47	Very low to low (Horizon A), low (Horizon B)
Cation Exchange Capacity (meq/100g)	7.2-12	2.8-18	Low (Horizon A), low to moderate (Horizon B)
Exchangeable Sodium Percentage (%)	<0.1	<0.1	Non sodic
Phosphorous (Colwell) (mg/kg)	32.4-65.8	11-161	Medium to high (Horizon A); low to high (Horizon B)
Texture	LC, LMC, LS	LMC, MC, SCL	Light clay, light medium clay and loamy sand (Horizon A); light medium clay, medium clay and sandy clay loam (Horizon B)
Emerson Aggregate Test	3b, 5	3b, 5	Slight dispersibility
% Passing 50mm	100	100	-
% Passing 2.36mm	57.5-72.3	33.4-46.4	Moderate coarse sands and/or gravel

Rudosols

Within the Rudosol soils, pH results were classed as strongly acid to slightly acid within horizon A and moderately acid to slightly acid (Hazelton and Murphy, 2007). EC within horizon A ranged from 54 to 120 µS/m and within horizon B 18 to 40 µS/m, both have a salinity rating of very low (Agriculture Victoria, 2011).

CEC of the soils within horizon A ranged from low to moderate within horizon A, and very low to moderate (12-25) within horizon B. ESP was reported below 0.2% within both soil horizon A and B, which is classified as non-sodic soils (Landcom, 2004). Phosphorous (Colwell) levels in horizon A was reported as low to medium (Hazelton and Murphy, 2007).

Emerson aggregate test results was consistent across the Rudosol soil samples reporting results of Class 3b which indicates slight dispersibility of material. Soil textures within the Rudosols reported loamy sand and a variety of dominant clay fraction soils. Key elements of the soil analysis are summarised below in Table 4.7.

Table 4.7 Rudosols Soil Analysis Summary

Analysis	Horizon A	Horizon B	Comments
pH	5.3-6.3	5.6-6.2	Strongly acid to slightly acid (Horizon A); moderately acid to slightly acid (Horizon B)
Electrical Conductivity(µS/cm)	54-120	18-40	Very low
Cation Exchange Capacity (meq/100g)	8.1-14	1.7-13	Low to moderate (Horizon A), very low to moderate (Horizon B)
Exchangeable Sodium Percentage (%)	<0.1	<0.1	Non sodic
Phosphorous (Colwell) (mg/kg)	12.8-25.1	12.8-21.9	Low to medium
Texture	LS, SC,	LC, SC, SCL	Loamy sand and sandy clay (Horizon A); light clay, sandy clay and sandy clay loam (Horizon B)
Emerson Aggregate Test	3b	3b	Slight dispersibility
% Passing 50mm	100	100	-
% Passing 2.36mm	68.7-90.2	52.4-82.1	Moderate coarse sands and/or gravel

4.3.2.12 Soils Summary

Overall, the soil character of the Project Area is identified as having a combination of soils that have low erodibility and are generally permeable which reduces runoff potential, and soils with moderate to severe erodibility with limited permeability. The soils were reported to be slightly dispersible and non-sodic. In dispersible soils, moist or wet clay breaks up into individual clay particles due to a chemical reaction between water and sodium. Generally the soil quality is not considered to be restrictive of plant growth, critical for rehabilitation of ground cover.

The primary concern for soil management is the disturbance of steep sloped areas. Detailed design has avoided proposed disturbance of steep sloped areas, with the primary ground excavation works associated with work pads located on the ridgeline. Further assessment of the erosion hazard of the Project is provided in Section 5.2.

4.3.3 Hydrology

4.3.3.1 Surface Water and Watercourse Crossings

In this section and elsewhere throughout this report, a reference to stream order relates to the Strahler system of stream ordering. This is explained as follows:

- starting at the top of a catchment, any watercourse that has no other watercourses flowing into it is classed as a first-order watercourse;
- where two first-order watercourse join, the watercourse becomes a second-order watercourse;
- if a second-order watercourse is joined by a first-order watercourse – it remains a second-order watercourse;
- when two or more second-order watercourses join they form a third-order watercourse; and
- a third-order watercourse does not become a fourth-order watercourse until it is joined by another third-order watercourse, and so on.

The Project Site is within the Lachlan River Catchment. The Abercrombie River forms the southern boundary of the Project Area, and flows into the Lachlan River. A number of ephemeral watercourses are located in the Project Area, characteristic of its ridgeline nature, refer to Figure 4-5. Overall site drainage is towards the south and west, to the Abercrombie River. The majority of these watercourse are first-order and second-order watercourses. All watercourses within the Project Area are ephemeral.

There are 14 tributaries classified as Strahler third order or above within the Project Site that are classified as Key Fish Habitat (KFH), as presented in Table 4.8. The *Fisheries Management Act 1994* (FM Act) does not define KFH, however the NSW Department of Primary Industries (DPI) definition of KFH was developed to include all marine and estuarine habitats up to highest astronomical tide level (that reached by 'king' tides) and most permanent and semi-permanent freshwater habitats including rivers, creeks, lakes, lagoons, billabongs, weir pools and impoundments up to the top of the bank.

Small headwater creeks and gullies (known as first and second order streams), that only flow for a short period after rain are generally excluded, as are farm dams constructed on such systems. Wholly artificial waterbodies such as irrigation channels, urban drains and ponds, salt and evaporation ponds are also excluded except where they are known to support populations of threatened fish or invertebrates.

Table 4.8 Third and Fourth Order Streams in Project Area

Named Tributary	Strahler Stream Order
Mount Browne Gully	3rd order
Cobra Gully	3rd order
Brothers Creek	3rd order
Middle Station Creek	4th order
Unnamed (south east portion of Project Area, joins Abercrombie River)	3rd order
Unnamed (south east portion of Project Area, joins Abercrombie River)	3rd order
Unnamed (south east portion of Project Area, joins Abercrombie River)	3rd order
Paling Yards Creek	3rd order
Black Bett Creek	3rd order
Oaky Creek	3rd order
Unnamed (western boundary of Project Area, joins Silent Creek)	3rd order
Unnamed (western boundary of Project Area, joins Silent Creek)	3rd order
Unnamed (western boundary of Project Area, joins Silent Creek)	3rd order
Unnamed (north west portion of Project Area, joins Silent Creek)	4th order

There are no third-order streams or larger which are directly impacted upon by the Development Footprint. The proposed WTGs, access tracks and cabling and other associated infrastructure are situated in elevated locations on plateaux areas and along ridge lines and crests. All disturbance areas associated with WTG construction are proposed to be outside of 40 metres of the high bank of any river, lake or wetlands (collectively waterfront land). There are no instances where proposed access tracks or cabling are required to cross significant watercourses that would require construction of bridges or culverts. There are no crossings of third order or higher watercourses.

There are a small number of locations where new access tracks and cabling is likely to cross ephemeral first order watercourses. These are typically located very high within the catchment. Typically, the first and second order streams (if required to be crossed) are ephemeral gullies that require culvert installations in the access tracks and the DPI guideline *Why do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings* (2003) and DPI Water *Guidelines for watercourse crossings on waterfront land* (2012) are not required to be considered during detailed design.

4.3.3.2 Water Quality Objectives

The NSW Water Quality Objectives (WQOs) are the agreed environmental values and long-term goals to achieve healthy waterways in surface water catchments across the State. The WQOs include a range of water quality indicated to help assess the current conditions of waterways and their ability to support its respective uses and values.

The Lachlan catchment occupies an area of around 90,000 km2. The Lachlan River is the fourth longest river in Australia at 1,448 kilometres, starting near Goulburn in the Great Dividing Range at an elevation of around 1,200 metres and terminating at The Great Cumbung near Oxley. Its waterways are a source of water for stock and domestic and agriculture use, tourism and recreational activities and Aboriginal cultural values and practices (DAWE, 2021). The Lachlan River is located approximately 53 km west of the Project Area.

Over the last several years the Lachlan catchment has been impacted by lower than average rainfall which has resulted in a drying of the catchment. During the second half of 2020-21 wet conditions returned to the catchment and continued into spring-summer of 2021-22.

The Lachlan River Catchment WQOs have been developed to provide guideline levels to assist water quality planning and management. Considering the Project Area is situated across tributaries that are 3rd order and above, meeting the WQO is vital for protecting the local ecosystem, environmental values, and uses people have for the water downstream of the Project.

The corresponding WQO for the Lachlan River Catchment (former NSW Department of Environment, Climate Change and Water (DECC), 2006) are detailed in Table 4.9.

Table 4.9 Water Quality Objectives

Catchment Areas	Applicable Water Quality Objectives	
Lachlan River	■ Aquatic ecosystems,	*Maintaining or improving the ecological condition of waterbodies and their riparian zones over the long term*
	■ Visual amenity,	*Aesthetic qualities of waters*
	■ Secondary contact recreation	*Maintaining or improving water quality for activities such as boating and wading, where there is a low probability of water being swallowed*
	■ Primary contact recreation	*Maintaining or improving water quality for activities such as swimming in which there is a high probability of water being swallowed*
	■ Livestock water supply	*Protecting water quality to maximise the production of healthy livestock*
	■ Irrigation water supply	*Protecting the quality of waters applied to crops and pasture*
	■ Homestead water supply	*Protecting water quality for domestic use in homesteads, including drinking, cooking and bathing*
	■ Drinking water – disinfection only, or ■ Drinking water – clarification and disinfection, or ■ Drinking water – groundwater	*Refers to the quality of drinking water drawn from the raw surface and groundwater sources before any treatment*
	■ Aquatic foods (to be cooked)	*Refers to protecting water quality so that it is suitable for the production of aquatic foods for human consumption and aquaculture activities.*
	■ Industrial water supplies	*Recognises the economic value of water as a resource for industrial use.*

Waterway health is assessed against the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC & ARMCANZ, 2000). The Guideline establishes values for various water quality measures which support the WQO's.

The WQO's identify the important economic value of water for industrial needs. As industry water supply needs are diverse, relevant water quality criteria are not summarised in the WQO's for the Lachlan River Catchment. Sources of water used for industry invariably have other environmental values, which mostly need water of a higher quality than that needed by industry. Further, individual industries generally have the capacity to monitor and treat the available water resources to meet their own needs. The Project requires a comparatively low volume of water, which is able to be sourced from a range of sources in consultation with WaterNSW.

4.3.3.3 Transmission Line Creek Crossings

The transmission line route will span a number of watercourses in the Project Area, including the following second and third order streams:

- Mount Browne Gully (third order);
- Brother Creek (second order); and
- Middle Station Creek (second order)

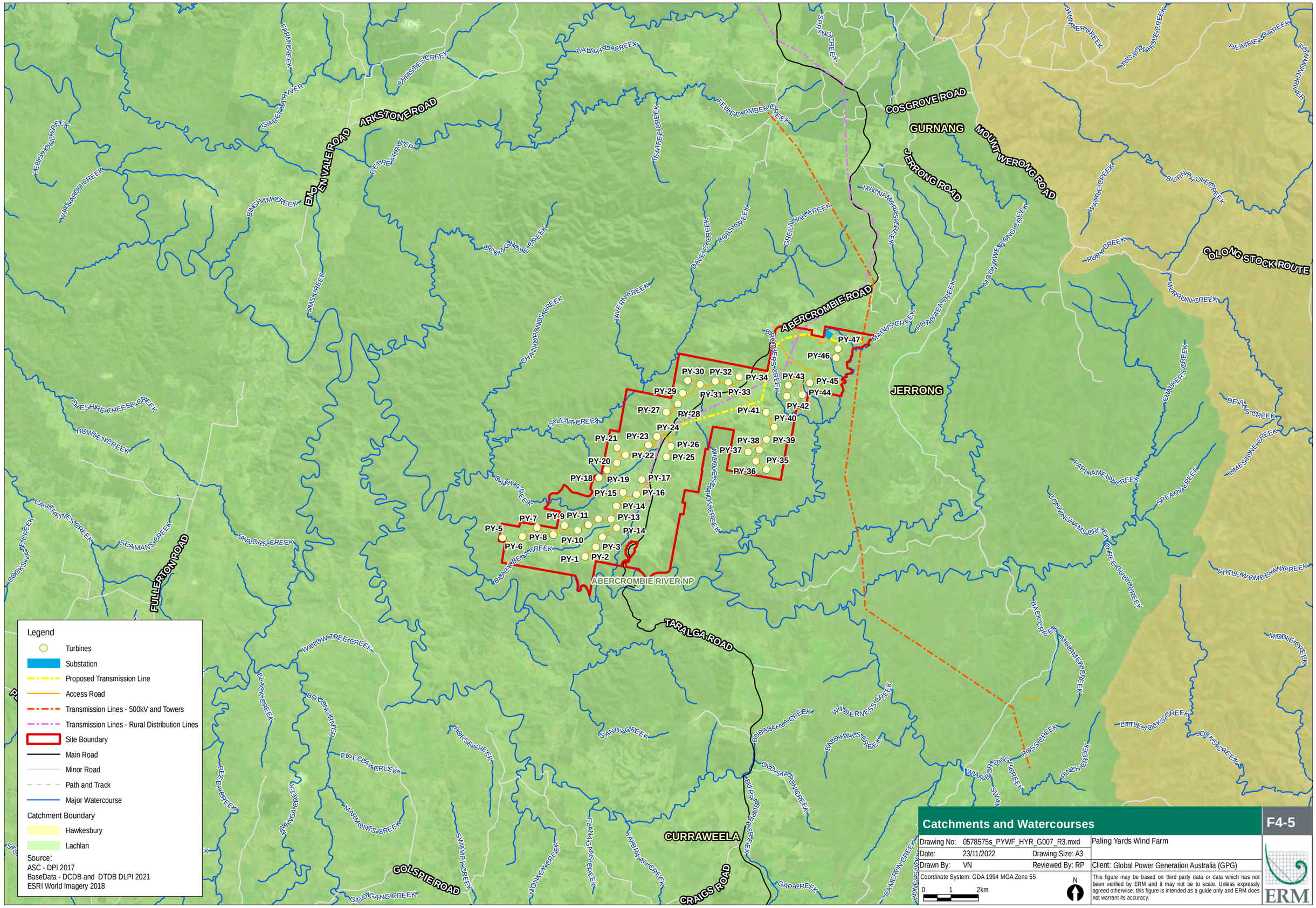
Although the transmission line route would cross a number of watercourses, transmission poles are not to be located closer than 40 m to any watercourse, with the exception of identified first order streams.

Erosion and sediment control measures will be implemented at the source of construction activities (e.g. pole and pad sites) and operational infrastructure (e.g. WTGs) to ensure sediment is appropriately managed and impacts to waterways are adequately mitigated. Overall, the Project will likely result in an enhancement of any creek crossings requiring upgrading through post construction rehabilitation and stabilisation works, reducing the levels of downstream sediment and consequently mitigating existing impacts to water quality.

4.3.3.4 Sensitive Locations

The Abercrombie River National Park is located adjacent to the Project Area, immediately to the west and south. Lands managed by National Parks and Wildlife Services (NPWS) include some of the most biologically diverse, culturally significant and scenic areas in Australia. The Project is unlikely to impact Abercrombie River National Park, and is not proposed to encroach onto NPWS land or restrict access. Measures are able to be effectively implemented in accordance with the guideline *Development adjacent to NPWS Lands: Guidelines for consent and planning authorities* (DPIE, 2020), to appropriately mitigate impacts associated with Abercrombie River National Park.

Soil and water mitigation measures to be implemented associated with Abercrombie River National Park and the Project in general, are outlined in Section 6 and are for inclusion in the Project's environmental management plans.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Transmission Lines - Rural Distribution Lines
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Minor Road
Path and Track
Major Watercourse
Catchment Boundary
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Source:
ASC - DPI 2017
BaseData - DCDB and DTDB DLPI 2021
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4.4 Assessment

4.4.1 Construction Impacts

Soils will be subject to disturbance during construction activities to allow for site establishment, installation of infrastructure and replacement of soils for revegetation. Specific construction activities that will potentially impact soils, and resultant potential downstream watercourse impacts, are outlined in Table 4.10.

Table 4.10 Potential Construction Impacts to Soils and Water

Construction Activities	Potential Impacts to Soils and Water
All-weather Unsealed Road Network	■ creation of fugitive dust due to vehicle movements; ■ creation of fugitive dust due to onsite livestock movements; ■ erosion of unsealed roadways and resultant sedimentation of run-off from road surfaces; ■ erosion of roads and roadside drainage in areas of steep terrain or in inappropriately 'finished' locations; ■ insufficient compacting of the road surface which could lead to erosion or batter slips in areas of steep terrain; and ■ mud tracking at the confluence of internal access roads with the public road network.
Watercourse Crossings	■ erosion of drainage lines and subsequent sedimentation; ■ removal of vegetation and subsequent increased erosion potential; ■ any vehicle movement across unaltered watercourses during construction phase leaving wheel tracks and causing damage to creek beds; ■ potential for any unstable steep banks collapsing under weight of vehicles/machinery; and ■ bank erosion at creek crossings from culvert installations.
Water Supply	■ over-extraction of surface water or groundwater resulting in reduced environmental flows, reduced water availability for existing licensed users and impacts on water dependent ecosystems.
Establishment of Pad Sites (e.g. Laydown Area, Batching Area)	■ erosion of relatively large disturbed areas during establishment and subsequent sedimentation of run-off.
Turbine and Transmission Pole Foundations	■ erosion of soils around turbine/pole foundations; ■ potential increase to water filtration and subsequent impacts to groundwater; and ■ erosion from spoil stockpiles and subsequent sedimentation should it reach a waterway.
Dewatering of Site	■ potential interception of groundwater during construction of turbine foundation, requiring dewatering.
Ancillary Infrastructure (e.g. substation, operations and maintenance facility)	■ erosion of relatively large disturbed areas during establishment and subsequent sedimentation of run-off; and ■ erosion from spoil stockpiles and subsequent sedimentation should it reach a waterway.
Stockpile Management	■ erosion of stockpiles and loss of soil resource; and ■ subsequent sedimentation impacts.
General Construction Activities (e.g. Machinery Operations)	■ erosion of soil stockpiles created during excavation works; ■ creation of fugitive dust due to exposed surfaces; ■ hydrocarbon spills from machinery (burst hoses, mechanical failures, leaking machinery, etc.); ■ contamination of soils from poor refuelling practices; and ■ discovery of previously contaminated sites.

4.4.2 Operational Impacts

Specific operational activities that will potentially impact soils, and resultant potential downstream watercourse impacts, are outlined in Table 4.11.

Table 4.11 Potential Operational Impacts to Soils and Water

Operational Activities	Potential Impacts to Soils and Water
Driving on All-weather Unsealed Road Network	■ creation of fugitive dust due to vehicle movements; ■ creation of fugitive dust due to onsite livestock movements; ■ erosion of roads and roadside drainage in areas of steep terrain or in inappropriately 'finished' locations; and ■ mud tracking at the confluence of internal access roads with the public road network.
Watercourse Crossings	■ any vehicle movement across unaltered watercourses during operational phase leaving wheel tracks and causing damage to creek beds; and ■ bank erosion at culvert crossings.
Pad Sites	■ potential for erosion and subsequent sedimentation of run-off during heavy rainfall.
General Operational Activities (e.g. Machinery Operations)	■ hydrocarbon spills from machinery (burst hoses, mechanical failures, leaking machinery, etc.); ■ contamination of soils from poor refuelling practices; and ■ increased soil erosion following heavy rainfall and potential subsequent sedimentation.

4.4.3 Soils and Water Assessment

A review of the baseline data presented above suggests that overall potential risks to water and soils are relatively minor to moderate, with the primary constraints being steep slopes adjacent to the Development Footprint. This is on the basis that:

- for the most part, pad sites and access road construction occur on relatively low gradient lands high up in the respective drainage catchments;
- there is generally a very low risk of run-on or run-off of concentrated stormwater flows;
- construction sites within the Project Area generally present a low erosion hazard considering factors such as climate, soils and landform. Note that an erosion hazard assessment is provided in *Appendix A*;
- previous inspections of the Project Area reported that the landscape was relatively stable with no significant areas of erosion;
- impacts on water flows is not anticipated for the construction of the Project, given the localised impacts are located upstream on the top of the ridgeline. Potential impacts downstream are able to be effectively managed at the source of works (i.e. velocity controls in areas with steep slopes) through the implementation of a progressive Erosion and Sediment Control Plan (ESCP);
- vegetated buffers over low gradient lands lie between work areas and watercourses;
- sustainable water supply options will be pursued through consultation with landowners and relevant Government agencies. Licenses would be obtained as required; and
- additional measures are able to be effectively implemented to appropriately mitigate impacts associated with the adjacent National Park.

The identified risks can be managed through implementation of appropriate preventative and management measures. These would be outlined in a construction environmental management plan (CEMP) supplemented by a progressive ESCP prepared post-approval. Section 5 outlines a range of management practices that would contribute to sound management of the Project Area's soil and water resources.

A quantitative estimation of the sites erosion hazard was undertaken using the Revised Universal Soil Loss Equation (RUSLE) as described in Section 5.2 and provided in *Appendix A*.

5. CONCEPTUAL SOIL MANAGEMENT PLAN

5.1 Introduction

In NSW, best practice guidance on soil and water management at construction sites is provided in the document *Managing Urban Stormwater: Soils and Construction*, *Volume 1, 4th edition* (Landcom, 2004). Landcom (2004) provides an overarching guideline, though is particularly targeted to urban development. A number of more targeted supporting guidelines are published under Volume 2 of the Managing Urban Stormwater series and include the following that are particularly relevant to construction of the Project:

- *Managing Urban Stormwater: Soils and Construction, Volume 2A, Installation of Services* (NSW Department of Environment and Climate Change, 2008a) (hereafter referred to as "Volume 2A"); and
- *Managing Urban Stormwater: Soils and Construction, Volume 2C, Unsealed Roads* (NSW Department of Environment and Climate Change, 2008b) (hereafter referred to as "Volume 2C").

ERM has prepared this Conceptual Soil and Water Management Plan (SWMP) to outline the fundamental principles to be followed in the planning and implementation of erosion and sediment control measures for the Project. This Conceptual SWMP provides guidance on the suite of best management practices that may be relevant to control soil and water impacts during construction, and outlines how a combination of controls may be used during particular activities.

It is not feasible to prepare a detailed SWMP at this stage that addresses all work sites, as works will be dispersed over large distances, will occur in stages, and in many cases have not yet been subject to detailed design.

This Conceptual SWMP does not include detailed engineering design of structures, nor does it provide plans showing the layout of all erosion controls across the site. It is recommended that Progressive ESCPs should be prepared for this purpose once detailed design plans are available, particularly any detailed road, drainage and creek crossing designs. In many cases these progressive ESCPs will be relatively simple documents, such as a sketch plan showing the layout of controls with attached commentary, prepared on topographic or drainage plans.

The head construction contractor will prepare their own CEMP including a detailed Soil and Water Management Plan that will include elements of this Conceptual SWMP and any additional measures required to manage the erosion, sedimentation and water quality risks of the project. The SWMP will outline the requirements for preparation of Progressive ESCPs for each area of works, and with a particular focus on high risk locations such as on steep lands and in the vicinity of watercourses. It is recommended that the SWMP be prepared in accordance with the Managing Urban Stormwater guidelines, particularly Volumes 2A and 2C.

5.2 Erosion Hazard and Assessment

Erosion hazard was estimated using the Revised Universal Soil Loss Equation (RUSLE), provided in *Appendix A.* The RUSLE provides a quantitative estimation of erosion hazard based on five factors: rainfall erosivity; soil erodibility; slope length and gradient; soil cover and management practices. A detailed description of the RUSLE equation and its contributing factors is provided in Landcom (2004).

The overall erosion hazard has been assessed as low. This is a consequence of favourable climatic conditions (low rainfall erosivity) and the lower slope gradient where disturbance will occur on the ridgeline, which limit the generation of high velocity, erosive run-off. Localised areas of greater erosion hazard will exist, for example where steeper slopes occur (e.g. road batters) and in areas of concentrated water flow, such as along watercourses and table drains. Particular attention to erosion control should be applied in these areas.

5.3 General Management Practices

Landcom (2004) provides a range of soil and water management principles for construction sites. These principles should be a key component of the decision making process as earthworks are planned and undertaken. These principles are:

- investigate site features and assess constraints;
- develop and implement plans for the management of soil and water;
- minimise disturbance;
- strip and stockpile topsoil for use in subsequent rehabilitation;
- divert upslope (clean) stormwater around the disturbed site;
- reduce erosion;
- capture sediment-laden run-off from within the disturbed site for diversion to sediment control devices;
- rehabilitate the site promptly and progressively as works progress; and
- inspect and maintain erosion and sediment control devices for the duration of the Project.

Industry standard erosion and sediment control measures are outlined in the following sections that will assist in meeting the principles outlined above.

Standard Drawings which further detail a management measure are referenced where relevant and provided in *Appendix D*.

5.3.1 Staging of Work

Staging of works is one of the simplest and most effective forms of erosion and sediment control. By limiting the exposed area to the minimum possible at any one time, reduces the risk of soil loss than if the entire sites earthworks are exposed.

Prior to disturbing an area the following management measures should be implemented:

- have a single stabilised site access point defined by barrier or sediment fencing, to prevent unnecessary disturbance at access locations;
- prior to disturbance, install sediment fence downslope and boundary fencing/flagging around perimeter of site to define the work areas and minimise disturbance outside construction boundaries (to be regularly maintained);
- install upstream stormwater diversion drains / bunds and stabilise their outlets (where required);
- install sediment traps with stabilised outlets as shown in Progressive ESCPs;
- direct run-off from disturbed areas to sediment traps during construction, using earth banks or drains;
- install checks at regular intervals to reduce scour velocity of flows;
- remove vegetation and store in appropriate locations (e.g. away from watercourses and riparian lands) and respread cut / mulched vegetation where appropriate during rehabilitation;
- commence earthworks, stripping topsoil and subsoil independently and storing these separately. Topsoil should be preserved for use later in rehabilitation;
- install erosion and sediment controls as required during progression of construction works and maintain existing controls;
- rehabilitate site as soon as practicable after completion of construction; and
- decommission / remove controls when site is successfully stabilised and vegetation established.

5.3.2 Stormwater Management

The following stormwater management controls apply to all construction activities and will be utilised during site development:

- where required, divert clean stormwater run-on away from areas to be disturbed by construction activities using earth banks or catch drains. Note that in some cases low-impact diversions can be created using sandbags or similar. Earth banks may also be used and construction requirements are shown in:
  - SD 5-5 for temporary earth banks (low flow); and
  - SD 5-6 for permanent earth banks (high flow).
- permanent diversion banks will be sized by a suitably qualified person, using hydrological data and design standards as recommended in Landcom (2004). Note that the need for upslope diversion may be removed where construction sites have minimal upslope catchment or the risk of stormwater run-on is low. This is likely to be the case for the vast majority of WTG sites;
- collect dirty water in earth banks or catch drains for diversion to sediment control structures as determined in the Progressive ESCP Drawings;
- install temporary earth diversion banks (refer SD 5-5) at the direction of the site manager to mitigate against unforeseen erosion hazards, particularly when rain is forecast. These shall be used to shorten slope lengths, or to divert localised run-on away from high hazard areas (such as unstable batters);
- check dams (SD 5-4) using rock aggregate, sandbags or geotextile “sausages” may be installed within drains and diversion channels to help reduce flow velocity and consequent erosion, especially on steep sections. Care to be taken to ensure there is adequate provision for a spillway that allows flows to be retained within the diversion channel and not escape thereby potentially causing scouring and/or flooding of adjacent lands; and
- maintain slope lengths no greater than 80 m in disturbed areas and preferably <50 m on exposed road surfaces and steep slopes. To reduce slope lengths in construction areas install temporary earth diversion banks following SD 5-5. On roads consider the use of cross banks and mitre drains to shed water from the surface.

5.3.3 Erosion Control

Erosion control should be prioritised in all aspects of the work – this being the most effective way to minimise site degradation and reduce potential impacts on land and water resources. Effective erosion control reduces the loss of sediment and improves the effectiveness and reliability of downstream sediment and pollution controls.

In addition to the erosion control measures outlined in the staging section above, the following are a series of general erosion control measures that apply to the day-to-day construction activities:

- stabilise the access point by sealing with concrete, asphalt or loose rock fill (refer SD6-14);
- limit unnecessary vehicle movements across the Project Area to those only required for construction activities and ensure movements are contained to the predefined construction access ways;
- limit stripping of topsoil to within two weeks of commencing construction activities to minimise the time and area that soil is exposed to erosive forces;
- where more than one contractor is onsite at any one time, co-ordinate works so that sites do not remain disturbed for longer than is necessary;
- stockpiles should be located greater than 40 m from natural waterways (refer SD 4-1);

- stockpiles are to have a buffer of at least 5 m from areas likely to receive concentrated water flows, including earth banks and roads;
- cover or stabilise stockpiles when not in use;
- unsealed access roads are to be kept moist by water carts during windy conditions and times of heavy traffic, to prevent dust generation; and
- all areas of concentrated flow (diversion banks and waterways), will be designed by a suitably qualified person to convey and remain stable during the design storm event. Stabilisation with 350 gram per square metre (gsm) jute matting or equivalent may be required (refer SD 5-7).

5.3.4 Sediment Control

Sediment traps will be used to treat sediment laden run-off that is generated from disturbed areas and maintain the sediment as close as possible to its source.

Sediment traps work by trapping water and allowing the coarser fragment of the sediment to settle out under gravity. Sediment traps are most effective for sheet flows of run-off rather than concentrated flow. Use of sediment traps in areas of concentrated flow such as drains are often ineffective, with the result often being scouring and further erosion.

The most easily recognisable and common form of sediment trap is sediment fencing, but sediment traps may also include earth or mulch bunds, geotextiles, rock or a combination of these (such as a rock-sock which involves wrapping rock in geotextile). Installation and sizing of these traps should be such that water does not find an alternative flow path underneath or around the trap. Anchoring of the traps should be sufficient to provide for strength and reliability of the trap. Traps should be designed with consideration to larger storm events, and incorporate spillways and bypasses to prevent scouring and erosion of adjacent areas.

Sediment fencing will be a primary sediment control method used throughout the construction stage of the project. The following principles apply to the use of sediment fencing:

- sediment fence (refer SD 6-8) should be placed downslope of disturbed areas to help retain the coarser sediment fraction;
- sediment fences will have a return of 1 m upslope at intervals of approximately 20 m. Returns are installed to subdivide the catchment area of the sediment fence, to improve its effectiveness and help prevent structural damage during peak flows. The catchment area of each section of fence should be small enough to limit flow if concentrated at one point to less than 50 L/s in the 10% (1 in 10) AEP storm event;
- place sediment fence as close as possible to along the contour, to provide a maximum surface area to the passage of stormwater;
- sediment fences require regular maintenance, with captured sediment to be removed prior to it reaching a third of the height of the sediment fence. Place sediment extracted from maintenance in a suitable location so as to prevent further sedimentation; and
- sediment basins are a specific type of sediment trap comprising large earth dams designed to capture dirty water run-off, and are the most effective of all sediment trapping devices. They may only be required at the larger construction sites such as the concrete batching plant and substation. Otherwise most of the work areas are relatively small and dispersed, and sediment control can be achieved using conventional sediment traps, without the use of sediment basins. Detailed design and sizing of sediment basins, where required, will be included in the Progressive ESCPs.

5.3.5 Dust Management

The majority of potential dust impacts from the Project will occur during the construction phase. Dust particles can be released from a range of activities, including:

- clearing of vegetation;
- stockpiles;
- haulage activities along unsealed roads; and
- excavation works.

The expected quantities of dust produced during the construction of the Project can be appropriately managed with the implementation of an Air Quality and Dust Management Plan. This would be sub-plan of the CEMP for the Project and would include appropriate preventative and management measures to mitigate dust impacts. Dust deposition gauges would be installed at select locations within the Project Area to monitor dust emissions in accordance with the *Approved Methods and Guidelines for the Modelling and Assessment of Air Pollutants in New South Wales* (NSW EPA, 2016). The trigger levels for deposited dust in accordance with the above guideline is presented in Table 5.1.

Table 5.1 Deposited Dust Trigger Levels

Averaging Period	Maximum increase in deposited dust level.	Maximum total deposited dust level.
Annual	2 g/m^2/month	4 g/m^2/month

In addition to the management practices to be implemented for the Project outlined in the above subsections, mitigation measures to manage potential dust impacts are presented in Section 6.

5.3.6 Pollution Control and Waste Management Measures

All fuels, oils and hazardous substances used onsite will be stored in appropriately bunded locations to prevent release to the environment. Bulk storage areas for fuels, oils and chemicals used during construction 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. Any spillage will be immediately contained and absorbed with a suitable absorbent material. Storage will comply with AS 1940- 2004 The Storage and Handling of Flammable and Combustible Liquids.

Spill clean-up kits will be located in numerous, well known locations throughout the site, and particularly within the precinct where the main infrastructure is proposed. Use of items within the spill kit will be demonstrated to all construction personnel. Spill kits should include floating booms in locations close to waterways (where relevant). Spill kits require regular maintenance to ensure that sufficient material is available in the event of a spill.

Material Safety Data Sheets (MSDS) will be available for all chemicals used on the site. All site personnel should be aware of the location of the MSDS.

Refuelling of equipment onsite or any other activity which could result in a spillage of a chemical, fuel or lubricant will be undertaken away from watercourses and stormwater drainage lines. In the event water is polluted by chemicals and/or firefighting materials (e.g. foams), the water will be collected, and disposed at an approved Liquid Waste Treatment Facility. A designated refuelling area should be established with drip trays installed and spill kits on stand-by. Should refuelling in the field be required, absorptive mats and drip trays are to be used in the refuelling process.

Bins will be available for the deposit of waste materials. Where possible, bins for recycling will be made available to facilitate separation and appropriate reuse or disposal of recyclable materials.

5.3.7 Site Rehabilitation

Predominately the majority of the areas that will be disturbed will be stabilised by the placement of concrete or the construction of a hardstand surface. However, rehabilitation of distributed soil will still be required progressively on the site as different aspects of the project are completed. As some individual construction areas are completed, rehabilitation should be undertaken immediately to stabilise and effectively finalise areas to prevent erosion and sediment issues. Site stabilisation can be achieved by several measures including the following:

- vegetative cover;
- mulch;
- rock armouring;
- paving;
- concrete;
- geofabrics; and
- synthetic soil binders.

It is essential that all disturbed lands be stabilised to mitigate ongoing erosion problems and prevent sediment pollution of downstream lands and waterways. The preferred site stabilisation method will be identified on a site by site basis and included within the Progressive ESCPs. In most areas it is likely that revegetation to pasture grasses would be the preferred approach.

When selecting stabilisation methods a key factor that will be considered is the form of water run-off over the stabilised area. Areas subject to concentrated flow (i.e. watercourses and drains) will require different stabilisation techniques to those subject to sheet flow.

In areas of sheet flow, vegetation will generally be acceptable and the revegetation goal over much of the site will be to re-establish pasture grasses, to achieve a similar condition and pasture species composition to present so that the lands may continue to be used for grazing purposes.

Areas of concentrated flow can be subject to scouring velocities and periodic inundation that render vegetation establishment difficult or impossible. Therefore, measures like hard armouring, and use of geofabrics to assist vegetation establishment is often required. To determine appropriate stabilisation techniques in areas of concentrated flow peak flows will be calculated and stabilisation designed accordingly, by reference to guidelines such as Landcom (2004) that provide advice for acceptable velocities within vegetated channels. Particularly steep slopes may require protection in the form of hard armouring if it is considered unlikely that vegetation will become established or will become stressed and jeopardise the stability of the slope. This detail will be outlined in the Progressive ESCPs.

5.4 Specific Construction Activity Mitigation Measures

5.4.1 Pad Sites

The term ‘pad sites’ is used to describe areas that may be cleared, levelled and then stabilised with road base and aggregate, for example crane hardstand areas, the substation site, and the concrete batching plant. Pad sites should be established in accordance with Section 5.3.1.

A Generic Erosion Sediment Control Plan (ESCP) has been developed for the layout of a pad site, refer to Figure 5-1. An outline of the erosion and sediment control measures to be undertaken during trenching activities is also provided in *Appendix D*. The relevant Progressive ESCP will be developed following detailed design.

5.4.2 Trenching

The WTGs will be linked across the Project Area through a network of underground electricity and fibre optic cables that predominately follow the internal access road network. The following management measures are relevant to trenching activities:

- minimise the land area to be disturbed;
- avoid trenching in locations of concentrated, permanent water flows;
- where possible utilise directional drilling techniques in areas of concentrated, permanent water flow;
- monitor weather and avoid opening trenches prior to forecast rainfall;
- fill trenches as soon as possible after opening – aim for three days from opening to closing trench;
- separate topsoil and subsoil during excavation and ensure that topsoil is replaced on the surface;
- manage topsoil resources to minimise the risk of erosion and sedimentation, and maximise reuse of topsoil during rehabilitation;
- when trenching parallel to site contours (across grade), soil from the excavation should be placed and compacted on the uphill side of the trench to form an earth bank. This is to prevent clean stormwater entering the trench (where after it must be managed as “dirty” water) by directing stormwater around and away from the open trench. This measure may be avoided where trenches are expected to be open for less than 24 hours and where the likelihood of rain is low;
- when trenching perpendicular to contours use sandbag plugs or bulkheads to shorten the length of stormwater flow and consequent erosion in the trench; and
- progressively backfill trenches and rehabilitate as soon as possible. Leave backfilled trenches with a slightly elevated profile to allow for settlement, and to prevent the trenches from becoming a depression that can concentrate stormwater run-off, and potential erode the replaced soil.

5.4.3 Dewatering

Water has the potential to collect in trenches, sediment traps and low lying depressions in the construction areas following rainfall events. This water is likely to become contaminated with suspended sediment and will require management to ensure that downstream waterways are not polluted.

Dewatering can be undertaken such that water collected is reused on the site within water carts, for dust suppression on unsealed access roads and watering of rehabilitated areas. Discharging run-off directly to a natural waterway is not supported. Low volumes of water can be discharged through vegetated areas to encourage infiltration and settlement of entrained sediment. Vegetated areas act as a filter, assisting in the removal of sediment from the discharged water. Dewatering bags may also be used.

5.4.4 Unsealed Internal Access Roads

A network of unsealed roads will be developed throughout the Project Area to allow access to the WTGs, batching plant and other project infrastructure.

The focus of erosion and sediment control for unsealed roads will be on maintaining good stormwater drainage. The primary aim is to ensure that stormwater is readily shed from the road surface and, most importantly, is not allowed to track longitudinally along the road for any great distance. Onsite assessment and review of topographical mapping noted that proposed roads are located along ridgelines and in areas without large upslope catchments thus minimising the erosion hazard and drainage requirements.

The primary access point is from Abercrombie Road. Mud tracking will be a risk in these locations and as such stabilised entry points will be required. Options may involve the sealing of the internal roads with bitumen for 50 m into the Project Area at confluence points with the access roads or the use of cattle grids and wheel washes, or a layer of crushed rock.

The following mitigation measures should also be considered during the planning and implementation phases of the access road construction:

- limit the clearing width to the minimum that is practicable;
- retain any cleared vegetation (i.e. as mulch and sheared timber) for use later in rehabilitation;
- strip and stockpile topsoil separately for use in rehabilitation;
- minimise cut and fill by constructing the road at-grade where ever possible;
- ensure the road surface has a cross-sectional grade to allow free surface drainage and avoid excessive ponding and concentration of flow in wheel ruts;
- employ outfall drainage where practicable to shed water over the downslope batter of the road, especially where the road alignment is generally parallel to the contours;
- where the road is positioned along a crest or ridge use a crowned road surface that sheds water to both sides;
- when grading roads, avoid the formation of windrows along the shoulders. These retain water on the road surface and increase erosion;
- where table drains are used, ensure these are properly stabilised and install regularly spaced mitre drains to discharge water from drains, releasing to well vegetated, stable areas;
- mitre drains shall be installed regularly to convey run-off from the road shoulders and any table drains to disposal areas away from the road alignment. As a general rule the maximum spacing between mitre drains should be 50 m, however this may be reduced in high erosion hazard areas (e.g. on steep slopes). Mitre drains should have a grade of no more than 5 %. They should discharge to areas that are well stabilised and free of obstructions (e.g. large rocks, tree trunks);
- cross-banks (or rollover banks) or cross-drains should be considered in suitable locations to shed water from the road surface, discharging water in well vegetated, stable areas. Cross-banks are earth banks that extend across the road roughly perpendicular to the road alignment. They contain a bank and upstream channel to direct run-off across the road surface, to prevent the concentration of run-off along the road surface and reduce runoff velocities, thereby reducing erosion. These measures are highly useful where roads are aligned acutely to or perpendicular to the contours over long distances; and
- stabilise road batters using a suitable combination of rolled erosion control products (RECPs) such as jute matting, mulching, spray-on stabilisation measures (e.g. hydromulching or bitumen emulsion) revegetation and hard armouring where required (e.g. within flow lines).

A recommended waterway crossing standard drawing (SD5-1) is provided in *Appendix D*.

5.4.5 Concrete Batching Plant

Establishment of the concrete batching plant will be similar to the establishment of all the pad sites and as such erosion and sediment controls are universal. However new water management issues arise during the operation of the plant due to the creation of run-off with entrained fine sediment and higher alkalinity run-off. The following mitigation measures are proposed during the operation of the concrete batching plant:

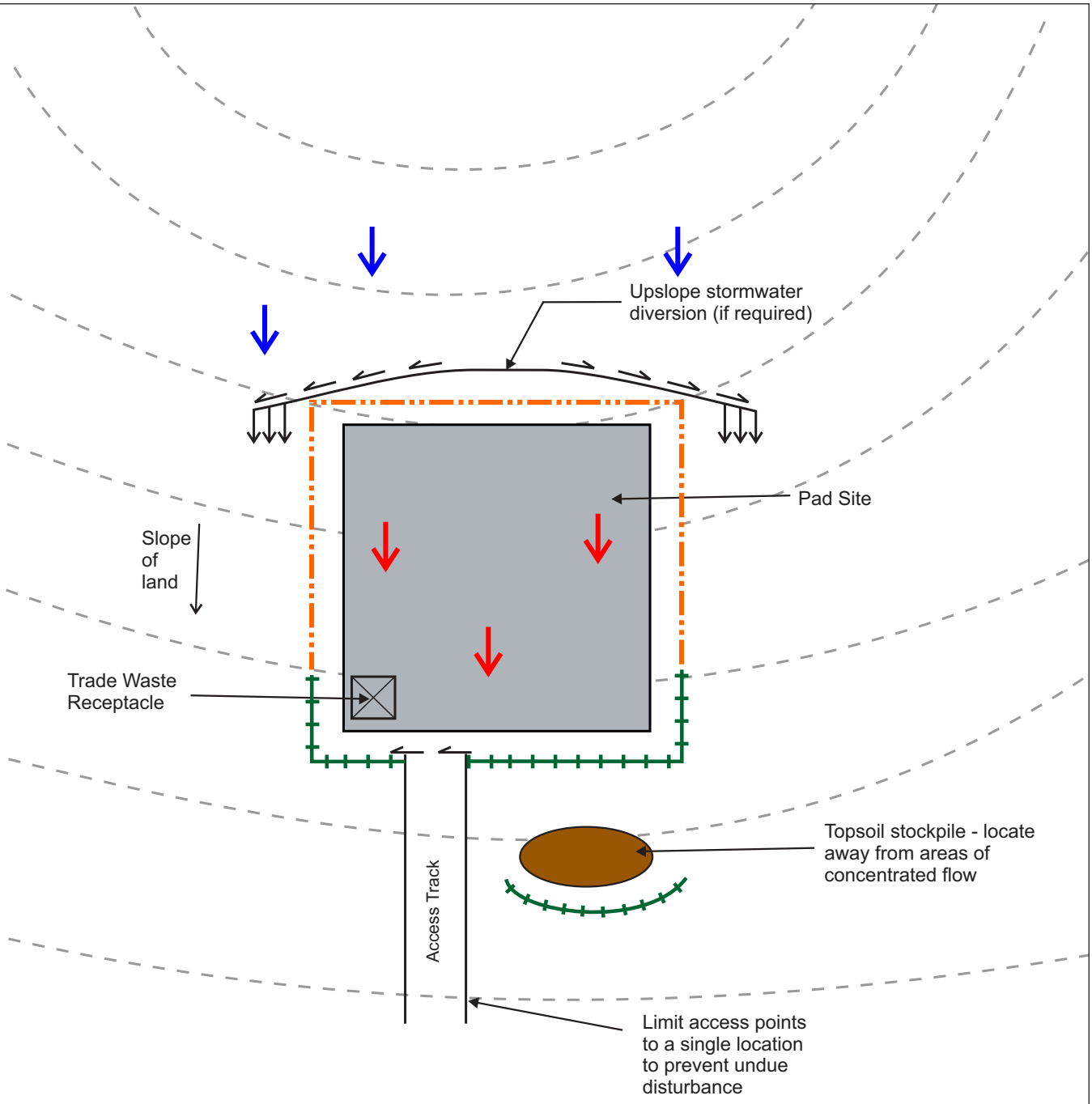
- separate stormwater collection and drainage systems will be provided to allow for discharge of clean stormwater (through a system designed to minimise local erosion) and collection and reuse of contaminated stormwater (through a first flush collection pit);

- a stormwater recycling system will be provided with capacity sufficient to store contaminated run-off generated by 20 mm rain within 24 hours, with operating management system to use collected wastewater as soon as possible (to maintain containment capacity);
- suitable washout locations will be provided for the placement of waste concrete and mortar slurries (either at the concrete batching plant or at individual works compounds, or both). These may comprise shallow excavations that are suitably bunded to prevent non-project impacted stormwater from entering the washout. Dried concrete will be disposed by an approved means;
- water within the washout will be encouraged to evaporate and/or infiltrate the soils;
- wet weather stormwater discharges will be monitored for pH and suspended solids;
- any excess contaminated waste water will be disposed of off-site by a licensed waste contractor; and
- the area of the batching plant will be fully rehabilitated after the construction phase is completed.

5.5 Site Monitoring and Maintenance

Essential to an effective system of sediment control devices, is an adequate inspection, maintenance and cleaning program. Inspections, particularly during storms, will show whether devices are operating effectively. Where a device proves inadequate, it should be quickly redesigned to make it effective. Visual monitoring of potential dust during construction is required to mitigate air quality impacts.

Recommended Inspection Schedules will be developed in the Detailed Construction Soil and Water Management Plan following approval.



Notes:

1. Monitor weather forecasts and avoid large ground disturbances prior to rain.
2. Install controls prior to disturbance.
3. Separate topsoil and subsoil during works.
4. Limit time of disturbance to minimum extent possible.
5. Progressively rehabilitate/stabilise as soon as possible.

Legend

- Earth Bank (refer to SD5-5)
- Level Spreader (refer to SD5-6)
- Sediment Fence (refer to SD6-8)
- Barrier Fence
- Topsoil Stockpile (refer to SD4-1)
- Clean Runoff
- Project Impacted Runoff
- Example Contours

Generic Erosion and Sediment Control Plan for Pad

F5-1

Drawing No:	0578575s_PYWF_HYR_C001_R0.cdr		**Paling Yards Wind Farm**
Date:	30/03/2022	Drawing size: A4	
Drawn by:	VN	Reviewed by: NR	Client: Global Power Generation Australia (GPG)

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6. MITIGATION MEASURES

6.1 Project Mitigation Management

The following measures will be implemented to address potential soil and water impacts:

- prepare a detailed SWMP prior to construction commencing. The SWMP should be prepared by a suitably qualified person, such as a soil conservationist;
- prepare Progressive ESCPs within the SWMP as the Project progresses to address management requirements at individual work sites;
- design and construct the Project to minimise land disturbance and therefore reduce the erosion hazard;
- stage construction activities to minimise the duration and extent of land disturbance;
- schedule dust-generating construction activities when there are favourable wind conditions;
- monitor air quality with dust deposition gauges during the construction phase of the Project;
- manage topsoil resources to minimise the risk of erosion and sedimentation, and maximise reuse of topsoil during rehabilitation;
- where required a water cart or alternative dust suppression would be available and applied to work areas;
- cover or stabilise stockpiles when not in use to reduce dust where practical;
- divert upslope (clean) stormwater around the disturbed sites and capture sediment-laden run-off from within the disturbed site for diversion to sediment control devices;
- rehabilitate the site promptly and progressively as works progress;
- inspect and maintain erosion and sediment control devices for the duration of the Project construction stage;
- avoid land disturbance beyond that identified in the assessment within 20 m of minor streams (first and second order watercourses) and 40 m of third order or higher watercourses;
- ensure appropriate procedures are in place for the transport, storage and handling of fuels, oils and other hazardous substances, including availability of spill clean-up kits;
- construct required access tracks at any early stage to minimises disturbance during construction;
- obtain all necessary water access licences; and
- ensure appropriate stormwater, collection, treatment and recycling at the concrete batch plant, in accordance with good practice and any requirements of the NSW Environmental Protection Authority.

6.2 Runoff Management

Changes to the catchment runoff characteristics due to project activities primarily relate to upgrading existing access tracks and replacing open vegetated ground cover with hardstand (all weather) access tracks, crane pads and WTG footings as well as construction of sealed areas for the associated infrastructure including substations.

6.2.1 Construction

Mitigation measures in addition to those recommended in Section 6.1.

- the drainage design for hardstand and access track infrastructure will aim to direct runoff from all hardstands and access tracks to appropriate sediment control facilities and/or flow velocity controls such where required;
- installation of appropriate erosion and sediment controls near waterways to contain surface water contaminated with sediment runoff entering the waterway;
- procedures to ensure that steep batters are treated appropriately for erosion and sediment control;
- appropriate overland flow management to prevent the concentration and diversion of water onto steep or erosion prone areas; and
- thorough visual inspections following significant rain events with a requirement for actions for localised erosion caused by runoff (within specified response times).

The separation of ‘clean’ and ‘dirty’ runoff is the first principle of best management practices in erosion and sediment control and minimises flows to be subject to water quality controls and will be implemented throughout the Project.

Mitigation measures will be included in site specific ESCPS developed by a suitably qualified and experienced person.

6.2.2 Operation

Runoff from Project infrastructure will is likely to have a marginally higher velocity with less infiltration compared to existing conditions. However, this will be somewhat offset by the installation of erosion and sediment controls such as grass swales with regular rock checks in access track and other constructed drainage lines, level spreaders onto naturally vegetated areas at flow outlets to reduce velocities and encourage infiltration.

Engineered designed and constructed hardstand areas graded to perimeter drains have minimal available fine materials on surfaces and limited potential to erode and hence the potential to generate sediment. Erosion risk is primarily during construction when working on disturbed surfaces and constructing cut and fill batters prior to completion of permanent stabilising works. Erosion risk also continues after construction in concentrated flow paths such as access track drainage lines, however these can be managed with the implementation of appropriate controls as noted above.

7. CONCLUSION

This Hydrology Assessment identified and assessed potential soil and water impacts related to the Project. Overall potential impacts are relatively minor due to the low erosion hazard over the majority of the Project Area to be impacted by construction. A standard suite of erosion and sediment controls may be adopted in most areas, with the more focused attention provided to areas of steep slopes adjacent to the Development Footprint.

It is considered that that construction works associated with the Project are unlikely to intercept the groundwater aquifer based on review of available drilling records from existing groundwater wells and the design of the Development Footprint, locating WTGs along the elevated ridge line.

Water supply options are available to meet the needs of the construction phase. The five viable options available to source the estimated 40 ML of water required for the 22-month Project construction period include:

- Council water supply, in agreement with the relevant Council(s);
- extraction of water collected from existing (or new) dams using landowner harvestable rights, in agreement with the landholder;
- extraction from an existing nearby landowner bore, in agreement to use their allocation;
- extraction from a new groundwater bore, which will require a WAL in consultation with WaterNSW; and
- extraction from a surface water source (e.g. Abercrombie River), which will require a WAL in consultation with WaterNSW.

Water access licencing requirements will be confirmed in consultation with WaterNSW and all required licences obtained once the preferred option has been determined.

The Project Area is located in the Lachlan River Catchment. The proposed Development Footprint is anticipated to only directly intersect a small number of ephemeral first order creek crossings. The transmission line spans across several watercourses, transmission poles are not to be located closer than 40 m to any watercourse, with the exception of identified first order streams.

A number of mitigation measures are proposed for the Project to address potential soil and water impacts, including the preparation of progressive ESCP's to address management requirements at individual work sites. Overall constraints are relatively minor due to the low erosion hazard over the majority of the Project Area to be impacted by construction. A detailed Soil and Water Management Plan should also be prepared for the Project prior to construction commencing that incorporates the measures identified within this assessment.

REFERENCES

ABS, 2016. Census Data - 2021, accessed 31 August 2022 via website https://www.abs.gov.au/census/find-census-data/search-by-area

Agriculture Victoria, 2007. Understanding soil tests for pastures, accessed 28 July 2022 via website https://agriculture.vic.gov.au/farm-management/soil/understanding-soil-tests-for-pastures

ANZECC & ARMCANZ, 2000. *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*

BOM, 2022. Climate Data Online - Monthly Rainfall Taralga Post Office accessed 2 May 2022 via website http://www.bom.gov.au/jsp/ncc/cdio/weatherData/

DAWE, 2021. Lachlan Catchment, accessed 1 April 2022 via website https://www.awe.gov.au/water/cewo/catchment/lachlan

Landcom, 2004. *Managing Urban Stormwater: Soils and Construction, Volume 1, 4th edition*

Morgan and Terrey, 1992. *Nature conservation in western New South Wales*. Sydney: National Parks Association

Murphy, Fogarty & Ryan, 1998. *Soil Regolith Stability Classification for State Forests in Eastern New South Wales, Technical Report No 41*, Department of Land and Water Conservation, Sydney.

NSW DECC, 2008a. *Managing Urban Stormwater: Soils and Construction, Volume 2A, Installation of Services*

NSW DECC, 2008b. *Managing Urban Stormwater: Soils and Construction, Volume 2C, Unsealed Roads*

NSW DECCW, 2006. NSW Water Quality and River Flow Objectives - Lachlan River, accessed 1 April 2022 accessed via https://www.environment.nsw.gov.au/ieo/lachlan/report-02.htm

NSW DoI, 2018. *Guidelines for controlled activities on waterfront land*

NSW DPE, 2018. Hydro Line spatial data web mapping accessed 1 April 2022 via website https://www.industry.nsw.gov.au/water/licensing-trade/hydroline-spatial-data

NSW DPE, 2020. Safeguarding our Agricultural Land, Biophysical Strategic Agricultural Land (BSAL) accessed 5 April 2020 accessed via https://www.planning.nsw.gov.au/Policy-and-Legislation/Mining-and-Resources/Safeguarding-our-Agricultural-Land

NSW DPE, 2022a. Water Allocation Statement - Lachlan Regulated River Water Source, accessed 3 April 2022 via website https://www.industry.nsw.gov.au/__data/assets/pdf_file/0018/500265/WAS-Lachlan-20220308.pdf

NSW DPE, 2022b. The Central Resource for Sharing and Enabling Environmental Data in NSW, online SEED mapping accessed 1 April 2022 via website https://www.seed.nsw.gov.au/

NSW DPE, 2022c. Online eSPADE mapping accessed 5 April 2022 via website https://www.environment.nsw.gov.au/eSpade2WebApp

NSW DPI 2012a. *Guidelines for controlled activities on waterfront land – Riparian corridors*

NSW DPI 2012b. *Water guidelines for watercourse crossings on waterfront land*

NSW DPI 2013. *Policy and guidelines for fish habitat conservation and management*

NSW DPIE, 2020. *Development adjacent to NPWS Lands: Guidelines for consent and planning authorities*

NSW EPA (2016). *Approved Methods and Guidelines for the Modelling and Assessment of Air Pollutants in New South Wales*

NSW NPWS (2003). *The Bioregions of New South Wales - their biodiversity, conservation and history*

OEH, 2012. *The land and soil capability assessment scheme – a general rural land evaluation system for New South Wales*

Hazelton & Murphy, 2007. *Interpreting soil test results: what do all the numbers mean?* CSIRO Publishing

WaterNSW, 2022a. Maximum harvestable rights dam capacity calculator, accessed 3 April 2022 via website https://www.waternsw.com.au/customer-service/water-licensing/blr/harvestable-rights-dams/maximum-harvestable-right-calculator

WaterNSW, 2022b. Real Time Data, accessed 3 April 2022 via website https://realtimedata.waternsw.com.au/

APPENDIX A EROSION HAZARD ASSESMENT

A.1 REVISED UNIVERSAL SOIL LOSS EQUATION

Managing Urban Stormwater: Soils and Construction, Volume 1 (Landcom 2004) describes a method for assessing erosion hazard using the revised universal soil loss equation (RUSLE). The RUSLE is designed to predict the long term, average, annual soil loss from sheet and rill erosion at nominated sites under specified management conditions. It is used to assess erosion hazard at construction sites and estimate sediment flux to sediment traps.

The RUSLE equation is represented by:

A = R K LS P C

where,

A = computed soil loss (tonnes/ha/yr)

R = rainfall erosivity factor

K = soil erodibility factor

LS = slope length/gradient factor

P = erosion control practice factor

C = ground cover and management factor.

R-Factor

The rainfall erosivity factor, *R*, is a measure of the ability of rainfall to cause erosion. It is the product of two components; total energy (E) and maximum 30 minute intensity for each storm (I_{30}). So the total EI for a year is equal to the R-factor.

A strong correlation between the R-factor and the 2-year ARI, 6-hour storm event (denoted S) was identified and small-scale maps of the R-factor for all New South Wales is provided in Landcom (2004). The Project Area is located between two R-factor contours of 1250 and 1500, and hence a R-factor of 1375 has been selected

Using the above, at Palings Yard is **R = 1,375.**

K-Factor

The soil erodibility factor, K, is a measure of the susceptibility of soil particles to detachment and transport by rainfall and run-off. Texture is the principle component affecting K, but structure, organic matter and permeability also contribute. In the RUSLE, it is a quantitative value that is normally experimentally determined.

Soil K-factor data was estimated with reference to the soil descriptions provided in eSPADE (DPE, 2022c). On the Taralga Soil Landscape topsoils and subsoils have low to moderate erodibility. A maximum K factor of 0.02 would be appropriate for these soils. Topsoils and subsoils of the Midgee Landscape have moderate to high erodibility, and a K-factor of 0.05 would be a reasonable estimate of these soils. It is noted that the majority of the disturbance would occur on the Taralga Soil Landscape, as a result a K-factor of 0.04 is adopted. Generally, K-factor ranges from 0.005 (very low) to 0.075 (very high) (Landcom 2004).

Therefore, **K = 0.04**.

LS-Factor

The slope length-gradient factor, LS, describes the combined effect of slope length and slope gradient on soil loss. It is the ratio of soil loss per unit area at any particular site to the corresponding loss from a specific experimental plot of known length and gradient. The LS factor can be read from Table AI in Landcom (2004). It should be noted that an increase in slope gradient has a proportionately greater effect on LS, compared with an increase in slope length.

The Project Area has variable gradients including some areas with slopes up to about 15 % (and in some areas higher), but in the turbine locations is commonly only gently sloping with gradients less than 5 %. Slope lengths in disturbed areas would be typically less than 80 m. Under the combination of 80 m slope length and 5 % gradient the LS Factor is 1.19. On steeper slopes it is assumed that slope lengths would be kept shorter through the use of appropriate stormwater controls. Under the combination of 40 m slope length and 15 % gradient the **LS Factor is 3.05.**

P-Factor

The erosion control practice factor, P, is the ratio of soil loss with a nominated surface condition ploughed up and down the slope. It is reduced by practices that reduce both the velocity of run-off and the tendency of run-off to flow directly downhill. At construction and mining sites, it reflects the roughening or smoothing of the soil surface by machinery. The **P-factor used here is 1.3** that is normally assigned to compacted construction sites.

C-Factor

The cover factor, C, is the ratio of soil loss from land under specified crop or mulch conditions to the corresponding loss from continuously tilled, bare soil. The most effective method of reducing the C-factor is maintenance, or formation of a good ground cover. The best practices are those that reduce both the amount of soil exposed to raindrop impact and the erosive effects of run-off.

The C-factor assigned here during construction operations is 1.0, typical of that for bare, compacted soil. Table A3 in Landcom (2004) provides estimated C-factors for various cover types. It is worth noting that the C-factor is the factor that can be most readily manipulated to affect a change in erosion hazard. For example, changing the soil surface from a condition of bare, compacted earth (C = 1.0) to one with 70% cover of grasses (C = 0.05) leads to a proportionate reduction in soil loss, i.e. 20 times lower erosion hazard.

C-Factor = 1.0

A.2 PREDICTED SOIL LOSS

A = R K LS P C

where,

R = 1,375

K = 0.04

LS = 3.0

P = 1.3

C = 1.0

Therefore, A = 218 tonnes per hectare per year.

Using the RUSLE, the predicted annual soil loss is 85 tonnes/hectare/year under the combination of 80 m slope length and 5 % gradient. This is Soil Loss Class 1 0 to 151 tonnes/ha/yr) which is rated very low (refer Table 4.2 in Landcom, 2004). Under the combination of 40 m slope length and 15 % gradient predicted annual soil loss is 218 tonnes/hectare/year which Soil Loss Class 2, rated low.

Based on this assessment it is concluded that the overall site erosion hazard is low and consequently, a standard suite of erosion and sediment controls may be widely employed. Specialised techniques may be required in high hazard areas, such as steep slopes and areas of concentrated flow.

APPENDIX B FLOOD ASSESSMENT

Paling Yards Wind Farm

Flood Assessment

Paling Yards Development Pty Ltd

25 November 2022

Project No.: 0578575

Tract

GPG
Naturgy Group

The business of sustainability

ERM

Document details	
Document title	Paling Yards Wind Farm
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Project No.	0578575
Date	25 November 2022
Version	2.1
Author	Ross Winckworth, Samuel Su
Client Name	Tract for Paling Yards Development Pty Ltd

Document history

				ERM approval to issue		
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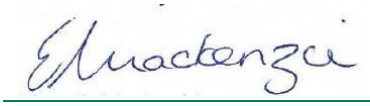
Final	02	R. Winckworth		K. Bradfield	25.11.2022	Final

Signature Page

25 November 2022

Paling Yards Wind Farm

Flood Assessment



Elspeth Mackenzie
Project Manager

Karie Bradfield
Partner

Environmental Resources Management Australia Pty Ltd
Level 15, 309 Kent St
Sydney NSW 2000

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Acronyms and Abbreviations

Name	Description
AEP	Annual Exceedance Probability
AGL	Above ground level
BOM	Bureau of Meteorology
DEM	Digital Elevation Model
DPE	Department of Planning and Environment
EIS	Environmental Impact Statement
ESCP	Erosion and Sediment Control Plan
GPG	Global Power Generation Australia
ha	hectares
IFD	Intensity-Frequency-Duration
km	kilometres
kV	kilovolts
ML	Megalitres
MW	Megawatts
NSW	New South Wales
PMF	Probable Maximum Flood
PMP	Probable Maximum Precipitation
RoG	Rain-on-grid
SEAR	Secretary's Environmental Assessment Requirements
SILO	Scientific Information for Landowners
WTG	Wind Turbine Generators

EXECUTIVE SUMMARY

This report presents a flood assessment as a part of the Hydrology Assessment supporting the Environmental Impact Statement (EIS), meeting the Secretary's Environmental Assessment Requirements (SEARs) and Department of Planning and Environment (DPE) requirements. The flood assessment comprises review and modelling of large and extreme flood events for the Paling Yards Wind Farm area. The assessment quantifies flood risk that can help inform design of the project, mitigation measures and risk management, emergency management and social and economic costs impacted by the possible flooding.

Results of the flood modelling showed that the 5% AEP and 1% AEP flood events would have little impact to the Project footprint. The position of the WTGs on the ridge lines and the steep topography of the area resulted in limited ponding of surface water outside of the defined creeks and watercourses of the Project. The steep gradient limited the formation of flood storage areas further limiting the potential of the Project to alter the flow regimes through change of land cover. The flood planning level was determined using the 0.5% AEP water surface elevation and applying a freeboard of 0.5 m. The hazard categorisation performed on the project site did not lead to the determination of high hazard flood risk within the immediate footprint of each of the WTGs. High hazard zones were determined in the defined creeks located on the tow slopes. These areas are away from the intended placement of the WTGs and risk is limited.

1. INTRODUCTION

1.1 Background

Global Power Generation Australia (GPG) is seeking approval to construct and operate the Paling Yards Wind Farm, located approximately 45 km south of Oberon and 25 km north-west of Taralga in the Central Tablelands region of New South Wales (NSW) and within the Oberon local government (the Project). A regional locality plan is provided in Figure 1. The Project would supply up to 287 megawatts (MW) of installed capacity renewable energy, directly into the national electricity grid by connecting to the existing Mt Piper to Bannaby 500 kilovolt (kV) transmission line to the north east via a proposed 9 km, 132/500 kV transmission line (the line is 132 kV for approximately 8 km before switching to 500 kV line for the final kilometre) and switching station.

The Project encompasses approximately 4,600 hectares (ha) (the 'Project Area') as outlined by the Project boundary in Figure 1. This flood technical assessment has been prepared for input into the Environmental Impact Statement (EIS) for the Project being prepared by Tract.

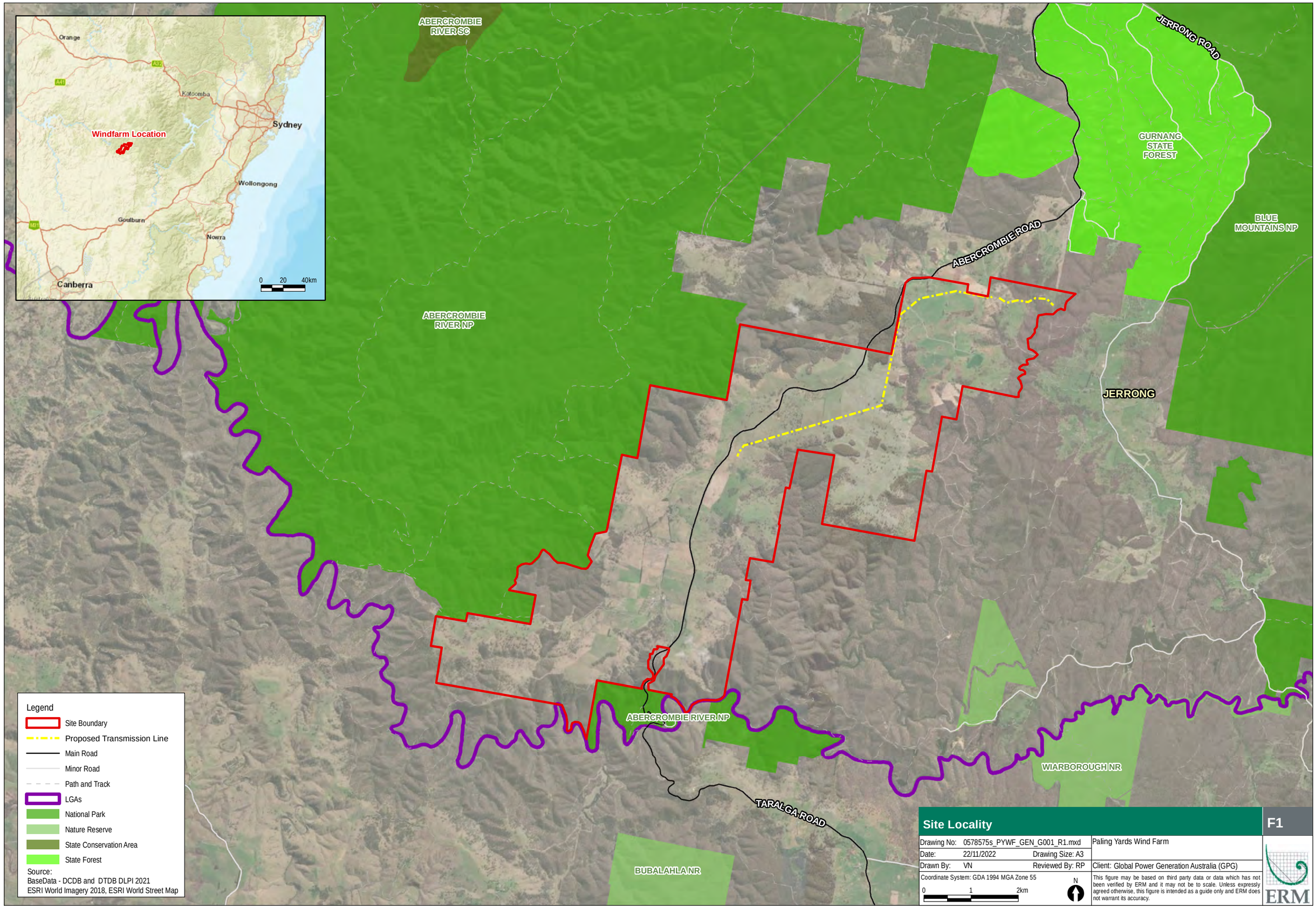
1.2 Objectives

The Flood Assessment has been prepared to:

- Map relevant flooding features as described in the "Floodplain Development Manual 2005";
- Describe flood assessment and modelling undertaken in determining the design flood levels for events, including a minimum of the 5% Annual Exceedance Probability (AEP), 1% AEP, flood levels and the probable maximum flood, or an equivalent extreme event;
- Model the effect of the proposed project (including fill) on the flood behaviour under the following scenarios:
    - Current flood behaviour for a range of design events as identified above. This includes the 0.5% and 0.2% AEP year flood events as proxies for assessing sensitivity to an increase in rainfall intensity of flood producing rainfall events due to climate change; and
    - Modelling must consider existing council flood studies, existing flood behaviour for a full range of flood events including PMF, impacts on the development of flood behaviour resulting in detrimental changes in potential flood affection of other developments or land and relevant provisions of the NSW "Floodplain Development Manual 2005".

Impacts of proposed project on flood behaviour to include:

- Applicable risk management plans;
- Hydraulic functions including floodway conveyance, storage and adverse or beneficial inundation;
- Erosion and material movement of riverbanks and watercourses; and
- Impacts to emergency management, social and economic costs to the community because of flooding.



Site Locality

F1

Drawing No:	0578575s_PYWF_GEN_G001_R1.mxd		Paling Yards Wind Farm
Date:	22/11/2022	Drawing Size: A3	
Drawn By:	VN	Reviewed By: RP	Client: Global Power Generation Australia (GPG)

Coordinate System: GDA 1994 MGA Zone 55

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2. PROJECT DESCRIPTION

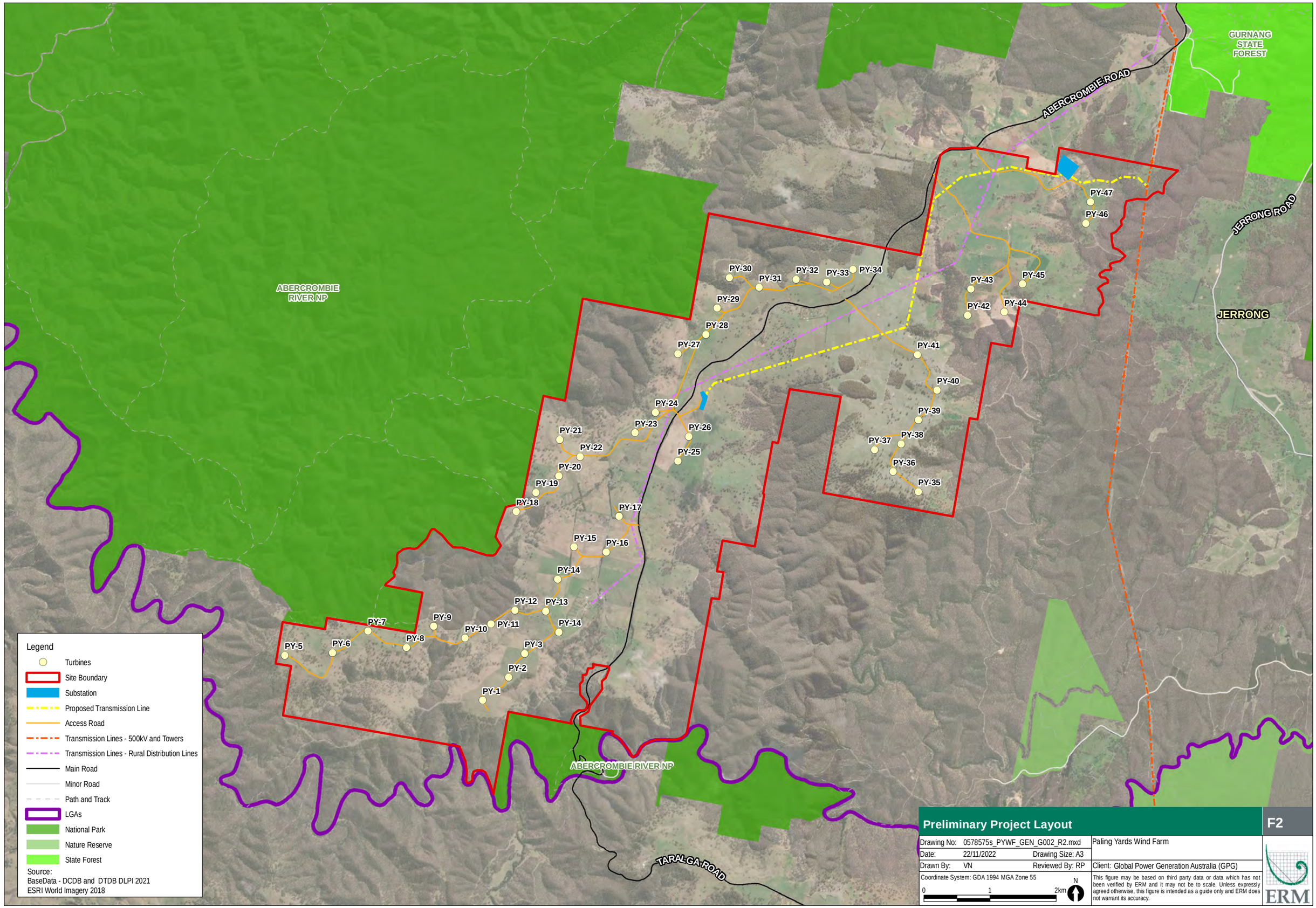
The Project involves the construction, operation and commissioning of a wind farm with up to 47 wind turbine generators (WTG), together with associated and ancillary infrastructure.

The Project has been revised and refined over time in response to design and constructability requirements, and in consideration of environmental constraints and the outcomes of community consultation.

The Project consists of the following key components:

- up to 47 WTGs, each with:
  - a maximum height of 240 m AGL (to the blade tip) with a generating capacity of approximately 6.1 MW;
  - tubular steel tower holding the nacelle;
  - three blades mounted to a rotor hub and the gearbox and generator assembly housed in the nacelle; and
  - adjacent hardstands for use as crane pads and assembly / laydown areas;
- installation of three wind monitoring masts, fitted with various instruments such as anemometers, wind vanes, temperature gauges and other electrical equipment;
- obstacle lighting to selected turbines (if required);
- construction of on-site electrical substations (collector substation and connection substation) with approximately 9 km of overhead powerline to connect to a 500 kV transmission line;
- construction of a control room, maintenance buildings, switchgear, and associated control systems in the vicinity of the wind turbine towers.);
- roadworks and upgrades to local road infrastructure at key access points along Abercrombie Road in addition to internal tracks for vehicle access to turbines and infrastructure;
- removal of native vegetation and additional vegetation planting to provide screening (as required);
- temporary site buildings and facilities for construction contractors / equipment, including site offices, car parking and amenities for the construction workforce; and
- a temporary batching plant to supply concrete.

Collectively, these Project elements are referred to throughout this report as the ‘Development Footprint. The Project layout and key design elements are provided in Figure 2.


GURNANG STATE FOREST
ABERCROMBIE ROAD
JERRONG ROAD
JERRONG
ABERCROMBIE RIVER NP
ABERCROMBIE RIVER NP
TARALGA ROAD
PY-1
PY-2
PY-3
PY-4
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PY-47
Legend
Turbines
Site Boundary
Substation
Proposed Transmission Line
Access Road
Transmission Lines - 500kV and Towers
Transmission Lines - Rural Distribution Lines
Main Road
Minor Road
Path and Track
LGAs
National Park
Nature Reserve
State Forest
Source:
BaseData - DCDB and DTDB DLPI 2021
ESRI World Imagery 2018
Preliminary Project Layout
F2
Drawing No: 0578575s_PYWF_GEN_G002_R2.mxd
Paling Yards Wind Farm
Date: 22/11/2022
Drawing Size: A3
Drawn By: VN
Reviewed By: RP
Client: Global Power Generation Australia (GPG)
Coordinate System: GDA 1994 MGA Zone 55
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3. FLOOD ASSESSMENT APPROACH

The Project is limited in footprint and positioning to primarily the catchment ridge lines. As such, the potential for significant or prolonged flood exposure across the site is limited. Some areas may experience short-lived surface flow if adjacent to drainage lines and gullies which feed the larger creeks and rivers in the valleys. The flood models developed are based on the Australian Rainfall and Runoff 2019 (ARR 2019) data and guidelines.

This assessment will also aid in the placement of the Project infrastructure to ensure that they are located outside of the predicted flood extents in addition to the mandated riparian setbacks for the relevant stream order. The assessment approach is discussed in the sections below.

3.1 Input Data

To facilitate the assessment, the following datasets have been obtained from publicly available sources on the internet (link provided):

- Aerial imagery of the study area;
- Project description and proposed layout of the Project components;
- Digital Elevation Model (DEM) in 2 m resolution tiles based on LiDAR aerial survey (classification level 3) obtained from the ELVIS webpage (https://elevation.fsdf.org.au/), sourced from the NSW Spatial Services database;
- Cadastral information and hydrolines (watercourses) from SIX Maps (https://maps.six.nsw.gov.au/clipnship.html);
- Bureau of Meteorology (BoM) 2016 design rainfalls (http://www.bom.gov.au/water/designRainfalls/revised-ifd/); and
- Storm losses and temporal patterns for design rainfalls from ARR 2019 Data Hub (https://data.arrsoftware.org/).

The following flood studies and guidelines have also been referred to while undertaking the assessment:

- The Village of Taralga Flood Study (2014) prepared by Lyall & Associates Consulting Water Engineers;
- Sydney Drinking Water Catchment Map obtained from WaterNSW (WaterNSW, 2022);
- Australian Rainfall and Runoff 2019 (ARR 2019); and
- Review of ARR Design Inputs for NSW (2019) prepared by WMAwater for NSW Office of Environment Heritage (OEH).

3.2 Climate

An understanding of the existing climatic context of the Project Area has been developed through data available from the Australian Governments Bureau of Meteorology (BoM). Climate data was available from BoM weather stations located at Taralga Post Office (Station No. 070080) approximately 35 km south of the Project Area and Oberon (Station No. 163063) approximately 68 km north of the Project Area.

The Taralga Post Office is located at an elevation of 845 m, whilst the Oberon weather station sits at 1088 m. Monthly rainfall data from the Taralga Post Office (070080) was used in further assessments as being the closest station and more representative to the Project Area. The mean monthly precipitation is summarised in Table 1 below, with the highest and lowest rainfall records highlighted in red and blue respectively.

Table 1 Monthly Precipitation Data for 1882[1] – 2022 (mm)

Statistic	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean	73.4	72.2	70.1	58.2	58.8	75.6	66.4	67.9	61.2	69.4	68.7	66.5	804.0
Lowest	6.4	0.0	0.0	0.8	3.1	0.0	4.3	0.5	8.4	0.4	0.5	0.0	360.4
Median	61.0	59.1	54.7	46.4	42.4	58.8	58.7	61.7	57.2	60.2	60.6	56.0	786.0
Highest	296.7	363.2	295.0	248.4	432.2	418.0	256.9	274.8	150.9	197.8	405.2	233.5	1492.7

[1] Taralga Post Office weather station has collected data since August 1882, however some gaps exist in datasets collected for the following years: 2001 and 2021.

Note: Data collected from BoM's climate data online, accessed 2 May 2022 (BOM, 2022).

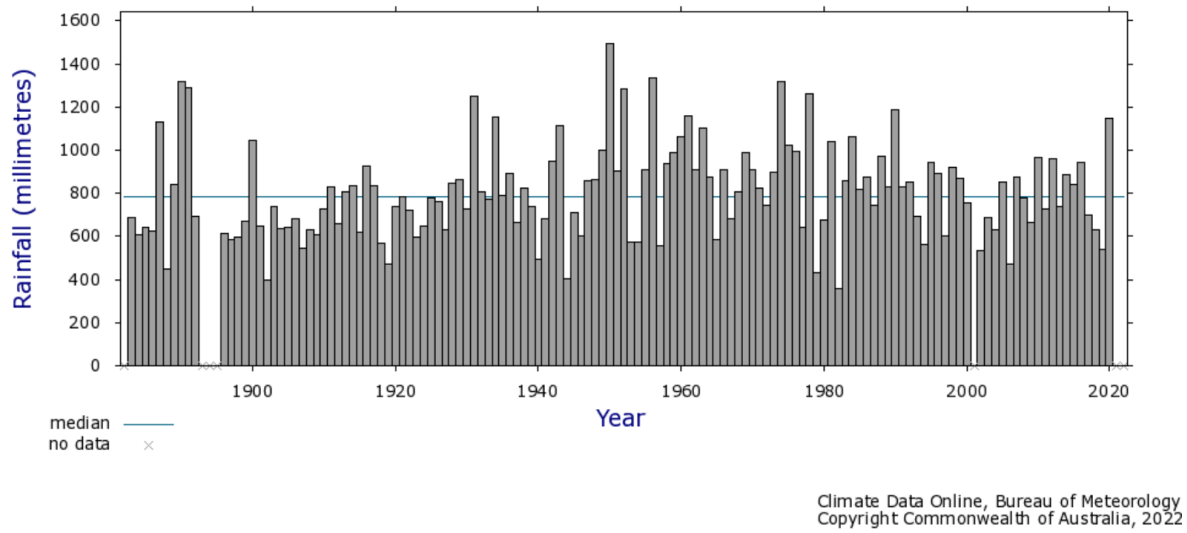

Figure 3 Teralga (Post Office) Annual Rainfall

Source: Data collected from BoM's climate data online, accessed 2 May 2022 (BOM,2022).

3.3 Model Development

A rain-on-grid model (RoG) hydraulic model and RORBWin rainfall-runoff routing model were developed based on the ARR 2019 data and methodology to facilitate the design flood simulation for 5% AEP, 1% AEP and PMF events for the study area. The 1% AEP (or 1 in 100 AEP) event generally depicts a critical flood event and is used to assess flood risk and to reduce flood exposure and damage (NSW Floodplain Development Manual, 2005). The models are developed to simulate the dynamic interactions between the watercourses, floodplains and overland flow paths within the study area, using RORBWin (version 6.45) and HEC-RAS (Version 6.2) modelling software. Overview of the hydrology and hydraulic model setup is presented in Section 3.3.2 and Section 3.3.3.

The DEM obtained for the study featured a resolution of 2 m. This resolution was considered appropriate to the area (~136 km^2) being modelled. The catchments used within the study were delineated from the 2 m DEM obtained from ELVIS.

3.3.1 Catchments

The Project area is part of the Lachlan River catchment in the Murray-Darling Basin. Two catchments were developed (Figure 4); focusing on the site boundary and creeks upgradient, where surface water flows are in proximity to the Project and creeks within the Project Area. The catchment focused on the Project Area encompasses several smaller creek catchments and is not focused on one individual watercourse and contributing catchment. This has resulted in the catchment following the site boundary on the downgradient aspect. The catchment is approximately 136 km^2 and features a ridge running in a north-east, south-west orientation. The watercourses run from this ridge in largely a north-westerly and south-easterly directions. No active or historical flow monitoring gauges were available in the immediate area to support the development of alternate catchments for the model.

Legend

- Turbines
- Site Boundary
- Model Area
- Substation
- Proposed Transmission Line
- Access Road
- Transmission Lines - 500kV and Towers
- Transmission Lines - Rural Distribution Lines
- Main Road
- Minor Road
- Path and Track
- Minor Watercourse
- Major Watercourse

Depth (m)

- <0.1
- 0.1 - 0.25
- 0.25 - 0.5
- 0.5 - 1
- 1 - 1.5
- 1.5 - 2
- 2 - 2.5
- 2.5 - 3
- 3 - 4
- >4

Source:
BaseData - DCDB and DTDB DLPI 2021
ESRI World Imagery 2018

ABERCROMBIE ROAD
TAVERN CREEK
SILENT CREEK
BACK CREEK
OAKY CREEK
BLACK BELT CREEK
PALING YARDS CREEK
MIDDLE STATION CREEK
BROTHERS CREEK
MANUS CREEK
JERRONG ROAD
JERRONG
MOUNT WERONG CREEK
ABERCROMBIE RIVER
REEDY CREEK
TARALGA ROAD

PY-1 PY-2 PY-3 PY-5 PY-6 PY-7 PY-8 PY-9 PY-10 PY-11 PY-12 PY-13 PY-14 PY-15 PY-16 PY-17 PY-18 PY-19 PY-20 PY-21 PY-22 PY-23 PY-24 PY-25 PY-26 PY-27 PY-28 PY-29 PY-30 PY-31 PY-32 PY-33 PY-34 PY-35 PY-36 PY-37 PY-38 PY-39 PY-40 PY-41 PY-42 PY-43 PY-44 PY-45 PY-46 PY-47

5% AEP Peak Flood Depth Overview

F4

Drawing No: 0578575s_PYWF_FA_G002_R2.mxd		Paling Yards Wind Farm
Date: 22/11/2022	Drawing Size: A3	
Drawn By: VN	Reviewed By: RP	Client: Global Power Generation Australia (GPG)

Coordinate System: GDA 1994 MGA Zone 55

0 0.5 1km

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3.3.2 Hydrology setup

The rain on grid hydraulic model requires hydrological data inputs and the intensity-frequency-duration (IFDs) developed by BOM, adopted within the ARR 2019 guidelines, were used in this study. The 1% AEP and 5% AEP design rainfall depths were extracted from the BOM provided IFD data set. The Probable Maximum Flood (PMF) was determined using the GSAM and GSDM methods, as appropriate based on the location of the catchment.

A basic RORBWin model was created to determine the critical storm duration for the area. A representative catchment was delineated for the model to provide a result, which could be transferred to the area delineated by the rain on grid model area. The RORBWin model was run using an ensemble simulation. The result indicated that the critical storm duration for the representative catchment was 6-hours for the 1% AEP. The design rainfall depths for the site are shown in Table 2; several AEPs and durations have been removed for brevity.

Table 2 Bureau of Meteorology IFD Design Rainfall Depths (mm) for the Project

Duration	2EY	63.2% AEP	50% AEP	20% AEP	10% AEP	5% AEP	2% AEP	1% AEP	1 in 200 AEP	1 in 1000 AEP	1 in 2000 AEP
5 min	3.73	4.86	5.45	7.32	8.62	9.91	11.6	12.9	14.4	17.8	19.3
10 min	5.76	7.55	8.51	11.6	13.7	15.8	18.6	20.9	23.3	28.7	31.2
15 min	7.12	9.31	10.5	14.3	16.9	19.6	23.1	25.9	29	35.7	38.7
20 min	8.15	10.6	12	16.3	19.3	22.2	26.3	29.5	32.9	40.6	44
25 min	8.99	11.7	13.1	17.8	21.1	24.3	28.7	32.2	35.9	44.3	48
30 min	9.71	12.5	14.1	19.1	22.5	26	30.7	34.4	38.3	47.2	51.2
45 min	11.4	14.6	16.3	21.9	25.8	29.8	35	39.1	43.6	53.7	58.2
1 hour	12.7	16.1	18	24.1	28.3	32.5	38.2	42.6	47.5	58.5	63.3
1.5 hour	14.8	18.6	20.7	27.5	32.1	36.8	43.1	48	53.5	65.8	71.3
2 hour	16.5	20.6	22.9	30.2	35.3	40.4	47.1	52.4	58.4	71.9	77.9
3 hour	19.3	24	26.6	35	40.7	46.4	54	59.9	66.9	82.4	89.3
4.5 hour	22.6	28.1	31.2	40.9	47.5	54.1	62.9	69.7	77.9	96.1	104
6 hour	25.3	31.5	35	46	53.5	60.8	70.8	78.5	87.8	108	117
9 hour	29.7	37.2	41.4	54.7	63.7	72.5	84.5	93.7	105	129	140
12 hour	33.2	41.7	46.6	61.9	72.3	82.5	96.3	107	120	148	160
18 hour	38.6	48.8	54.7	73.5	86.4	99.1	116	129	144	178	193
24 hour	42.6	54.1	60.9	82.4	97.4	112	132	146	163	201	218
30 hour	45.8	58.4	65.8	89.6	106	123	145	161	179	221	240
36 hour	48.3	61.8	69.7	95.5	114	132	155	173	192	236	256
48 hour	52.4	67.1	75.9	105	125	146	172	192	212	260	282
72 hour	57.9	74.3	84.1	117	140	165	194	216	237	290	313
96 hour	61.8	79.3	89.8	125	150	176	206	230	252	308	331
120 hour	65.1	83.4	94.3	130	157	183	215	238	262	319	344

Duration	2EY	63.2% AEP	50% AEP	20% AEP	10% AEP	5% AEP	2% AEP	1% AEP	1 in 200 AEP	1 in 1000 AEP	1 in 2000 AEP
144 hour	68.1	87.1	98.4	135	162	189	220	244	269	326	352
168 hour	70.9	90.7	102	140	166	192	224	248	273	330	358

ARR 2019 recommends the application of an Areal Reduction Factor (ARF) in the determination of the design rainfall estimates for a catchment contributing flows to point of interest that is larger than 1 km^2. The ARF is the ratio between the average rainfall occurring on a specific area and the point rainfall computed for the same duration and AEP. This ratio is applied as design rainfall intensities at a point are not representative of the areal average rainfall intensity across the catchment. However, as most of the Project infrastructure is located primarily along catchment ridge lines, where the catchment contributing flows is generally small, a conservative ARF factor of 1 has been adopted across the study area (in other words, no reduction in the rainfall depth).

Rainfall losses for the study area were determined based on the 5-level hierarchical approach (Table 3) found in the 'Review of ARR Design Inputs for NSW' (OEH, 2019) which guides the selection of rainfall losses for NSW catchments. Pre-existing flood studies undertaken for the entire study area were not found and The Village of Taralga Flood Study (2014) was the only local study that could provide information on rainfall losses within the catchments modelled herein. The flood model was not available in the public domain and could not be used to advise the flood assessment. It was decided that the IL and CL values be adopted based on Approach 4 as outlined in Table 3 which is based on Flood Frequency Analysis (FFA), i.e. initial loss (IL) based on the Probability Neutral Burst Loss from the ARR Data Hub and the continual loss (CL) based on the FFA reconciled continuing losses (Figure 5). The adopted rainfall losses are summarised in Table 4. The catchment peak flows modelled based on these rainfall loss values.

Table 3 Hierarchy of Loss Approach from Most (1) to Least (5) Preferred

Approach	Data to use	Storm Initial Loss	Pre-burst (transformational)	IL Burst	Continuing Loss
1	Current Study	Average Calibration	Not required or back calculated using $IL_{Storm} - IL_{Burst}$	Calculated using Equation 6*	Average Calibration
2	Other Studies within the Catchment	Average Calibration	Not required or back calculated using $IL_{Storm} - IL_{Burst}$	Calculated using Equation 6*	Average Calibration
3	Neighbouring Studies	Average Calibration	Not required or back calculated using $IL_{Storm} - IL_{Burst}$	Calculated using Equation 6*	Average Calibration
4	FFA (Flood Frequency Analysis)	NSW FFA reconciled initial loss	Not required or back calculated using $IL_{Storm} - IL_{Burst}$	Probability Neutral Burst Loss	NSW FFA reconciled continuing loss
5	ARR Data Hub	ARR Data Hub initial loss	Not required or back calculated using $IL_{Storm} - IL_{Burst}$	Probability Neutral Burst Loss	ARR Data Hub continuing losses multiplied x0.4

Table 4 Adopted Rainfall Losses

Catchment	Initial Loss (mm)	Continuing Loss (mm)
Main	10.2	6.44

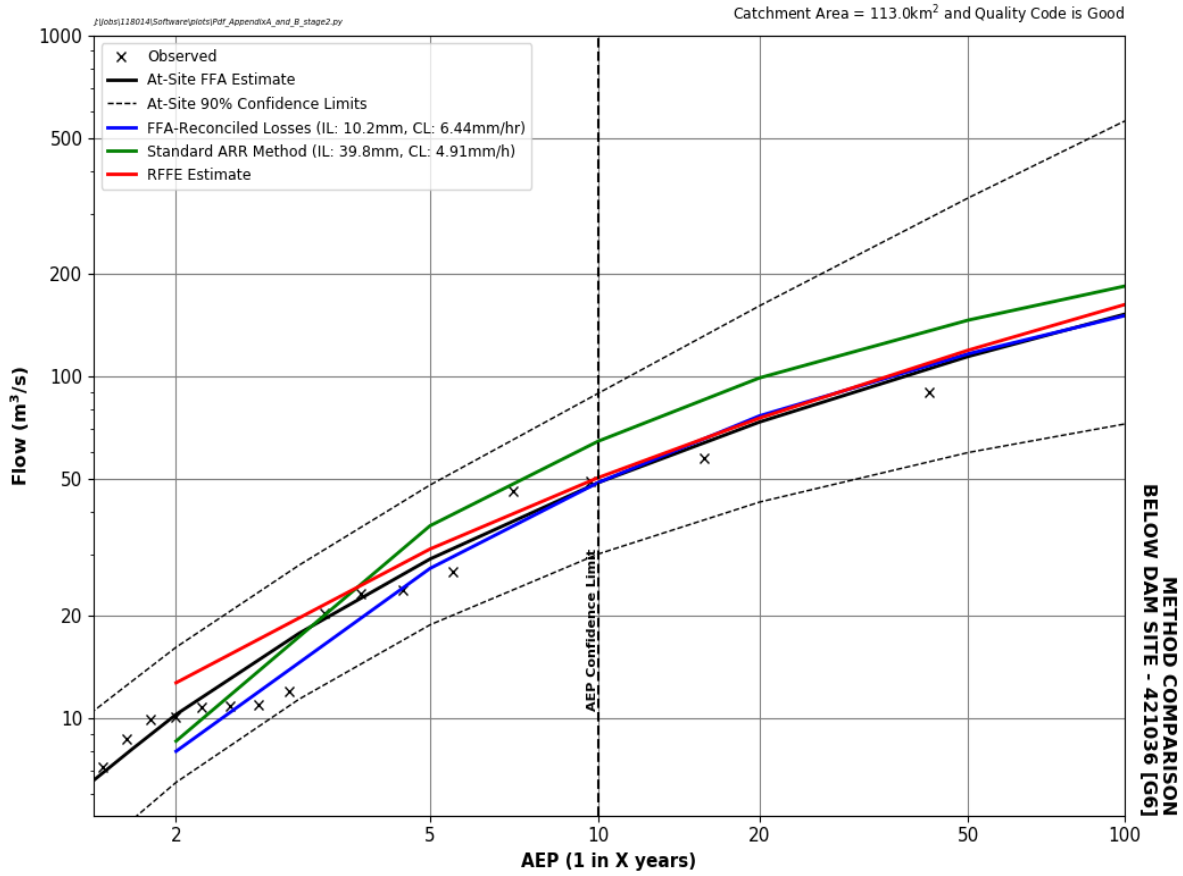

Figure 5 Flood Frequency Analysis for Below Dam Site (421036) (OEH, 2019)

The method used to determine the design rainfall adopted the BOM IFD and applied the appropriate IL and CL depths to calculate the effective rainfall. The design rainfall is calculated for front-load, middle-load and back-loaded storms. The middle-load rainfall distribution was adopted as input to the rain on grid model for the flood assessment. The effective rainfall was entered in the RoG model on a one-minute timestep after taking account of the IL and CL depths, using the 6-hour duration rainfall depths for the AEP under consideration.

The probable maximum precipitation (PMP) was calculated using the Generalised Short Duration Method (GSDM) and the Generalised Southeast Australia Method (GSAM). The two methods provide results for different precipitation durations; the GSDM provides PMP estimates for 15 minutes to six hours and the GSAM provides PMP estimates for 24 hours to five days.

Data used in the PMP rainfall estimation process include;

- Bureau of Meteorology (BOM) Intensity-Frequency-Depth (IFD) dataset for the site; and
- Australian Rainfall and Runoff (AR&R) (Babister et al. 2016) Online datahub data for the site.

An interpolation process is used to obtain the intermediate duration rainfall events from the long duration and short duration rainfall events (Ball et al. 2019). Input data to the GSDM and the GSAM are shown in Table 5 and Table 6.

Table 5 GSDM Input Data

Generalised Short-Duration Method (GSDM)

Location Information				
Catchment Name	Paling Yards		*Reference: Generalised Short Duration Method (BOM, 2003)*	
Catchment Area	135.0 km²			
State	NSW			
Latitude	Longitude	Duration Limit	Prop Smooth	Prop Rough
-34.1	149.7	6	0	1
Elevation Adjustment Factor (EAF)				
Mean Elevation at Site Location:		900 m	**EAF**	1
Moisture Adjustment Factor (MAF)				
			MAF	0.65

Table 6 GSAM Input Data

Generalised Southeast Australia Method

Topographical Adjustment Factor			1.08
Annual Moisture Adjustment Factor			
Season	**$EPW_{seasonal\ catchment\ average}$**	**$EPW_{seasonal\ standard}$**	**MAF**
Summer (Annual)	71.4	80.8	0.88
Autumn	57.7	71	0.81

The PMP estimates obtained from the GSDM and GTSMR methods is shown in Figure 6. The preliminary PMP estimates and the final smoothed PMP envelope are plotted together after incorporating envelope adjustment factors.

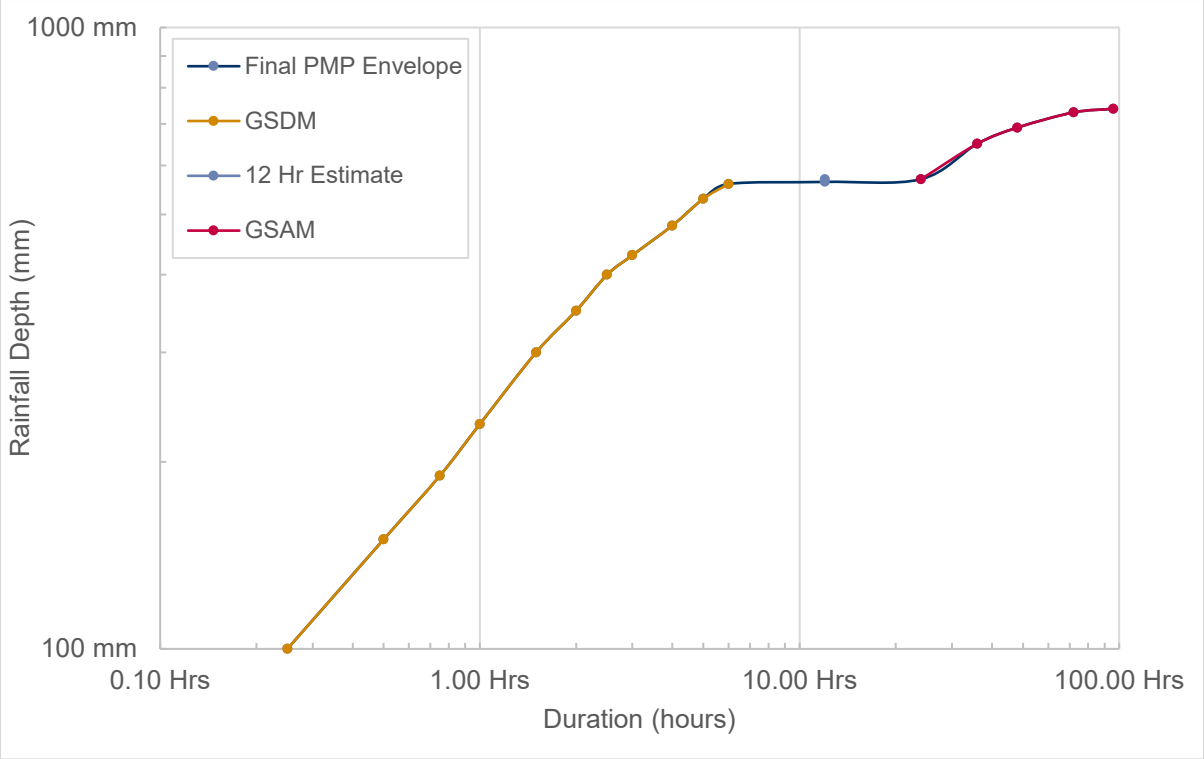

Figure 6 GSDM and GSAM PMP Estimates

The PMP critical duration storm rainfall depth of 560 mm was then distributed across the storm duration using the *Bulletin 53* design temporal pattern, as discussed in Jordan et al., (2005) and are shown below in Table 7.

Table 7 PMP Cumulative Distribution Across the 6-Hour Storm

Proportion of Time	BOM 2003	Proportional rainfall distribution	Rainfall depth as a proportion	Rainfall intensity (mm/hour)
0	0	0	0	0.0
0.1	10	10	56	93.3
0.2	25	15	84	140.0
0.3	39	14	78.4	130.7
0.4	52	13	72.8	121.3
0.5	64	12	67.2	112.0
0.6	75	11	61.6	102.7
0.7	85	10	56	93.3
0.8	92	7	39.2	65.3
0.9	97	5	28	46.7
1	100	3	16.8	28.0

3.3.3 Hydraulic model setup

The hydraulic model was developed in HEC-RAS, Version 6.2, using the 2-dimensional (2D) approach. The hydraulic model covered several catchments either partially or wholly; based on the position of infrastructure.

The 2D mesh was constructed using a 18 m cell size. The majority of the area modelled featured modified grazing as the land cover. On this basis, a uniform Manning's roughness of 0.035 (pasture, high grass – no brush) was applied, which was obtained from Chow (1959).

The initial (pre-development) simulation of the RoG model was conducted using the Manning's roughness presented above, for the whole Project area (0.035). The Manning's roughness was further refined from the initial simulation by incorporating the provided layout with individualised roughness factors. The roughness factors were selected from Chow (2005) based on the material and design logic. The simulation using the updated roughness coefficients represented the post-development phase of the project.

The boundary conditions incorporated in the hydraulic models included rainfall inflows as defined in the section above and a normal boundary condition at downstream catchment outlets. The model results indicate that in some locations, the boundary allowed the collection of water, leading to artefacts at those locations. The locations of the downstream boundary conditions are indicated in Figure 4

It should be noted that the hydraulic models were two-dimensional (2D) and no drainage or one dimensional (1D) structures (i.e., pits, pipes, culverts and bridges) have been incorporated as this information is not available.

A confirmation of appropriateness was performed at this point. The absence of flow gauging records in the immediate vicinity prevented model calibration through comparison of historical high flow or flood events. As a substitute, the Regional Flood Frequency Estimation Model (RFFE) database was used, as made available by collaboration by Engineers Australia (EA) and Western Sydney University for the Australian Rainfall & Runoff Project (Haddad and Rahman, 2012).

The results of the check are shown in Table 8. The catchment used for this procedure was the smaller, eastern catchment for Manus Creek indicated in Figure 4. The NSW ARR parameters provided in Table 4 were adopted for the RORBWin model and in the determination of the precipitation input for the RoG HEC-RAS model. The results indicate that the RORBWin and the RoG model flow results fit within the RFFE 5% and 95% confidence limits. In the absence of further sources for calibration, the RoG model was accepted as the preferred method for further use in the flood assessment being undertaken, using the parameters applied in the model check.

Table 8 Model Results Comparison

Model		AEP (%)					
		50	20	10	5	2	1
		Design Flow Rate (m^3/s)					
RORBWin		9	19	26	34	49	56
RoG		6	13	19	26	37	45
RFFE	**5%**	3	8	13	19	28	37
	Discharge	9	21	33	48	74	99
	95%	24	54	84	124	195	267

4. FLOOD ASSESSMENT RESULTS

4.1 Flood Extents Including Flood Planning Level and Flood Prone Land

Based on the HEC-RAS RoG models, the 5% AEP and 1% AEP design flood events were simulated for the study area to establish the peak flood depths and indicative flood extents that can be used to assess the flood risks for the Project infrastructure. The PMF was also simulated to provide an understanding of the potential impact from an extreme event. An overview of the 5% AEP, 1% AEP and the PMF are indicated in Figure 7 to Figure 9. Greater detail of the 5% AEP, 1% AEP and PMF are shown in Appendices A to C respectively. The area of the Project inundated by the PMF indicates the extent of flood prone land across the Project site. The extent of the flood prone land is shown in Appendix C.

The results presented indicate both flooding from watercourses and minor overland flow paths. The results have been filtered to not show flows depths less than 0.25 m, which may be accounted for in quality of the surveyed surface and model mesh cell size selected. The DEM obtained for the study featured contour berms associated with water control in agricultural settings. These features impact the flood modelling results by retaining water across the landscape, perpendicular to the slope. These were taken into account when assessing the model outputs.

The potential flood planning level (FPL) indicates the potential for land to be inundated and are determined from a flood event, a historic flood, or a flood of a certain AEP (NSW, 2005). Factors influencing FPLs include:

- Risk to life;
- Flood behaviour;
- Social issues;
- Economic factors;
- Environmental issues, and
- Cultural Issues.

In determining the FPL, the above factors and issues were considered as discussed in the Floodplain Development Manual for NSW. For the purposes of the assessment, the 0.5% AEP was selected as the FPL. A freeboard of 0.5 m was added to the water surface elevation (WSE) associated with the FPL to function as pseudo-factor of safety. The FPL and the area below the FPL are indicated in Figure 10 as an overview and in Appendix D as insets showing greater details. The 0.5% AEP was selected to acknowledge the probability of rare rainfall events taking place within the greater region as being experienced in NSW in 2022.

Legend

- Turbines
- Site Boundary
- Substation
- Model Area
- Proposed Transmission Line
- Transmission Lines - 500kV and Towers
- Transmission Lines - Rural Distribution Lines
- Access Road
- Main Road
- Minor Road
- Path and Track
- Minor Watercourse
- Major Watercourse

Depth (m)

- <0.1
- 0.1 - 0.25
- 0.25 - 0.5
- 0.5 - 1
- 1 - 1.5
- 1.5 - 2
- 2 - 2.5
- 2.5 - 3
- 3 - 4
- >4

Source:
BaseData - DCDB and DTDB DLPI 2021
ESRI World Imagery 2018

ABERCROMBIE ROAD
TAVERN CREEK
SILENT CREEK
BACK CREEK
MIDDLE STATION CREEK
BROTHERS CREEK
MANUS CREEK
JERRONG ROAD
JERRONG
OAKY CREEK
PALING YARDS CREEK
BLACK BETTY CREEK
REEDY CREEK
TARALGA ROAD
MOUNT WERONG CREEK
ABERCROMBIE RIVER

PY-1 PY-2 PY-3 PY-5 PY-6 PY-7 PY-8 PY-9 PY-10 PY-11 PY-12 PY-13 PY-14 PY-15 PY-16 PY-17 PY-18 PY-19 PY-20 PY-21 PY-22 PY-23 PY-24 PY-25 PY-26 PY-27 PY-28 PY-29 PY-30 PY-31 PY-32 PY-33 PY-34 PY-35 PY-36 PY-37 PY-38 PY-39 PY-40 PY-41 PY-42 PY-43 PY-44 PY-45 PY-46 PY-47

5% AEP Peak Flood Depth Overview

F7

Drawing No: 0578575s_PYWF_FA_G002_R1.mxd		Paling Yards Wind Farm
Date: 01/09/2022	Drawing Size: A3	
Drawn By: VN	Reviewed By: RP	Client: Global Power Generation Australia (GPG)

Coordinate System: GDA 1994 MGA Zone 55

0 0.5 1km

N

ERM

Legend

- Turbines
- Site Boundary
- Substation
- Model Area
- Proposed Transmission Line
- Transmission Lines - 500kV and Towers
- Transmission Lines - Rural Distribution Lines
- Access Road
- Main Road
- Minor Road
- Path and Track
- Minor Watercourse
- Major Watercourse

Depth (m)

- <0.1
- 0.1 - 0.25
- 0.25 - 0.5
- 0.5 - 1
- 1 - 1.5
- 1.5 - 2
- 2 - 2.5
- 2.5 - 3
- 3 - 4
- >4

Source:
BaseData - DCDB and DTDB DLPI 2021
ESRI World Imagery 2018

ABERCROMBIE ROAD
TAVERN CREEK
SILENT CREEK
BACK CREEK
OAKY CREEK
BLACK BETTY CREEK
PALING YARDS CREEK
MIDDLE STATION CREEK
BROTHERS CREEK
MANUS CREEK
JERRONG ROAD
JERRONG
MOUNT WERONG CREEK
ABERCROMBIE RIVER
REEDY CREEK
TARALGA ROAD

PY-1 PY-2 PY-3 PY-5 PY-6 PY-7 PY-8 PY-9 PY-10 PY-11 PY-12 PY-13 PY-14 PY-15 PY-16 PY-17 PY-18 PY-19 PY-20 PY-21 PY-22 PY-23 PY-24 PY-25 PY-26 PY-27 PY-28 PY-29 PY-30 PY-31 PY-32 PY-33 PY-34 PY-35 PY-36 PY-37 PY-38 PY-39 PY-40 PY-41 PY-42 PY-43 PY-44 PY-45 PY-46 PY-47

1% AEP Peak Flood Depth Overview

F8

Drawing No:	0578575s_PYWF_FA_G003_R1.mxd		Paling Yards Wind Farm
Date:	01/09/2022	Drawing Size: A3	
Drawn By:	VN	Reviewed By: RP	Client: Global Power Generation Australia (GPG)

Coordinate System: GDA 1994 MGA Zone 55

0 0.5 1km

N

ERM

Legend

- Turbines
- Site Boundary
- Substation
- Model Area
- Proposed Transmission Line
- Transmission Lines - 500kV and Towers
- Transmission Lines - Rural Distribution Lines
- Access Road
- Main Road
- Minor Road
- Path and Track
- Minor Watercourse
- Major Watercourse

Depth (m)

- <0.1
- 0.1 - 0.25
- 0.25 - 0.5
- 0.5 - 1
- 1 - 1.5
- 1.5 - 2
- 2 - 2.5
- 2.5 - 3
- 3 - 4
- >4

Source:
BaseData - DCDB and DTDB DLPI 2021
ESRI World Imagery 2018

ABERCROMBIE ROAD
TAVERN CREEK
SILENT CREEK
BACK CREEK
MIDDLE STATION CREEK
BROTHERS CREEK
MANUS CREEK
JERRONG ROAD
JERRONG
OAKEY CREEK
PALING YARDS CREEK
BLACK BETTY CREEK
MOUNT WERONG CREEK
ABERCROMBIE RIVER
REEDY CREEK
TARALGA ROAD

PY-1 PY-2 PY-3 PY-5 PY-6 PY-7 PY-8 PY-9 PY-10 PY-11 PY-12 PY-13 PY-14 PY-15 PY-16 PY-17 PY-18 PY-19 PY-20 PY-21 PY-22 PY-23 PY-24 PY-25 PY-26 PY-27 PY-28 PY-29 PY-30 PY-31 PY-32 PY-33 PY-34 PY-35 PY-36 PY-37 PY-38 PY-39 PY-40 PY-41 PY-42 PY-43 PY-44 PY-45 PY-46 PY-47

PMF Peak Flood Depth Overview

F9

Drawing No:	0578575s_PYWF_FA_G004_R1.mxd		Paling Yards Wind Farm
Date:	01/09/2022	Drawing Size: A3	
Drawn By:	VN	Reviewed By: RP	Client: Global Power Generation Australia (GPG)

Coordinate System: GDA 1994 MGA Zone 55

0 0.5 1km

N

ERM

Legend

- Turbines
- Site Boundary
- Substation
- Proposed Transmission Line
- Transmission Lines - 500kV and Towers
- Transmission Lines - Rural Distribution Lines
- Access Road
- Main Road
- Minor Road
- Path and Track
- Minor Watercourse
- Major Watercourse

Elevation (m)

1,083.m

654.7m

Source:
BaseData - DCDB and DTDB DLPI 2021
ESRI World Imagery 2018

ABERCROMBIE ROAD
TAVERN CREEK
SILENT CREEK
BACK CREEK
MIDDLE STATION CREEK
BROTHERS CREEK
MANUS CREEK
JERRONG ROAD
JERRONG
OAKY CREEK
BLACK BETTY CREEK
PALING YARDS CREEK
MOUNT WERONG CREEK
ABERCROMBIE RIVER
REEDY CREEK
TARALGA ROAD

PY-1
PY-2
PY-3
PY-5
PY-6
PY-7
PY-8
PY-9
PY-10
PY-11
PY-12
PY-13
PY-14
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PY-41
PY-42
PY-43
PY-44
PY-45
PY-46
PY-47

Flood Planning Level (FPL) 0.5% AEP + 0.5m Freeboard

F10

Drawing No:	0578575s_PYWF_FA_G005_R0.mxd		Paling Yards Wind Farm
Date:	18/07/2022	Drawing Size: A3	
Drawn By:	VN	Reviewed By: RP	Client: Global Power Generation Australia (GPG)

Coordinate System: GDA 1994 MGA Zone 55

0 0.5 1km

N

ERM

4.2 Flood Risks to Project Including Hydraulic and Hazard Categorisation

The NSW (2005) Floodplain development Manual provides for the classification of three hydraulic categories and two hazard categories. The hydraulic categories are; floodway, flood storage and flood fringe. The hazard categories imply low hazard and high hazard.

The hydraulic categories describe the areas where significant water flows during floods are often aligned with natural channels (floodway). Changes in these floodways are deemed to have a significant impact on flood levels and/or redistribution of flood flow. The flood storage areas are those parts of the floodplain that are important for temporary storage of flood waters. Decreases to flood storage available may impact final water surface elevation and the peak flow experienced at downstream locations. The flood fringe is the remaining land impacted by flooding, after floodway and flood storage have been defined (NSW, 2005).

The Project site is in an area with deeply incised valleys and the hill tops roll off quickly to form slopes with gradient of between 10% and 20%. The opportunity for flood storage component is negligible, resulting in the floodway representing approximately all the flow in the creek. Flood hydraulic categorisation was not undertaken due to the Project being located in catchment headwaters, where gradients are steep with minimal opportunity for the development and presence of floodplains.

The hazard categorisation was performed using the velocity multiplied by depth (V x D) approach. The results of the 5% AEP and the 1% AEP hazard categorisation are shown in Appendix E. The hazard categories of high and low can be defined as:

- High hazard – possible danger to personal safety; evacuation by trucks difficult; able-bodied adults would have difficulty in wading to safety; potential for significant structural damage to buildings.
- Low hazard – trucks could evacuate people and possessions; able-bodied adults would have little difficulty in wading to safety.

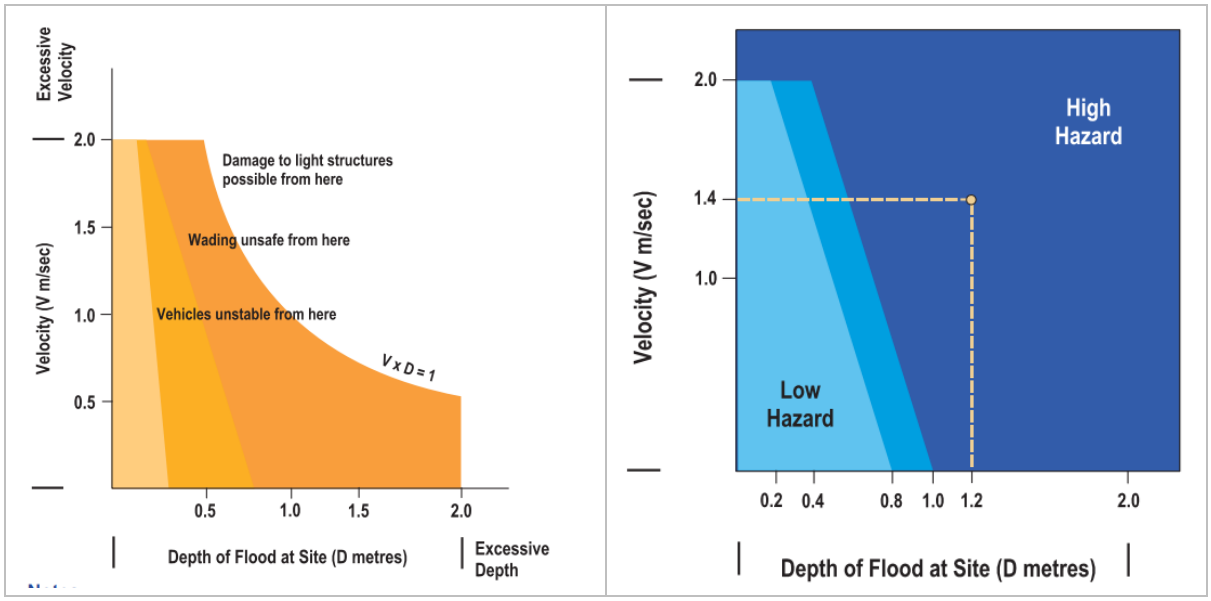


Figure 11 Velocity – Depth Relationships and Provisional Hydraulic Hazard Categories (NSW, 2005)

Results indicate that the creeks draining the hill tops show a low hazard rating. This is consistent with the expectation that the relatively small local catchment would generate a smaller depth of flow and the relatively gentle slopes associated with the top of the ridges would result in a low velocity. These areas are associated with the zones where the WTGs have been conceptually placed.

5. CONCLUSION

The Paling Yards project is located in undulating hilly terrain, featuring sharply incised valleys and hill tops which roll off to steep gradients. Surface water flows are quickly concentrated to form watercourses and creeks. The WTGs have been conceptually placed following the available ridge lines, avoiding areas which potentially function as a drainage line during runoff producing rainfall events.

The flood assessment hydraulic modelling indicated that concentrated flows were largely limited to the valleys within the Project. Larger surface areas draining the hill tops resulted in flow being contracted before reaching the valley in some locations. These areas where identified and checked against the positioning of the WTGs to confirm if an impact from flood water were possible. The flood assessment results for the 5% AEP and 1% AEP indicate that based on available design detail and environmental data, potential impact to the Project is not expected.

REFERENCES

Chow, 1959. Manning's n Values. Website: http://www.fsl.orst.edu/geowater/FX3/help/FX3_Help.html#8_Hydraulic_Reference/Mannings_n_Tables.htm Accessed: 21 June 2022.

Haddad K and Rahman A (2012): Regional flood frequency analysis in eastern Australia: Bayesian GLS regression-based methods within fixed region and ROI framework – Quantile regression vs. parameter regression technique, Journal of Hydrology, 430-431, 142-161.

Jordan, P., Nathan, R., Mittiga, L. and Taylor, B. (2005),'Growth Curves and Temporal Patterns for Application to Short Duration Extreme Events'. Aust J Water Resour, 9(1), 69-80.

NSW Floodplain Management Manual, Department of Infrastructure, Planning and Natural Resources, New South Wales Government, 2005.

WaterNSW, 2022. Sydney Drinking Water Catchment Map. Website; https://www.waternsw.com.au/water-quality/catchment/catchment-map. Accessed: 29/08/2022

APPENDIX A 5% AEP INSET FLOOD MAPS

A1 and A2

PY-47

PY-46

MANUS CREEK

Legend

- Turbines
- Site Boundary
- Substation
- Proposed Transmission Line
- Transmission Lines - 500kV and Towers
- Transmission Lines - Rural Distribution Lines
- Access Road
- Path and Track

Depth (m)

- <0.1
- 0.1 - 0.25
- 0.25 - 0.5
- 0.5 - 1
- 1 - 1.5
- 1.5 - 2
- 2 - 2.5
- 2.5 - 3
- 3 - 4
- >4

- Minor Watercourse
- Major Watercourse

Source:
BaseData - DCDB and DTDB DLPI 2021
ESRI World Imagery 2018

5% AEP Peak Flood Depth

A1

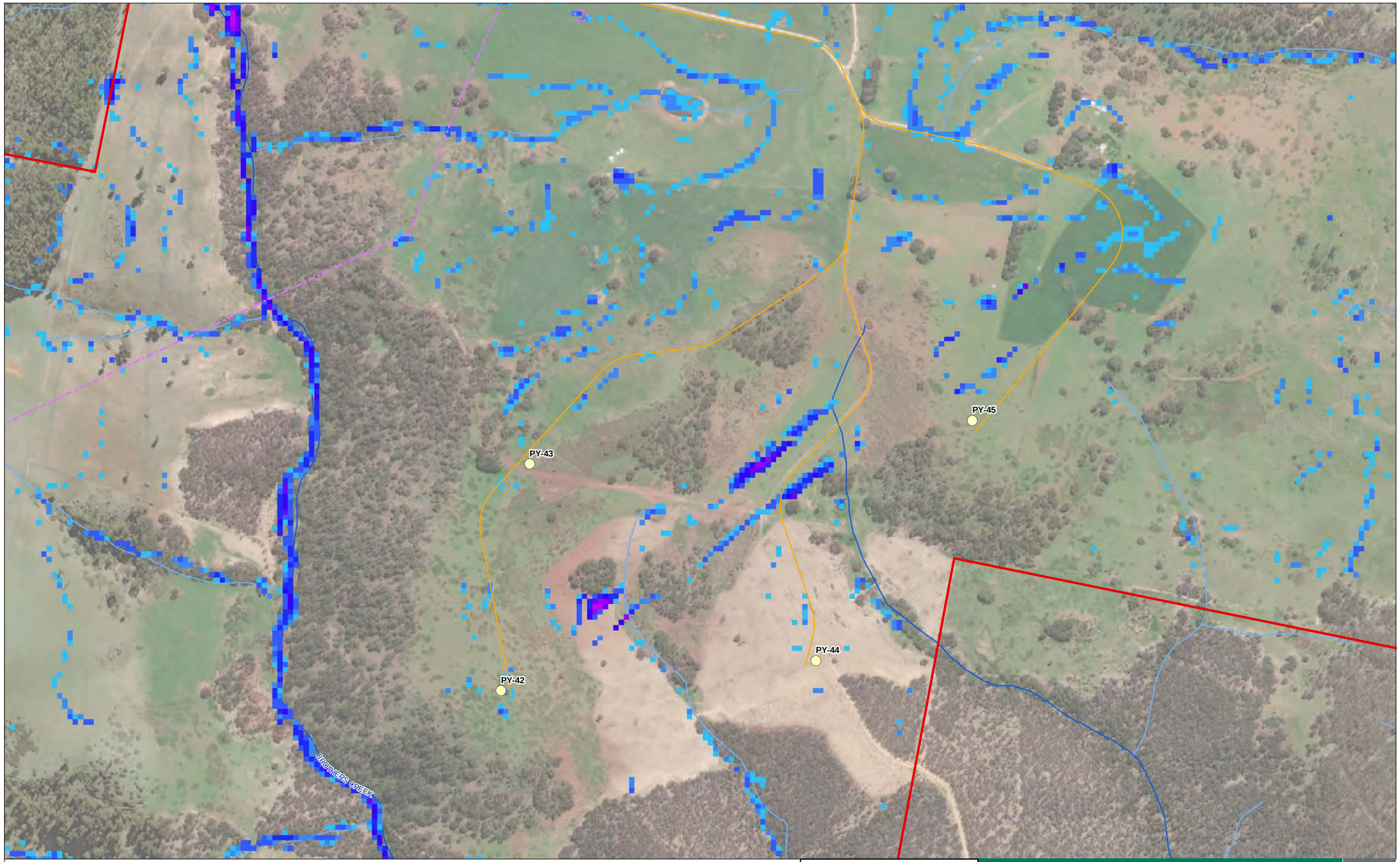
Drawing No:	0578575s_PYWF_FA_G006_R2.mxd		Paling Yards Wind Farm
Date:	22/11/2022	Drawing Size: A3	
Drawn By:	VN	Reviewed By: RP	Client: Global Power Generation Australia (GPG)

Coordinate System: GDA 1994 MGA Zone 55

0 0.1 0.2km

N

ERM



Legend

Turbines
Site Boundary
Transmission Lines - Rural Distribution Lines
Access Road
Path and Track

Depth (m)
<0.1
0.1 - 0.25
0.25 - 0.5
0.5 - 1
1 - 1.5
1.5 - 2
2 - 2.5
2.5 - 3
3 - 4

Minor Watercourse
Major Watercourse

Source:
BaseData - DCDB and DTDB DLPI 2021
ESRI World Imagery 2018

5% AEP Peak Flood Depth

A1

Drawing No:	0578575s_PYWF_FA_G006_R2.mxd		Paling Yards Wind Farm
Date:	22/11/2022	Drawing Size: A3	
Drawn By:	VN	Reviewed By: RP	Client: Global Power Generation Australia (GPG)

Coordinate System: GDA 1994 MGA Zone 55

0 0.1 0.2km

N

ERM

PY-41

PY-40

PY-39

BROTHERS CREEK

Legend

Turbines
Site Boundary
Access Road
Path and Track

Depth (m)
<0.1
0.1 - 0.25
0.25 - 0.5
0.5 - 1
1 - 1.5
1.5 - 2
2 - 2.5

Minor Watercourse
Major Watercourse

Source:
BaseData - DCDB and DTDB DLPI 2021
ESRI World Imagery 2018

5% AEP Peak Flood Depth

A1

Drawing No:	0578575s_PYWF_FA_G006_R2.mxd		Paling Yards Wind Farm
Date:	22/11/2022	Drawing Size: A3	
Drawn By:	VN	Reviewed By: RP	Client: Global Power Generation Australia (GPG)

Coordinate System: GDA 1994 MGA Zone 55

0 0.1 0.2km

N

ERM

PY-39
PY-38
PY-37
PY-36
PY-35

Legend

Turbines
Site Boundary
Access Road
Path and Track

Depth (m)
<0.1
0.1 - 0.25
0.25 - 0.5
0.5 - 1
1 - 1.5
1.5 - 2
2 - 2.5
2.5 - 3
3 - 4

Minor Watercourse

Source:
BaseData - DCDB and DTDB DLPI 2021
ESRI World Imagery 2018

5% AEP Peak Flood Depth

A1

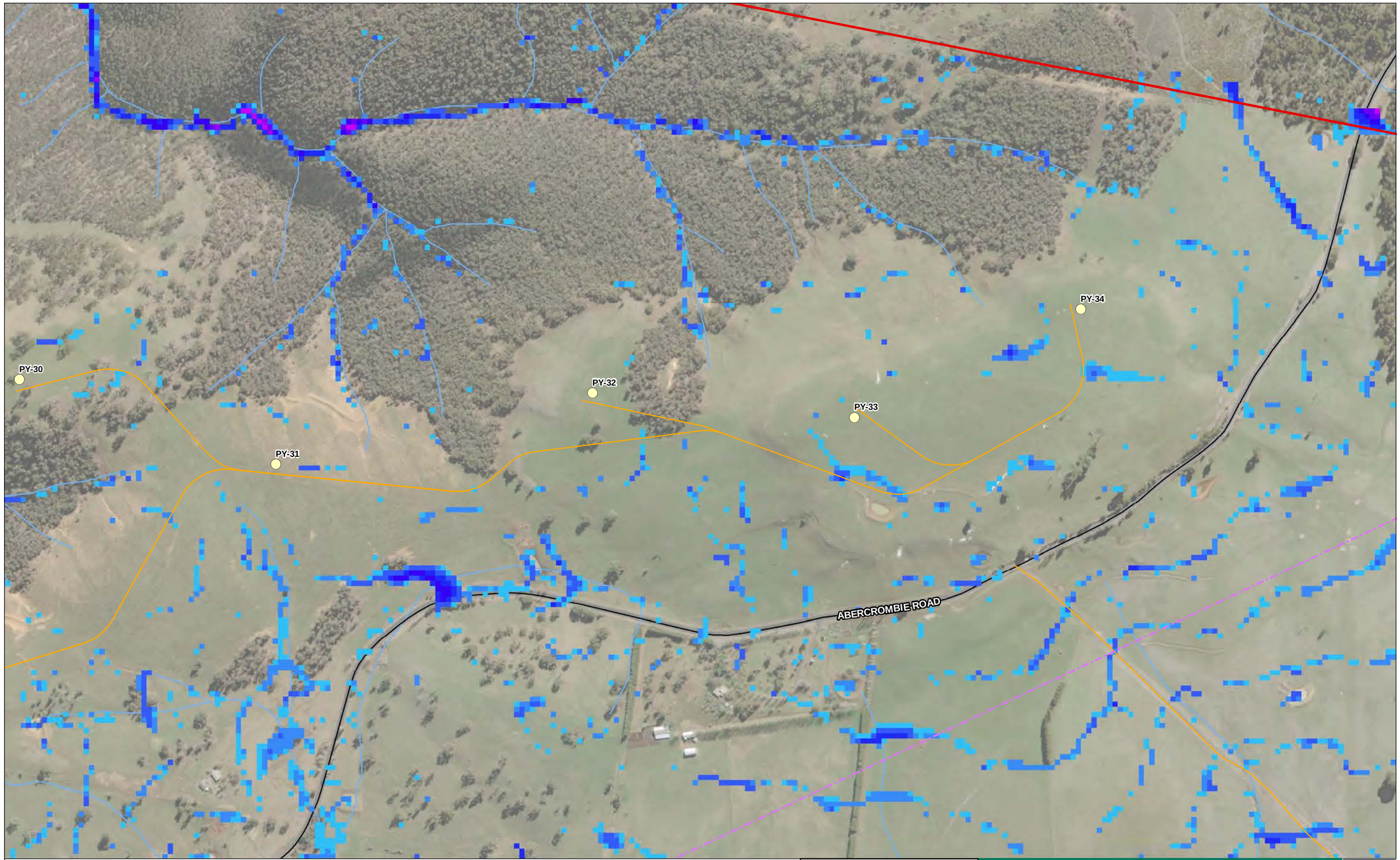
Drawing No:	0578575s_PYWF_FA_G006_R2.mxd		Paling Yards Wind Farm
Date:	22/11/2022	Drawing Size: A3	
Drawn By:	VN	Reviewed By: RP	Client: Global Power Generation Australia (GPG)

Coordinate System: GDA 1994 MGA Zone 55

0 0.1 0.2km

N

ERM



Legend

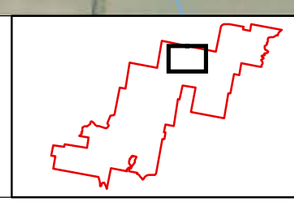
- Turbines
- Site Boundary
- Transmission Lines - Rural Distribution Lines
- Access Road
- Main Road
- Path and Track

Depth (m)

- <0.1
- 0.1 - 0.25
- 0.25 - 0.5
- 0.5 - 1
- 1 - 1.5
- 1.5 - 2
- 2 - 2.5
- 2.5 - 3
- 3 - 4

- Minor Watercourse
- Major Watercourse

Source:
BaseData - DCDB and DTDB DLPI 2021
ESRI World Imagery 2018



5% AEP Peak Flood Depth

A1

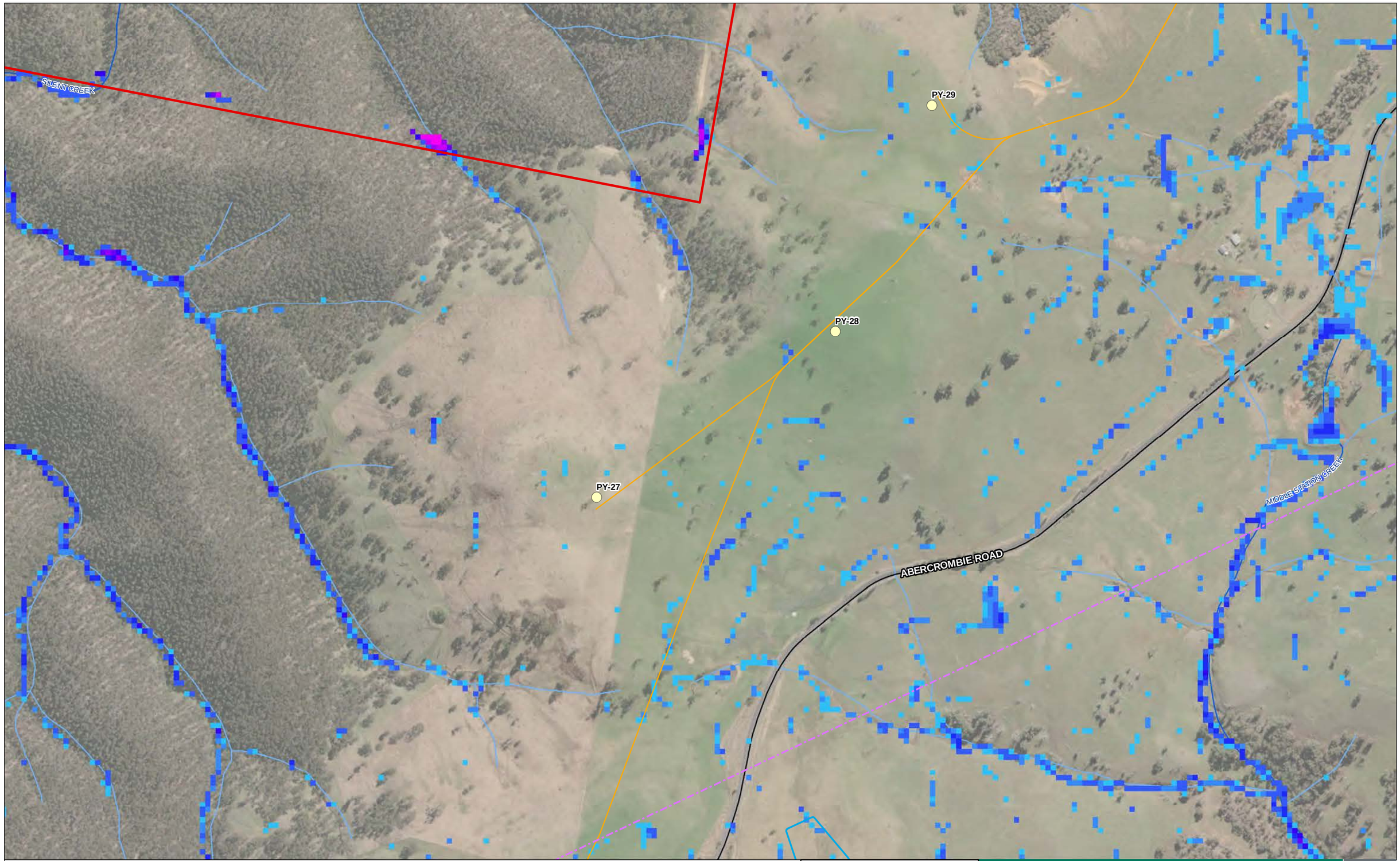
Drawing No:	0578575s_PYWF_FA_G006_R2.mxd		Paling Yards Wind Farm
Date:	22/11/2022	Drawing Size: A3	
Drawn By:	VN	Reviewed By: RP	Client: Global Power Generation Australia (GPG)

Coordinate System: GDA 1994 MGA Zone 55

0 0.1 0.2km

N

ERM



Legend

Turbines
Site Boundary
Substation
Transmission Lines - Rural Distribution Lines
Access Road
Main Road

Depth (m)
<0.1
0.1 - 0.25
0.25 - 0.5
0.5 - 1
1 - 1.5
1.5 - 2
2 - 2.5
2.5 - 3
3 - 4
>4

Minor Watercourse
Major Watercourse

Source:
BaseData - DCDB and DTDB DLPI 2021
ESRI World Imagery 2018

5% AEP Peak Flood Depth

A1

Drawing No:	0578575s_PYWF_FA_G006_R2.mxd		Paling Yards Wind Farm
Date:	22/11/2022	Drawing Size: A3	
Drawn By:	VN	Reviewed By: RP	Client: Global Power Generation Australia (GPG)

Coordinate System: GDA 1994 MGA Zone 55

0 0.1 0.2km

N

ERM

PY-24
PY-23
PY-26
PY-25
ABERCROMBIE ROAD
OAKY CREEK

Legend

Turbines
Site Boundary
Substation
Transmission Lines - Rural Distribution Lines
Access Road
Main Road
Path and Track
Depth (m)
<0.1
0.1 - 0.25
0.25 - 0.5
0.5 - 1
1 - 1.5
1.5 - 2
Minor Watercourse
Major Watercourse

Source:
BaseData - DCDB and DTDB DLPI 2021
ESRI World Imagery 2018

5% AEP Peak Flood Depth

A1

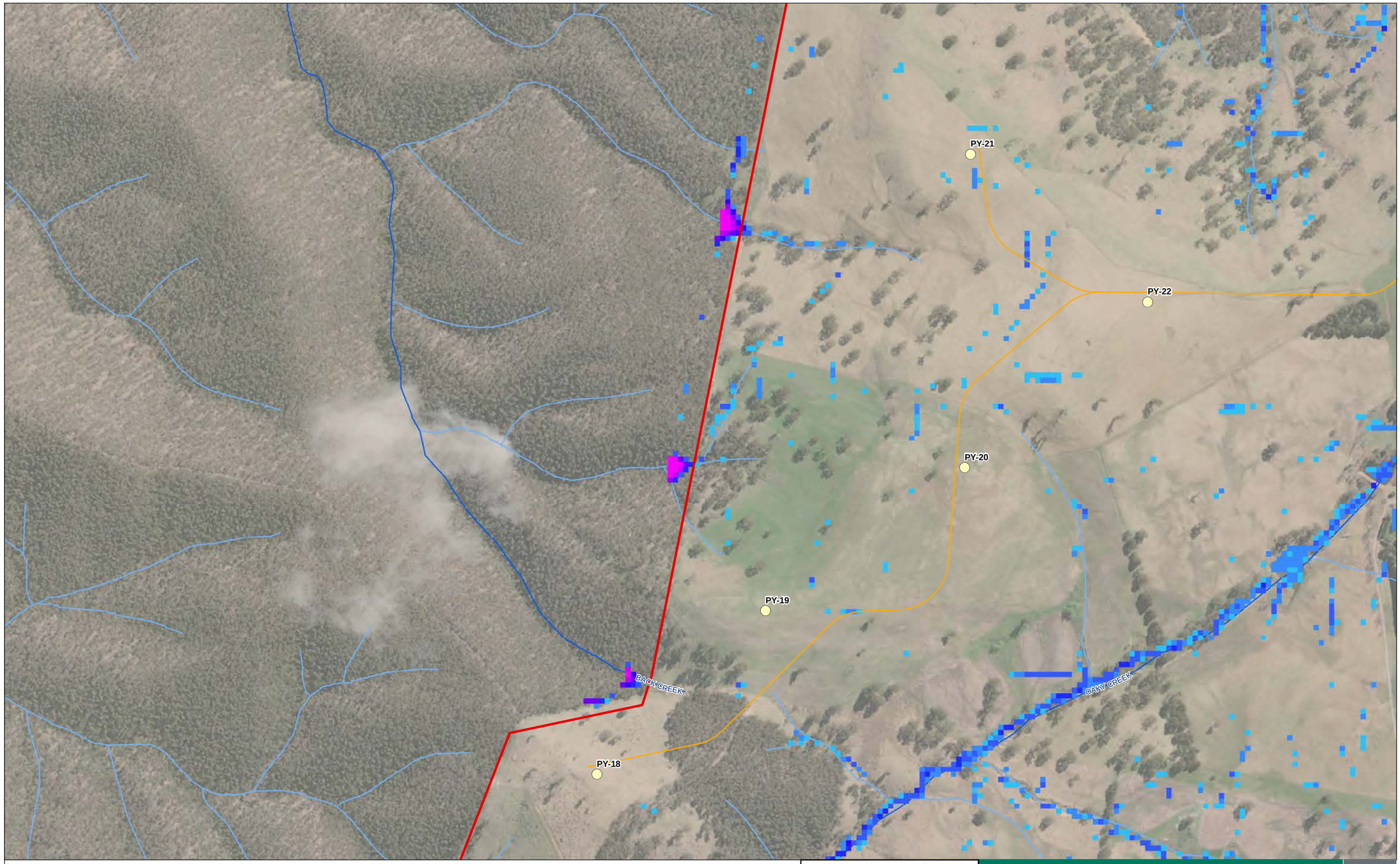
Drawing No:	0578575s_PYWF_FA_G006_R2.mxd		Paling Yards Wind Farm
Date:	22/11/2022	Drawing Size: A3	
Drawn By:	VN	Reviewed By: RP	Client: Global Power Generation Australia (GPG)

Coordinate System: GDA 1994 MGA Zone 55

0 0.1 0.2km

N

ERM



Legend

Turbines
Site Boundary
Access Road
Path and Track

Depth (m)
<0.1
0.1 - 0.25
0.25 - 0.5
0.5 - 1
1 - 1.5
1.5 - 2
2 - 2.5
2.5 - 3
3 - 4
>4

Minor Watercourse
Major Watercourse

Source:
BaseData - DCDB and DTDB DLPI 2021
ESRI World Imagery 2018

5% AEP Peak Flood Depth

A1

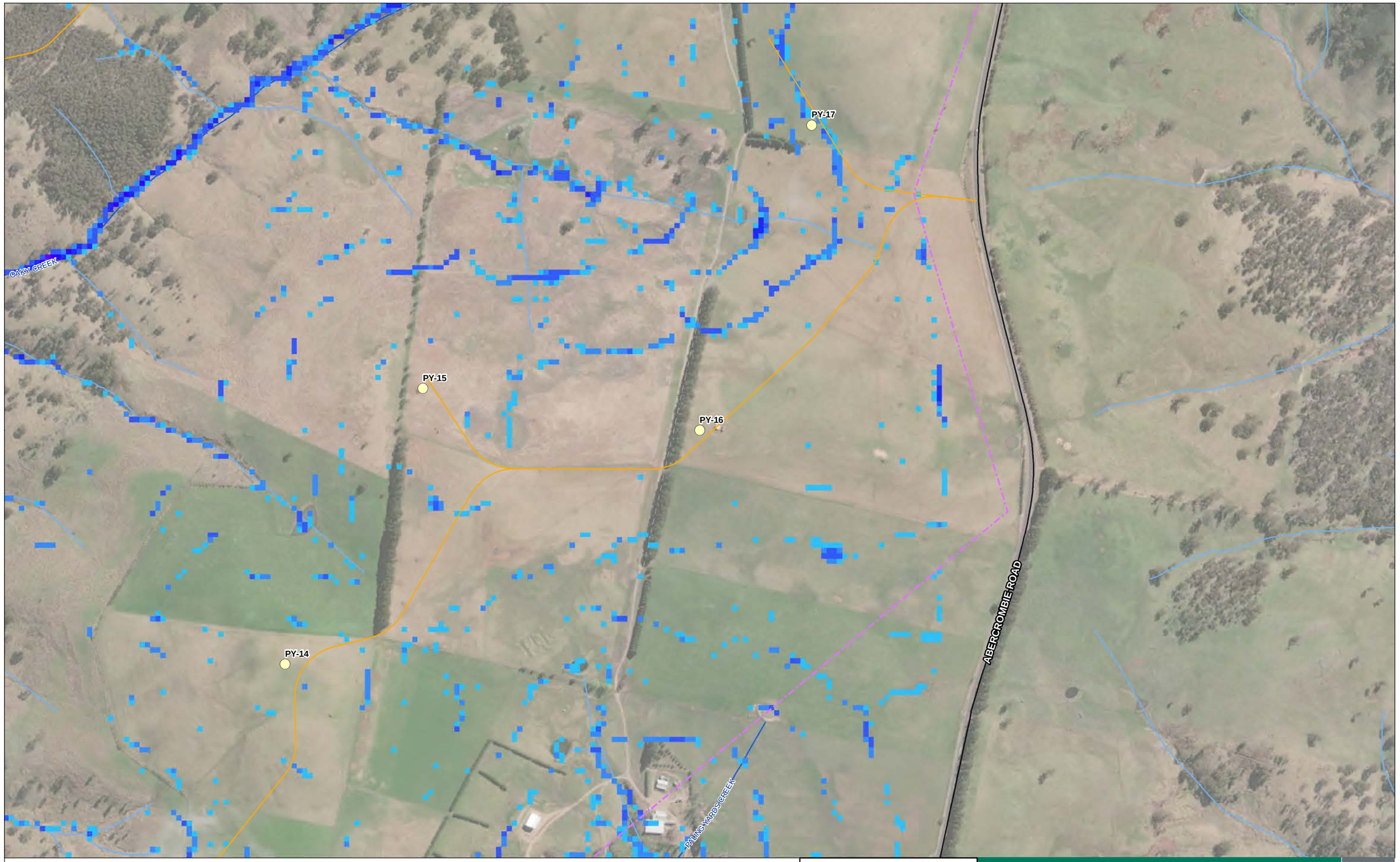
Drawing No:	0578575s_PYWF_FA_G006_R2.mxd		Paling Yards Wind Farm
Date:	22/11/2022	Drawing Size: A3	
Drawn By:	VN	Reviewed By: RP	Client: Global Power Generation Australia (GPG)

Coordinate System: GDA 1994 MGA Zone 55

0 0.1 0.2km

N

ERM



Legend

- Turbines
- Site Boundary
- Transmission Lines - Rural Distribution Lines
- Access Road
- Main Road
- Path and Track

Depth (m)

- <0.1
- 0.1 - 0.25
- 0.25 - 0.5
- 0.5 - 1
- 1 - 1.5
- 1.5 - 2
- 2 - 2.5

- Minor Watercourse
- Major Watercourse

Source:
BaseData - DCDB and DTDB DLPI 2021
ESRI World Imagery 2018

5% AEP Peak Flood Depth

A1

Drawing No:	0578575s_PYWF_FA_G006_R2.mxd		Paling Yards Wind Farm
Date:	22/11/2022	Drawing Size: A3	
Drawn By:	VN	Reviewed By: RP	Client: Global Power Generation Australia (GPG)

Coordinate System: GDA 1994 MGA Zone 55

0 0.1 0.2km

N

ERM

PY-12
PY-13
PY-11
PY-9
BLACK BETTY CREEK
PY-14
PY-10
PY-3
PY-2
PALING YARDS CREEK
PY-1

Legend

- Turbines
- Site Boundary
- Access Road
- Path and Track

Depth (m)

- <0.1
- 0.1 - 0.25
- 0.25 - 0.5
- 0.5 - 1
- 1 - 1.5
- 1.5 - 2
- 2 - 2.5
- 2.5 - 3

- Minor Watercourse
- Major Watercourse

Source:
BaseData - DCDB and DTDB DLPI 2021
ESRI World Imagery 2018

5% AEP Peak Flood Depth

A1

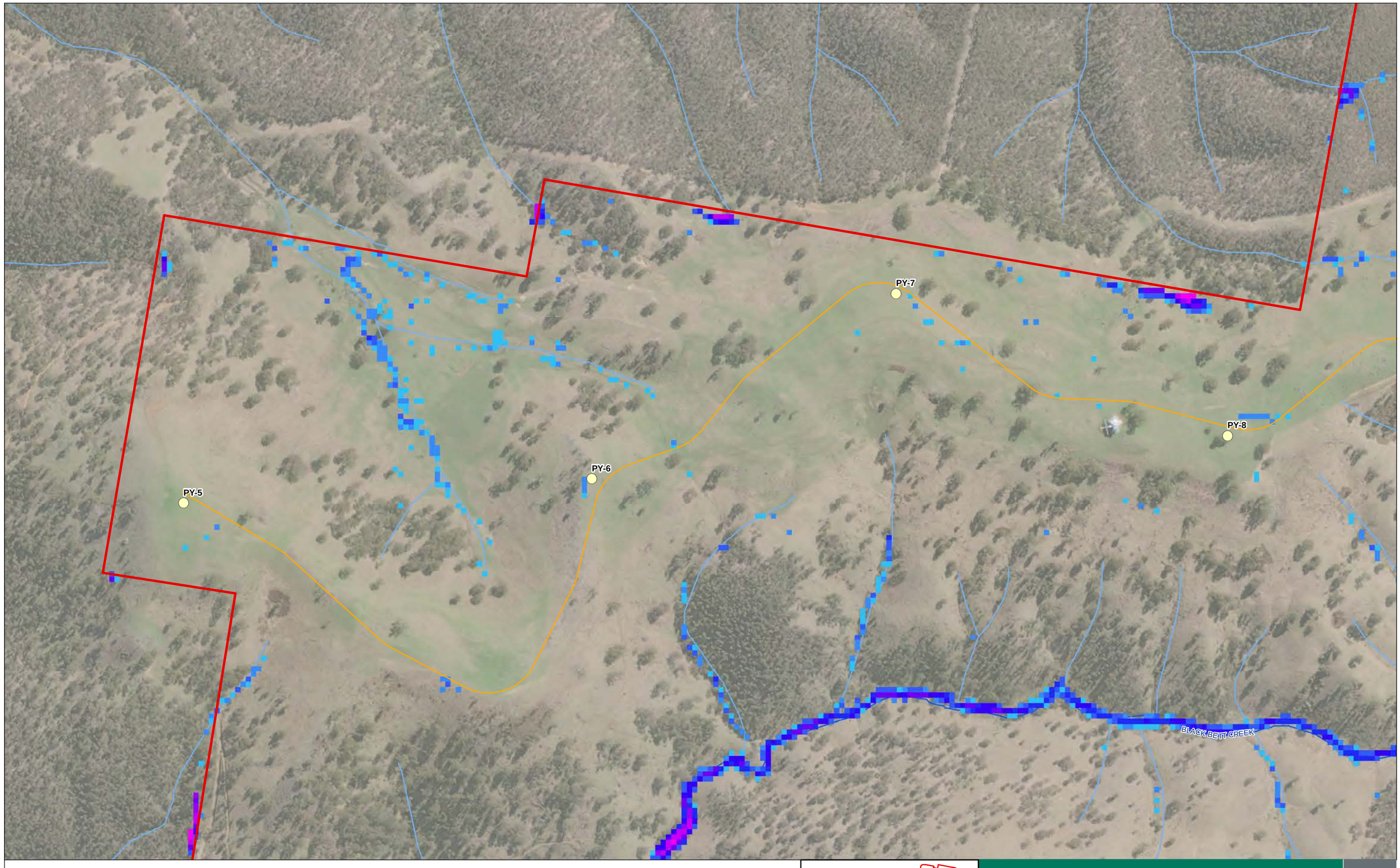
Drawing No:	0578575s_PYWF_FA_G006_R2.mxd		Paling Yards Wind Farm
Date:	22/11/2022	Drawing Size: A3	
Drawn By:	VN	Reviewed By: RP	Client: Global Power Generation Australia (GPG)

Coordinate System: GDA 1994 MGA Zone 55

0 0.1 0.2km

N

ERM



Legend

Turbines
Site Boundary
Access Road
Path and Track

Depth (m)
<0.1
0.1 - 0.25
0.25 - 0.5
0.5 - 1
1 - 1.5
1.5 - 2
2 - 2.5
2.5 - 3
3 - 4
>4

Minor Watercourse
Major Watercourse

Source:
BaseData - DCDB and DTDB DLPI 2021
ESRI World Imagery 2018

5% AEP Peak Flood Depth

A1

Drawing No:	0578575s_PYWF_FA_G006_R2.mxd		Paling Yards Wind Farm
Date:	22/11/2022	Drawing Size: A3	
Drawn By:	VN	Reviewed By: RP	Client: Global Power Generation Australia (GPG)

Coordinate System: GDA 1994 MGA Zone 55

0 0.1 0.2km

N

ERM

Legend

- Turbines
- Site Boundary
- Substation
- Proposed Transmission Line
- Access Road
- Transmission Lines - 500kV and Towers
- Transmission Lines - Rural Distribution Lines
- Main Road
- Minor Road
- Path and Track

Velocity (m/s)

- <1
- 1 - 2
- 2 - 3
- 3 - 4
- 4- 5
- >5
- Minor Watercourse
- Major Watercourse

Source:
BaseData - DCDB and DTDB DLPI 2021
ESRI World Imagery 2018

ABERCROMBIE ROAD
TAVERN CREEK
SILENT CREEK
BACK CREEK
OAKY CREEK
MANUS CREEK
MIDDLE STATION CREEK
BROTHERS CREEK
JERRONG ROAD
JERRONG
PALING YARDS CREEK
BLACK BETTY CREEK
MOUNT WERONG CREEK
ABERCROMBIE RIVER
REEDY CREEK
TARALGA ROAD

PY-1
PY-2
PY-3
PY-5
PY-6
PY-7
PY-8
PY-9
PY-10
PY-11
PY-12
PY-13
PY-14
PY-15
PY-16
PY-17
PY-18
PY-19
PY-20
PY-21
PY-22
PY-23
PY-24
PY-25
PY-26
PY-27
PY-28
PY-29
PY-30
PY-31
PY-32
PY-33
PY-34
PY-35
PY-36
PY-37
PY-38
PY-39
PY-40
PY-41
PY-42
PY-43
PY-44
PY-45
PY-46
PY-47

5% AEP Flood Velocity Overall

A2

Drawing No:	0578575s_PYWF_FA_G007_R1.mxd		Paling Yards Wind Farm
Date:	22/11/2022	Drawing Size: A3	
Drawn By:	VN	Reviewed By: RP	Client: Global Power Generation Australia (GPG)

Coordinate System: GDA 1994 MGA Zone 55

0 0.5 1km

N

ERM

APPENDIX B 1% AEP INSET FLOOD MAPS

A4 and A5

PY-47

PY-46

MANUS CREEK

Legend

- Turbines
- Site Boundary
- Substation
- Proposed Transmission Line
- Transmission Lines - 500kV and Towers
- Transmission Lines - Rural Distribution Lines
- Access Road
- Path and Track

Depth (m)

- <0.1
- 0.1 - 0.25
- 0.25 - 0.5
- 0.5 - 1
- 1 - 1.5
- 1.5 - 2
- 2 - 2.5
- 2.5 - 3
- 3 - 4
- >4

- Minor Watercourse
- Major Watercourse

Source:
BaseData - DCDB and DTDB DLPI 2021
ESRI World Imagery 2018

1% AEP Peak Flood Depth

A4

Drawing No:	0578575s_PYWF_FA_G009_R2.mxd		Paling Yards Wind Farm
Date:	22/11/2022	Drawing Size: A3	
Drawn By:	VN	Reviewed By: RP	Client: Global Power Generation Australia (GPG)

Coordinate System: GDA 1994 MGA Zone 55

0 0.1 0.2km

N

ERM

PY-45

PY-43

PY-44

PY-42

BROTHERS CREEK

Legend

Turbines
Site Boundary
Transmission Lines - Rural Distribution Lines
Access Road
Path and Track

Depth (m)
<0.1
0.1 - 0.25
0.25 - 0.5
0.5 - 1
1 - 1.5
1.5 - 2
2 - 2.5
2.5 - 3
3 - 4
>4

Minor Watercourse
Major Watercourse

Source:
BaseData - DCDB and DTDB DLPI 2021
ESRI World Imagery 2018

1% AEP Peak Flood Depth

A4

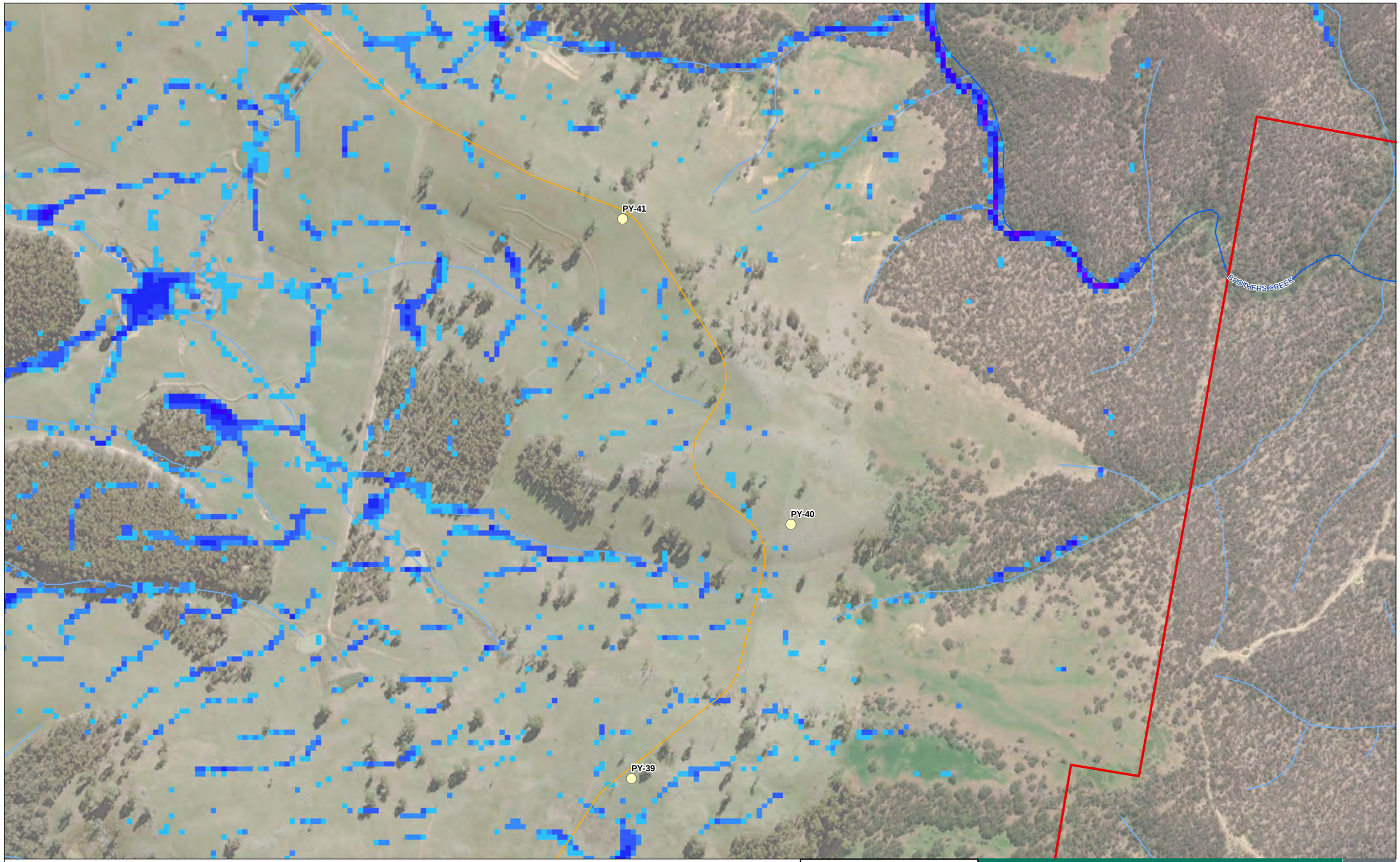
Drawing No:	0578575s_PYWF_FA_G009_R2.mxd		Paling Yards Wind Farm
Date:	22/11/2022	Drawing Size: A3	
Drawn By:	VN	Reviewed By: RP	Client: Global Power Generation Australia (GPG)

Coordinate System: GDA 1994 MGA Zone 55

0 0.1 0.2km

N

ERM



Legend

Turbines
Site Boundary
Access Road
Path and Track

Depth (m)
<0.1
0.1 - 0.25
0.25 - 0.5
0.5 - 1
1 - 1.5
1.5 - 2
2 - 2.5
2.5 - 3

Minor Watercourse
Major Watercourse

Source:
BaseData - DCDB and DTDB DLPI 2021
ESRI World Imagery 2018

1% AEP Peak Flood Depth

A4

Drawing No:	0578575s_PYWF_FA_G009_R2.mxd		Paling Yards Wind Farm
Date:	22/11/2022	Drawing Size: A3	
Drawn By:	VN	Reviewed By: RP	Client: Global Power Generation Australia (GPG)

Coordinate System: GDA 1994 MGA Zone 55

0 0.1 0.2km

N

ERM

PY-39
PY-38
PY-37
PY-36
PY-35

Legend

Turbines
Site Boundary
Access Road
Path and Track

Depth (m)
<0.1
0.1 - 0.25
0.25 - 0.5
0.5 - 1
1 - 1.5
1.5 - 2
2 - 2.5
2.5 - 3
3 - 4
>4

Minor Watercourse

Source:
BaseData - DCDB and DTDB DLPI 2021
ESRI World Imagery 2018

1% AEP Peak Flood Depth

A4

Drawing No:	0578575s_PYWF_FA_G009_R2.mxd		Paling Yards Wind Farm
Date:	22/11/2022	Drawing Size: A3	
Drawn By:	VN	Reviewed By: RP	Client: Global Power Generation Australia (GPG)

Coordinate System: GDA 1994 MGA Zone 55

0 0.1 0.2km

N

ERM

PY-30
PY-31
PY-32
PY-33
PY-34
ABERCROMBIE ROAD

Legend

Turbines
Site Boundary
Transmission Lines - Rural Distribution Lines
Access Road
Main Road
Path and Track

Depth (m)
<0.1
0.1 - 0.25
0.25 - 0.5
0.5 - 1
1 - 1.5
1.5 - 2
2 - 2.5
2.5 - 3
3 - 4
>4

Minor Watercourse
Major Watercourse

Source:
BaseData - DCDB and DTDB DLPI 2021
ESRI World Imagery 2018

1% AEP Peak Flood Depth

A4

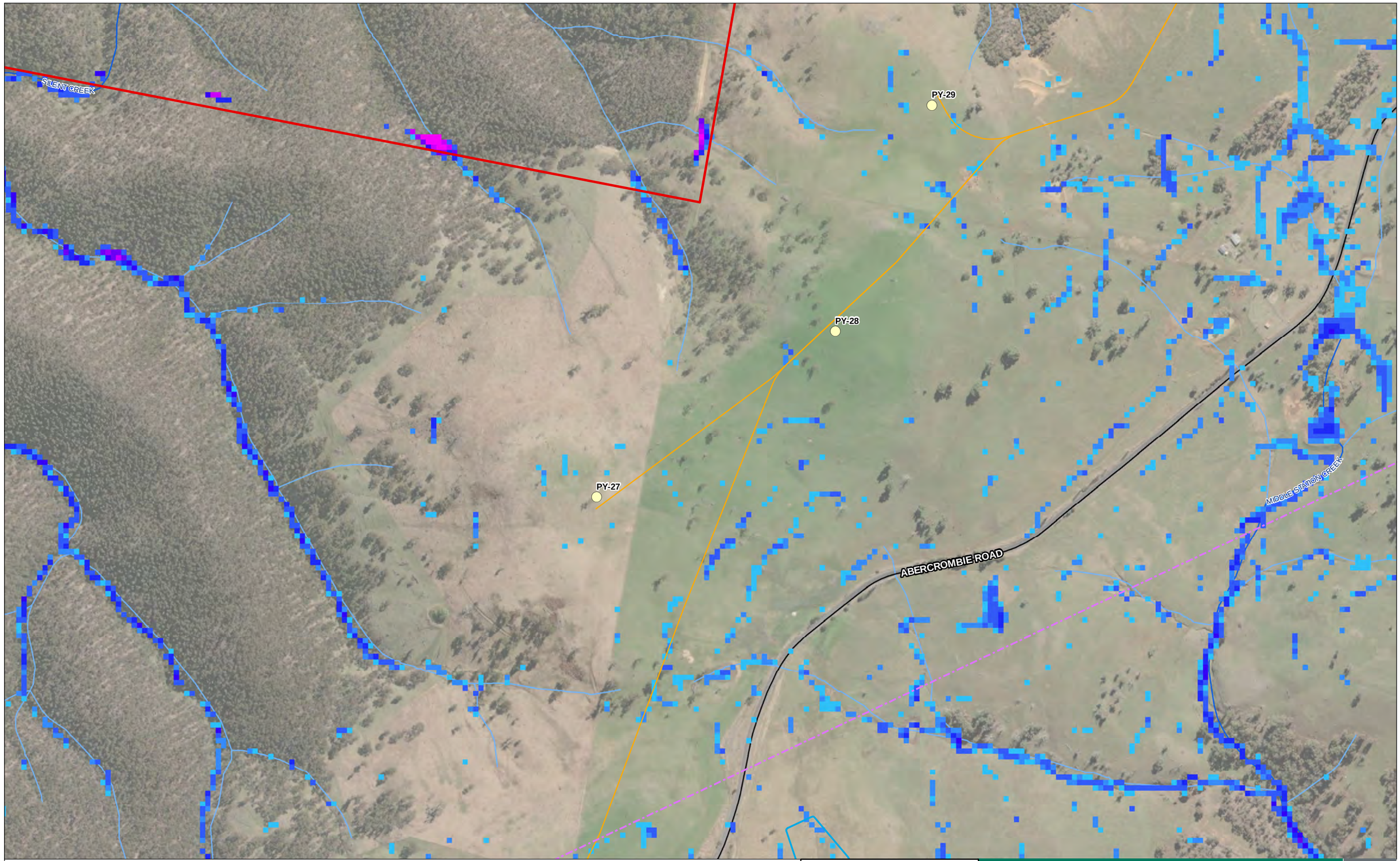
Drawing No:	0578575s_PYWF_FA_G009_R2.mxd		Paling Yards Wind Farm
Date:	22/11/2022	Drawing Size: A3	
Drawn By:	VN	Reviewed By: RP	Client: Global Power Generation Australia (GPG)

Coordinate System: GDA 1994 MGA Zone 55

0 0.1 0.2km

N

ERM



Legend

Turbines
Site Boundary
Substation
Transmission Lines - Rural Distribution Lines
Access Road
Main Road

Depth (m)
<0.1
0.1 - 0.25
0.25 - 0.5
0.5 - 1
1 - 1.5
1.5 - 2
2 - 2.5
2.5 - 3
3 - 4
>4

Minor Watercourse
Major Watercourse

Source:
BaseData - DCDB and DTDB DLPI 2021
ESRI World Imagery 2018

1% AEP Peak Flood Depth

A4

Drawing No:	0578575s_PYWF_FA_G009_R2.mxd		Paling Yards Wind Farm
Date:	22/11/2022	Drawing Size: A3	
Drawn By:	VN	Reviewed By: RP	Client: Global Power Generation Australia (GPG)

Coordinate System: GDA 1994 MGA Zone 55

0 0.1 0.2km

N

ERM

PY-24
PY-23
PY-26
PY-25
ABERCROMBIE ROAD
OAKY CREEK

Legend

Turbines
Site Boundary
Substation
Transmission Lines - Rural Distribution Lines
Access Road
Main Road
Path and Track

Depth (m)
<0.1
0.1 - 0.25
0.25 - 0.5
0.5 - 1
1 - 1.5
1.5 - 2
2 - 2.5

Minor Watercourse
Major Watercourse

Source:
BaseData - DCDB and DTDB DLPI 2021
ESRI World Imagery 2018

1% AEP Peak Flood Depth

A4

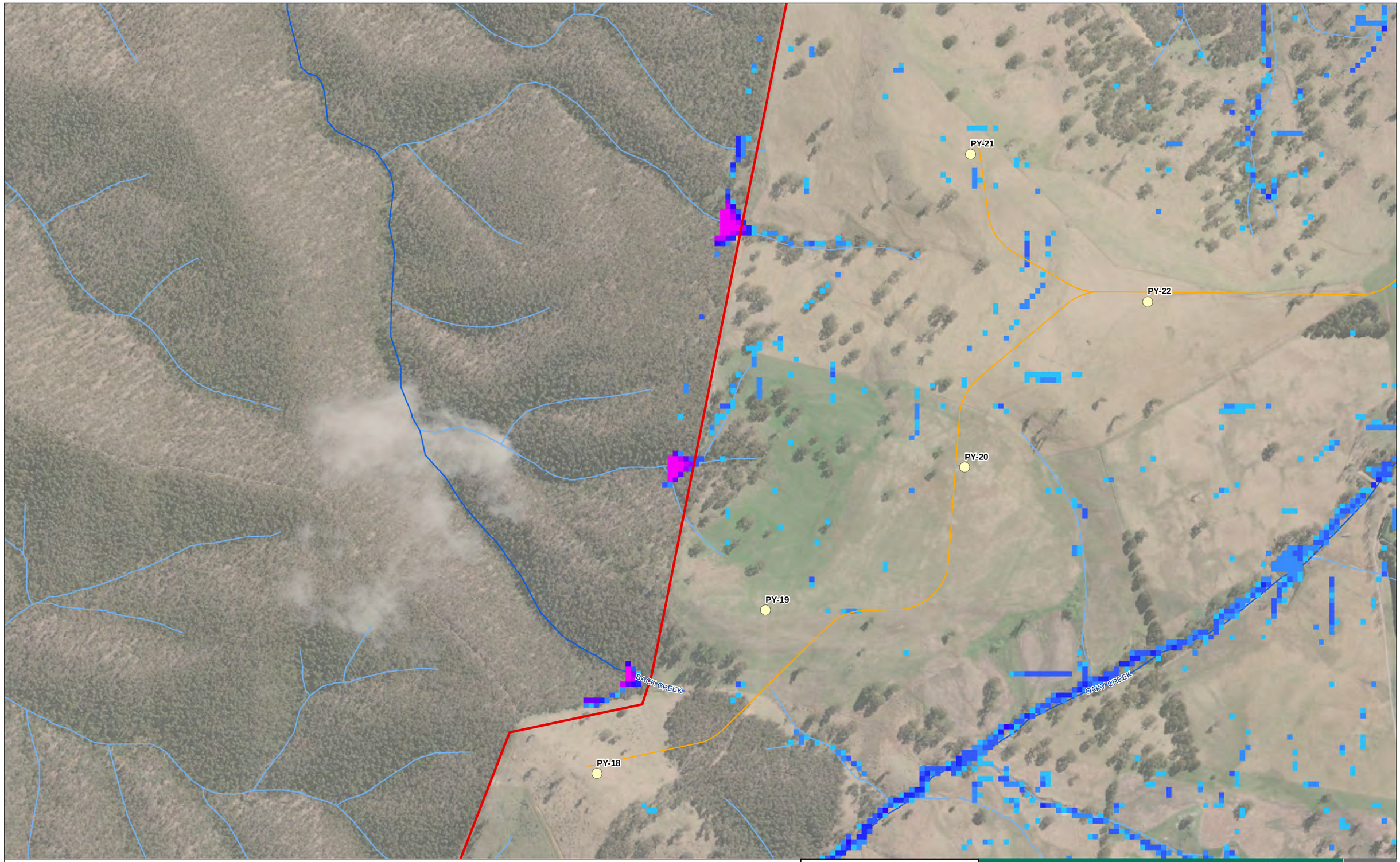
Drawing No:	0578575s_PYWF_FA_G009_R2.mxd		Paling Yards Wind Farm
Date:	22/11/2022	Drawing Size: A3	
Drawn By:	VN	Reviewed By: RP	Client: Global Power Generation Australia (GPG)

Coordinate System: GDA 1994 MGA Zone 55

0 0.1 0.2km

N

ERM



Legend

Turbines
Site Boundary
Access Road
Path and Track

Depth (m)
<0.1
0.1 - 0.25
0.25 - 0.5
0.5 - 1
1 - 1.5
1.5 - 2
2 - 2.5
2.5 - 3
3 - 4
>4

Minor Watercourse
Major Watercourse

Source:
BaseData - DCDB and DTDB DLPI 2021
ESRI World Imagery 2018

1% AEP Peak Flood Depth

A4

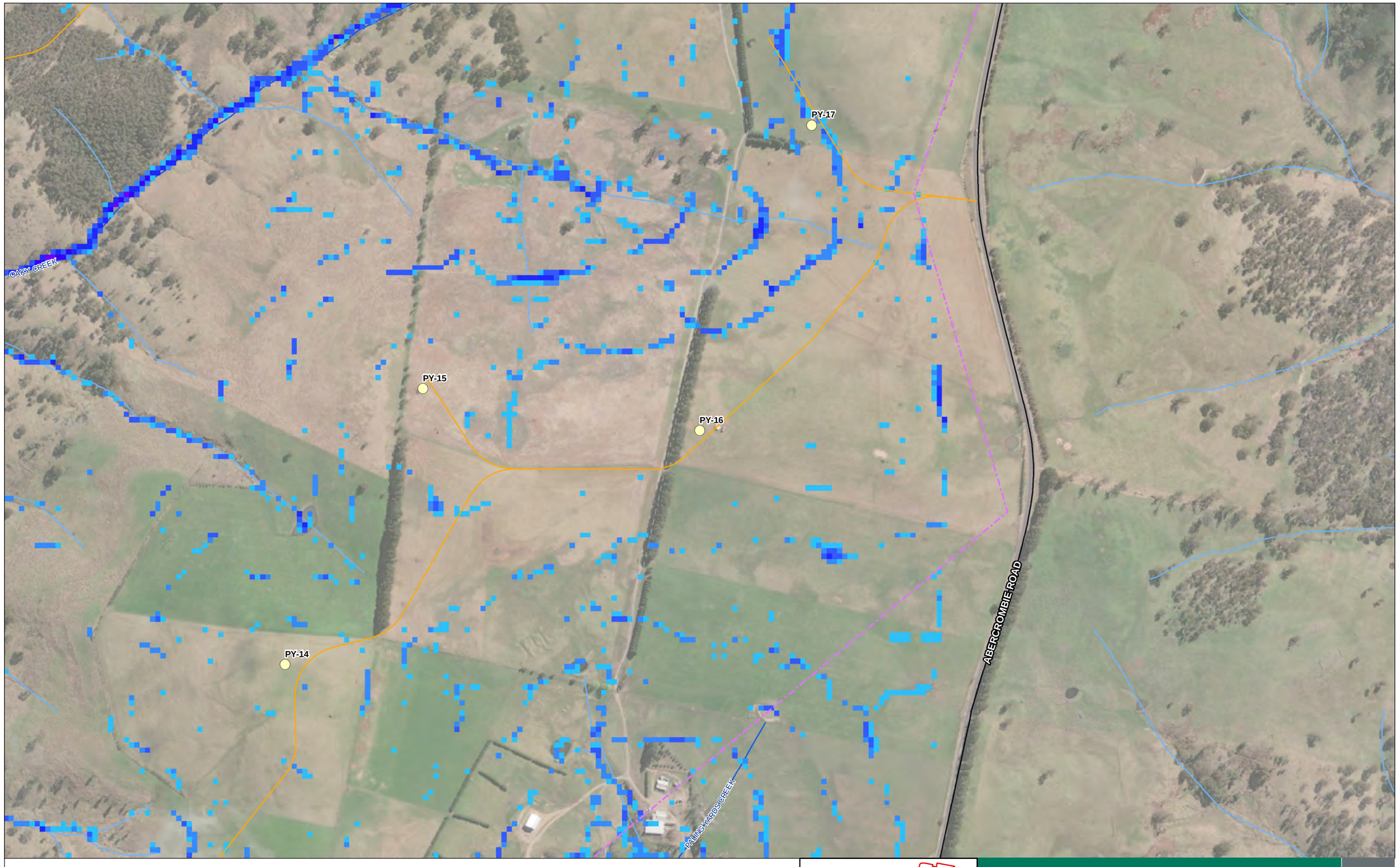
Drawing No:	0578575s_PYWF_FA_G009_R2.mxd		Paling Yards Wind Farm
Date:	22/11/2022	Drawing Size: A3	
Drawn By:	VN	Reviewed By: RP	Client: Global Power Generation Australia (GPG)

Coordinate System: GDA 1994 MGA Zone 55

0 0.1 0.2km

N

ERM



Legend

Turbines
Site Boundary
Transmission Lines - Rural Distribution Lines
Access Road
Main Road
Path and Track

Depth (m)
<0.1
0.1 - 0.25
0.25 - 0.5
0.5 - 1
1 - 1.5
1.5 - 2
2 - 2.5

Minor Watercourse
Major Watercourse

Source:
BaseData - DCDB and DTDB DLPI 2021
ESRI World Imagery 2018

1% AEP Peak Flood Depth

A4

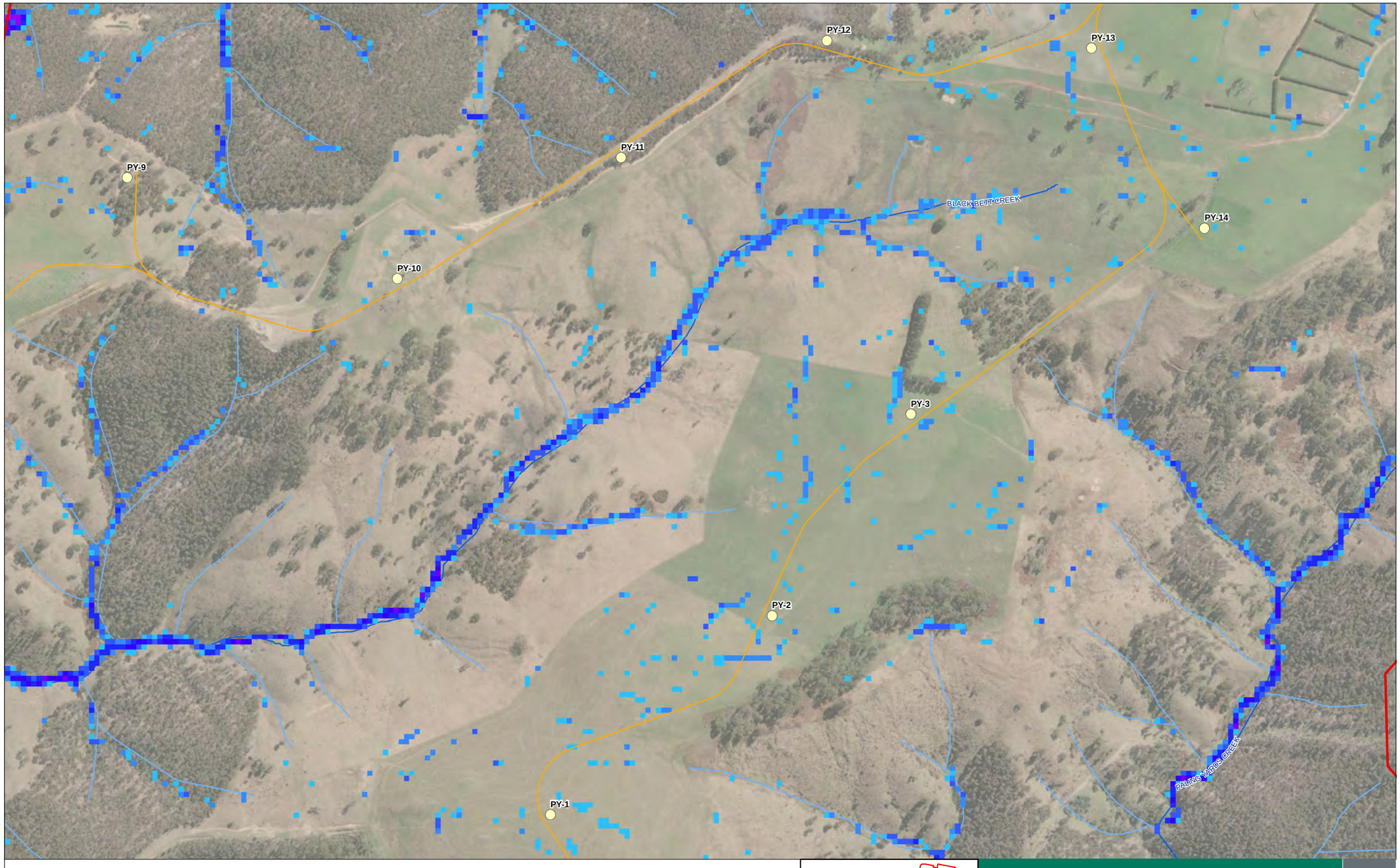
Drawing No:	0578575s_PYWF_FA_G009_R2.mxd		Paling Yards Wind Farm
Date:	22/11/2022	Drawing Size: A3	
Drawn By:	VN	Reviewed By: RP	Client: Global Power Generation Australia (GPG)

Coordinate System: GDA 1994 MGA Zone 55

0 0.1 0.2km

N

ERM



Legend

Turbines
Site Boundary
Access Road
Path and Track

Depth (m)
<0.1
0.1 - 0.25
0.25 - 0.5
0.5 - 1
1 - 1.5
1.5 - 2
2 - 2.5
2.5 - 3
3 - 4

Minor Watercourse
Major Watercourse

Source:
BaseData - DCDB and DTDB DLPI 2021
ESRI World Imagery 2018

1% AEP Peak Flood Depth

A4

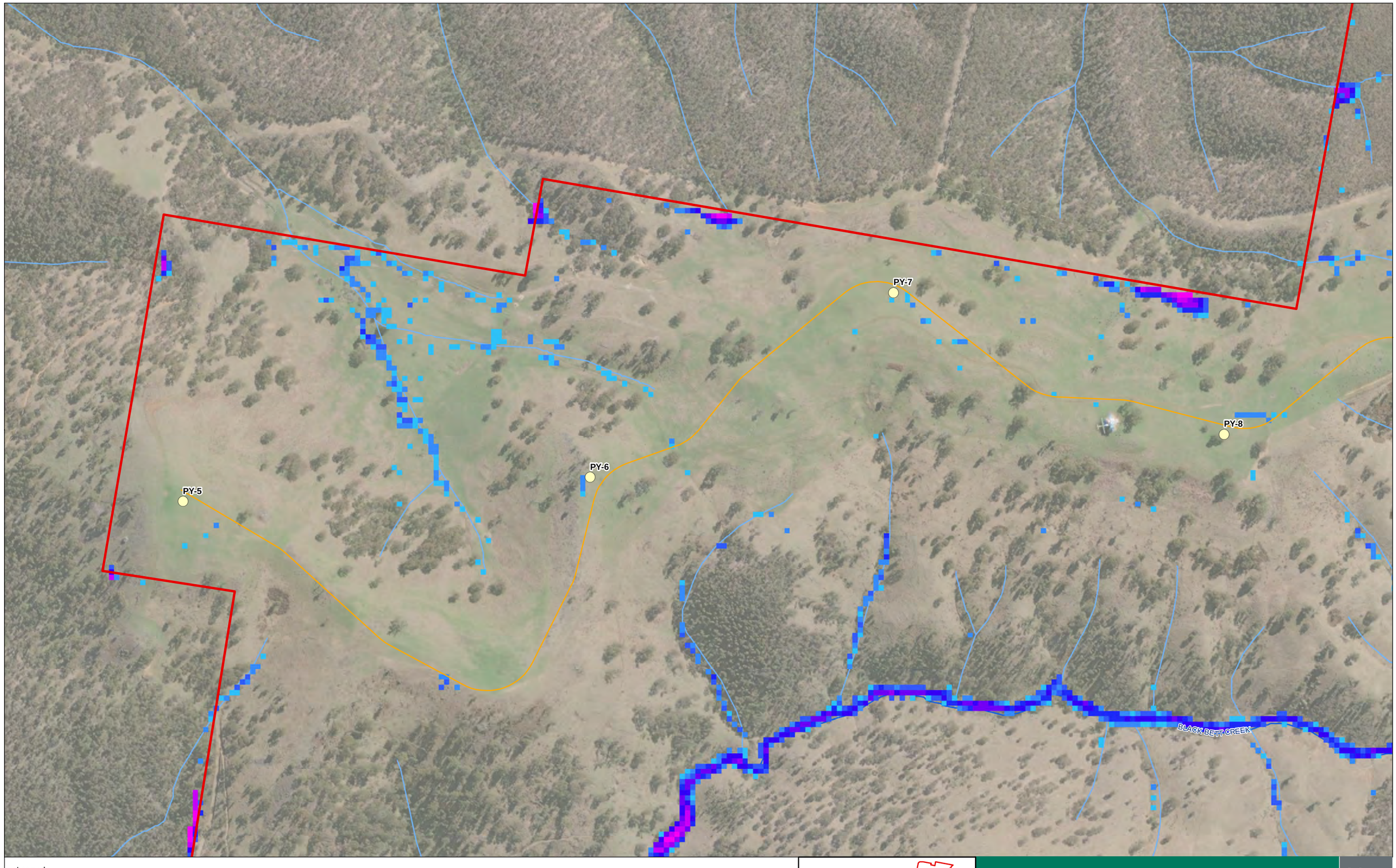
Drawing No:	0578575s_PYWF_FA_G009_R2.mxd		Paling Yards Wind Farm
Date:	22/11/2022	Drawing Size: A3	
Drawn By:	VN	Reviewed By: RP	Client: Global Power Generation Australia (GPG)

Coordinate System: GDA 1994 MGA Zone 55

0 0.1 0.2km

N

ERM



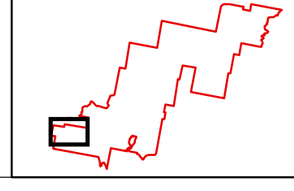
Legend

Turbines
Site Boundary
Access Road
Path and Track

Depth (m)
<0.1
0.1 - 0.25
0.25 - 0.5
0.5 - 1
1 - 1.5
1.5 - 2
2 - 2.5
2.5 - 3
3 - 4
>4

Minor Watercourse
Major Watercourse

Source:
BaseData - DCDB and DTDB DLPI 2021
ESRI World Imagery 2018



1% AEP Peak Flood Depth

A4

Drawing No:	0578575s_PYWF_FA_G009_R2.mxd		Paling Yards Wind Farm
Date:	22/11/2022	Drawing Size: A3	
Drawn By:	VN	Reviewed By: RP	Client: Global Power Generation Australia (GPG)

Coordinate System: GDA 1994 MGA Zone 55

0 0.1 0.2km

N

ERM

Legend

- Turbines
- Site Boundary
- Substation
- Proposed Transmission Line
- Transmission Lines - 500kV and Towers
- Transmission Lines - Rural Distribution Lines
- Access Road
- Main Road
- Minor Road
- Path and Track

Velocity (m/s)

- <1
- 1 - 2
- 2 - 3
- 3 - 4
- 4- 5
- >5
- Minor Watercourse
- Major Watercourse

Source:
BaseData - DCDB and DTDB DLPI 2021
ESRI World Imagery 2018

PY-1, PY-2, PY-3, PY-5, PY-6, PY-7, PY-8, PY-9, PY-10, PY-11, PY-12, PY-13, PY-14, PY-15, PY-16, PY-17, PY-18, PY-19, PY-20, PY-21, PY-22, PY-23, PY-24, PY-25, PY-26, PY-27, PY-28, PY-29, PY-30, PY-31, PY-32, PY-33, PY-34, PY-35, PY-36, PY-37, PY-38, PY-39, PY-40, PY-41, PY-42, PY-43, PY-44, PY-45, PY-46, PY-47

ABERCROMBIE ROAD
JERRONG ROAD
JERRONG
TARALGA ROAD
TAVERN CREEK
SILENT CREEK
BACK CREEK
BLACK BETT CREEK
OAKY CREEK
PALING YARDS CREEK
MIDDLE STATION CREEK
BROTHERS CREEK
WANUS CREEK
MOUNT WERONG CREEK
ABERCROMBIE RIVER
RETOY CREEK

1% AEP Flood Velocity Overall

A5

Drawing No:	0578575s_PYWF_FA_G010_R0.mxd		Paling Yards Wind Farm
Date:	18/07/2022	Drawing Size: A3	
Drawn By:	VN	Reviewed By: RP	Client: Global Power Generation Australia (GPG)

Coordinate System: GDA 1994 MGA Zone 55

0 0.5 1km

N

ERM

APPENDIX C PMF INSET FLOOD MAPS AND FLOOD PRONE LAND

A7 and A8

PY-47

PY-46

MANUS CREEK

Legend

- Turbines
- Site Boundary
- Substation
- Proposed Transmission Line
- Transmission Lines - 500kV and Towers
- Transmission Lines - Rural Distribution Lines
- Access Road
- Path and Track

Depth (m)

- <0.1
- 0.1 - 0.25
- 0.25 - 0.5
- 0.5 - 1
- 1 - 1.5
- 1.5 - 2
- 2 - 2.5
- 2.5 - 3
- 3 - 4
- >4

- Minor Watercourse
- Major Watercourse

Source:
BaseData - DCDB and DTDB DLPI 2021
ESRI World Imagery 2018

PMF Peak Flood Depth

A7

Drawing No:	0578575s_PYWF_FA_G012_R1.mxd		Paling Yards Wind Farm
Date:	22/11/2022	Drawing Size: A3	
Drawn By:	VN	Reviewed By: RP	Client: Global Power Generation Australia (GPG)

Coordinate System: GDA 1994 MGA Zone 55

0 0.1 0.2km

N

ERM

PY-43

PY-45

PY-44

PY-42

BROTHERS CREEK

Legend

Turbines
Site Boundary
Transmission Lines - Rural Distribution Lines
Access Road
Path and Track

Depth (m)
<0.1
0.1 - 0.25
0.25 - 0.5
0.5 - 1
1 - 1.5
1.5 - 2
2 - 2.5
2.5 - 3
3 - 4
>4

Minor Watercourse
Major Watercourse

Source:
BaseData - DCDB and DTDB DLPI 2021
ESRI World Imagery 2018

PMF Peak Flood Depth

A7

Drawing No: 0578575s_PYWF_FA_G012_R1.mxd		Paling Yards Wind Farm
Date: 22/11/2022	Drawing Size: A3	
Drawn By: VN	Reviewed By: RP	Client: Global Power Generation Australia (GPG)

Coordinate System: GDA 1994 MGA Zone 55

0 0.1 0.2km

N

ERM

PY-41

PY-40

PY-39

BROTHERS CREEK

Legend

Turbines
Site Boundary
Access Road
Path and Track

Depth (m)
<0.1
0.1 - 0.25
0.25 - 0.5
0.5 - 1
1 - 1.5
1.5 - 2
2 - 2.5
2.5 - 3
3 - 4

Minor Watercourse
Major Watercourse

Source:
BaseData - DCDB and DTDB DLPI 2021
ESRI World Imagery 2018

PMF Peak Flood Depth

A7

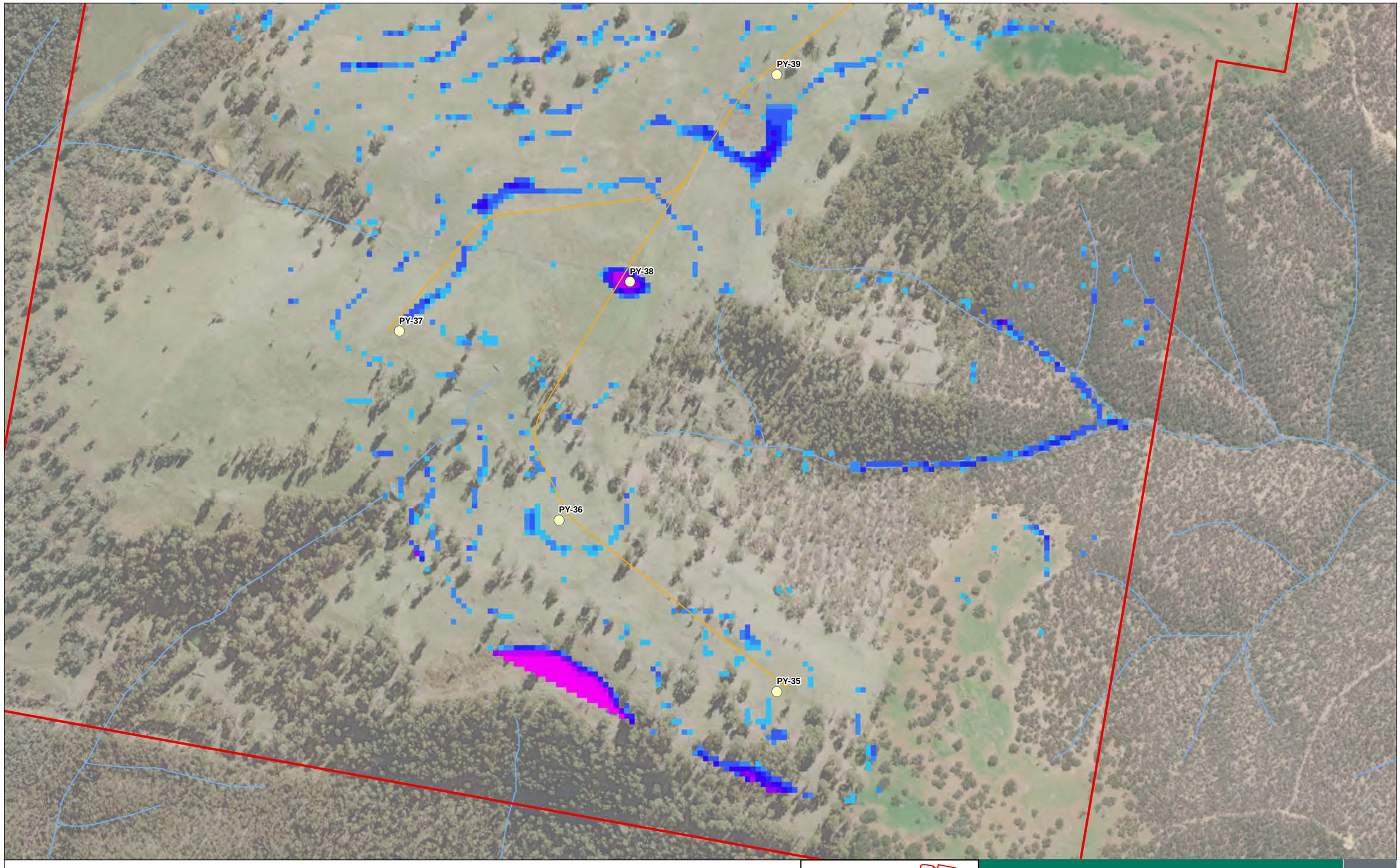
Drawing No:	0578575s_PYWF_FA_G012_R1.mxd		Paling Yards Wind Farm
Date:	22/11/2022	Drawing Size: A3	
Drawn By:	VN	Reviewed By: RP	Client: Global Power Generation Australia (GPG)

Coordinate System: GDA 1994 MGA Zone 55

0 0.1 0.2km

N

ERM



Legend

Turbines
Site Boundary
Access Road
Path and Track

Depth (m)
0.1 - 0.25
0.25 - 0.5
0.5 - 1
1 - 1.5
1.5 - 2
2 - 2.5
2.5 - 3
3 - 4
>4

Minor Watercourse

Source:
BaseData - DCDB and DTDB DLPI 2021
ESRI World Imagery 2018

PMF Peak Flood Depth

A7

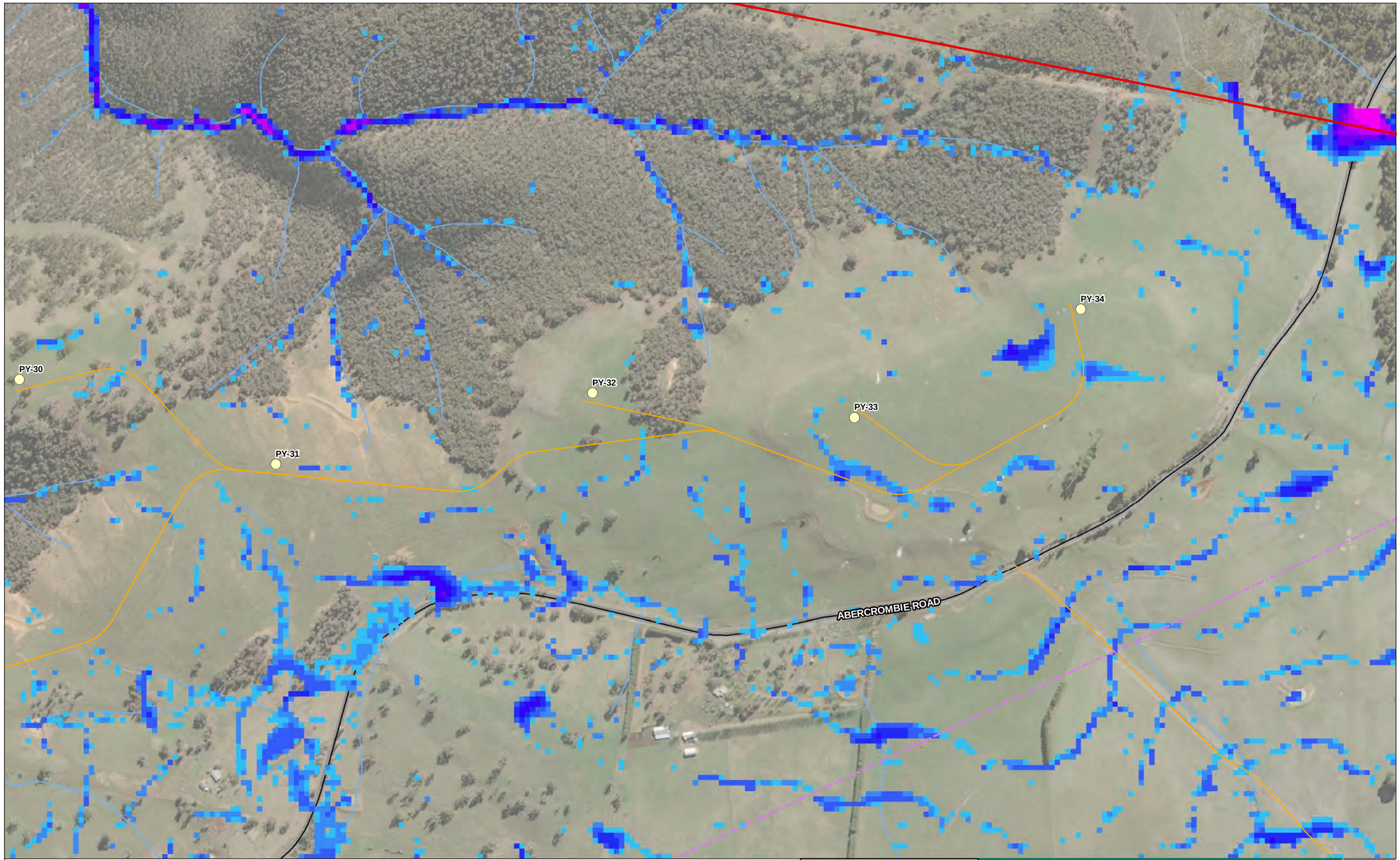
Drawing No:	0578575s_PYWF_FA_G012_R1.mxd		Paling Yards Wind Farm
Date:	22/11/2022	Drawing Size: A3	
Drawn By:	VN	Reviewed By: RP	Client: Global Power Generation Australia (GPG)

Coordinate System: GDA 1994 MGA Zone 55

0 0.1 0.2km

N

ERM



Legend

- Turbines
- Site Boundary
- Transmission Lines - Rural Distribution Lines
- Access Road
- Main Road
- Path and Track
- Depth (m)
  - 0.1 - 0.25
  - 0.25 - 0.5
  - 0.5 - 1
  - 1 - 1.5
  - 1.5 - 2
  - 2 - 2.5
  - 2.5 - 3
  - 3 - 4
  - >4
- Minor Watercourse
- Major Watercourse

Source:
BaseData - DCDB and DTDB DLPI 2021
ESRI World Imagery 2018

PMF Peak Flood Depth

A7

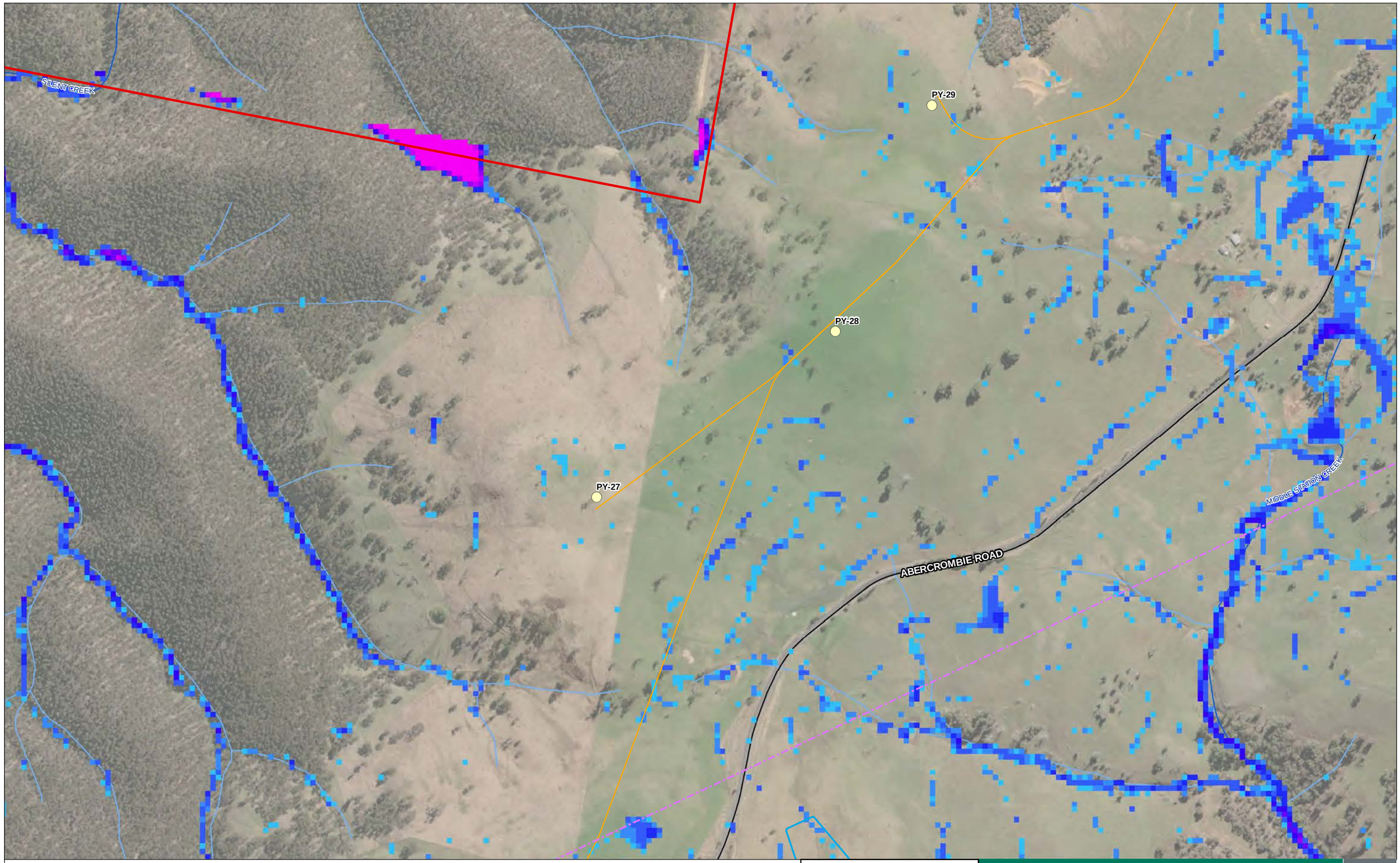
Drawing No:	0578575s_PYWF_FA_G012_R1.mxd		Paling Yards Wind Farm
Date:	22/11/2022	Drawing Size: A3	
Drawn By:	VN	Reviewed By: RP	Client: Global Power Generation Australia (GPG)

Coordinate System: GDA 1994 MGA Zone 55

0 0.1 0.2km

N

ERM



Legend

Turbines
Site Boundary
Substation
Transmission Lines - Rural Distribution Lines
Access Road
Main Road

Depth (m)
<0.1
0.1 - 0.25
0.25 - 0.5
0.5 - 1
1 - 1.5
1.5 - 2
2 - 2.5
2.5 - 3
3 - 4
>4

Minor Watercourse
Major Watercourse

Source:
BaseData - DCDB and DTDB DLPI 2021
ESRI World Imagery 2018

PMF Peak Flood Depth

A7

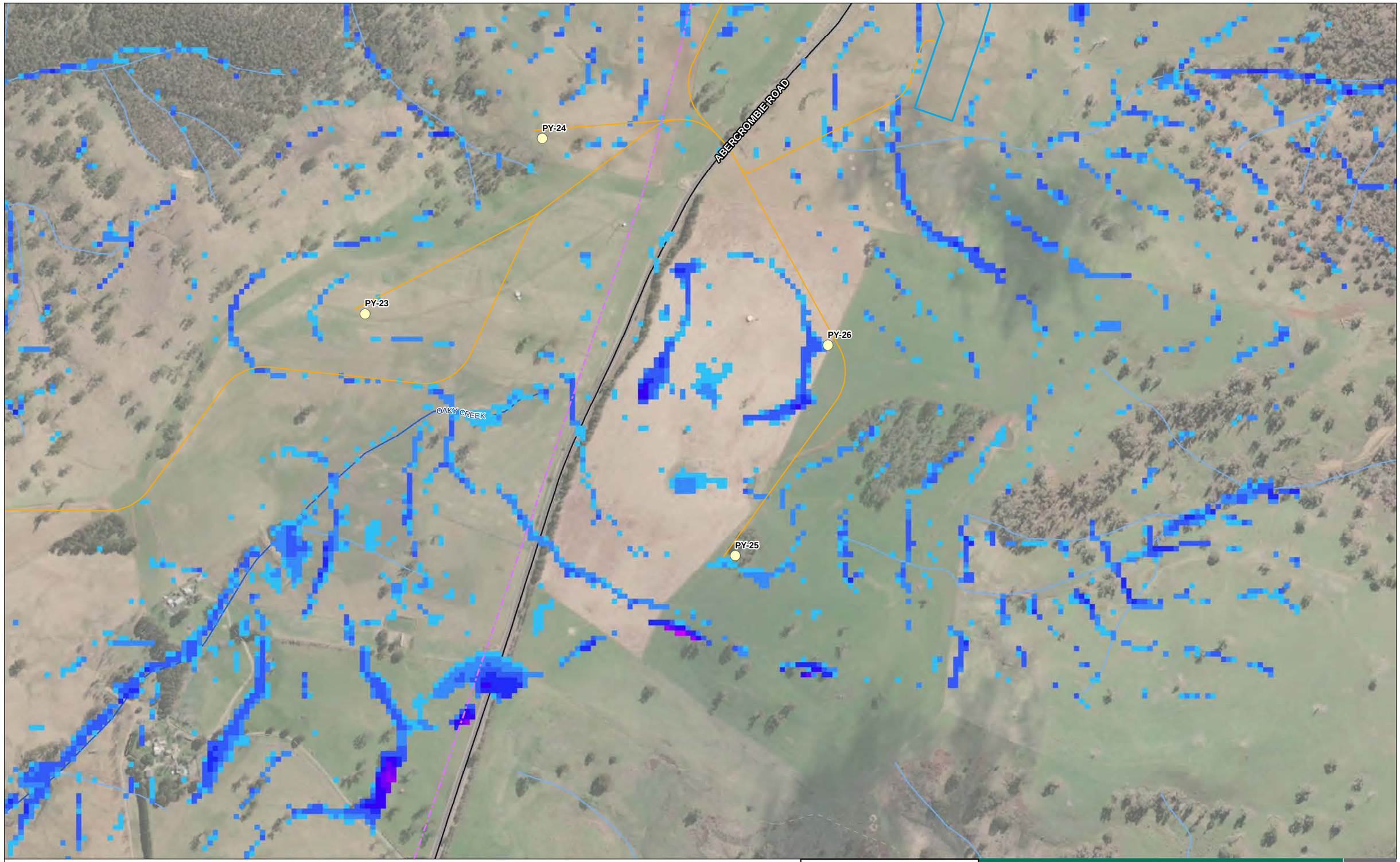
Drawing No:	0578575s_PYWF_FA_G012_R1.mxd		Paling Yards Wind Farm
Date:	22/11/2022	Drawing Size: A3	
Drawn By:	VN	Reviewed By: RP	Client: Global Power Generation Australia (GPG)

Coordinate System: GDA 1994 MGA Zone 55

0 0.1 0.2km

N

ERM



Legend

Turbines
Site Boundary
Substation
Transmission Lines - Rural Distribution Lines
Access Road
Main Road
Path and Track

Depth (m)
<0.1
0.1 - 0.25
0.25 - 0.5
0.5 - 1
1 - 1.5
1.5 - 2
2 - 2.5
2.5 - 3
3 - 4

Minor Watercourse
Major Watercourse

Source:
BaseData - DCDB and DTDB DLPI 2021
ESRI World Imagery 2018

PMF Peak Flood Depth

A7

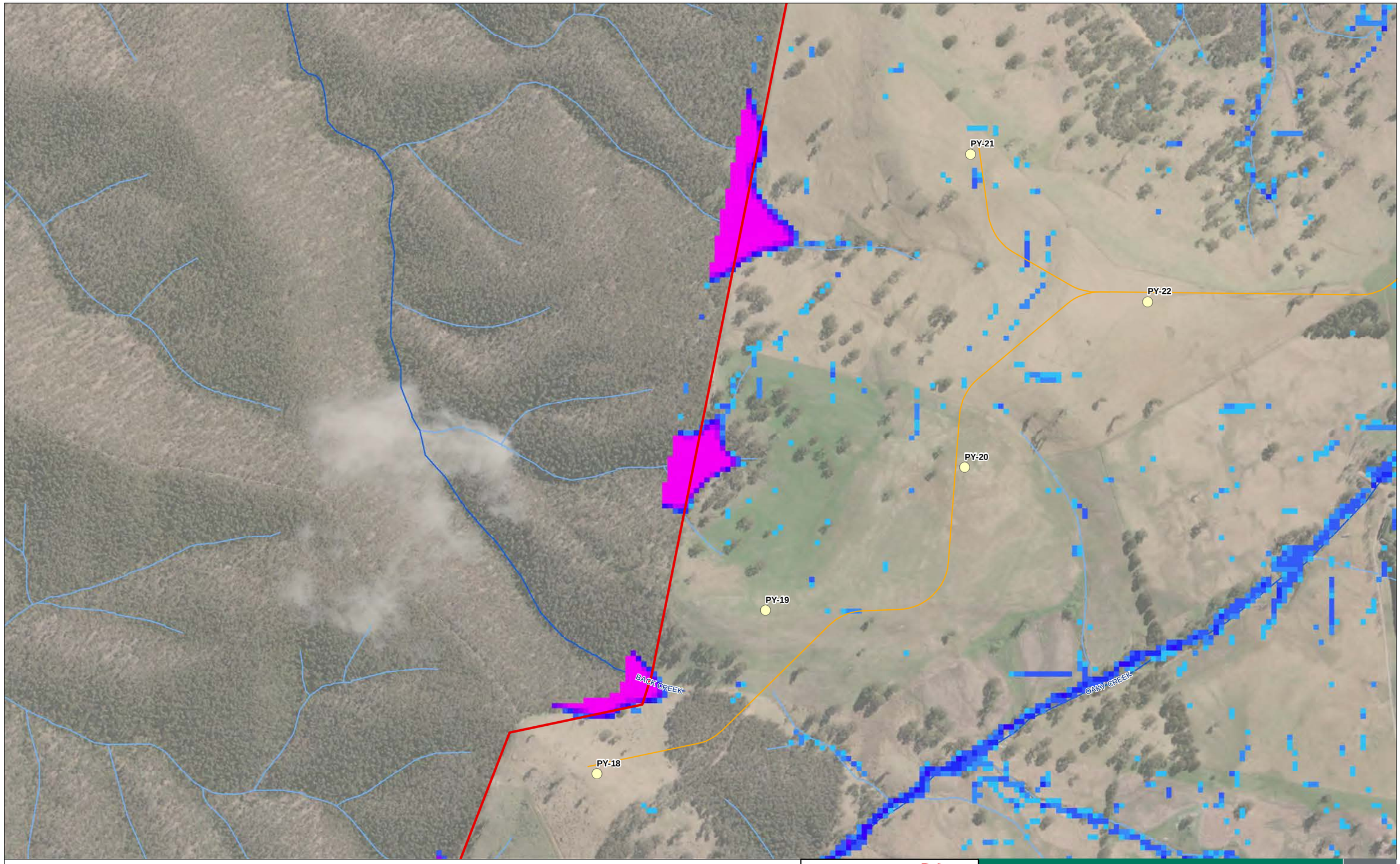
Drawing No:	0578575s_PYWF_FA_G012_R1.mxd		Paling Yards Wind Farm
Date:	22/11/2022	Drawing Size: A3	
Drawn By:	VN	Reviewed By: RP	Client: Global Power Generation Australia (GPG)

Coordinate System: GDA 1994 MGA Zone 55

0 0.1 0.2km

N

ERM



Legend

Turbines
Site Boundary
Access Road
Path and Track

Depth (m)
<0.1
0.1 - 0.25
0.25 - 0.5
0.5 - 1
1 - 1.5
1.5 - 2
2 - 2.5
2.5 - 3
3 - 4
>4

Minor Watercourse
Major Watercourse

Source:
BaseData - DCDB and DTDB DLPI 2021
ESRI World Imagery 2018

PMF Peak Flood Depth

A7

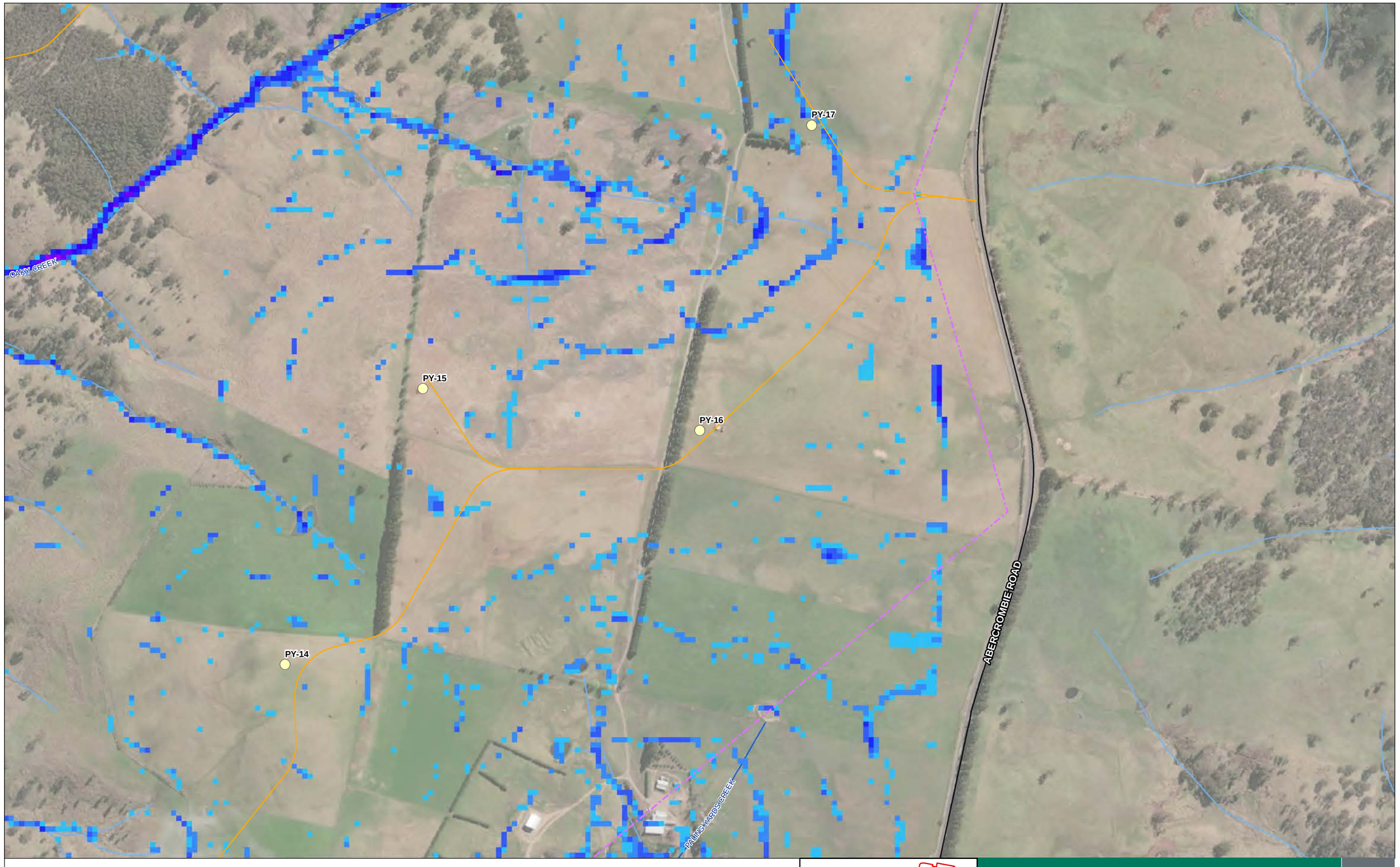
Drawing No: 0578575s_PYWF_FA_G012_R1.mxd		Paling Yards Wind Farm
Date: 22/11/2022	Drawing Size: A3	
Drawn By: VN	Reviewed By: RP	Client: Global Power Generation Australia (GPG)

Coordinate System: GDA 1994 MGA Zone 55

0 0.1 0.2km

N

ERM



Legend

- Turbines
- Site Boundary
- Transmission Lines - Rural Distribution Lines
- Access Road
- Main Road
- Path and Track

Depth (m)

- 0.1 - 0.25
- 0.25 - 0.5
- 0.5 - 1
- 1 - 1.5
- 1.5 - 2
- 2 - 2.5
- 2.5 - 3

- Minor Watercourse
- Major Watercourse

Source:
BaseData - DCDB and DTDB DLPI 2021
ESRI World Imagery 2018

PMF Peak Flood Depth

A7

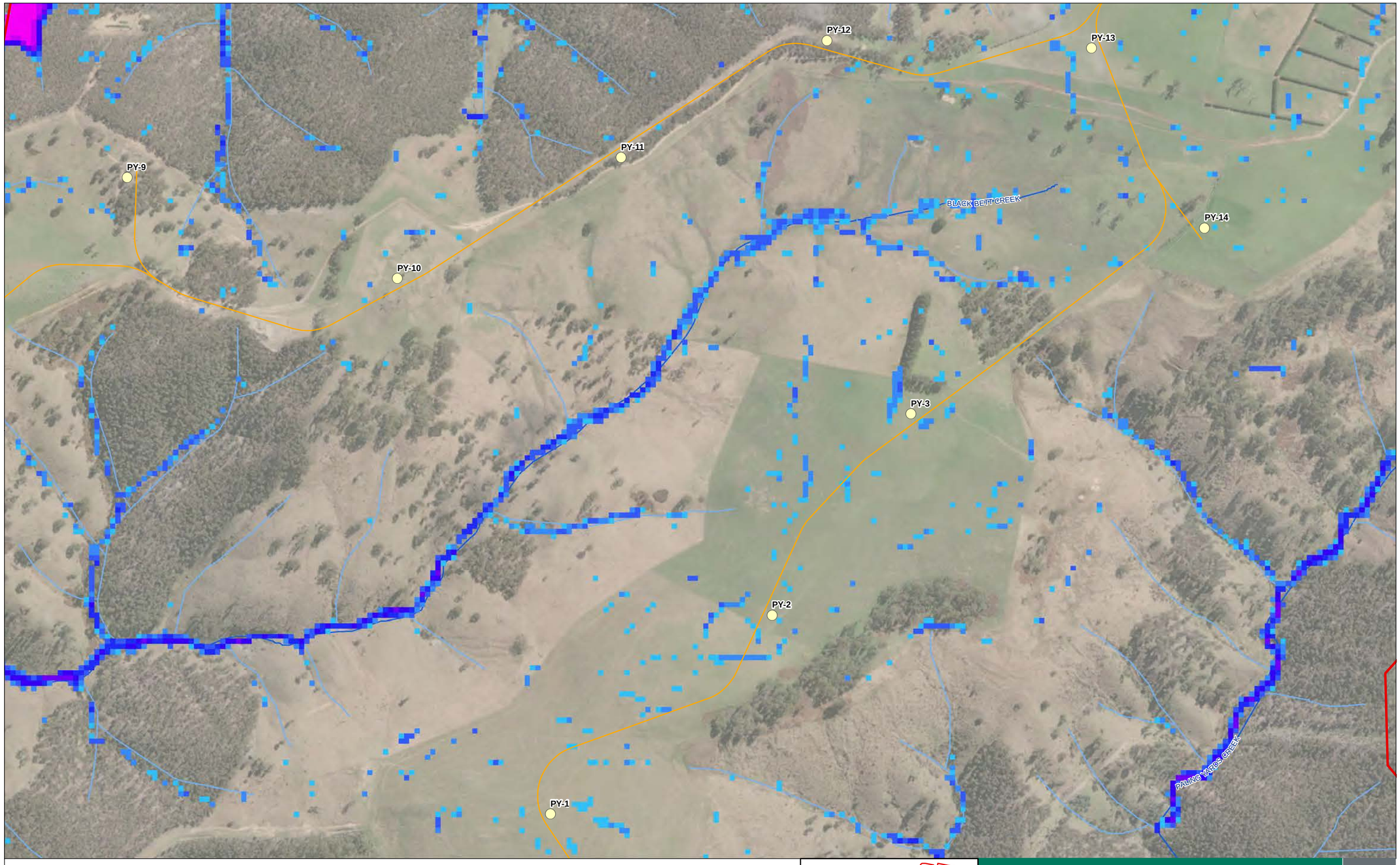
Drawing No:	0578575s_PYWF_FA_G012_R1.mxd		Paling Yards Wind Farm
Date:	22/11/2022	Drawing Size: A3	
Drawn By:	VN	Reviewed By: RP	Client: Global Power Generation Australia (GPG)

Coordinate System: GDA 1994 MGA Zone 55

0 0.1 0.2km

N

ERM



Legend

- Turbines
- Site Boundary
- Access Road
- Path and Track

Depth (m)

- 0.1 - 0.25
- 0.25 - 0.5
- 0.5 - 1
- 1 - 1.5
- 1.5 - 2
- 2 - 2.5
- 2.5 - 3
- 3 - 4
- >4

- Minor Watercourse
- Major Watercourse

Source:
BaseData - DCDB and DTDB DLPI 2021
ESRI World Imagery 2018

PMF Peak Flood Depth

A7

Drawing No:	0578575s_PYWF_FA_G012_R1.mxd		Paling Yards Wind Farm
Date:	22/11/2022	Drawing Size: A3	
Drawn By:	VN	Reviewed By: RP	Client: Global Power Generation Australia (GPG)

Coordinate System: GDA 1994 MGA Zone 55

0 0.1 0.2km

N

ERM

PY-7

PY-8

PY-6

PY-5

BLACK BETTY CREEK

Legend

Turbines

Site Boundary

Access Road

Path and Track

Depth (m)

0.1 - 0.25

0.25 - 0.5

0.5 - 1

1 - 1.5

1.5 - 2

2 - 2.5

2.5 - 3

3 - 4

>4

Minor Watercourse

Major Watercourse

Source:
BaseData - DCDB and DTDB DLPI 2021
ESRI World Imagery 2018

PMF Peak Flood Depth

A7

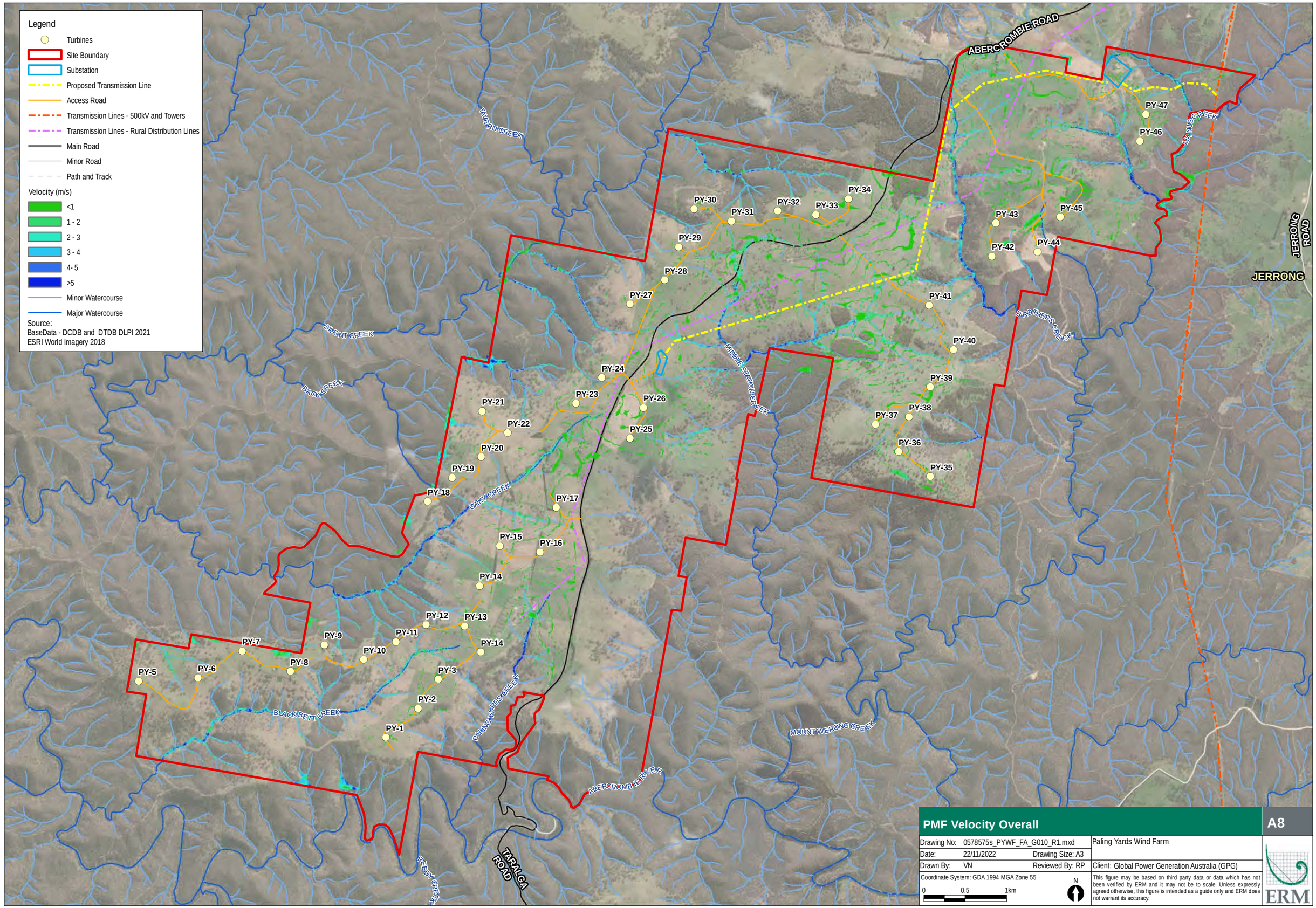
Drawing No:	0578575s_PYWF_FA_G012_R1.mxd		Paling Yards Wind Farm
Date:	22/11/2022	Drawing Size: A3	
Drawn By:	VN	Reviewed By: RP	Client: Global Power Generation Australia (GPG)

Coordinate System: GDA 1994 MGA Zone 55

0 0.1 0.2km

N

ERM



PMF Velocity Overall

A8

Drawing No: 0578575s_PYWF_FA_G010_R1.mxd		Paling Yards Wind Farm
Date: 22/11/2022	Drawing Size: A3	
Drawn By: VN	Reviewed By: RP	Client: Global Power Generation Australia (GPG)

Coordinate System: GDA 1994 MGA Zone 55

0 0.5 1km

N

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APPENDIX D FLOOD HAZARD CATEGORISATION

A3 and A6

Legend

- Turbines
- Site Boundary
- Substation
- Proposed Transmission Line
- Access Road
- Transmission Lines - 500kV and Towers
- Transmission Lines - Rural Distribution Lines
- Main Road
- Minor Road
- Path and Track
- Low Flood Hazard
- High Flood Hazrd
- Minor Watercourse
- Major Watercourse

Source:
BaseData - DCDB and DTDB DLPI 2021
ESRI World Imagery 2018

ABERCROMBIE ROAD
TAVERN CREEK
MANUS CREEK
JERRONG ROAD
JERRONG
SILENT CREEK
BACK CREEK
MIDDLE STATION CREEK
BROTHERS CREEK
OAKY CREEK
BLACK BETTY CREEK
PALING YARDS CREEK
MOUNT WERONG CREEK
ABERCROMBIE RIVER
REEDY CREEK
TARALGA ROAD

PY-1 PY-2 PY-3 PY-5 PY-6 PY-7 PY-8 PY-9 PY-10 PY-11 PY-12 PY-13 PY-14 PY-15 PY-16 PY-17 PY-18 PY-19 PY-20 PY-21 PY-22 PY-23 PY-24 PY-25 PY-26 PY-27 PY-28 PY-29 PY-30 PY-31 PY-32 PY-33 PY-34 PY-35 PY-36 PY-37 PY-38 PY-39 PY-40 PY-41 PY-42 PY-43 PY-44 PY-45 PY-46 PY-47

5% AEP Flood Hazard

A3

Drawing No:	0578575s_PYWF_FA_G008_R2.mxd		Paling Yards Wind Farm
Date:	22/11/2022	Drawing Size: A3	
Drawn By:	VN	Reviewed By: RP	Client: Global Power Generation Australia (GPG)

Coordinate System: GDA 1994 MGA Zone 55

0 0.5 1km

N

ERM

Legend

- Turbines
- Site Boundary
- Substation
- Proposed Transmission Line
- Access Road
- Transmission Lines - 500kV and Towers
- Transmission Lines - Rural Distribution Lines
- Main Road
- Minor Road
- Path and Track
- Low Flood Hazard
- High Flood Hazrd
- Minor Watercourse
- Major Watercourse

Source:
BaseData - DCDB and DTDB DLPI 2021
ESRI World Imagery 2018

ABERCROMBIE ROAD
TAVERN CREEK
MANUS CREEK
JERRONG ROAD
JERRONG
SILENT CREEK
BACK CREEK
MIDDLE STATION CREEK
BROTHERS CREEK
OAKY CREEK
BLACK BETT CREEK
PALING YARDS CREEK
MOUNT WERONG CREEK
ABERCROMBIE RIVER
REEDY CREEK
TARALGA ROAD

PY-1 PY-2 PY-3 PY-5 PY-6 PY-7 PY-8 PY-9 PY-10 PY-11 PY-12 PY-13 PY-14 PY-15 PY-16 PY-17 PY-18 PY-19 PY-20 PY-21 PY-22 PY-23 PY-24 PY-25 PY-26 PY-27 PY-28 PY-29 PY-30 PY-31 PY-32 PY-33 PY-34 PY-35 PY-36 PY-37 PY-38 PY-39 PY-40 PY-41 PY-42 PY-43 PY-44 PY-45 PY-46 PY-47

1% AEP Flood Hazard

A6

Drawing No: 0578575s_PYWF_FA_G011_R2.mxd		Paling Yards Wind Farm
Date: 22/11/2022	Drawing Size: A3	
Drawn By: VN	Reviewed By: RP	Client: Global Power Generation Australia (GPG)

Coordinate System: GDA 1994 MGA Zone 55

0 0.5 1km

N

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APPENDIX C SOIL SURVEY

			pH	Conductivity (1:5 aqueous extract at 25 °C as rec.)	Moisture	Acidity (as CaCO3)*	Magnesium (exchangeable)	Potassium (exchangeable)	Sodium (exchangeable)	Calcium (exchangeable)	Cation Exchange Capacity	Exchangeable Sodium Percentage (ESP)	Total Carbon	Chloride	Phosphorous	Sulphate (as SO4)	Total Nitogen (as N)	Nitrate (as N)	Nitrite (as N)	Nitrate & Nitrite (as N)	Total Kjeldahl Nitrogen (as N)	Ammonia (as N)	Phosphorus (Colwell)	Texture	Emerson Aggregate Test	% Passing 50mm	% Passing 2.36mm
Unit			pH units	uS/cm	%	mg/kg	meq/100g	meq/100g	meq/100g	meq/100g	meq/100g	%	%	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	Class	no.	%	%
LOR			0.1	10	1	25	0.1	0.1	0.1	0.1	0.05	0.1	0.1	10	10	10	10	5	5	5	10	5	5	na	na	na	na
Sample	**Date**	**Lab Report**																										
G1-HOR A	27/07/2022	909364	6.2	30	25	33	2.2	0.5	< 0.1	9.2	12	< 0.1	2.5	< 10	1300	< 10	3300	< 5	< 5	< 5	3300	< 5	65.8	LC	5	100	72.3
G1-HOR B	27/07/2022	909364	6.5	15	20	< 25	4.3	0.8	< 0.1	13	18	< 0.1	0.6	< 10	2400	< 10	1200	< 5	< 5	< 5	1200	< 5	161	LMC	3b	100	46.4
B1-HOR A	27/07/2022	909364	5.7	120	32	79	0.5	0.3	< 0.1	4.4	5.2	< 0.1	7.1	11	630	< 10	8700	< 5	< 5	< 5	8700	< 5	140	LC	5	100	82.3
B1-HOR B	27/07/2022	909364	5.6	21	17	< 25	0.8	0.2	< 0.1	3.1	4.1	< 0.1	1.3	< 10	250	< 10	1200	< 5	< 5	< 5	1200	< 5	27.2	LMC	5	100	56.1
Y1-HOR A	27/07/2022	909364	5.9	54	26	< 25	1.4	0.7	< 0.1	6	8.1	< 0.1	11	< 10	380	13	3000	< 5	< 5	< 5	3000	< 5	25.1	LS	3b	100	31.6
Y1-HOR B	27/07/2022	909364	5.6	31	16	< 25	0.8	0.5	< 0.1	2	3.2	< 0.1	2.7	< 10	490	< 10	1100	< 20	< 20	< 20	1100	< 5	21.9	LC	3b	100	46.0
G2-HOR A	27/07/2022	909364	5.5	140	24	26	0.9	1.8	< 0.1	4.5	7.2	< 0.1	2.1	48	800	28	3411	11	< 5	11	3400	12	50.1	LMC	3b	100	74.1
G2-HOR B	27/07/2022	909364	6.2	47	21	< 25	4.4	1.1	< 0.1	7	12	< 0.1	1.3	13	630	< 10	1300	< 20	< 20	< 20	1300	< 5	14.3	MC	5	100	33.4
Y2-HOR A	27/07/2022	909364	6.3	92	19	< 25	3.7	0.8	< 0.1	9.2	14	< 0.1	3.8	< 10	690	< 10	1806.7	6.7	< 5	6.7	1800	< 5	21.6	SC	3b	100	41.4
Y2-HOR B	27/07/2022	909364	6.2	40	13	< 25	4.3	0.7	< 0.1	8.1	13	< 0.1	1.1	< 10	560	< 10	1300	< 5	< 5	< 5	1300	< 5	15.4	SC	3b	100	50.1
G3-HOR A	27/07/2022	909364	5.2	230	35	190	2.1	0.5	< 0.1	8.7	11	< 0.1	19	< 10	300	< 10	10013	12	< 5	13	10000	< 5	32.4	LS	5	100	57.5
G3-HOR B	27/07/2022	909364	5.3	29	14	< 25	0.9	0.2	< 0.1	1.7	2.8	< 0.1	0.8	< 10	210	< 10	1000	< 5	< 5	< 5	1000	< 5	11.0	SCL	3b	100	50.8
B3-HOR A	27/07/2022	909364	5.3	35	16	31	0.1	0.2	< 0.1	2.1	2.4	< 0.1	2.7	< 10	820	< 10	1800	< 5	< 5	< 5	1800	< 5	24.2	LMC	3b	100	68.7
B3-HOR B	27/07/2022	909364	6.5	42	15	< 25	0.4	0.2	< 0.1	2	2.6	< 0.1	0.6	< 10	790	< 10	500	< 5	< 5	< 5	500	< 5	10.2	SCL	3b	100	52.4
Y3-HOR A	27/07/2022	909364	5.3	120	29	45	2	0.7	< 0.1	5.4	8.1	< 0.1	19	< 10	330	< 10	5900	< 5	< 5	< 5	5900	< 5	12.8	LS	3b	100	53.8
Y3-HOR B	27/07/2022	909364	5.8	18	15	< 25	1	0.5	< 0.1	0.2	1.7	< 0.1	1.5	< 10	240	< 10	1300	< 5	< 5	< 5	1300	< 5	12.8	SCL	3b	100	58.2
B2 PYTL-TP11-A01 (b2)	21/07/2022	907940	6.7	21	16	< 25	2.6	0.8	0.1	4.5	8	0.1	0.9	< 10	690	< 10	490	< 5	< 5	< 5	490	< 5	42	LMC	5	100	90.2
B2 PYTL-TP11-B01 (b2)	21/07/2022	907940	6.7	15	19	< 25	5.8	0.4	0.2	6	12	0.2	0.3	< 10	970	< 10	400	< 5	< 5	< 5	400	< 5	9.57	LMC	3b	100	82.1

Notes:
SC = Clayey sand
SCL = Sandy clay loam
LC = Light clay
LMC = Light medium clay
LS = Loamy sand
B2 PYTL-TP11-A01 sample is location B2 Horizon A
B2 PYTL-TP11-B01 B2 PYTL-TP11-A01 sample is location B2 Horizon A

SLR Consulting
Tenancy 202, Submarine School, Sub Base Platypus,
North Sydney
NSW 2060

Attention: **Nick Barker**

Report **907940-S**
Project name Paling Yards Wing Farm and Transmission GI
Project ID 650.30012
Received Date Jul 21, 2022

Client Sample ID			**PYTL-TP11-A01**	**PYTL-TP11-B01**
Sample Matrix			**Soil**	**Soil**
Eurofins Sample No.			**S22-JI0045378**	**S22-JI0045379**
Date Sampled			**Jul 21, 2022**	**Jul 21, 2022**
Test/Reference	LOR	Unit		
Acidity (as CaCO3)*	25	mg/kg	< 25	< 25
Ammonia (as N)	5	mg/kg	< 5	< 5
Chloride	10	mg/kg	< 10	< 10
Conductivity (1:5 aqueous extract at 25 °C as rec.)	10	uS/cm	21	15
Nitrate & Nitrite (as N)	5	mg/kg	< 5	< 5
Nitrate (as N)	5	mg/kg	< 5	< 5
Nitrite (as N)	5	mg/kg	< 5	< 5
pH (1:5 Aqueous extract at 25 °C as rec.)	0.1	pH Units	6.7	6.7
Sulphate (as SO4)	10	mg/kg	< 10	< 10
Total Carbon	0.1	%	0.9	0.3
Total Kjeldahl Nitrogen (as N)	10	mg/kg	490	400
Total Nitrogen (as N)*	10	mg/kg	490	400
Exchangeable Sodium Percentage (ESP)	0.1	%	1.4	1.4
Magnesium (exchangeable)	0.1	meq/100g	2.6	5.8
Potassium (exchangeable)	0.1	meq/100g	0.8	0.4
Sodium (exchangeable)	0.1	meq/100g	0.1	0.2
% Moisture	1	%	16	19
Emerson aggregate test			see attached	see attached
Particle Size Distribution			see attached	see attached
Phosphorus – Colwell*			see attached	see attached
Texture		comment	see attached	see attached
Heavy Metals				
Phosphorus	10	mg/kg	690	970
Cation Exchange Capacity				
Calcium (exchangeable)	0.1	meq/100g	4.5	6.0
Cation Exchange Capacity	0.05	meq/100g	8.0	12

Sample History

Where samples are submitted/analysed over several days, the last date of extraction is reported.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Acidity (as CaCO3)*	Melbourne	Jul 30, 2022	14 Days
- Method: LTM-INO-4210 Acidity			
Chloride	Sydney	Jul 28, 2022	28 Days
- Method: LTM-INO-4270 Anions by Ion Chromatography			
pH (1:5 Aqueous extract at 25 °C as rec.)	Sydney	Jul 28, 2022	7 Days
- Method: LTM-GEN-7090 pH by ISE			
Sulphate (as SO4)	Sydney	Jul 28, 2022	28 Days
- Method: In-house method LTM-INO-4270 Sulphate by Ion Chromatograph			
Total Carbon	Melbourne	Jul 29, 2022	28 Days
- Method: LTM-INO-4060 Total Organic Carbon in water and soil			
Phosphorus – Colwell*	Melbourne	Jul 22, 2022	0 Days
- Method:			
Eurofins Suite B19D: Total N, TKN, NOx, NO2, NO3, NH3, Total P			
Ammonia (as N)	Sydney	Jul 28, 2022	28 Days
- Method: LTM-INO-4200 Ammonia by Discrete Analyser			
Nitrate & Nitrite (as N)	Melbourne	Jul 29, 2022	28 Days
- Method: LTM-INO-4120 Analysis of NOx NO2 NH3 by FIA			
Nitrate (as N)	Melbourne	Jul 29, 2022	28 Days
- Method: LTM-INO-4120 Analysis of NOx NO2 NH3 by FIA			
Nitrite (as N)	Melbourne	Jul 29, 2022	28 Days
- Method: LTM-INO-4120 Analysis of NOx NO2 NH3 by FIA			
Total Kjeldahl Nitrogen (as N)	Melbourne	Jul 29, 2022	28 Days
- Method: APHA 4500-Norg B,D Total Kjeldahl Nitrogen by FIA			
Heavy Metals	Sydney	Jul 28, 2022	28 Days
- Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS			
Conductivity (1:5 aqueous extract at 25 °C as rec.)	Melbourne	Jul 29, 2022	7 Days
- Method: LTM-INO-4030 Conductivity			
Magnesium (exchangeable)	Melbourne	Jul 29, 2022	180 Days
- Method: LTM-MET-3060 Cation Exchange Capacity and ESP			
Potassium (exchangeable)	Melbourne	Jul 29, 2022	180 Days
- Method: LTM-MET-3060 Cation Exchange Capacity and ESP			
Sodium (exchangeable)	Melbourne	Jul 29, 2022	180 Days
- Method: LTM-MET-3060 Cation Exchange Capacity and ESP			
Cation Exchange Capacity	Melbourne	Jul 29, 2022	28 Days
- Method: LTM-MET-3060 Cation Exchange Capacity by bases & Exchangeable Sodium Percentage			
Exchangeable Sodium Percentage (ESP)	Melbourne	Jul 29, 2022	28 Days
- Method: LTM-MET-3060 - Cation Exchange Capacity (CEC) & Exchangeable Sodium Percentage (ESP)			
% Moisture	Sydney	Jul 22, 2022	14 Days
- Method: LTM-GEN-7080 Moisture			

eurofins

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Christchurch 7675
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Company Name: SLR Consulting (Sydney)
Address: Tenancy 202, Submarine School, Sub Base Platypus, North Sydney NSW 2060

Project Name: Paling Yards Wing Farm and Transmission GI
Project ID: 650.30012

Order No.:
Report #: 907940
Phone: 02 9428 8100
Fax:

Received: Jul 21, 2022 11:23 AM
Due: Jul 28, 2022
Priority: 5 Day
Contact Name: Nick Barker

Eurofins Analytical Services Manager : Andrew Black

Sample Detail						Acidity (as CaCO3)*	Chloride	Emerson aggregate test	HOLD	Particle Size Distribution	pH (1:5 Aqueous extract at 25 °C as rec.)	Phosphorus – Colwell*	Sulphate (as SO4)	Texture	Total Carbon	Eurofins Suite B20	Moisture Set	Eurofins Suite B19D: Total N, TKN, NOx, NO2, NO3, NH3, Total P
Melbourne Laboratory - NATA # 1261 Site # 1254						X									X	X		X
Sydney Laboratory - NATA # 1261 Site # 18217							X		X		X		X				X	X
Perth Laboratory - NATA # 2377 Site # 2370																		
External Laboratory								X		X		X		X				
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**													
1	PYTL-TP11-A01	Jul 21, 2022		Soil	S22-Jl0045378	X	X	X	X	X	X	X	X	X	X	X	X	X
2	PYTL-TP11-B01	Jul 21, 2022		Soil	S22-Jl0045379	X	X	X	X	X	X	X	X	X	X	X	X	X
3	PYTL-TP11-A02	Jul 21, 2022		Soil	S22-Jl0045380				X									
4	PYTL-TP11-B02	Jul 21, 2022		Soil	S22-Jl0045381				X									
5	PYTL-TP12-A01	Jul 21, 2022		Soil	S22-Jl0045382				X									
6	PYTL-TP12-A02	Jul 21, 2022		Soil	S22-Jl0045383				X									
7	PYTL-TP12-	Jul 21, 2022		Soil	S22-Jl0045384				X									

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Company Name: SLR Consulting (Sydney)
Address: Tenancy 202, Submarine School, Sub Base Platypus, North Sydney NSW 2060

Project Name: Paling Yards Wing Farm and Transmission GI
Project ID: 650.30012

Order No.:
Report #: 907940
Phone: 02 9428 8100
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Received: Jul 21, 2022 11:23 AM
Due: Jul 28, 2022
Priority: 5 Day
Contact Name: Nick Barker

Eurofins Analytical Services Manager : Andrew Black

Sample Detail						Acidity (as CaCO3)*	Chloride	Emerson aggregate test	HOLD	Particle Size Distribution	pH (1:5 Aqueous extract at 25 °C as rec.)	Phosphorus – Colwell*	Sulphate (as SO4)	Texture	Total Carbon	Eurofins Suite B20	Moisture Set	Eurofins Suite B19D: Total N, TKN, NOx, NO2, NO3, NH3, Total P
Melbourne Laboratory - NATA # 1261 Site # 1254						X									X	X		X
Sydney Laboratory - NATA # 1261 Site # 18217							X		X		X		X				X	X
Perth Laboratory - NATA # 2377 Site # 2370																		
	B01																	
8	PYTL-TP12-B02	Jul 21, 2022		Soil	S22-Jl0045385				X									
Test Counts						2	2	2	8	2	2	2	2	2	2	2	2	2

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013 and are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. Information identified on this report with blue colour, indicates data provided by customer that may have an impact on the results.
9. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

Units

mg/kg: milligrams per kilogram
mg/L: milligrams per litre
µg/L: micrograms per litre
ppm: parts per million
ppb: parts per billion
%: Percentage
org/100 mL: Organisms per 100 millilitres
NTU: Nephelometric Turbidity Units
MPN/100 mL: Most Probable Number of organisms per 100 millilitres

Terms

APHA	American Public Health Association
COC	Chain of Custody
CP	Client Parent - QC was performed on samples pertaining to this report
CRM	Certified Reference Material (ISO17034) - reported as percent recovery.
Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
LOR	Limit of Reporting.
LCS	Laboratory Control Sample - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
SRA	Sample Receipt Advice
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
TBTO	Tributyltin oxide (*bis*-tributyltin oxide) - individual tributyltin compounds cannot be identified separately in the environment however free tributyltin was measured and its values were converted stoichiometrically into tributyltin oxide for comparison with regulatory limits.
TCLP	Toxicity Characteristic Leaching Procedure
TEQ	Toxic Equivalency Quotient or Total Equivalence
QSM	US Department of Defense Quality Systems Manual Version 5.4
US EPA	United States Environmental Protection Agency
WA DWER	Sum of PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC - Acceptance Criteria

The acceptance criteria should be used as a guide only and may be different when site specific Sampling Analysis and Quality Plan (SAQP) have been implemented

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR: No Limit

Results between 10-20 times the LOR: RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

NOTE: pH duplicates are reported as a range not as RPD

Surrogate Recoveries: Recoveries must lie between 20-130% for Speciated Phenols & 50-150% for PFAS

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.4 where no positive PFAS results have been reported have been reviewed and no data was affected.

.

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling. Therefore, laboratory analysis is unlikely to be completed within holding time.Analysis will begin as soon as possible after sample receipt.
4. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of recovery the term "INT" appears against that analyte.
5. For Matrix Spikes and LCS results a dash "-" in the report means that the specific analyte was not added to the QC sample.
6. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Ammonia (as N)	mg/kg	< 5			5	Pass	
Chloride	mg/kg	< 10			10	Pass	
Conductivity (1:5 aqueous extract at 25 °C as rec.)	uS/cm	< 10			10	Pass	
Sulphate (as SO4)	mg/kg	< 10			10	Pass	
Total Kjeldahl Nitrogen (as N)	mg/kg	< 10			10	Pass	
Exchangeable Sodium Percentage (ESP)	%	< 0.1			0.1	Pass	
Magnesium (exchangeable)	meq/100g	< 0.1			0.1	Pass	
Potassium (exchangeable)	meq/100g	< 0.1			0.1	Pass	
Sodium (exchangeable)	meq/100g	< 0.1			0.1	Pass	
Method Blank							
Heavy Metals							
Phosphorus	mg/kg	< 10			10	Pass	
Method Blank							
Cation Exchange Capacity							
Calcium (exchangeable)	meq/100g	< 0.1			0.1	Pass	
Cation Exchange Capacity	meq/100g	< 0.05			0.05	Pass	
LCS - % Recovery							
Ammonia (as N)	%	96			70-130	Pass	
Chloride	%	104			70-130	Pass	
Sulphate (as SO4)	%	102			70-130	Pass	
Total Kjeldahl Nitrogen (as N)	%	82			70-130	Pass	
LCS - % Recovery							
Heavy Metals							
Phosphorus	%	110			80-120	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
				Result 1					
Chloride	S22-JI0047348	NCP	%	105			70-130	Pass	
Sulphate (as SO4)	S22-JI0047348	NCP	%	114			70-130	Pass	
Spike - % Recovery									
				Result 1					
Ammonia (as N)	S22-JI0045379	CP	%	115			70-130	Pass	
Spike - % Recovery									
Heavy Metals				Result 1					
Phosphorus	S22-JI0045379	CP	%	100			75-125	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1	Result 2	RPD	Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
				Result 1	Result 2	RPD			
Ammonia (as N)	S22-JI0045378	CP	mg/kg	< 5	< 5	<1	30%	Pass	
Chloride	S22-JI0047345	NCP	mg/kg	1100	1100	<1	30%	Pass	
Conductivity (1:5 aqueous extract at 25 °C as rec.)	M22-JI0059045	NCP	uS/cm	58	59	1.4	30%	Pass	
pH (1:5 Aqueous extract at 25 °C as rec.)	S22-JI0044260	NCP	pH Units	9.1	9.0	<1	30%	Pass	
Sulphate (as SO4)	S22-JI0047345	NCP	mg/kg	50	49	3.5	30%	Pass	
Total Kjeldahl Nitrogen (as N)	M22-JI0058614	NCP	mg/kg	1300	1200	9.2	30%	Pass	
Exchangeable Sodium Percentage (ESP)	S22-JI0047269	NCP	%	3.6	3.5	2.1	30%	Pass	
Magnesium (exchangeable)	S22-JI0047269	NCP	meq/100g	5.8	6.3	8.1	30%	Pass	
Potassium (exchangeable)	S22-JI0047269	NCP	meq/100g	0.4	0.4	7.1	30%	Pass	
Sodium (exchangeable)	S22-JI0047269	NCP	meq/100g	0.4	0.4	5.6	30%	Pass	
% Moisture	S22-JI0044280	NCP	%	17	16	5.3	30%	Pass	

Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Phosphorus	S22-Jl0045378	CP	mg/kg	690	720	5.0	30%	Pass	
Duplicate									
Cation Exchange Capacity				Result 1	Result 2	RPD			
Calcium (exchangeable)	S22-Jl0047269	NCP	meq/100g	4.7	5.1	7.5	30%	Pass	
Cation Exchange Capacity	S22-Jl0047269	NCP	meq/100g	11	12	7.7	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
Total Carbon	S22-Jl0045379	CP	%	0.3	0.6	60	30%	Fail	Q15

Comments

Emerson Aggregate Test performed by Eastwest Geo Ag Enviro; report reference EW221380.

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	Yes

Qualifier Codes/Comments

Code	Description
Q15	The RPD reported passes Eurofins Environment Testing's QC - Acceptance Criteria as defined in the Internal Quality Control Review and Glossary page of this report.

Authorised by:

Andrew Black	Analytical Services Manager
Caitlin Breeze	Senior Analyst-Inorganic
Dilani Samarakoon	Senior Analyst-Inorganic
Gabriele Cordero	Senior Analyst-Inorganic
Gabriele Cordero	Senior Analyst-Metal
Mary Makarios	Senior Analyst-Inorganic
Mary Makarios	Senior Analyst-Metal
Ryan Phillips	Senior Analyst-Inorganic
Scott Beddoes	Senior Analyst-Inorganic

Glenn Jackson
General Manager

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please click here.

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ANALYSIS REPORT SOIL

PROJECT NO: EW221380		**Date of Issue:**	**02/08/2022**
Customer:	EUROFINS SYDNEY	Report No:	1
Address:	Unit F3 Unit F3, 16 Mars Road, Lane Cove NSW 2066 LANE COVE NSW 2066	Date Received:	29/07/2022
		Matrix:	Soil
Attention:	Andrew Black	Location:	907940
Phone:	0410 220 750	Sampler ID:	Client
Fax:		Date of Sampling:	21/07/2022
Email:	AndrewBlack@eurofins.com	Sample Condition:	Acceptable

Comments:
3b = moderate to slight dispersion of the remould.

Results apply to the samples as submitted. All pages of this report have been checked and approved for release.

Signed: Anne Michie

ASPAC PROFICIENT LAB
Visit www.aspac-australasia.com to view our certification details.

East West is certified by the Australian-Asian Soil & Plant Analysis Council to perform various soil and plant tissue analysis. The tests reported herein have been performed in accordance with our terms of accreditation.

This report must not be reproduced except in full and EWEA takes no responsibility of the end use of the results within this report.

This analysis relates to the sample submitted and it is the client's responsibility to make certain the sample is representative of the matrix to be tested.

Samples will be discarded one month after the date of this report. Please advise if you wish to have your sample/s returned.

ANALYSIS REPORT

PROJECT NO: EW221380 **Location: 907940**

				CLIENT SAMPLE ID	S22-JI0045379	S22-JI0045378		
				DEPTH	PYTL-TP11-B01	PYTL-TP11-A01		
Test Parameter	**Method Description**	**Method Reference**	**Units**	**LOR**	**221380-1**	**221380-2**		
Phosphorus (Colwell)	Bicarb/UV-Vis	R&L 9B1	mg/kg	1	42.0	9.57		
Texture	Field	Northcote	Class	na	LMC	LMC		
Emerson Aggregate Test	Class	PMS-21	Number	na	5	3b		
% Passing 50mm	Sieve	MRTS16	%	na	100	100		
% Passing 2.36mm	Sieve	In House	%	na	90.2	82.1		

This Analysis Report shall not be reproduced except in full without the written approval of the laboratory.

Soils are air dried at 40^{0}C and ground <2mm.

NB: LOR is the Lowest Obtainable Reading.

DOCUMENT END

eurofins | Environment Testing

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6 Monterey Road	19/8 Lewalan Street	179 Magowar Road	Unit 1,2 Dacre Street	1/21 Smallwood Place	4/52 Industrial Drive
Dandenong South	Grovedale	Girraween	Mitchell	Murarrie	Mayfield East NSW 2304
VIC 3175	VIC 3216	NSW 2145	ACT 2911	QLD 4172	PO Box 60 Wickham 2293
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NATA# 1261 Site# 1254	NATA# 1261 Site# 1254	NATA# 1261 Site# 18217		NATA# 1261 Site# 20794	NATA# 1261 Site# 25079

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NZBN: 9429046024954

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Penrose,	Rolleston,
Auckland 1061	Christchurch 7675
Tel: +64 9 526 45 51	Tel: 0800 856 450
IANZ# 1327	IANZ# 1290

Sample Receipt Advice

Company name:	SLR Consulting (Sydney)
Contact name:	Nick Barker
Project name:	Paling Yards Wing Farm and Transmission GI
Project ID:	650.30012
Turnaround time:	5 Day
Date/Time received	Jul 21, 2022 11:23 AM
Eurofins reference	907940

Sample Information

✓	A detailed list of analytes logged into our LIMS, is included in the attached summary table.
✓	All samples have been received as described on the above COC.
✓	COC has been completed correctly.
✓	Attempt to chill was evident.
✓	Appropriately preserved sample containers have been used.
✓	All samples were received in good condition.
✓	Samples have been provided with adequate time to commence analysis in accordance with the relevant holding times.
✓	Appropriate sample containers have been used.
✓	Sample containers for volatile analysis received with zero headspace.
✓	Split sample sent to requested external lab.
✓	Some samples have been subcontracted.
N/A	Custody Seals intact (if used).

Notes

Contact

If you have any questions with respect to these samples, please contact your Analytical Services Manager:

Andrew Black on phone : (+61) 2 9900 8490 or by email: AndrewBlack@eurofins.com

Results will be delivered electronically via email to Nick Barker - nbarker@slrconsulting.com.

Note: A copy of these results will also be delivered to the general SLR Consulting (Sydney) email address.

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web: www.eurofins.com.au
email: EnviroSales@eurofins.com

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NATA# 1261 Site# 1254

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Tel: 0800 856 450
IANZ# 1290

Company Name: SLR Consulting (Sydney)
Address: Tenancy 202, Submarine School, Sub Base Platypus, North Sydney NSW 2060

Project Name: Paling Yards Wing Farm and Transmission GI
Project ID: 650.30012

Order No.:
Report #: 907940
Phone: 02 9428 8100
Fax:

Received: Jul 21, 2022 11:23 AM
Due: Jul 28, 2022
Priority: 5 Day
Contact Name: Nick Barker

Eurofins Analytical Services Manager : Andrew Black

Sample Detail						Acidity (as CaCO3)*	Chloride	Emerson aggregate test	HOLD	Particle Size Distribution	pH (1:5 Aqueous extract at 25 °C as rec.)	Phosphorus – Colwell*	Sulphate (as SO4)	Texture	Total Carbon	Eurofins Suite B20	Moisture Set	Eurofins Suite B19D: Total N, TKN, NOx, NO2, NO3, NH3, Total P
Melbourne Laboratory - NATA # 1261 Site # 1254						X									X	X		X
Sydney Laboratory - NATA # 1261 Site # 18217							X		X		X		X				X	X
Perth Laboratory - NATA # 2377 Site # 2370																		
External Laboratory								X		X		X		X				
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**													
1	PYTL-TP11-A01	Jul 21, 2022		Soil	S22-Jl0045378	X	X	X	X	X	X	X	X	X	X	X	X	X
2	PYTL-TP11-B01	Jul 21, 2022		Soil	S22-Jl0045379	X	X	X	X	X	X	X	X	X	X	X	X	X
3	PYTL-TP11-A02	Jul 21, 2022		Soil	S22-Jl0045380				X									
4	PYTL-TP11-B02	Jul 21, 2022		Soil	S22-Jl0045381				X									
5	PYTL-TP12-A01	Jul 21, 2022		Soil	S22-Jl0045382				X									
6	PYTL-TP12-A02	Jul 21, 2022		Soil	S22-Jl0045383				X									
7	PYTL-TP12-	Jul 21, 2022		Soil	S22-Jl0045384				X									

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Christchurch 7675
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IANZ# 1290

Company Name: SLR Consulting (Sydney)
Address: Tenancy 202, Submarine School, Sub Base Platypus, North Sydney NSW 2060

Project Name: Paling Yards Wing Farm and Transmission GI
Project ID: 650.30012

Order No.:
Report #: 907940
Phone: 02 9428 8100
Fax:

Received: Jul 21, 2022 11:23 AM
Due: Jul 28, 2022
Priority: 5 Day
Contact Name: Nick Barker

Eurofins Analytical Services Manager : Andrew Black

Sample Detail						Acidity (as CaCO3)*	Chloride	Emerson aggregate test	HOLD	Particle Size Distribution	pH (1:5 Aqueous extract at 25 °C as rec.)	Phosphorus – Colwell*	Sulphate (as SO4)	Texture	Total Carbon	Eurofins Suite B20	Moisture Set	Eurofins Suite B19D: Total N, TKN, NOx, NO2, NO3, NH3, Total P
Melbourne Laboratory - NATA # 1261 Site # 1254						X									X	X		X
Sydney Laboratory - NATA # 1261 Site # 18217							X		X		X		X				X	X
Perth Laboratory - NATA # 2377 Site # 2370																		
	B01																	
8	PYTL-TP12-B02	Jul 21, 2022		Soil	S22-Jl0045385				X									
Test Counts						2	2	2	8	2	2	2	2	2	2	2	2	2

CHAIN OF CUSTODY DOCUMENTATION

SLR Consulting Australia Pty Ltd

ABN 29 001 584 612

CLIENT: SLR Consulting	**LABORATORY: Eurofins**	Turnaround Time (TAT)	COC Number 1 of 1
PROJECT: Paling Yards Wing Farm and Transmission GI	**LABORATORY ADDRESS: Eurifins Wollongong**		
PROJECT NUMBER: 650.30012	**SAMPLER: Gadha Lal**	☒ Standard TAT	
PROJECT MANAGER: Nick Barker	**SAMPLER CONTACT No: 0449 660 135**	☐ Non Standard or Urgent TAT	
PM CONTACT No: 0405 366 535	**Email Reports and Invoices to: glal@slrconsulting.com**	Required TAT: Standard	

COMMENTS OR ADDITIONAL DIRECTIONS

No.	Sample ID	Date & Time	Matrix (Soil, water, ACM, etc)	Containers and Preservatives	REQUESTED ANALYSIS: B19D -Nutrients Suite	B20 - Ion Excahane Suite	Total Carbon	Chloride	Sulphate	Moisture Content	Soil Texture	Exchange Acidity	Colwell Phosphorus	Emerson Aggregate	PSD by sieve and Hydrometer	pH (1:5 Aqueous Extract)	Additional Information (Comment on any gross contamination or specific requirements)
1	PYTL-TP11-A01	21-07-2022	Soil	1 jar	x	x	x	x	x	x	x	x	x	x	x	x	hold
2	PYTL-TP11-A02	"	Soil	"													hold
	PYTL-TP11-B01	"	Soil	"	x	x	x	x	x	x	x	x	x	x	x	x	hold
	PYTL-TP11-B02	"	Soil	"													hold
	PYTL-TP12-A01	"	Soil	"													hold
	PYTL-TP12-A02	"	Soil	"													hold
	PYTL-TP12-B01	"	Soil	"													hold
	PYTL-TP12-B02	"	Soil	"													hold

907940

Sample Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass; Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag; LI = Lugols Iodine Preserved Bottles; STT = Sterile Sodium Thiosulfate Preserved Bottles; G = unpreserved glass soil jar;

I attest that the proper field sampling procedures were used during the collection of these samples.

Relinquished By Sampler	Gadha Lal	Date / Time	21-Jul	**Received b**	Eurofins Wollongong	21-07-2022	**Temperature Received:**
Relinquished By		Date / Time		**Received b**	Sign	Date / Time	
Relinquished By		Date / Time		**Received b**	Sign	Date / Time	

SLR Consulting
Tenancy 202, Submarine School, Sub Base Platypus,
North Sydney
NSW 2060

Attention: **Nick Barker**

Report **909364-S**
Project name PALING YARDS WING FARM AND TRANSMISSION GL
Project ID 650.30012
Received Date Jul 27, 2022

Client Sample ID			**G1-HOR A**	**G1-HOR B**	**B1-HOR A**	**B1-HOR B**
Sample Matrix			**Soil**	**Soil**	**Soil**	**Soil**
Eurofins Sample No.			**S22-JI0056472**	**S22-JI0056473**	**S22-JI0056474**	**S22-JI0056475**
Date Sampled			**Jul 27, 2022**	**Jul 27, 2022**	**Jul 27, 2022**	**Jul 27, 2022**
Test/Reference	LOR	Unit				
Acidity (as CaCO3)*	25	mg/kg	33	< 25	79	< 25
Ammonia (as N)	5	mg/kg	< 5	< 5	< 5	< 5
Chloride	10	mg/kg	< 10	< 10	11	< 10
Conductivity (1:5 aqueous extract at 25 °C as rec.)	10	uS/cm	30	15	120	21
Nitrate & Nitrite (as N)	5	mg/kg	< 5	< 5	< 5	< 5
Nitrate (as N)	5	mg/kg	< 5	< 5	< 5	< 5
Nitrite (as N)	5	mg/kg	< 5	< 5	< 5	< 5
pH (1:5 Aqueous extract at 25 °C as rec.)	0.1	pH Units	6.2	6.5	5.7	5.6
Sulphate (as SO4)	10	mg/kg	< 10	< 10	< 10	< 10
Total Carbon	0.1	%	2.5	0.6	7.1	1.3
Total Kjeldahl Nitrogen (as N)	10	mg/kg	3300	1200	8700	1200
Total Nitrogen (as N)*	10	mg/kg	3300	1200	8700	1200
Exchangeable Sodium Percentage (ESP)	0.1	%	< 0.1	< 0.1	< 0.1	< 0.1
Magnesium (exchangeable)	0.1	meq/100g	2.2	4.3	0.5	0.8
Potassium (exchangeable)	0.1	meq/100g	0.5	0.8	0.3	0.2
Sodium (exchangeable)	0.1	meq/100g	< 0.1	< 0.1	< 0.1	< 0.1
% Moisture	1	%	25	20	32	17
Emerson aggregate test			See Attached	See Attached	See Attached	See Attached
Particle Size Distribution			See Attached	See Attached	See Attached	See Attached
Phosphorus – Colwell*						
Texture		comment				
Heavy Metals						
Phosphorus	10	mg/kg	1300	2400	630	250
Cation Exchange Capacity						
Calcium (exchangeable)	0.1	meq/100g	9.2	13	4.4	3.1
Cation Exchange Capacity	0.05	meq/100g	12	18	5.2	4.1

Client Sample ID			Y1-HOR A	[G01]Y1-HOR B	G2-HOR A	[G01]G2-HOR B
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			S22-JI0056476	S22-JI0056477	S22-JI0056478	S22-JI0056479
Date Sampled			Jul 27, 2022	Jul 27, 2022	Jul 27, 2022	Jul 27, 2022
Test/Reference	LOR	Unit				
Acidity (as CaCO3)*	25	mg/kg	< 25	< 25	26	< 25
Ammonia (as N)	5	mg/kg	< 5	< 5	12	< 5
Chloride	10	mg/kg	< 10	< 10	48	13
Conductivity (1:5 aqueous extract at 25 °C as rec.)	10	uS/cm	54	31	140	47
Nitrate & Nitrite (as N)	5	mg/kg	< 5	< 20	11	< 20
Nitrate (as N)	5	mg/kg	< 5	< 20	11	< 20
Nitrite (as N)	5	mg/kg	< 5	< 20	< 5	< 20
pH (1:5 Aqueous extract at 25 °C as rec.)	0.1	pH Units	5.9	5.6	5.5	6.2
Sulphate (as SO4)	10	mg/kg	13	< 10	28	< 10
Total Carbon	0.1	%	11	2.7	2.1	1.3
Total Kjeldahl Nitrogen (as N)	10	mg/kg	3000	1100	3400	1300
Total Nitrogen (as N)*	10	mg/kg	3000	1100	3411	1300
Exchangeable Sodium Percentage (ESP)	0.1	%	< 0.1	< 0.1	< 0.1	< 0.1
Magnesium (exchangeable)	0.1	meq/100g	1.4	0.8	0.9	4.4
Potassium (exchangeable)	0.1	meq/100g	0.7	0.5	1.8	1.1
Sodium (exchangeable)	0.1	meq/100g	< 0.1	< 0.1	< 0.1	< 0.1
% Moisture	1	%	26	16	24	21
Emerson aggregate test			See Attached	See Attached	See Attached	See Attached
Particle Size Distribution			See Attached	See Attached	See Attached	See Attached
Phosphorus – Colwell*						
Texture		comment				
Heavy Metals						
Phosphorus	10	mg/kg	380	490	800	630
Cation Exchange Capacity						
Calcium (exchangeable)	0.1	meq/100g	6.0	2.0	4.5	7.0
Cation Exchange Capacity	0.05	meq/100g	8.1	3.2	7.2	12

Client Sample ID			Y2-HOR A	Y2-HOR B	G3-HOR A	G3-HOR B
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			S22-JI0056480	S22-JI0056481	S22-JI0056482	S22-JI0056483
Date Sampled			Jul 27, 2022	Jul 27, 2022	Jul 27, 2022	Jul 27, 2022
Test/Reference	LOR	Unit				
Acidity (as CaCO3)*	25	mg/kg	< 25	< 25	190	< 25
Ammonia (as N)	5	mg/kg	< 5	< 5	< 5	< 5
Chloride	10	mg/kg	< 10	< 10	< 10	< 10
Conductivity (1:5 aqueous extract at 25 °C as rec.)	10	uS/cm	92	40	230	29
Nitrate & Nitrite (as N)	5	mg/kg	6.7	< 5	13	< 5
Nitrate (as N)	5	mg/kg	6.7	< 5	12	< 5
Nitrite (as N)	5	mg/kg	< 5	< 5	< 5	< 5
pH (1:5 Aqueous extract at 25 °C as rec.)	0.1	pH Units	6.3	6.2	5.2	5.3
Sulphate (as SO4)	10	mg/kg	< 10	< 10	< 10	< 10
Total Carbon	0.1	%	3.8	1.1	19	0.8
Total Kjeldahl Nitrogen (as N)	10	mg/kg	1800	1300	10000	1000
Total Nitrogen (as N)*	10	mg/kg	1806.7	1300	10013	1000
Exchangeable Sodium Percentage (ESP)	0.1	%	< 0.1	< 0.1	< 0.1	< 0.1
Magnesium (exchangeable)	0.1	meq/100g	3.7	4.3	2.1	0.9
Potassium (exchangeable)	0.1	meq/100g	0.8	0.7	0.5	0.2

Client Sample ID			Y2-HOR A	Y2-HOR B	G3-HOR A	G3-HOR B
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			S22-JI0056480	S22-JI0056481	S22-JI0056482	S22-JI0056483
Date Sampled			Jul 27, 2022	Jul 27, 2022	Jul 27, 2022	Jul 27, 2022
Test/Reference	LOR	Unit				
Sodium (exchangeable)	0.1	meq/100g	< 0.1	< 0.1	< 0.1	< 0.1
% Moisture	1	%	19	13	35	14
Emerson aggregate test			See Attached	See Attached	See Attached	See Attached
Particle Size Distribution			See Attached	See Attached	See Attached	See Attached
Phosphorus – Colwell*						
Texture		comment				
Heavy Metals						
Phosphorus	10	mg/kg	690	560	300	210
Cation Exchange Capacity						
Calcium (exchangeable)	0.1	meq/100g	9.2	8.1	8.7	1.7
Cation Exchange Capacity	0.05	meq/100g	14	13	11	2.8

Client Sample ID			B3-HOR A	B3-HOR B	Y3-HOR A	Y3-HOR B
Sample Matrix			Soil	Soil	Soil	Soil
Eurofins Sample No.			S22-JI0056484	S22-JI0056485	S22-JI0056486	S22-JI0056487
Date Sampled			Jul 27, 2022	Jul 27, 2022	Jul 27, 2022	Jul 27, 2022
Test/Reference	LOR	Unit				
Acidity (as CaCO3)*	25	mg/kg	31	< 25	45	< 25
Ammonia (as N)	5	mg/kg	< 5	< 5	< 5	< 5
Chloride	10	mg/kg	< 10	< 10	< 10	< 10
Conductivity (1:5 aqueous extract at 25 °C as rec.)	10	uS/cm	35	42	120	18
Nitrate & Nitrite (as N)	5	mg/kg	< 5	< 5	< 5	< 5
Nitrate (as N)	5	mg/kg	< 5	< 5	< 5	< 5
Nitrite (as N)	5	mg/kg	< 5	< 5	< 5	< 5
pH (1:5 Aqueous extract at 25 °C as rec.)	0.1	pH Units	5.3	6.5	5.3	5.8
Sulphate (as SO4)	10	mg/kg	< 10	< 10	< 10	< 10
Total Carbon	0.1	%	2.7	0.6	19	1.5
Total Kjeldahl Nitrogen (as N)	10	mg/kg	1800	500	5900	1300
Total Nitrogen (as N)*	10	mg/kg	1800	500	5900	1300
Exchangeable Sodium Percentage (ESP)	0.1	%	< 0.1	< 0.1	< 0.1	< 0.1
Magnesium (exchangeable)	0.1	meq/100g	0.1	0.4	2.0	1.0
Potassium (exchangeable)	0.1	meq/100g	0.2	0.2	0.7	0.5
Sodium (exchangeable)	0.1	meq/100g	< 0.1	< 0.1	< 0.1	< 0.1
% Moisture	1	%	16	15	29	15
Emerson aggregate test			See Attached	See Attached	See Attached	See Attached
Particle Size Distribution			See Attached	See Attached	See Attached	See Attached
Phosphorus – Colwell*						
Texture		comment				
Heavy Metals						
Phosphorus	10	mg/kg	820	790	330	240
Cation Exchange Capacity						
Calcium (exchangeable)	0.1	meq/100g	2.1	2.0	5.4	0.2
Cation Exchange Capacity	0.05	meq/100g	2.4	2.6	8.1	1.7

Sample History

Where samples are submitted/analysed over several days, the last date of extraction is reported.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Acidity (as CaCO3)*	Melbourne	Aug 03, 2022	14 Days
- Method: LTM-INO-4210 Acidity			
Chloride	Sydney	Aug 02, 2022	28 Days
- Method: LTM-INO-4270 Anions by Ion Chromatography			
pH (1:5 Aqueous extract at 25 °C as rec.)	Sydney	Aug 02, 2022	7 Days
- Method: LTM-GEN-7090 pH by ISE			
Sulphate (as SO4)	Sydney	Aug 02, 2022	28 Days
- Method: In-house method LTM-INO-4270 Sulphate by Ion Chromatograph			
Total Carbon	Melbourne	Aug 03, 2022	28 Days
- Method: LTM-INO-4060 Total Organic Carbon in water and soil			
Phosphorus – Colwell*	Sydney	Jul 28, 2022	0 Days
- Method:			
Eurofins Suite B19D: Total N, TKN, NOx, NO2, NO3, NH3, Total P			
Ammonia (as N)	Sydney	Aug 02, 2022	28 Days
- Method: LTM-INO-4200 Ammonia by Discrete Analyser			
Nitrate & Nitrite (as N)	Melbourne	Aug 03, 2022	28 Days
- Method: LTM-INO-4120 Analysis of NOx NO2 NH3 by FIA			
Nitrate (as N)	Melbourne	Aug 03, 2022	28 Days
- Method: LTM-INO-4120 Analysis of NOx NO2 NH3 by FIA			
Nitrite (as N)	Melbourne	Aug 03, 2022	28 Days
- Method: LTM-INO-4120 Analysis of NOx NO2 NH3 by FIA			
Total Kjeldahl Nitrogen (as N)	Melbourne	Aug 03, 2022	28 Days
- Method: APHA 4500-Norg B,D Total Kjeldahl Nitrogen by FIA			
Heavy Metals	Sydney	Aug 02, 2022	28 Days
- Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS			
Conductivity (1:5 aqueous extract at 25 °C as rec.)	Melbourne	Aug 03, 2022	7 Days
- Method: LTM-INO-4030 Conductivity			
Magnesium (exchangeable)	Melbourne	Aug 05, 2022	180 Days
- Method: LTM-MET-3060 Cation Exchange Capacity and ESP			
Potassium (exchangeable)	Melbourne	Aug 05, 2022	180 Days
- Method: LTM-MET-3060 Cation Exchange Capacity and ESP			
Sodium (exchangeable)	Melbourne	Aug 05, 2022	180 Days
- Method: LTM-MET-3060 Cation Exchange Capacity and ESP			
Cation Exchange Capacity	Melbourne	Aug 05, 2022	28 Days
- Method: LTM-MET-3060 Cation Exchange Capacity by bases & Exchangeable Sodium Percentage			
Exchangeable Sodium Percentage (ESP)	Melbourne	Aug 05, 2022	28 Days
- Method: LTM-MET-3060 - Cation Exchange Capacity (CEC) & Exchangeable Sodium Percentage (ESP)			
% Moisture	Sydney	Jul 28, 2022	14 Days
- Method: LTM-GEN-7080 Moisture			

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web: www.eurofins.com.au
email: EnviroSales@eurofins.com

Eurofins Environment Testing Australia Pty Ltd
ABN: 50 005 085 521

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Tel: +61 3 8564 5000
NATA# 1261 Site# 1254

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VIC 3216
Tel: +61 3 8564 5000
NATA# 1261 Site# 1254

Sydney
179 Magowar Road
Girraween
NSW 2145
Tel: +61 2 9900 8400
NATA# 1261 Site# 18217

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Mitchell
ACT 2911
Tel: +61 2 6113 8091

Brisbane
1/21 Smallwood Place
Murarrie
QLD 4172
Tel: +61 7 3902 4600
NATA# 1261 Site# 20794

Newcastle
4/52 Industrial Drive
Mayfield East NSW 2304
PO Box 60 Wickham 2293
Tel: +61 2 4968 8448
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Eurofins ARL Pty Ltd
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46-48 Banksia Road
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NATA# 2377 Site# 2370

Eurofins Environment Testing NZ Ltd
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Penrose,
Auckland 1061
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IANZ# 1327

Christchurch
43 Detroit Drive
Rolleston,
Christchurch 7675
Tel: 0800 856 450
IANZ# 1290

Company Name: SLR Consulting (Sydney)
Address: Tenancy 202, Submarine School, Sub Base Platypus, North Sydney NSW 2060

Project Name: PALING YARDS WING FARM AND TRANSMISSION GL
Project ID: 650.30012

Order No.:
Report #: 909364
Phone: 02 9428 8100
Fax:

Received: Jul 27, 2022 5:00 PM
Due: Aug 3, 2022
Priority: 5 Day
Contact Name: Nick Barker

Eurofins Analytical Services Manager : Andrew Black

Sample Detail						Acidity (as CaCO3)*	Chloride	Emerson aggregate test	Particle Size Distribution	pH (1:5 Aqueous extract at 25 °C as rec.)	Phosphorus – Colwell*	Sulphate (as SO4)	Texture	Total Carbon	Eurofins Suite B20	Moisture Set	Eurofins Suite B19D: Total N, TKN, NOx, NO2, NO3, NH3, Total P
Melbourne Laboratory - NATA # 1261 Site # 1254						X								X	X		X
Sydney Laboratory - NATA # 1261 Site # 18217							X			X		X				X	X
Perth Laboratory - NATA # 2377 Site # 2370																	
External Laboratory								X	X		X		X				
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**												
1	G1-HOR A	Jul 27, 2022		Soil	S22-Jl0056472	X	X	X	X	X	X	X	X	X	X	X	X
2	G1-HOR B	Jul 27, 2022		Soil	S22-Jl0056473	X	X	X	X	X	X	X	X	X	X	X	X
3	B1-HOR A	Jul 27, 2022		Soil	S22-Jl0056474	X	X	X	X	X	X	X	X	X	X	X	X
4	B1-HOR B	Jul 27, 2022		Soil	S22-Jl0056475	X	X	X	X	X	X	X	X	X	X	X	X
5	Y1-HOR A	Jul 27, 2022		Soil	S22-Jl0056476	X	X	X	X	X	X	X	X	X	X	X	X
6	Y1-HOR B	Jul 27, 2022		Soil	S22-Jl0056477	X	X	X	X	X	X	X	X	X	X	X	X
7	G2-HOR A	Jul 27, 2022		Soil	S22-Jl0056478	X	X	X	X	X	X	X	X	X	X	X	X
8	G2-HOR B	Jul 27, 2022		Soil	S22-Jl0056479	X	X	X	X	X	X	X	X	X	X	X	X
9	Y2-HOR A	Jul 27, 2022		Soil	S22-Jl0056480	X	X	X	X	X	X	X	X	X	X	X	X
10	Y2-HOR B	Jul 27, 2022		Soil	S22-Jl0056481	X	X	X	X	X	X	X	X	X	X	X	X
11	G3-HOR A	Jul 27, 2022		Soil	S22-Jl0056482	X	X	X	X	X	X	X	X	X	X	X	X

eurofins

web: www.eurofins.com.au
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Eurofins Environment Testing Australia Pty Ltd
ABN: 50 005 085 521

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Christchurch 7675
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Melbourne Laboratory - NATA # 1261 Site # 1254						X								X	X		X
Sydney Laboratory - NATA # 1261 Site # 18217							X			X		X				X	X
Perth Laboratory - NATA # 2377 Site # 2370																	
12	G3-HOR B	Jul 27, 2022		Soil	S22-Jl0056483	X	X	X	X	X	X	X	X	X	X	X	X
13	B3-HOR A	Jul 27, 2022		Soil	S22-Jl0056484	X	X	X	X	X	X	X	X	X	X	X	X
14	B3-HOR B	Jul 27, 2022		Soil	S22-Jl0056485	X	X	X	X	X	X	X	X	X	X	X	X
15	Y3-HOR A	Jul 27, 2022		Soil	S22-Jl0056486	X	X	X	X	X	X	X	X	X	X	X	X
16	Y3-HOR B	Jul 27, 2022		Soil	S22-Jl0056487	X	X	X	X	X	X	X	X	X	X	X	X
Test Counts						16	16	16	16	16	16	16	16	16	16	16	16

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013 and are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. Information identified on this report with blue colour, indicates data provided by customer that may have an impact on the results.
9. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

Units

mg/kg: milligrams per kilogram
mg/L: milligrams per litre
µg/L: micrograms per litre
ppm: parts per million
ppb: parts per billion
%: Percentage
org/100 mL: Organisms per 100 millilitres
NTU: Nephelometric Turbidity Units
MPN/100 mL: Most Probable Number of organisms per 100 millilitres

Terms

APHA	American Public Health Association
COC	Chain of Custody
CP	Client Parent - QC was performed on samples pertaining to this report
CRM	Certified Reference Material (ISO17034) - reported as percent recovery.
Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
LOR	Limit of Reporting.
LCS	Laboratory Control Sample - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
SRA	Sample Receipt Advice
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
TBTO	Tributyltin oxide (*bis*-tributyltin oxide) - individual tributyltin compounds cannot be identified separately in the environment however free tributyltin was measured and its values were converted stoichiometrically into tributyltin oxide for comparison with regulatory limits.
TCLP	Toxicity Characteristic Leaching Procedure
TEQ	Toxic Equivalency Quotient or Total Equivalence
QSM	US Department of Defense Quality Systems Manual Version 5.4
US EPA	United States Environmental Protection Agency
WA DWER	Sum of PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC - Acceptance Criteria

The acceptance criteria should be used as a guide only and may be different when site specific Sampling Analysis and Quality Plan (SAQP) have been implemented

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR: No Limit

Results between 10-20 times the LOR: RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

NOTE: pH duplicates are reported as a range not as RPD

Surrogate Recoveries: Recoveries must lie between 20-130% for Speciated Phenols & 50-150% for PFAS

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.4 where no positive PFAS results have been reported have been reviewed and no data was affected.

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QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling. Therefore, laboratory analysis is unlikely to be completed within holding time.Analysis will begin as soon as possible after sample receipt.
4. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of recovery the term "INT" appears against that analyte.
5. For Matrix Spikes and LCS results a dash "-" in the report means that the specific analyte was not added to the QC sample.
6. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Acidity (as CaCO3)*	mg/kg	< 25			25	Pass	
Ammonia (as N)	mg/kg	< 5			5	Pass	
Chloride	mg/kg	< 10			10	Pass	
Conductivity (1:5 aqueous extract at 25 °C as rec.)	uS/cm	< 10			10	Pass	
Sulphate (as SO4)	mg/kg	< 10			10	Pass	
Total Kjeldahl Nitrogen (as N)	mg/kg	< 10			10	Pass	
Exchangeable Sodium Percentage (ESP)	%	< 0.1			0.1	Pass	
Magnesium (exchangeable)	meq/100g	< 0.1			0.1	Pass	
Potassium (exchangeable)	meq/100g	< 0.1			0.1	Pass	
Sodium (exchangeable)	meq/100g	< 0.1			0.1	Pass	
Method Blank							
Heavy Metals							
Phosphorus	mg/kg	< 10			10	Pass	
Method Blank							
Cation Exchange Capacity							
Calcium (exchangeable)	meq/100g	< 0.1			0.1	Pass	
Cation Exchange Capacity	meq/100g	< 0.05			0.05	Pass	
LCS - % Recovery							
Ammonia (as N)	%	99			70-130	Pass	
Chloride	%	99			70-130	Pass	
Sulphate (as SO4)	%	99			70-130	Pass	
Total Kjeldahl Nitrogen (as N)	%	92			70-130	Pass	
LCS - % Recovery							
Heavy Metals							
Phosphorus	%	97			80-120	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
				Result 1					
Ammonia (as N)	S22-Jl0056472	CP	%	92			70-130	Pass	
Chloride	S22-Au0000728	NCP	%	100			70-130	Pass	
Sulphate (as SO4)	S22-Au0000728	NCP	%	97			70-130	Pass	
Spike - % Recovery									
				Result 1					
Ammonia (as N)	S22-Jl0056485	CP	%	102			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1	Result 2	RPD	Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
				Result 1	Result 2	RPD			
Conductivity (1:5 aqueous extract at 25 °C as rec.)	M22-Au0007734	NCP	uS/cm	52	100	2.6	30%	Pass	
Nitrate & Nitrite (as N)	M22-Jl0061429	NCP	mg/kg	< 5	< 5	<1	30%	Pass	
Nitrate (as N)	M22-Jl0061429	NCP	mg/kg	< 5	< 5	<1	30%	Pass	
Nitrite (as N)	M22-Jl0061429	NCP	mg/kg	< 5	< 5	<1	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
Exchangeable Sodium Percentage (ESP)	S22-Jl0056473	CP	%	< 0.1	< 0.1	<1	30%	Pass	
Magnesium (exchangeable)	S22-Jl0056473	CP	meq/100g	4.3	3.7	16	30%	Pass	
Potassium (exchangeable)	S22-Jl0056473	CP	meq/100g	0.8	0.6	19	30%	Pass	
Sodium (exchangeable)	S22-Jl0056473	CP	meq/100g	< 0.1	< 0.1	<1	30%	Pass	

Duplicate									
Cation Exchange Capacity				Result 1	Result 2	RPD			
Calcium (exchangeable)	S22-Jl0056473	CP	meq/100g	13	11	16	30%	Pass	
Cation Exchange Capacity	S22-Jl0056473	CP	meq/100g	18	15	16	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
Exchangeable Sodium Percentage (ESP)	S22-Jl0056475	CP	%	< 0.1	< 0.1	<1	30%	Pass	
Magnesium (exchangeable)	S22-Jl0056475	CP	meq/100g	0.8	0.6	27	30%	Pass	
Potassium (exchangeable)	S22-Jl0056475	CP	meq/100g	0.2	0.2	22	30%	Pass	
Sodium (exchangeable)	S22-Jl0056475	CP	meq/100g	< 0.1	< 0.1	<1	30%	Pass	
Duplicate									
Cation Exchange Capacity				Result 1	Result 2	RPD			
Calcium (exchangeable)	S22-Jl0056475	CP	meq/100g	3.1	2.9	5.9	30%	Pass	
Cation Exchange Capacity	S22-Jl0056475	CP	meq/100g	4.1	3.7	10	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
Total Carbon	S22-Jl0056481	CP	%	1.1	1.1	<1	30%	Pass	
% Moisture	S22-Jl0056481	CP	%	13	16	23	30%	Pass	
Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Phosphorus	S22-Jl0056482	CP	mg/kg	300	280	7.6	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
Chloride	S22-Jl0056483	CP	mg/kg	< 10	< 10	<1	30%	Pass	
Sulphate (as SO4)	S22-Jl0056483	CP	mg/kg	< 10	< 10	<1	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
Ammonia (as N)	S22-Jl0056484	CP	mg/kg	< 5	< 5	<1	30%	Pass	
pH (1:5 Aqueous extract at 25 °C as rec.)	S22-Jl0056484	CP	pH Units	5.3	5.3	<1	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
pH (1:5 Aqueous extract at 25 °C as rec.)	S22-Jl0056485	CP	pH Units	6.5	6.3	<1	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
Exchangeable Sodium Percentage (ESP)	S22-Jl0056486	CP	%	< 0.1	< 0.1	<1	30%	Pass	
Magnesium (exchangeable)	S22-Jl0056486	CP	meq/100g	2.0	2.0	<1	30%	Pass	
Potassium (exchangeable)	S22-Jl0056486	CP	meq/100g	0.7	0.7	<1	30%	Pass	
Sodium (exchangeable)	S22-Jl0056486	CP	meq/100g	< 0.1	< 0.1	<1	30%	Pass	
Duplicate									
Cation Exchange Capacity				Result 1	Result 2	RPD			
Calcium (exchangeable)	S22-Jl0056486	CP	meq/100g	5.4	5.3	1.2	30%	Pass	
Cation Exchange Capacity	S22-Jl0056486	CP	meq/100g	8.1	8.0	<1	30%	Pass	

Comments

Emerson Aggregate Test and Particle Size Distribution analysed by EastWest Geo Ag Enviro; report reference EW221412

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	Yes

Qualifier Codes/Comments

Code	Description
G01	The LORs have been raised due to matrix interference

Authorised by:

Quinn Raw	Analytical Services Manager
Caitlin Breeze	Senior Analyst-Inorganic
Dilani Samarakoon	Senior Analyst-Inorganic
Gabriele Cordero	Senior Analyst-Inorganic
Gabriele Cordero	Senior Analyst-Metal
Mary Makarios	Senior Analyst-Inorganic
Mary Makarios	Senior Analyst-Metal
Ryan Phillips	Senior Analyst-Inorganic
Scott Beddoes	Senior Analyst-Inorganic

Glenn Jackson
General Manager

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please click here.

eastwest
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ANALYSIS REPORT SOIL

PROJECT NO: EW221412		**Date of Issue:**	**17/08/2022**
Customer:	EUROFINS SYDNEY	Report No:	2
Address:	Unit F3 Unit F3, 16 Mars Road, Lane Cove NSW 2066 LANE COVE NSW 2066	Date Received:	4/08/2022
		Matrix:	Soil
Attention:	Andrew Black	Location:	909364
Phone:	0410 220 750	Sampler ID:	Client
Fax:		Date of Sampling:	27/07/2022
Email:	AndrewBlack@eurofins.com	Sample Condition:	Acceptable

Comments:
This report supercedes any previous report with this reference. Emerson Aggregate Test was carried out on ground sample only. 3b = moderate to slight dispersion of the remould.

Results apply to the samples as submitted. All pages of this report have been checked and approved for release.

Signed: Lisa Nies

ASPAC PROFICIENT LAB
Visit www.aspac-australasia.com to view our certification details.

East West is certified by the Australian-Asian Soil & Plant Analysis Council to perform various soil and plant tissue analysis. The tests reported herein have been performed in accordance with our terms of accreditation.

This report must not be reproduced except in full and EWEA takes no responsibility of the end use of the results within this report.

This analysis relates to the sample submitted and it is the client's responsibility to make certain the sample is representative of the matrix to be tested.

Samples will be discarded one month after the date of this report. Please advise if you wish to have your sample/s returned.

ANALYSIS REPORT

PROJECT NO: EW221412 Location: 909364

				CLIENT SAMPLE ID	S22-JI0056472	S22-JI0056473	S22-JI0056474	S22-JI0056475
				DEPTH	G1-HOR A	G1-HOR B	B1-HOR A	B1-HOR B
Test Parameter	**Method Description**	**Method Reference**	**Units**	**LOR**	**221412-1**	**221412-2**	**221412-3**	**221412-4**
Phosphorus (Colwell)	Bicarb/UV-Vis	R&L 9B1	mg/kg	5	65.8	161	140	27.2
Texture	Field	Northcote	Class	na	LC	LMC	LC	LMC
Emerson Aggregate Test	Class	PMS-21	Number	na	5	3b	5	5
% Passing 50mm	Sieve	MRTS16	%	na	100	100	100	100
% Passing 2.36mm	Sieve	In House	%	na	72.3	46.4	82.3	56.1

ANALYSIS REPORT

PROJECT NO: EW221412 Location: 909364

				CLIENT SAMPLE ID	S22-JI0056476	S22-JI0056477	S22-JI0056478	S22-JI0056479
				DEPTH	Y1-HOR-A	Y1-HOR B	G2-HOR A	G2-HOR B
Test Parameter	**Method Description**	**Method Reference**	**Units**	**LOR**	**221412-5**	**221412-6**	**221412-7**	**221412-8**
Phosphorus (Colwell)	Bicarb/UV-Vis	R&L 9B1	mg/kg	5	25.1	21.9	50.1	14.3
Texture	Field	Northcote	Class	na	LS	LC	LMC	MC
Emerson Aggregate Test	Class	PMS-21	Number	na	3b	3b	3b	5
% Passing 50mm	Sieve	MRTS16	%	na	100	100	100	100
% Passing 2.36mm	Sieve	In House	%	na	31.6	46.0	74.1	33.4

ANALYSIS REPORT

PROJECT NO: EW221412 Location: 909364

				CLIENT SAMPLE ID	S22-JI0056480	S22-JI0056481	S22-JI0056482	S22-JI0056483
				DEPTH	Y2-HOR A	Y2-HOR B	G3-HOR A	G3-HOR B
Test Parameter	**Method Description**	**Method Reference**	**Units**	**LOR**	**221412-9**	**221412-10**	**221412-11**	**221412-12**
Phosphorus (Colwell)	Bicarb/UV-Vis	R&L 9B1	mg/kg	5	21.6	15.4	32.4	11.0
Texture	Field	Northcote	Class	na	SC	SC	LS	SCL
Emerson Aggregate Test	Class	PMS-21	Number	na	3b	3b	5	3b
% Passing 50mm	Sieve	MRTS16	%	na	100	100	100	100
% Passing 2.36mm	Sieve	In House	%	na	41.4	50.1	57.5	50.8

ANALYSIS REPORT

PROJECT NO: EW221412 **Location: 909364**

				CLIENT SAMPLE ID	S22-JI0056484	S22-JI0056485	S22-JI0056486	S22-JI0056487
				DEPTH	B3-HOR A	B3-HOR B	Y3-HOR A	Y3-HOR B
Test Parameter	**Method Description**	**Method Reference**	**Units**	**LOR**	**221412-13**	**221412-14**	**221412-15**	**221412-16**
Phosphorus (Colwell)	Bicarb/UV-Vis	R&L 9B1	mg/kg	5	24.2	10.2	12.8	12.8
Texture	Field	Northcote	Class	na	LMC	SCL	LS	SCL
Emerson Aggregate Test	Class	PMS-21	Number	na	3b	3b	3b	3b
% Passing 50mm	Sieve	MRTS16	%	na	100	100	100	100
% Passing 2.36mm	Sieve	In House	%	na	68.7	52.4	53.8	58.2

Soils are air dried at 40^{0}C and ground <2mm.

NB: LOR is the Lowest Obtainable Reading.

DOCUMENT END

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Eurofins Environment Testing Australia Pty Ltd

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Dandenong South	Grovedale	Girraween	Mitchell	Murarrie	Mayfield East NSW 2304
VIC 3175	VIC 3216	NSW 2145	ACT 2911	QLD 4172	PO Box 60 Wickham 2293
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Auckland 1061	Christchurch 7675
Tel: +64 9 526 45 51	Tel: 0800 856 450
IANZ# 1327	IANZ# 1290

Sample Receipt Advice

Company name:	SLR Consulting (Sydney)
Contact name:	Nick Barker
Project name:	PALING YARDS WING FARM AND TRANSMISSION GL
Project ID:	650.30012
Turnaround time:	5 Day
Date/Time received	Jul 27, 2022 5:00 PM
Eurofins reference	909364

Sample Information

✓	A detailed list of analytes logged into our LIMS, is included in the attached summary table.
✓	All samples have been received as described on the above COC.
✓	COC has been completed correctly.
✓	Attempt to chill was evident.
✓	Appropriately preserved sample containers have been used.
✓	All samples were received in good condition.
✓	Samples have been provided with adequate time to commence analysis in accordance with the relevant holding times.
✓	Appropriate sample containers have been used.
✓	Sample containers for volatile analysis received with zero headspace.
✓	Split sample sent to requested external lab.
✓	Some samples have been subcontracted.
N/A	Custody Seals intact (if used).

Notes

Contact

If you have any questions with respect to these samples, please contact your Analytical Services Manager:

Andrew Black on phone : (+61) 2 9900 8490 or by email: AndrewBlack@eurofins.com

Results will be delivered electronically via email to Nick Barker - nbarker@slrconsulting.com.

Note: A copy of these results will also be delivered to the general SLR Consulting (Sydney) email address.

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web: www.eurofins.com.au
email: EnviroSales@eurofins.com

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43 Detroit Drive
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Christchurch 7675
Tel: 0800 856 450
IANZ# 1290

Company Name: SLR Consulting (Sydney)
Address: Tenancy 202, Submarine School, Sub Base Platypus, North Sydney NSW 2060

Project Name: PALING YARDS WING FARM AND TRANSMISSION GL
Project ID: 650.30012

Order No.:
Report #: 909364
Phone: 02 9428 8100
Fax:

Received: Jul 27, 2022 5:00 PM
Due: Aug 3, 2022
Priority: 5 Day
Contact Name: Nick Barker

Eurofins Analytical Services Manager : Andrew Black

Sample Detail						Acidity (as CaCO3)*	Chloride	Emerson aggregate test	Particle Size Distribution	pH (1:5 Aqueous extract at 25 °C as rec.)	Phosphorus – Colwell*	Sulphate (as SO4)	Texture	Total Carbon	Eurofins Suite B20	Moisture Set	Eurofins Suite B19D: Total N, TKN, NOx, NO2, NO3, NH3, Total P
Melbourne Laboratory - NATA # 1261 Site # 1254						X								X	X		X
Sydney Laboratory - NATA # 1261 Site # 18217							X			X		X				X	X
Perth Laboratory - NATA # 2377 Site # 2370																	
External Laboratory								X	X		X		X				
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**												
1	G1-HOR A	Jul 27, 2022		Soil	S22-Jl0056472	X	X	X	X	X	X	X	X	X	X	X	X
2	G1-HOR B	Jul 27, 2022		Soil	S22-Jl0056473	X	X	X	X	X	X	X	X	X	X	X	X
3	B1-HOR A	Jul 27, 2022		Soil	S22-Jl0056474	X	X	X	X	X	X	X	X	X	X	X	X
4	B1-HOR B	Jul 27, 2022		Soil	S22-Jl0056475	X	X	X	X	X	X	X	X	X	X	X	X
5	Y1-HOR A	Jul 27, 2022		Soil	S22-Jl0056476	X	X	X	X	X	X	X	X	X	X	X	X
6	Y1-HOR B	Jul 27, 2022		Soil	S22-Jl0056477	X	X	X	X	X	X	X	X	X	X	X	X
7	G2-HOR A	Jul 27, 2022		Soil	S22-Jl0056478	X	X	X	X	X	X	X	X	X	X	X	X
8	G2-HOR B	Jul 27, 2022		Soil	S22-Jl0056479	X	X	X	X	X	X	X	X	X	X	X	X
9	Y2-HOR A	Jul 27, 2022		Soil	S22-Jl0056480	X	X	X	X	X	X	X	X	X	X	X	X
10	Y2-HOR B	Jul 27, 2022		Soil	S22-Jl0056481	X	X	X	X	X	X	X	X	X	X	X	X
11	G3-HOR A	Jul 27, 2022		Soil	S22-Jl0056482	X	X	X	X	X	X	X	X	X	X	X	X

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Sample Detail						Acidity (as CaCO3)*	Chloride	Emerson aggregate test	Particle Size Distribution	pH (1:5 Aqueous extract at 25 °C as rec.)	Phosphorus – Colwell*	Sulphate (as SO4)	Texture	Total Carbon	Eurofins Suite B20	Moisture Set	Eurofins Suite B19D: Total N, TKN, NOx, NO2, NO3, NH3, Total P
Melbourne Laboratory - NATA # 1261 Site # 1254						X								X	X		X
Sydney Laboratory - NATA # 1261 Site # 18217							X			X		X				X	X
Perth Laboratory - NATA # 2377 Site # 2370																	
12	G3-HOR B	Jul 27, 2022		Soil	S22-Jl0056483	X	X	X	X	X	X	X	X	X	X	X	X
13	B3-HOR A	Jul 27, 2022		Soil	S22-Jl0056484	X	X	X	X	X	X	X	X	X	X	X	X
14	B3-HOR B	Jul 27, 2022		Soil	S22-Jl0056485	X	X	X	X	X	X	X	X	X	X	X	X
15	Y3-HOR A	Jul 27, 2022		Soil	S22-Jl0056486	X	X	X	X	X	X	X	X	X	X	X	X
16	Y3-HOR B	Jul 27, 2022		Soil	S22-Jl0056487	X	X	X	X	X	X	X	X	X	X	X	X
Test Counts						16	16	16	16	16	16	16	16	16	16	16	16

CHAIN OF CUSTODY DOCUMENTATION

SLR Consulting Australia Pty Ltd
ABN 29 001 584 612

SLR

CLIENT: SLR Consulting	**LABORATORY: Eurofins**	Turnaround Time (TAT)	COC Number 1 of 1
PROJECT: Paling Yards Wing Farm and Transmission GI	**LABORATORY ADDRESS: Eurifins Wollongong**		
PROJECT NUMBER: 650.30012	**SAMPLER: Gadha Lal**	☒ Standard TAT	
PROJECT MANAGER: Nick Barker	**SAMPLER CONTACT No: 0449 660 135**	☐ Non Standard or Urgent TAT	
PM CONTACT No: 0405 366 535	**Email Reports and Invoices to: glal@slrconsulting.com**	Required TAT: Standard	

COMMENTS OR ADDITIONAL DIRECTIONS

REQUESTED ANALYSIS

No.	Sample ID	Date & Time	Matrix (Soil, water, ACM, etc)	Containers and Preservatives	B19D -Nutrients Suite	B20 - Ion Excahane Suite	Total Carbon	Chloride	Sulphate	Moisture Content	Soil Texture	Exchange Acidity	Colwell Phosphorus	Emerson Aggregate	PSD by sieve and Hydrometer	pH (1:5 Aqueous Extract)	Additional Information (Comment on any gross contamination or specific requirements)
1	G1-Hor A	27-07-2022	Soil	1 jar	x	x	x	x	x	x	x	x	x	x	x	x	hold
2	G1-Hor B	"	Soil	"	x	x	x	x	x	x	x	x	x	x	x	x	hold
3	B1-Hor A	"	Soil	"	x	x	x	x	x	x	x	x	x	x	x	x	hold
4	B1-Hor B	"	Soil	"	x	x	x	x	x	x	x	x	x	x	x	x	hold
5	Y1-Hor A	"	Soil	"	x	x	x	x	x	x	x	x	x	x	x	x	hold
6	Y1-Hor B	"	Soil	"	x	x	x	x	x	x	x	x	x	x	x	x	hold
7	G2-Hor A	"	Soil	"	x	x	x	x	x	x	x	x	x	x	x	x	hold
8	G2-Hor B	"	Soil	"	x	x	x	x	x	x	x	x	x	x	x	x	hold
9	Y2-Hor A	"	Soil	"	x	x	x	x	x	x	x	x	x	x	x	x	hold
10	Y2-Hor B	"	Soil	"	x	x	x	x	x	x	x	x	x	x	x	x	hold
11	G3-Hor A	"	Soil	"	x	x	x	x	x	x	x	x	x	x	x	x	hold
12	G3-Hor B	"	Soil	"	x	x	x	x	x	x	x	x	x	x	x	x	hold.
13	B3-Hor A	"	Soil	"	x	x	x	x	x	x	x	x	x	x	x	x	hold
14	B3-Hor B	"	Soil	"	x	x	x	x	x	x	x	x	x	x	x	x	hold
15	Y3-Hor A	"	Soil	"	x	x	x	x	x	x	x	x	x	x	x	x	hold
16	Y3-Hor B	"	Soil	"	x	x	x	x	x	x	x	x	x	x	x	x	hold

SLR

Sample Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass; Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag; LI = Lugols Iodine Preserved Bottles; STT = Sterile Sodium Thiosulfate Preserved Bottles; G = unpreserved glass soil jar;

I attest that the proper field sampling procedures were used during the collection of these samples.

Relinquished By Sampler	Gadha Lal	Date / Time	27-Jul	**Received b**	Eurofins Wollongong	27-07-2022	**Temperature Received:**
Relinquished By	James Thomas	Date / Time	27/7/22	**Received b**	Sign JThomas	Date / Time 27/7 5PM	10.5C
Relinquished By	Sign	Date / Time	909364	**Received b**	Sign	Date / Time	

APPENDIX D STANDARD DRAWINGS FOR EROSION AND SEDIMENT CONTROL

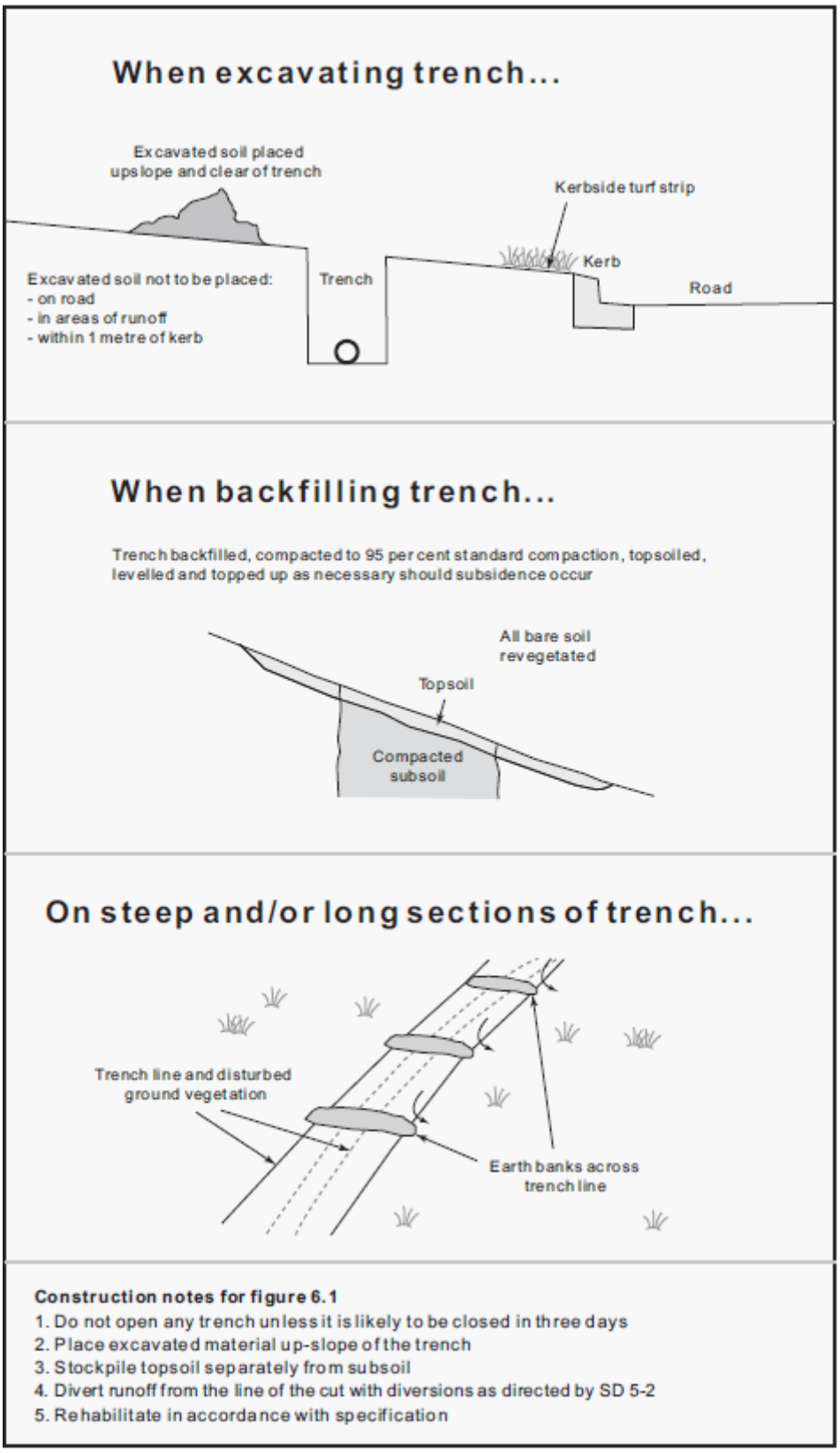


Figure 6.1 Erosion and sediment control during trenching activities

Source: Managing Urban Stormwater: Soils and Construction – Volume 2A Installation of Services

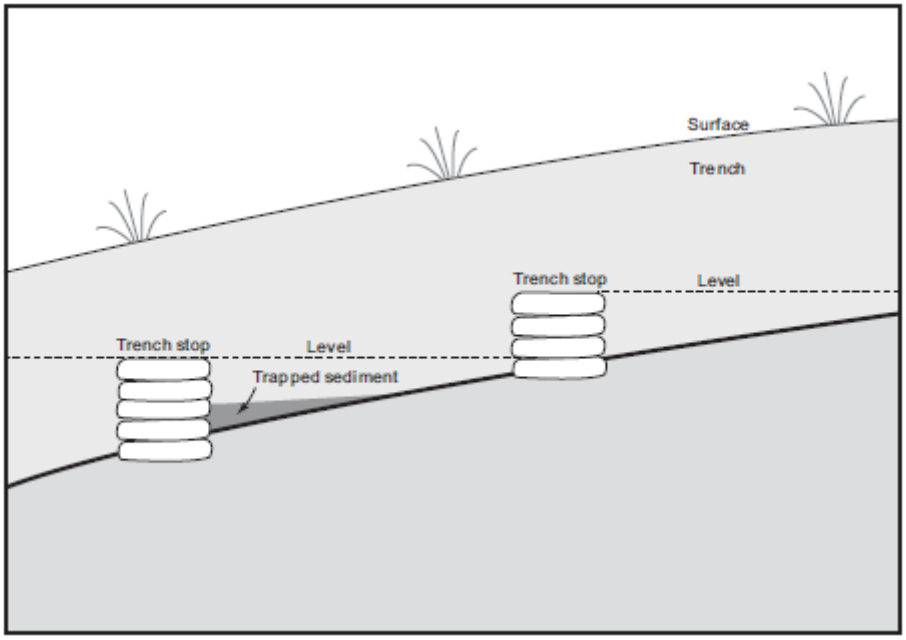


Figure 6.2 Typical trench stop detail

Source: Managing Urban Stormwater: Soils and Construction – Volume 2A Installation of Services

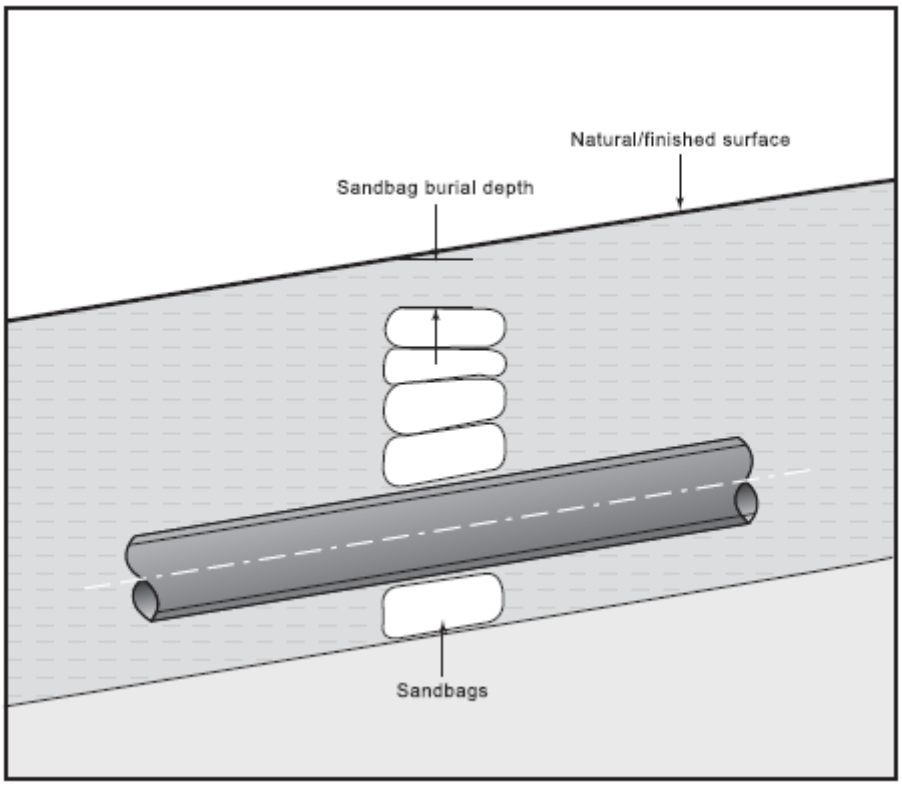
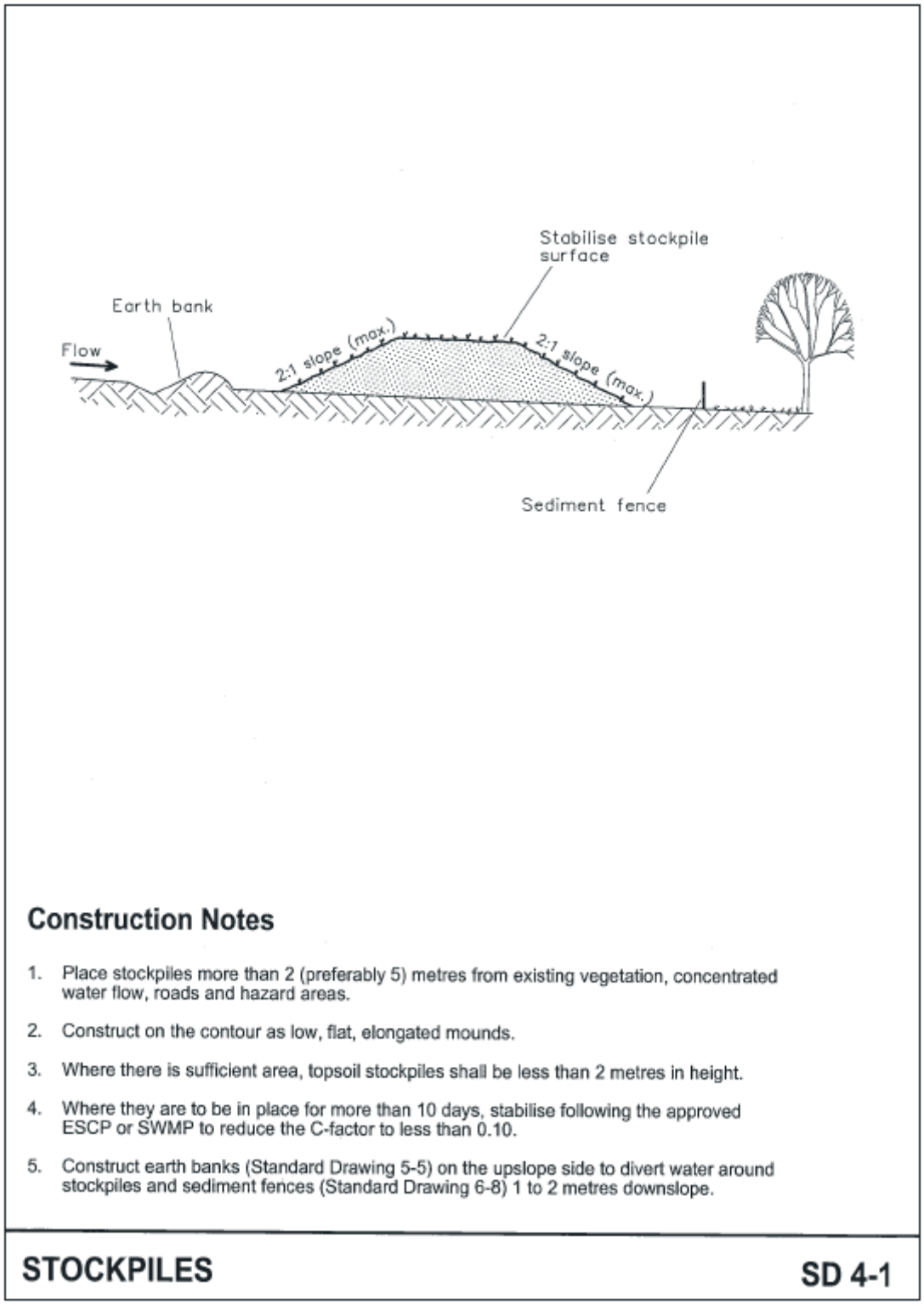
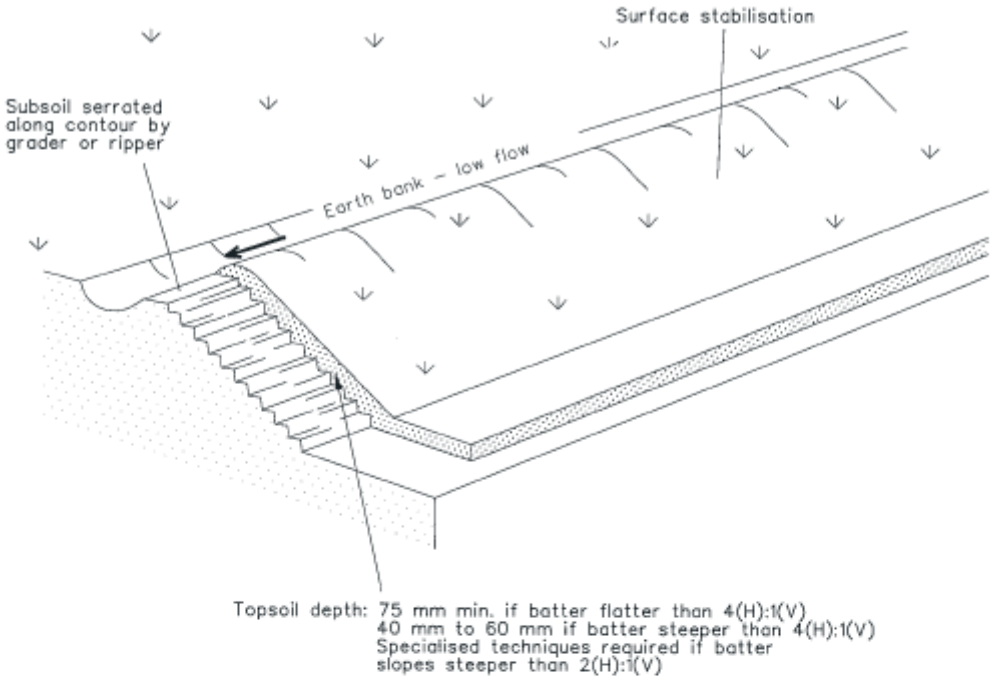


Figure 6.3 Detail of typical seepage collar or bulkhead

Source: Managing Urban Stormwater: Soils and Construction – Volume 2A Installation of Services



Source: Managing Urban Stormwater: Soils and Construction – Volume 1, 4th Edition

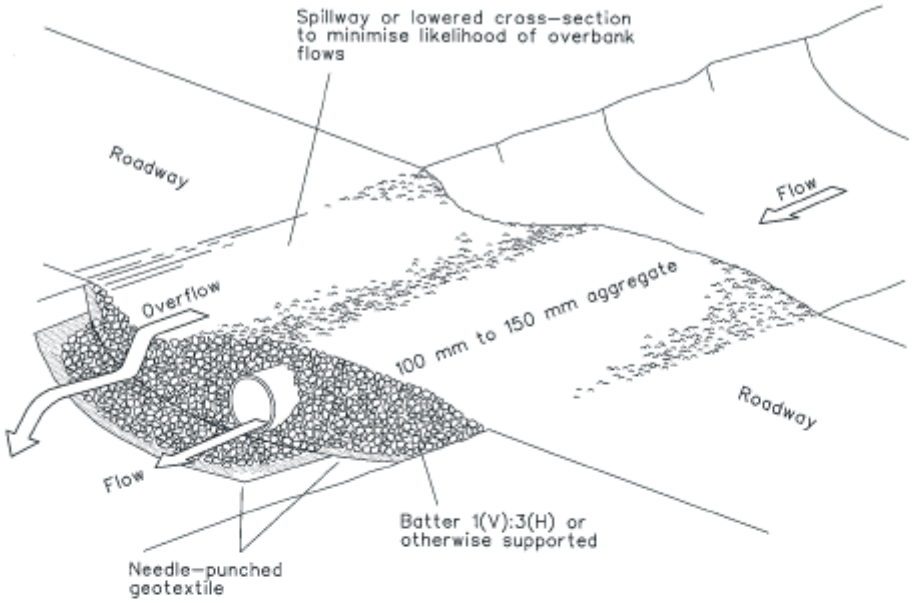


Construction Notes

1. Scarify the ground surface along the line of the contour to a depth of 50 mm to 100 mm to break up any hardsetting surfaces and to provide a good bond between the respread material and subsoil.
2. Add soil ameliorants as required by the ESCP or SWMP.
3. Rip to a depth of 300 mm if compacted layers occur.
4. Where possible, replace topsoil to a depth of 40 to 60 mm on lands where the slope exceeds 4(H):1(V) and to at least 75 mm on lower gradients.

REPLACING TOPSOIL **SD 4-2**

Source: Managing Urban Stormwater: Soils and Construction – Volume 1, 4th Edition

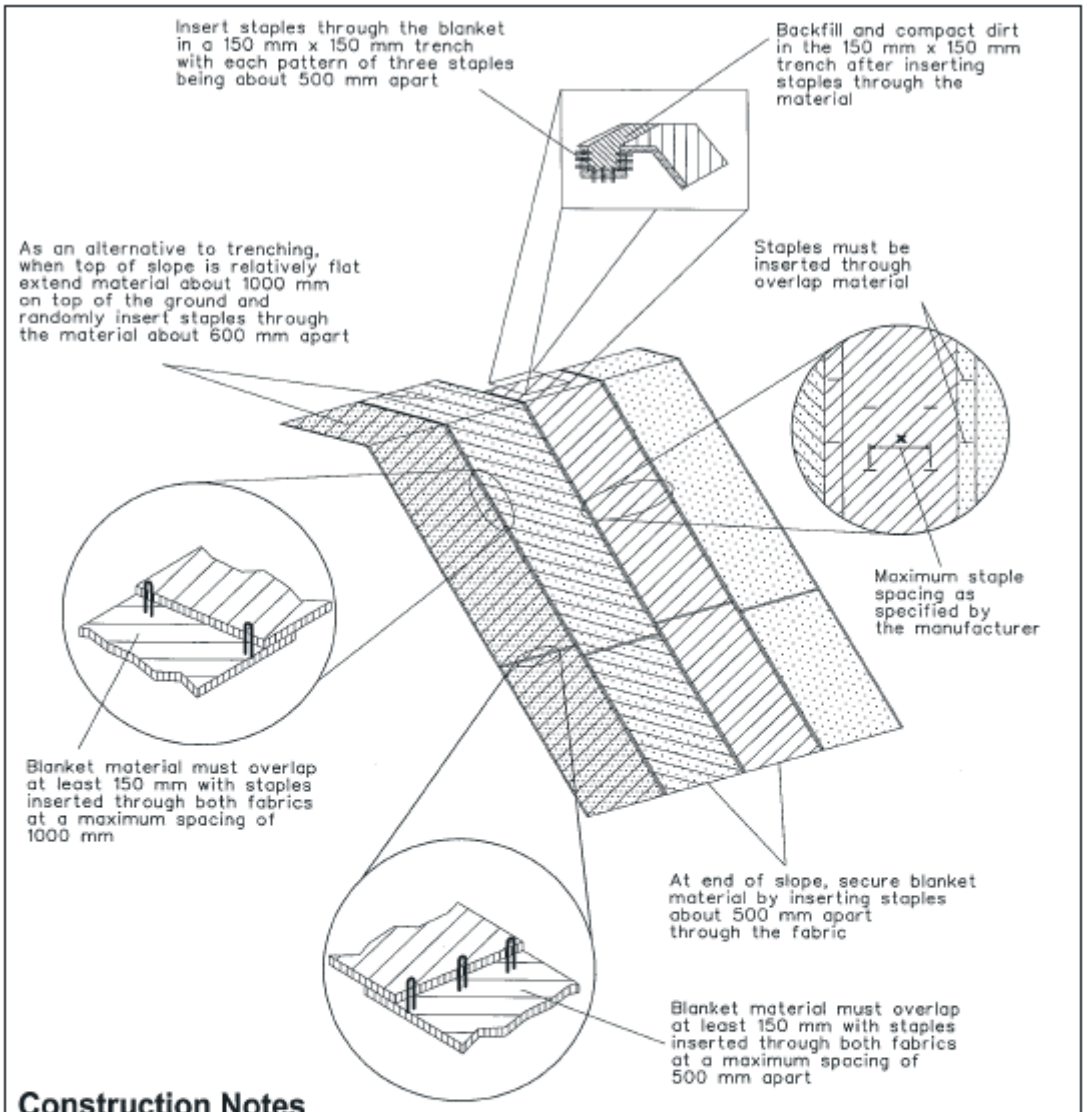


Construction Notes

1. Prohibit all traffic until the access way is constructed.
2. Strip any topsoil and place a needle-punched textile over the base of the crossing.
3. Place clean, rigid, non polluting aggregate or gravel in the 100 mm to 150 mm size class over the fabric to a minimum depth of 200 mm.
4. Provide a 3-metre wide carriageway with sufficient length of culvert pipe to allow less than a 3(H): 1 (V) slope on side batters.
5. Install a lower section to act as an emergency spillway in greater than design storm events.
6. Ensure that culvert outlets extend beyond the toe of fill embankments.

TEMPORARY WATERWAY CROSSING **SD 5-1**

Source: Managing Urban Stormwater: Soils and Construction – Volume 1, 4th Edition

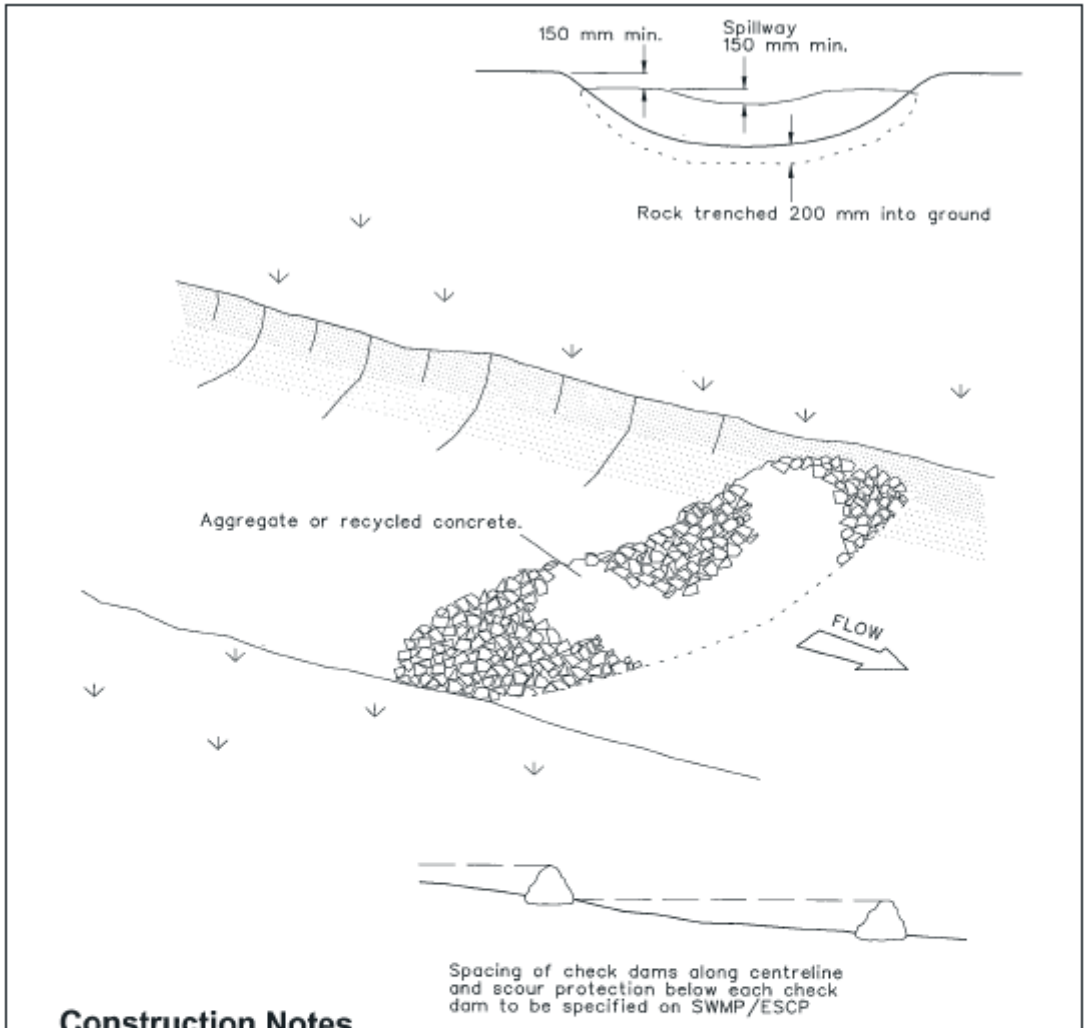


Construction Notes

1. Remove any rocks, clods, sticks or grass from the ground surface before laying the matting.
2. Spread topsoil to at least 75 mm depth.
3. Where appropriate, complete fertilising and seeding on a properly prepared seedbed (Standard Drawing 7-1) before laying the matting.
4. Ensure the fabric can be continuously in contact with the soil by grading the surface carefully first.
5. Lay the matting in "shingle-fashion" with the ends of each upstream roll overlapping the next roll downslope.
6. Ensure sufficient staples are used to maintain a good contact between the soil and the matting.

RECP : SHEET FLOW **SD 5-2**

Source: Managing Urban Stormwater: Soils and Construction – Volume 1, 4th Edition

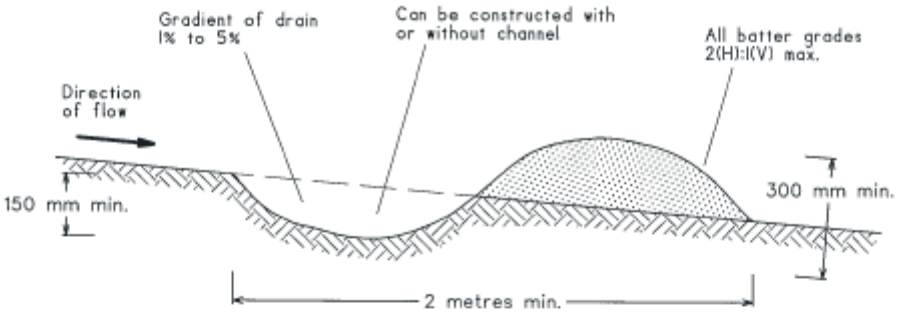


Construction Notes

1. Check dams can be built with various materials, including rocks, logs, sandbags and straw bales. The maintenance program should ensure their integrity is retained, especially where constructed with straw bales. In the case of bales, this might require their replacement each two to four months.
2. Trench the check dam 200 mm into the ground across its whole width. Where rock is used, fill the trenches to at least 100 mm above the ground surface to reduce the risk of undercutting.
3. Normally, their maximum height should not exceed 600 mm above the gully floor. The centre should act as a spillway, being at least 150 mm lower than the outer edges.
4. Space the dams so the toe of the upstream dam is level with the spillway of the next downstream dam.

ROCK CHECK DAM **SD 5-4**

Source: Managing Urban Stormwater: Soils and Construction – Volume 1, 4th Edition



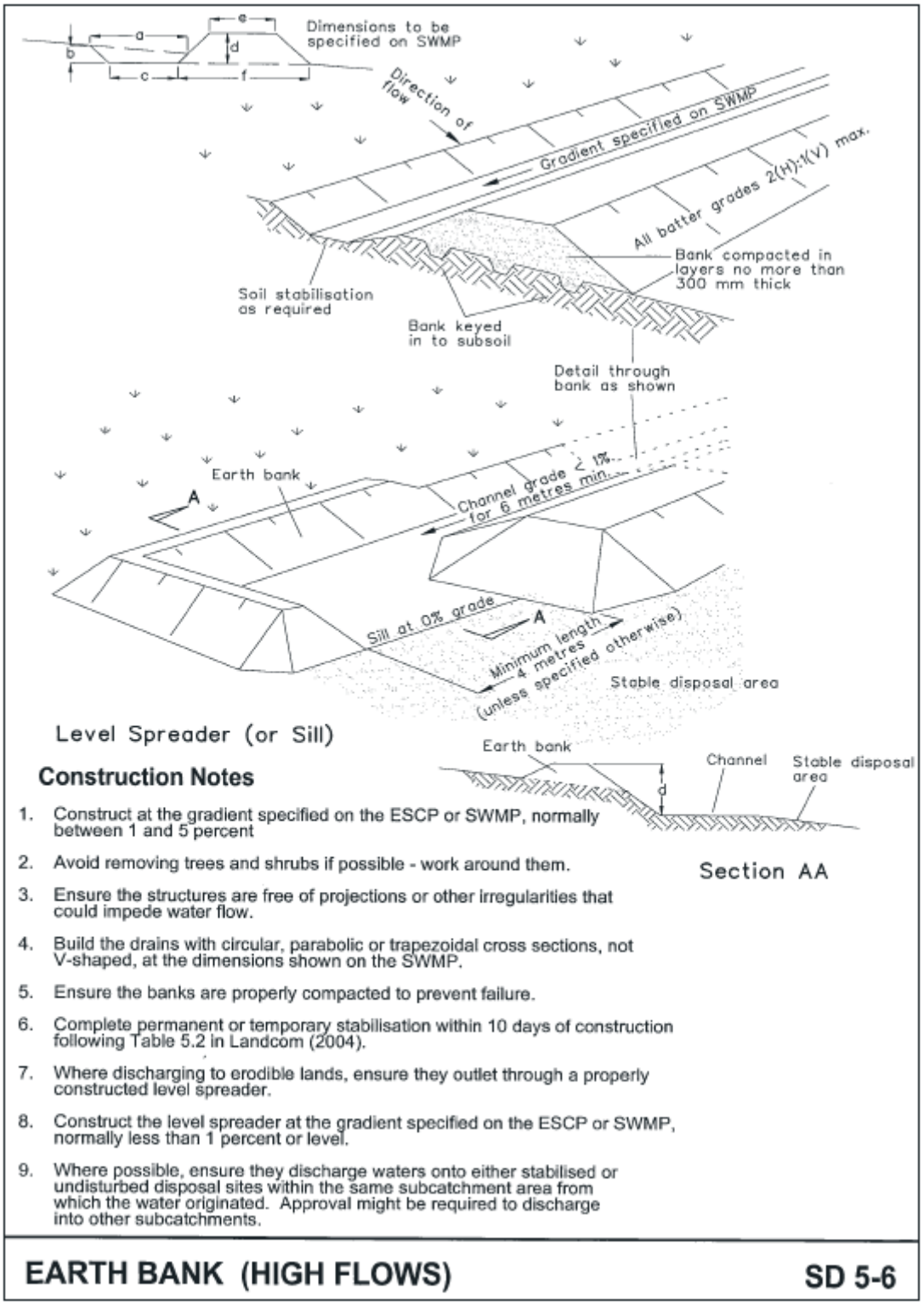
NOTE: Only to be used as temporary bank where maximum upslope length is 80 metres.

Construction Notes

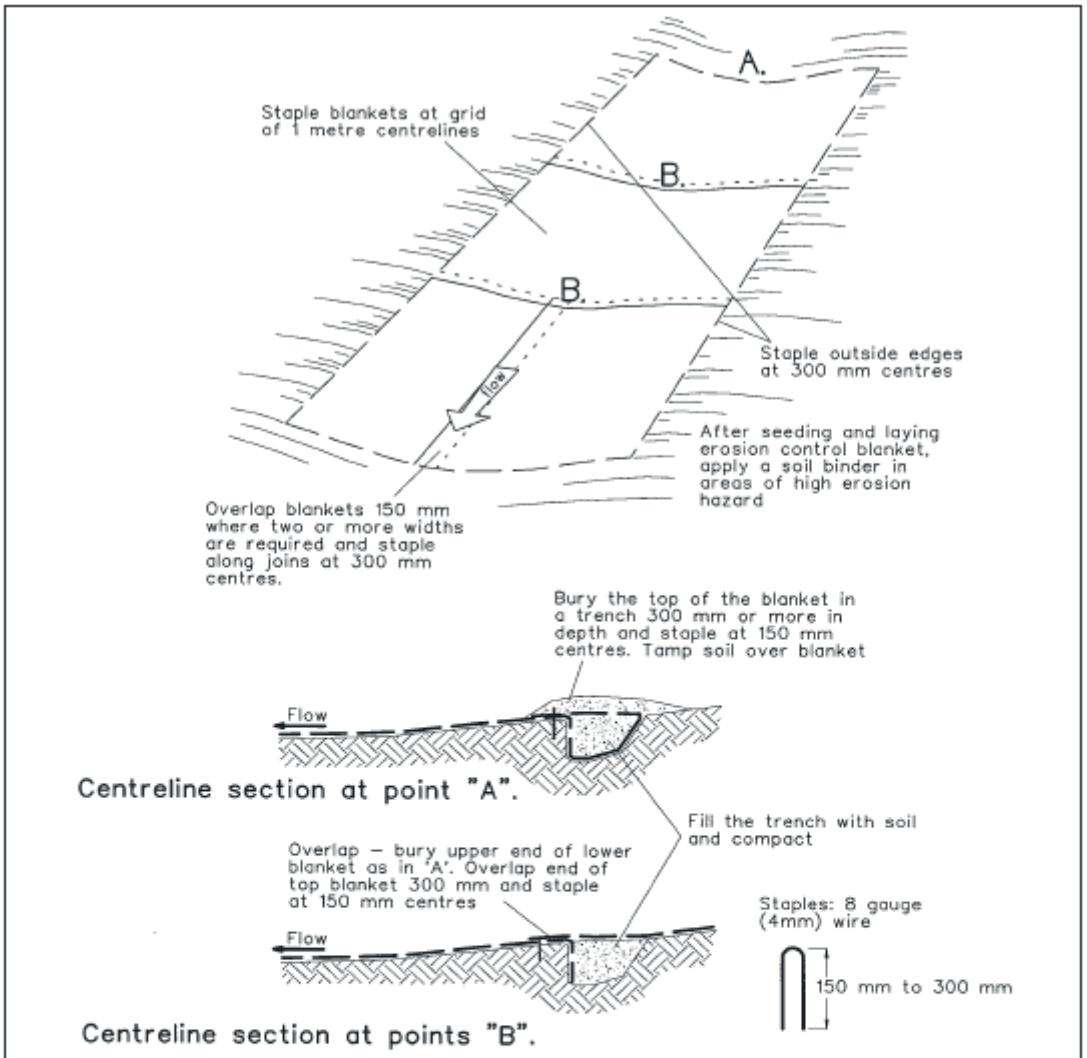
1. Build with gradients between 1 percent and 5 percent.
2. Avoid removing trees and shrubs if possible - work around them.
3. Ensure the structures are free of projections or other irregularities that could impede water flow.
4. Build the drains with circular, parabolic or trapezoidal cross sections, not V shaped.
5. Ensure the banks are properly compacted to prevent failure.
6. Complete permanent or temporary stabilisation within 10 days of construction.

EARTH BANK (LOW FLOW) **SD 5-5**

Source: Managing Urban Stormwater: Soils and Construction – Volume 1, 4th Edition



Source: Managing Urban Stormwater: Soils and Construction – Volume 1, 4th Edition

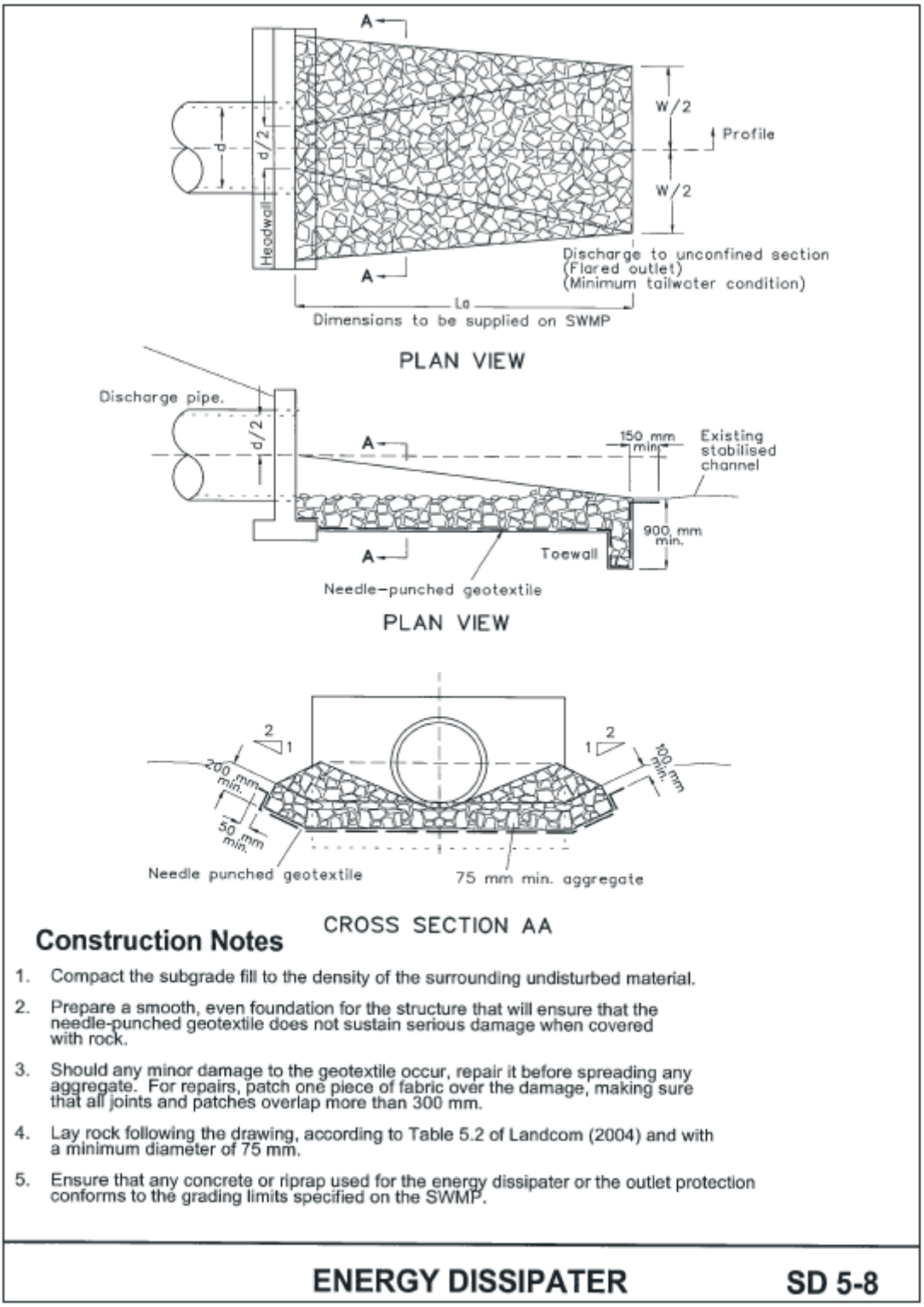


Construction Notes

1. Remove any rocks, clods, sticks or grass from the surface before laying matting
2. Ensure that topsoil is at least 75 mm deep.
3. Complete fertilising and seeding before laying the matting.
4. Ensure fabric will be continuously in contact with the soil by grading the surface carefully first.
5. Lay the fabric in "shingle-fashion", with the end of each upstream roll overlapping those downstream. Ensure each roll is anchored properly at its upslope end (Standard Drawing 5-7b).
6. Ensure that the full width of flow in the channel is covered by the matting up to the design storm event, usually in the 10-year ARI time of concentration storm event.
7. Divert water from the structure until vegetation is stabilised properly.

RECP : CONCENTRATED FLOW **SD 5-7**

Source: Managing Urban Stormwater: Soils and Construction – Volume 1, 4th Edition

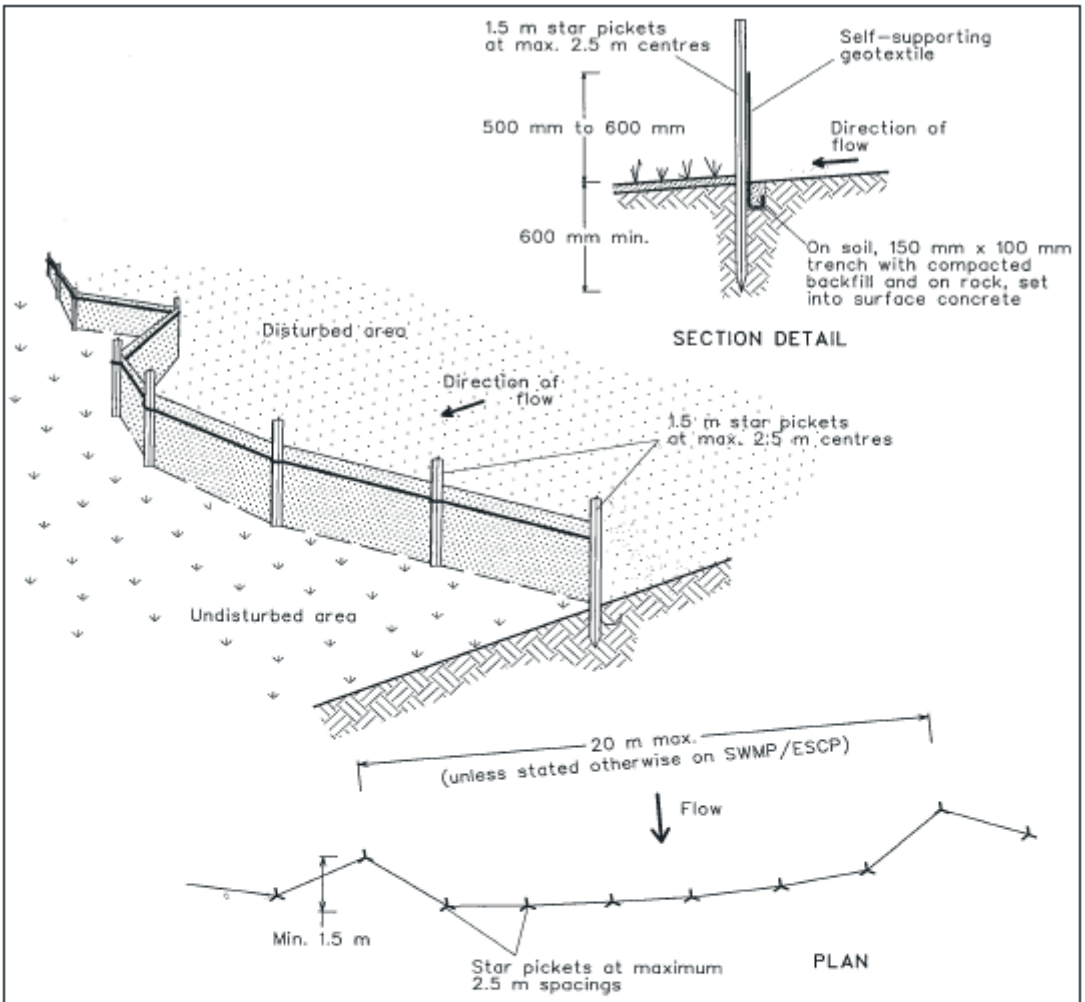


Construction Notes

1. Compact the subgrade fill to the density of the surrounding undisturbed material.
2. Prepare a smooth, even foundation for the structure that will ensure that the needle-punched geotextile does not sustain serious damage when covered with rock.
3. Should any minor damage to the geotextile occur, repair it before spreading any aggregate. For repairs, patch one piece of fabric over the damage, making sure that all joints and patches overlap more than 300 mm.
4. Lay rock following the drawing, according to Table 5.2 of Landcom (2004) and with a minimum diameter of 75 mm.
5. Ensure that any concrete or riprap used for the energy dissipater or the outlet protection conforms to the grading limits specified on the SWMP.

ENERGY DISSIPATER **SD 5-8**

Source: Managing Urban Stormwater: Soils and Construction – Volume 1, 4th Edition

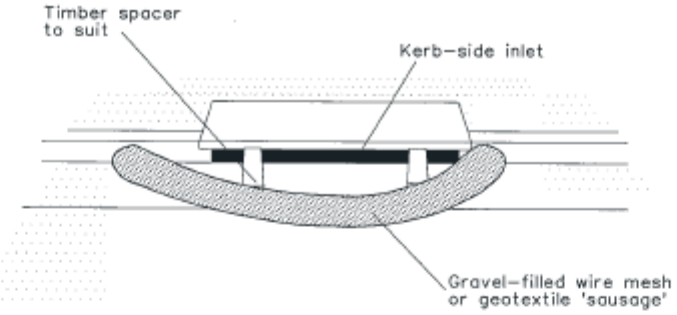


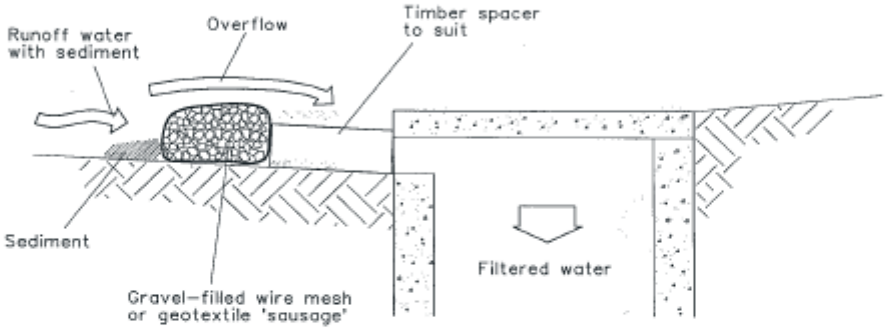
Construction Notes

1. Construct sediment fences as close as possible to being parallel to the contours of the site, but with small returns as shown in the drawing to limit the catchment area of any one section. The catchment area should be small enough to limit water flow if concentrated at one point to 50 litres per second in the design storm event, usually the 10-year event.
2. Cut a 150-mm deep trench along the upslope line of the fence for the bottom of the fabric to be entrenched.
3. Drive 1.5 metre long star pickets into ground at 2.5 metre intervals (max) at the downslope edge of the trench. Ensure any star pickets are fitted with safety caps.
4. Fix self-supporting geotextile to the upslope side of the posts ensuring it goes to the base of the trench. Fix the geotextile with wire ties or as recommended by the manufacturer. Only use geotextile specifically produced for sediment fencing. The use of shade cloth for this purpose is not satisfactory.
5. Join sections of fabric at a support post with a 150-mm overlap.
6. Backfill the trench over the base of the fabric and compact it thoroughly over the geotextile.

SEDIMENT FENCE **SD 6-8**

Source: Managing Urban Stormwater: Soils and Construction – Volume 1, 4th Edition





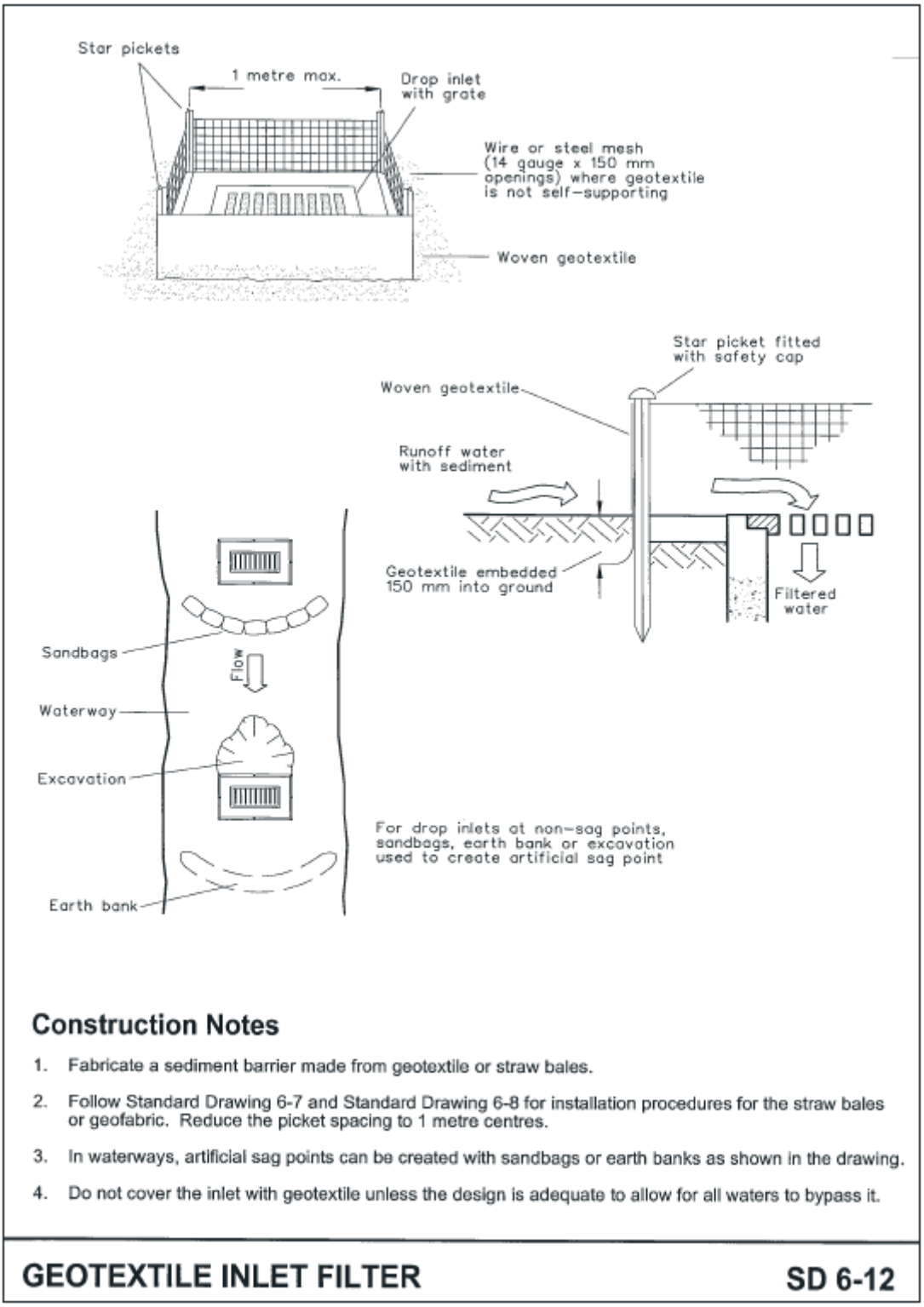
NOTE: This practice only to be used where specified in an approved SWMP/ESCP.

Construction Notes

1. Install filters to kerb inlets only at sag points.
2. Fabricate a sleeve made from geotextile or wire mesh longer than the length of the inlet pit and fill it with 25 mm to 50 mm gravel.
3. Form an elliptical cross-section about 150 mm high x 400 mm wide.
4. Place the filter at the opening leaving at least a 100-mm space between it and the kerb inlet. Maintain the opening with spacer blocks.
5. Form a seal with the kerb to prevent sediment bypassing the filter.
6. Sandbags filled with gravel can substitute for the mesh or geotextile providing they are placed so that they firmly abut each other and sediment-laden waters cannot pass between.

MESH AND GRAVEL INLET FILTER **SD 6-11**

Source: Managing Urban Stormwater: Soils and Construction – Volume 1, 4th Edition

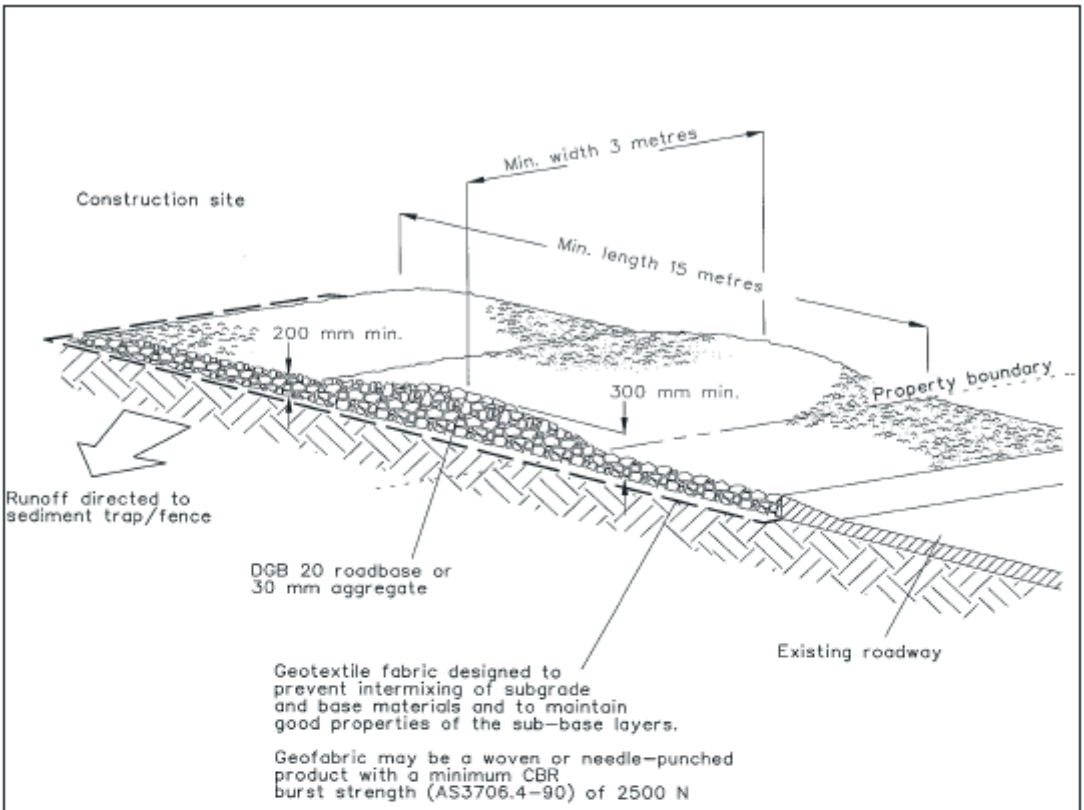


Construction Notes

1. Fabricate a sediment barrier made from geotextile or straw bales.
2. Follow Standard Drawing 6-7 and Standard Drawing 6-8 for installation procedures for the straw bales or geofabric. Reduce the picket spacing to 1 metre centres.
3. In waterways, artificial sag points can be created with sandbags or earth banks as shown in the drawing.
4. Do not cover the inlet with geotextile unless the design is adequate to allow for all waters to bypass it.

GEOTEXTILE INLET FILTER **SD 6-12**

Source: Managing Urban Stormwater: Soils and Construction – Volume 1, 4th Edition

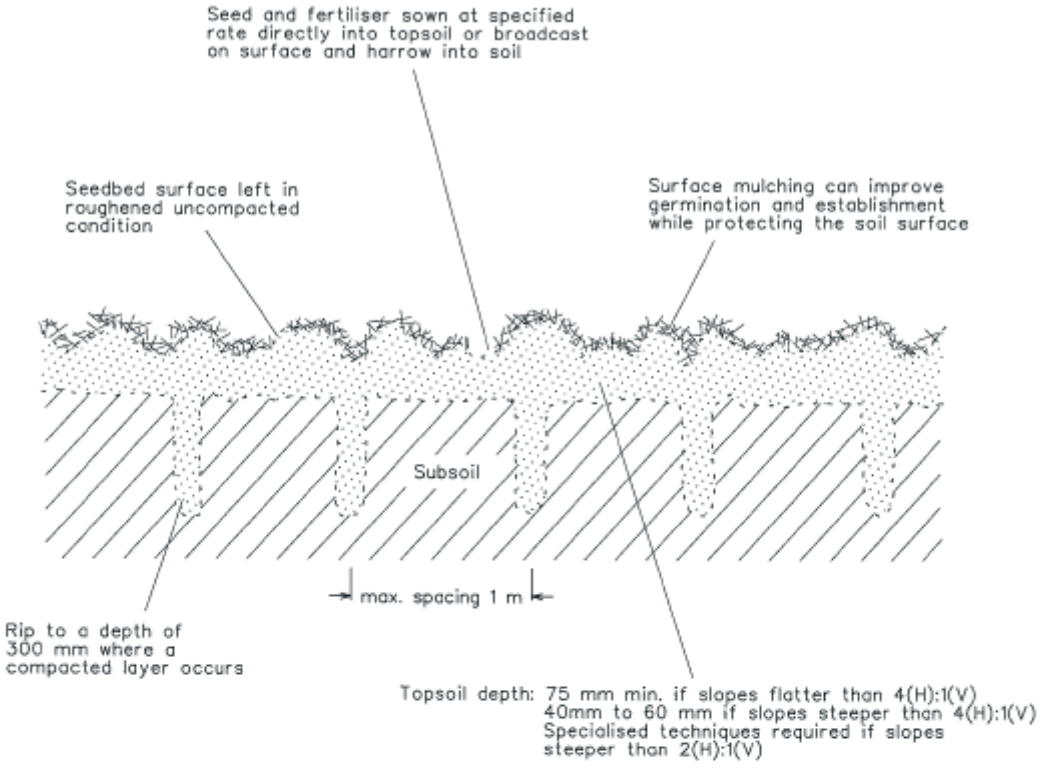


Construction Notes

1. Strip the topsoil, level the site and compact the subgrade.
2. Cover the area with needle-punched geotextile.
3. Construct a 200-mm thick pad over the geotextile using road base or 30-mm aggregate.
4. Ensure the structure is at least 15 metres long or to building alignment and at least 3 metres wide.
5. Where a sediment fence joins onto the stabilised access, construct a hump in the stabilised access to divert water to the sediment fence

STABILISED SITE ACCESS **SD 6-14**

Source: Managing Urban Stormwater: Soils and Construction – Volume 1, 4th Edition



Construction Notes

1. Loosen compacted soil before sowing any seed. If necessary, rip the soil to a depth of 300 mm. Avoid rotary hoe cultivation.
2. Work the ground only as much as necessary to achieve the desired tilth and prepare a good seedbed.
3. Avoid cultivation in very wet or very dry conditions.
4. Cultivate on or close to the contour where possible, not up and down the slope.

SEEDBED PREPARATION **SD 7-1**

Source: Managing Urban Stormwater: Soils and Construction – Volume 1, 4th Edition

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