# Appendix 10

# Surface Water Assessment

prepared by

R.W. Corkery & Co. Pty Limited

(Total No. of pages including blank pages = 46)

RZ Resources Limited
ABN: 23 160 863 892

# Surface Water Assessment

for the

# Copi Mineral Sands Project

*Prepared by:*

RWCorkery&co

March 2024

ACKNOWLEDGEMENT

*R.W. Corkery & Co. acknowledge and pay our respects to the Traditional Custodians of the lands in NSW and Australia on which our projects are located. We value the knowledge, advice and involvement of the Elders and extended Aboriginal community that contribute to our Projects and extend our respect to all Aboriginal and Torres Strait Islander peoples.*

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# Surface Water Assessment

for the

# Copi Mineral Sands Project

**Prepared for:**


RZ Resources Limited
ABN: 23 160 863 892

Telephone: 1300 735 368
Email: media@rzresources.com

Level 8, 10 Eagle Street
BRISBANE QLD 4000


**Prepared by:**


**R.W. Corkery & Co. Pty. Limited**
Geological & Environmental Consultants
ABN: 31 002 033 712

Telephone: (02) 9985 8511
Email: admin@rwcorkery.com
Postal: PO Box 1796
CHATSWOOD NSW 2057

**Sydney | Orange | Brisbane | Townsville**

**Sydney**
Suite 12.01, 1-5 Railway Street
CHATSWOOD NSW 2067

**Orange**
62 Hill Street
ORANGE NSW 2800



Ref No. 928/12 March2024


RWCorkery&co

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# Acronyms

| | |
|---|---|
| AEP | Annual Exceedance Probability |
| ANZG | Australian and New Zealand Guidelines for Fresh and Marine Water Quality |
| BCD | Biodiversity and Conservation Division |
| BoM | Bureau of Meteorology |
| DCCEEW | Department of Climate Change, Energy, the Environment and Water |
| DECCW | Department of Environment and Climate Change and Water |
| DES | Department of Environment and Science |
| DPHI | Department of Planning, Housing and Infrastructure |
| DPE-Water | Department of Planning and Environment - Water |
| EA | Environmental Assessment |
| EC | electrical conductivity |
| EIS | Environmental Impact Statement |
| EP&A Act | *Environmental Planning and Assessment Act 1979* |
| EPA | Environment Protection Authority |
| EPL | environment protection licence |
| LEP | Local Environmental Plan |
| LGA | Local Government Area |
| Mtpa | million tonnes per annum |
| NRAR | Natural Resources Access Regulator |
| NWQMS | National Water Quality Management Strategy |
| OEH | Office of Environment and Heritage |
| POEO Act | *Protection of the Environment Operations Act 1997* |
| RWC | R.W. Corkery & Co. Pty. Limited |
| SES | State Emergency Service |
| SEARs | Secretary's Environmental Assessment Requirements |
| SILO | Scientific Information for Landowners |
| SSD | State Significant Development |
| SSM | Sustainable Soils Management Pty Ltd |
| SWA | Surface Water Assessment |
| WAL | Water access license |
| WM Act | *Water Management Act 2000* |
| WSP | water sharing plans |

# Executive Summary

RZ Resources Limited (the Applicant) is proposing to develop and operate the Copi Mineral Sands Project for the extraction and processing of heavy mineral ore to produce a heavy mineral concentrate. The proposed mine and its associated infrastructure would be located approximately 75km northwest of Wentworth, NSW, within the Wentworth Local Government Area (LGA) of New South Wales. Mineral concentrate would be transported via the proposed transportation route to a rail load out facility located on Holten Drive in the Broken Hill LGA (Rail Facility).

Mining operations would be undertaken using conventional dredge mining methods, with overburden extracted using conventional free dig, load and haul mining methods. Extracted ore would then be transferred to the floating Wet Concentration Plant. Heavy mineral concentrate would then be transferred to land-based plant situated in the Infrastructure Area for dewatering and further processing in the Rare Earth Concentrate Plant. The Project would extract up to 27.7 million tonnes of ore per annum for on-site processing to produce up to 450,000 tonnes per annum of heavy mineral concentrate. Following an approximately two year construction period, extraction operations would commence and are expected to continue for a period of 17 years that would be followed by a 7 year post-mining rehabilitation period. However, progressive rehabilitation would be undertaken throughout the life of mine, to take advantage of seasonal conditions as the mine progresses.

Secretary's Environmental Assessment Requirements (SSD-41294067 dated 19 May 2022) have been issued for the Project, which require a detailed assessment of likely surface water impacts of the development.

The surface water resources of the Mine Site are managed by the *Water Management Act 2000* (WM Act) under the rules of the water sharing plan for the *Lower Murray-Darling Unregulated River Water Source 2011*. The WM Act also contains provisions for basic landholder (harvestable) rights which entitle the owner or occupier of a landholding to take water without the need for a water access licence or approval. As the Mine Site is located within the Western Division harvestable rights order area, the Project is entitled to utilise all collected runoff for use in operations.

Within the Mine Site, there are six catchments of which five would be intersected by Project-related disturbance. Existing catchment drainage is topographically controlled and directed to internal, central depressions that provide no linkage or outlet to adjacent catchments. Where watercourses do occur, they comprise indistinct, discontinuous, ephemeral, first order drainage features which terminate in historically constructed farm dams. Some of the central depressions contain areas identified in the *Wentworth Shire Council Local Environmental Plan 2011* (Wentworth LEP) as wetland features. However, much of these areas are also identified on 1:100,000 topographic maps as “Lakes-mainly dry”. Approximately 105ha of these mapped wetlands are situated within the proposed disturbance footprint. The remaining mapped wetlands, where retained in the Mine Site, would maintain a degree of sub-surface hydraulic connection as each would either abut, or be proximal to, the proposed clean water bunds and thus receive recharge from the infiltration of ponded water.

The Mine Site is not situated on land identified as a Flood Planning Area in the Wentworth LEP.

During operations, the proposed water management strategy for the Project would ensure that clean runoff is prevented from entering disturbance areas by the construction of four bunds across the basal areas of four sub-catchments that would be created by Project-related disturbance. These bunds are considered “excluded works” under the *Water Management (General) Regulation 2018* and therefore permissible under the WM Act. Water ponded against these bunds would be allowed to infiltrate or evaporate, which is consistent with the current hydrologic regime. Sediment-laden runoff within disturbance areas would be prevented from entering the downstream environment by bunding or roads with internally directed cross-fall that would be situated along the boundary of the disturbance footprint.

In summary, whilst the Project would result in a reduction to areas of mapped wetlands, flow accumulation in undisturbed sub-catchments, that represent the majority of existing catchments, would be unimpacted. Any sediment-laden runoff from disturbed sub-catchments would be retained to prevent impacts to the receiving surface water environment.

# 1. Introduction

## 1.1 Scope

This Surface Water Assessment (SWA) has been prepared by R.W. Corkery & Co. Pty. Limited (RWC) to support an Environmental Impact Statement (EIS) which was also prepared by RWC on behalf of RZ Resources Limited (hereafter referred to as "the Applicant"). The SWA and EIS have been prepared to support an application for State Significant Development consent for the proposed construction and operation of the Copi Mineral Sands Project (hereafter referred to as the "Project").

The purpose of this SWA is to determine the potential impacts to local and regional surface water resources and users within and surrounding the Mine Site as a result of the Project and identify appropriate management measures to mitigate any identified impacts. The Rail Facility is currently disturbed and surface water runoff would continue to be managed through appropriate sediment and erosion controls. As a result, the Rail Facility is not considered further in this assessment,

## 1.2 Project Summary

### 1.2.1 Overview

The Applicant proposes to develop and operate the Project, an open cut mineral sands mine for the extraction and processing of mineral sand to produce a heavy mineral concentrate. The proposed mine and its associated infrastructure would be located within an area referred to as the Mine Site, located approximately 75km northwest of Wentworth, NSW, within the Wentworth Local Government Area (LGA) (**Figure 1**). Mineral concentrate would be transported via the proposed transportation route to a rail load out facility located on Holten Drive in the Broken Hill LGA (Rail Facility).

The Project would comprise the following (**Figure 2**).

- Construction and use of a range of ancillary infrastructure within an Infrastructure Area that would be comprised of the following components.
  - Rare Earth Concentrate Plant.
  - Offices, Administration, Workshop, Stores and Laydown Area.
  - A Mine Camp area, including accommodation for up to 220 persons, amenities, car parking and related infrastructure.
  - A 35 megawatt (MW) solar farm and diesel-powered generators (30MW – construction operations only).
  - Internal roads.
- A 27 kilometre (km) Site Access Road linking the Infrastructure Area to the Anabranch Mail Road.
- A 66 kilovolt (kV) powerline, adjacent to the Site Access Road to connect the Mine Site with the 220kV Buronga to Broken Hill transmission line.

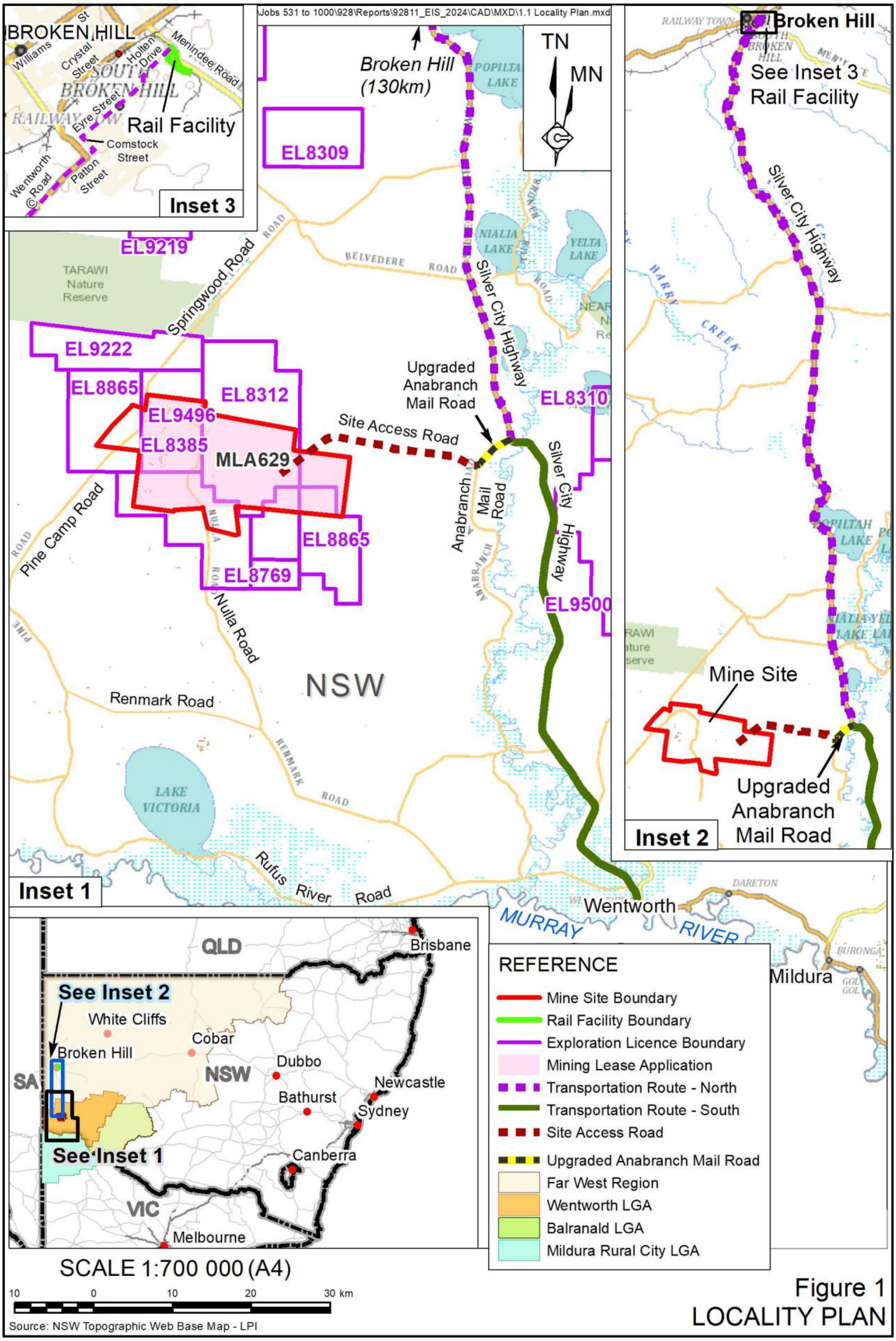


Figure 1
LOCALITY PLAN

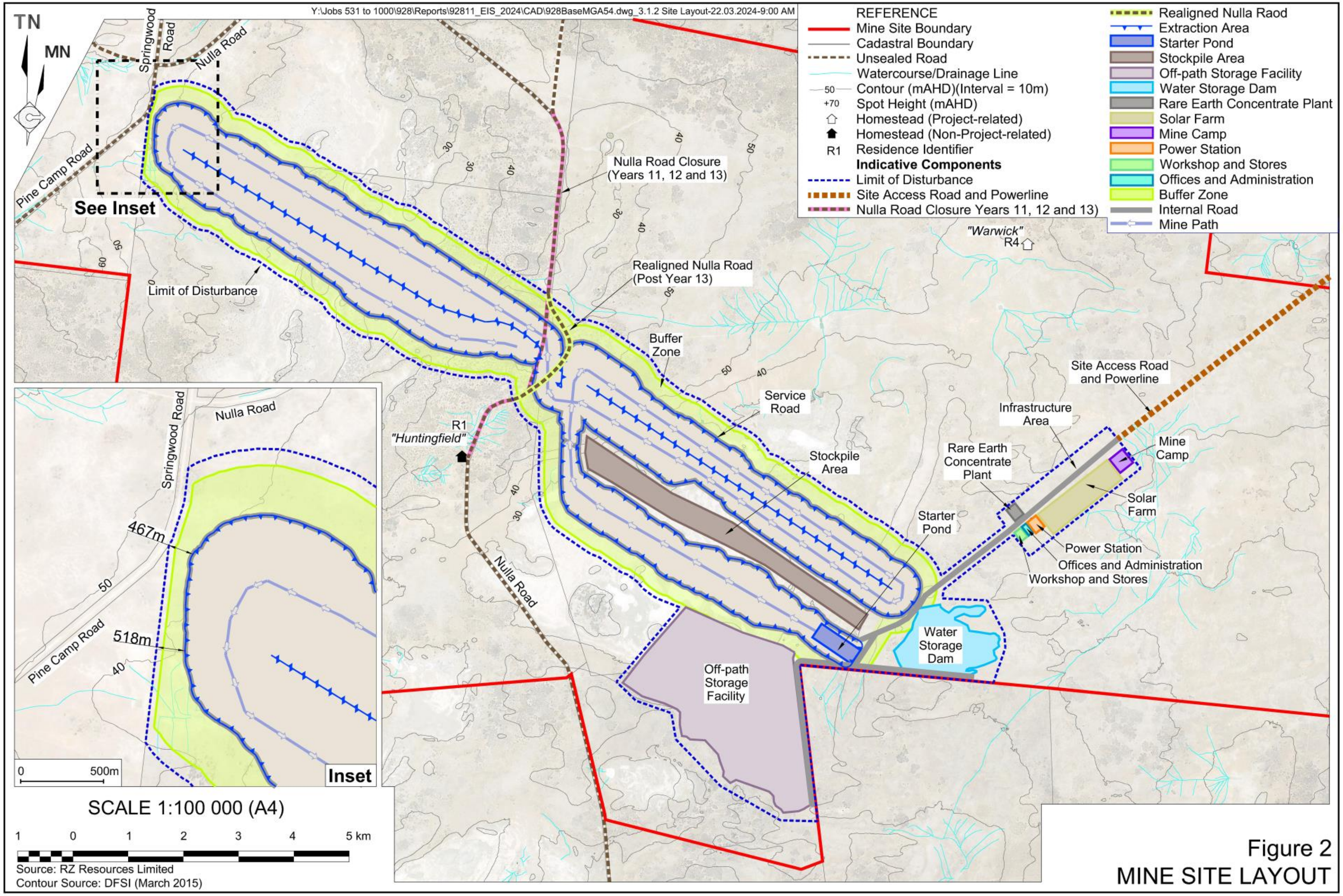


Figure 2
MINE SITE LAYOUT

- Open cut mining using a combination of traditional dry (excavate, load and haul) and wet (dredging) mining techniques to extract approximately 28.2 million tonnes per annum (Mtpa) of overburden, 48.0Mtpa of interburden and 27.7Mtpa of ore.
- On-site processing of extracted ore using a floating Wet Concentrator Plant and land-based Rare Earth Concentrate Plant to produce up to approximately 450,000 tonnes per annum (tpa) of heavy mineral concentrate.
- Transportation of heavy mineral concentrate in sealed containers from the Mine Site to the Rail Facility via the Site Access Road, an upgraded section of the Anabranch Mail Road and the Silver City Highway to Broken Hill.
- Loading of heavy mineral concentrate containers onto trains or direct transportation by road to port. Separate approvals would be sought for transportation from the Rail Facility.
- Initial placement of overburden, interburden and tailings within an Off Path Storage Facility until sufficient area within the dredge pond has been established. Following this, interburden and tailings would be placed within completed sections of the dredge pond, with overburden used to cap the placed material and for construction of the final landform.
- A Water Storage Dam for the management of water levels within the construction/starter ponds during the assembly of the dredges and Wet Concentration Plant.
- Progressive rehabilitation of completed sections of the Mine Site, including re-establishment of a final landform that would largely mimic the existing landform and revegetation with native species to re-establish ecosystem function within the Mine Site.
- The life of the Project would be approximately 24 years, comprising an initial 2 year construction period, followed by 17 years of mining operations and a further period of 5 years of rehabilitation.

### 1.2.2 Site Establishment and Construction Stage

The site establishment and construction activities for all key components for the Project would be sequenced to achieve the commencement of ore processing approximately 12 months after the commencement of the site establishment and construction stage. The general preparatory activities to be undertaken during this stage would include the following (**Figure 2**).

- The survey and marking out of all component areas to be disturbed during the site establishment and construction stage.
- Installation of fencing, gates, cameras and communications systems/infrastructure.
- Installation of erosion and sediment controls and associated drainage infrastructure to ensure exclusion of all surface water flows from areas outside the disturbance areas and containment of all incident rainfall within those areas.

- Development of a track along the alignment of the Site Access Road to permit access for construction-related equipment.
- Vegetation clearing.
- Soil stripping and stockpiling.
- Construction of internal roads.
- Installation of areas and facilities to support construction, including:
  - A Construction, Offices, Administration and associated infrastructure;
  - a Laydown Area, Workshop and Stores;
  - a Power Station (diesel);
  - an Off Path Storage Facility; and
  - the Water Storage Dam.

During this stage of the Project, water necessary for dust suppression and other construction activities would be sourced from groundwater via existing production bores within the Mine Site. These bores were installed in 2019 for investigating the feasibility of dewatering operations to facilitate dry mining.

### 1.2.3 Operational Stage

Prior to the commencement of mining operations, the Applicant would establish a construction pad above the water table and an adjacent construction pond, with a depth of approximately three metres below the water table. This construction pad would be used to individually assemble three dredges and the Wet Concentration Plant. During this period, a small temporary dredge would also be used to expand the construction pond and provide sufficient area to float all assembled equipment. Whilst the construction pond is in use, water levels would be managed via pumping to the Water Storage Dam. Once a dredge (or the Wet Concentration Plant) has been assembled, water would be returned from the Water Storage Dam to the construction pond to flood the construction pad and float the assembled equipment. This process would be repeated until all plant has been assembled and dredge mining operations would commence.

The establishment of the construction pad / pond and subsequent mining operations would involve the removal of vegetation and soil from the dredge pond footprint. This material would initially be placed in stockpiles within the approved limit of disturbance until such time as backfilling of the dredge pond commences. Following vegetation clearing and soil stripping, overburden, or non-mineralised material located above the water table would be extracted using conventional free dig, load and haul open cut mining methods. The thickness of overburden removed using this method would vary depending on the depth to the water table. Extracted overburden would initially be used to construct the Water Storage Dam, Off Path Storage Facility and other infrastructure then subsequently used to cover the backfilled sections of the dredge pond.

The extraction of material below the water table, namely interburden and ore, would then be undertaken using three jet suction dredges which use high pressure water jets to extract material that is then removed via a suction pipe. Typically, two dredges would extract interburden whilst the remaining dredge would extract the ore. As these dredges would be capable of operating up to a nominal water depth of 40 metres (m), the management of water levels within the dredge pond through dewatering operations is not required.

Extracted material from each dredge would be pumped to the Wet Concentration Plant, with material from the interburden dredges passing directly to the reject circuit. Initially, reject and interburden would be pumped to the Off Path Storage Facility. However, once the dredge pond is fully established and progressively moving along the mine path, the trailing edge of the dredge pond would be backfilled with reject and interburden using floating stackers. As this material would be primarily comprised of coarse to fine sand, it would settle relatively quickly and naturally consolidate to form a beach with a slope towards the dredge pond. Any water released during this consolidation would then return to the dredge pond. Once sufficiently consolidated and stabilised, overburden would be placed over the placed reject and interburden to promote further consolidation and compaction prior to shaping the final landform and rehabilitation.

### 1.2.4 Mining Schedule

**Figure 3** presents the anticipated mine schedule which may be summarised as follows. It is noted that circumstances during the Project-life may alter the mining schedule and the following description is indicative only.

- The starter pond would be located at the southeastern limit of the Extraction Area.
- Once the starter pit has been established, mining during Years 1 to 5 would progress to the northwest.
- In Year 5, the mine path would be reorientated to the north.
- Following completion of Year 5, mining operations would proceed in a southeasterly direction path until approximately midway through Year 8.
- During Year 8, the mine path would undergo a 180° rotation to proceed in a north westerly direction, parallel and adjacent to the Years 6 and 7 mine path, until the end of Year 10.
- During Year 11, the mine path would cross Nulla Road. That road would be closed at this time to permit mining operations until the end of mining life.
- From Year 12 until approximately midway through Year 15, the mine path would proceed in a northwesterly direction.
- During Year 15, the mine path would again rotate by 180° degrees and proceed in a southeasterly direction, parallel and adjacent to the Years 12, 13 and 14 mine path until the end of Year 17 that represents the end of mine life.  The final void would be backfilled using material stockpiled on path adjacent to the Year 17 Extraction Area.

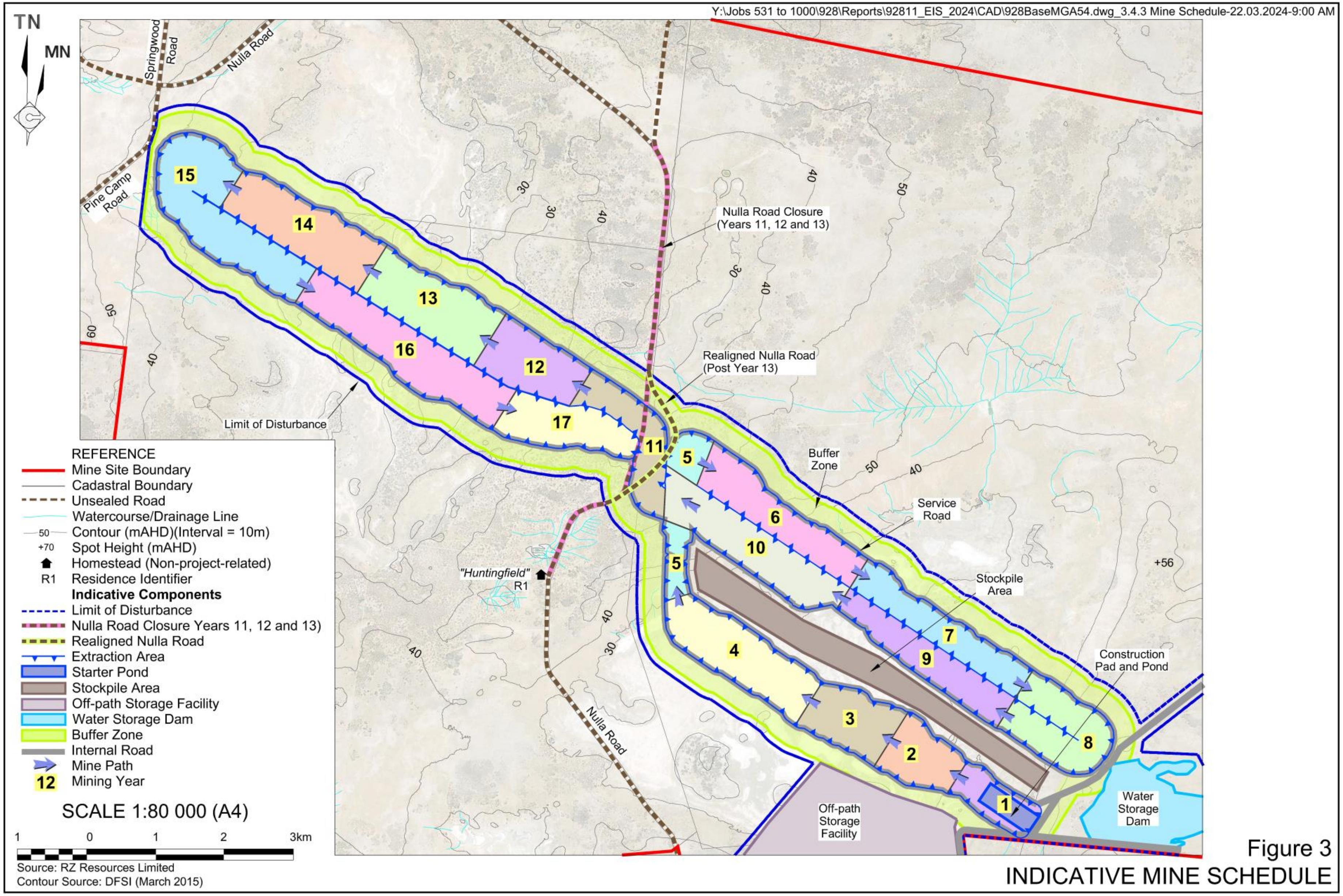


Figure 3
INDICATIVE MINE SCHEDULE

# 2. Regulatory framework

## 2.1 Assessment Requirements

The NSW Department of Planning and Environment (DPE) has provided Secretary's Environmental Assessment Requirements (SEARs) for the Project (application number SSD-41294067). The requirements of the SEARs in relation to surface water are presented in **Table 1** with the relevant section(s) of this SWA in which they have been addressed.

**Table 1**
**Coverage of SEARs – Surface Water**

| Agency / Organisation | Requirement | Relevant Section(s) |
|---|---|---|
| Department of Planning & Environment 19/05/22 | a water management strategy; | 4 |
| | a description of all works/activities that may intercept, extract, use, divert or receive surface water and/or groundwater; | 1.2 and 4 |
| | details of all water take for the life of the development and the relevant water source where water entitlements are required to account for the water take. If the water is to be taken from an alternative source, confirmation should be provided by the supplier that the appropriate volumes can be obtained; | Not applicable |
| | details of Water Access Licences (WALs) held to account for any take of water where required, or demonstration that WALs can be obtained prior to take of water occurring. This should include an assessment of the current market depth where water entitlement is required to be purchased and details of any exemptions or exclusions to requiring approvals or licenses under the *Water Management Act 2000*; | Not applicable |
| | an assessment of impacts on surface and groundwater sources (both quality and quantity), related infrastructure, adjacent licensed water users, basic landholder rights, watercourses, riparian land; | 5 |
| | a detailed and consolidated site water balance, including a description of site water demands, water disposal methods (inclusive of volume and frequency of any water discharges), water supply and transfer infrastructure and water storage structures, and measures to minimise water use; | EIS Section 3.8.4 |
| | a description of the measures proposed, including monitoring activities and methodologies, to ensure the development can operate in accordance with the requirements of any relevant WSP or water source embargo; | 4, 5 |
| | a detailed description of the proposed water management system (including sewage), water monitoring program and other measures to mitigate surface and groundwater impacts; | 4, 5 |
| | a description of construction erosion and sediment controls, how the impacts of the development on areas of erosion, salinity or acid-sulphate risk or erodible soils types would be managed and any contingency requirements to address residual impacts; | 4.1.4 and EIS Section 6.4 |
| | identification and impact assessment of all works located on waterfront land including consideration of the *Guidelines for Controlled Activity Approvals*; and | Not applicable |
| | an assessment of any likely flooding impacts of the development including consideration of the hydrology of the site in the site design and the placement of infrastructure to minimise flood risks. | 5.1.4 |

In the preparation of the SEARs, relevant government agencies have been consulted, with responses received from the following.

- Department of Planning and Environment – Water (DPE – Water) - 21 April 2022
- Environment Protection Authority (EPA) - 4 May 2022
- Biodiversity and Conservation Division (BCD) - 4 May 2022

Each of these agencies provided a detailed (generic) list of requirements to be addressed in the preparation of the SWA. The relevant requirements are listed in **Table 2** together with the section of this report where each requirement is addressed.

No specific assessment requirements have been provided by the Wentworth Shire Council for the SWA.

**Table 2**
**NSW Government Agency Requirements– Surface Water**

Page 1 of 2

| Issue | Requirement | Addressed |
|---|---|---|
| DPE – Water 21/04/2022 | The identification of an adequate and secure water supply for the life of the project. Confirmation that water can be sourced from an appropriately authorised and reliable supply. This is to include an assessment of the current market depth where water entitlement is required to be purchased. | Addressed in Groundwater Assessment |
| | A detailed and consolidated site water balance | Refer EIS Section 3.8.4 |
| | Assessment of impacts on surface water sources (both quality and quantity), related infrastructure, adjacent licensed water users, basic landholder rights, watercourses and riparian land, and measures proposed to reduce and mitigate these impacts. | 5 |
| | Proposed surface water monitoring activities and methodologies. | 4.1.6 |
| | Consideration of relevant legislation, policies and guidelines, including the *Guidelines for Controlled Activities on Waterfront Land (NRAR 2018)* and the relevant Water Sharing Plans. | Not applicable |
| NSW Environment Protection Authority 04/05/2022 | The following potential environmental impacts of the project need to be assessed, quantified and reported on.<br>(c) Water;<br>The Environmental Assessment (EA) should address how the required environmental goals outlined below will be met for each potential impact. | This report |
| | The EA should describe mitigation and management options that will be used to prevent, control, abate or mitigate identified potential environmental impacts associated with the project and to reduce risks to human health and prevent the degradation of the environment. | 4 |
| | Potential impacts on water quantity and quality | 5 |
| | Details of the site drainage and any natural or artificial waters within or adjacent to the development must be identified and where applicable measures proposed to mitigate potential impacts of the development on these waters. The EA should provide details of the proposed design and construction of water management systems for the site to ensure surface and ground waters are protected from contaminants. | 4 |
| DPE – Biodiversity & Conservation Division 04/05/2022 | The EIS should fully describe the proposal, the existing environment, including threatened species habitat not associated with vegetation communities such as paddock trees, and impacts of the development including the location and extent of all proposed works that may impact on flooding. | 4, 5.1.4 |
| | The EIS should specifically address the attached requirements for flooding and conduct suitable flood modelling for the purposes of appropriately locating infrastructure and for assessing impacts, including on waterway crossings for site access. | Not applicable |
| | The EIS must map the following features relevant to flooding as described in the Floodplain Development Manual 2005 (NSW Government 2005) including:<br>a. Flood prone land.<br>b. Flood planning area, the area below the flood planning level.<br>c. Hydraulic categorisation (floodways and flood storage areas).<br>d. Flood hazard. | Not applicable |

**Table 2 (Cont'd)**
**NSW Government Agency Requirements for SSD 41294067 – Surface Water**

Page 2 of 2

| Issue | Requirement | Addressed |
|---|---|---|
| DPE – Biodiversity & Conservation Division 04/05/2022 (Cont'd) | The EIS must 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. | Not applicable |
| | The EIS must model the effect of the proposed development (including fill) on the flood behaviour under the following scenarios:<br>a. Current flood behaviour for a range of design events as identified in 7 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. | Not applicable |
| | Modelling in the EIS must consider and document:<br>a. Existing council flood studies in the area and examine consistency to the flood behaviour documented in these studies. | 3.3.1 |
| | b. The impact on existing flood behaviour for a full range of flood events including up to the probable maximum flood. | Not applicable |
| | c. Impacts of the development on flood behaviour resulting in detrimental changes in potential flood affection of other developments or land. This may include redirection of flow, flow velocities, flood levels, hazards and hydraulic categories. | Not applicable |
| | d. Relevant provisions of the NSW Floodplain Development Manual 2005. | Not applicable |
| | The EIS must assess the impacts on the proposed development on flood behaviour, including:<br>a. Whether there will be detrimental increases in the potential flood affectation of other properties, assets and infrastructure. | Not applicable |
| | b. Consistency with Council Floodplain Risk Management Plans. | Not applicable |
| | c. Consistency with any Rural Floodplain Management Plans. | Not applicable |
| | d. Compatibility with the flood hazard of the land. | Not applicable |
| | e. Compatibility with the hydraulic functions of flow conveyance in floodways and storage in flood storage areas of the land. | 5.1.2 |
| | f. Whether there will be adverse effect to beneficial inundation of the floodplain environment, on, adjacent to or downstream of the site. | 5.1.2 |
| | g. Whether there will be direct or indirect increase in erosion, siltation, destruction of riparian vegetation or a reduction in the stability of river banks or watercourses. | 5.1.2 |
| | h. Any impacts the development may have upon existing community emergency management arrangements for flooding. These matters are to be discussed with the SES and Council. | Not applicable |
| | i. Whether the proposal incorporates specific measures to manage risk to life from flood. These matters are to be discussed with the SES and Council. | Not applicable |
| | j. Emergency management, evacuation and access, and contingency measures for the development considering the full range or flood risk (based upon the probable maximum flood or an equivalent extreme flood event). These matters are to be discussed with and have the support of Council and the SES. | Not applicable |
| | k. Any impacts the development may have on the social and economic costs to the community as consequence of flooding. | Not applicable |

## 2.2 Applicable Legislation, Policies, Plans and Guidelines

### 2.2.1 Water Management Act

The *Water Management Act 2000* (WM Act) was developed in recognition of the need for NSW water resources to be managed in a sustainable and integrated manner for the benefit of both present and future generations. The WM Act is administered by the NSW Department of Climate Change, Energy, the Environment and Water (DCCEEW), WaterNSW and the Natural Resources Access Regulator (NRAR) to provide clear arrangements relating to the allocation of, and regulating access to, NSW's water resources. The WM Act also contains provisions for controlling land-based activities that may affect the quality and quantity of the State's water resources via the granting of certain approvals.

**Table 3** below presents the surface water licensing and approval requirements of the WM Act and how they apply to the Project.

**Table 3**
**WM Act Approvals and Application to Project**

| WM Act Section | Name and purpose | Applicability for Project |
|---|---|---|
| 53 | Harvestable rights that entitle the owner or occupier of a landholding to construct works for the capture, storage and use of water without the need for a WAL or water management work approval. | The Mine Site is situated within the Western Division of the harvestable rights area, the owner or occupier of the land is entitled to capture all rainfall and runoff and use it for any purpose. |
| 56 | Water access license (WAL) that entitles the holder to take and use water up to a specified share (share component) within a specified water management area or specified water source. | Not applicable as no licensed entitlement to surface water resources would be sought or are required. |
| 89 | Water use approval authorising the use of water for a specific purpose and at a specific location | Not applicable. The Project is exempt from this requirement under Section 4.41 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) and Section 53 (harvestable rights) of the WM Act. |
| 90 | Water management work approval authorising the construction of a water supply work, drainage work or flood work at a specified location. | Not applicable. The Project is exempt from this requirement under Section 4.41 of the EP&A Act. In addition, water management works in certain areas of the Mine Site are considered "excluded works" under Section 39 of the WM (General) Regulation 2018. |
| 91 | Approval authorising a controlled activity on waterfront land. | Not applicable. The Project is exempt from the requirement for a controlled activity approval under Section 4.41 of the EP&A Act. |

### 2.2.2 Protection of the Environment Operations Act

The *Protection of the Environment Operations Act 1997* (POEO Act) provides the framework for regulation and reduction of pollution and waste in NSW. The POEO Act is regulated by the Environment Protection Authority (EPA), which issues environment protection licences (EPLs) for certain activities including water discharge. As the Project would exceed the 4ha disturbance threshold under Clause 29(2) of Schedule 1 of the POEO Act and EPL would be required.

The POEO Act also requires immediate reporting of pollution incidents which cause or threaten to cause material harm to the environment. All holders of EPLs are required to prepare, implement and regularly test *Pollution Incident Response Management Plans*.

### 2.2.3 Water Sharing Plan

The principles of the WM Act require that operational water sharing plans (WSP) for the respective river or aquifer system be established to protect the water resource, dependent ecosystems and surface water users by identifying and establishing the resource allocations available for distribution (e.g., WALs) and share components) and the objectives for the relevant system.

Surface water resources of the area in which the Mine Site is situated are managed under the terms of the *Water Sharing Plan for the Lower Murray-Darling Unregulated River Water Source 2011*. However, as identified in **Table 3**, no WALs entitling access to surface water resources are required or would be sought by the Applicant. This notwithstanding, the Applicant would endeavour to ensure the Project meets the environmental objectives of the WSP.

### 2.2.4 Wentworth Local Environmental Plan

The Mine Site is situated within the Wentworth Local Government Area (LGA) and as such is subject to the planning provisions contained in the Wentworth Local Environmental Plan (LEP) 2011. Regarding the management of surface water, the provisions of the LEP require the consent authority to consider whether the Project:

- is compatible with the land's flood function;
- avoids adverse or cumulative impacts on flood behaviour;
- does not disrupt or have a detrimental effect on existing drainage patterns and soil stability;
- would have adverse impacts on any waterway, drinking water catchment or environmentally sensitive area;
- would protect the ecological processes necessary for the continued existence of native flora and fauna; and
- has the potential for adverse impacts to the surface water characteristics, quality and flows to wetlands, watercourses and riparian areas.

The Mine Site is not identified as being within an LEP flood planning area. However, mining-related disturbance would occur in areas mapped as wetlands under the LEP (**Figure 4**). These LEP mapped wetlands align with mapped watercourse areas of the WM (General) Regulations 2018 hydrolines spatial dataset. However, comparison with **Figure 7** shows that the mapped LEP wetlands also correspond with areas identified as "Lakes – Mainly Dry" on the NSW 1: 100,000 topographic map series.

### 2.2.5 Erosion and Sediment Control Guidelines

Whilst there are a number of documents available for the management of stormwater runoff with respect to the prevention of water quality impacts as a result of increased erosion and potentially sediment-laden runoff, the following guidelines are typically referenced in NSW and with regard to similar developments as the Project.

- *Managing Urban Stormwater: Soils and Construction, Volume 1 (Landcom, 2004).* This document is commonly referred to as the "Blue Book".
- *Managing Urban Stormwater: Soils and Construction, Volume 2E – Mines and Quarries (DECC, 2008).*

In particular, the guidelines referenced above contain details relating to the methodologies employed in the design calculations of sedimentation basins necessary for the capture, storage and treatment of stormwater prior to release.

### 2.2.6 Water Quality Guidelines

The principal guideline for water quality in Australia is the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZG, 2019). This guideline was established under the National Water Quality Management Strategy (NWQMS). The ANZG 2019 Guideline sets quantitative and qualitative values for a range of water quality parameters for the protection of water quality objectives.

There are a range of water quality objectives reflecting the ecological, social and economic attributes and ecosystem function of the regional catchment. The identification of these water quality objectives helps to identify the water quality trigger values for the Project. A summary of the surface water quality objectives and their aims for the uncontrolled streams of the Barwon – Darling and Far Western Catchments (DECCW, 2006) that constitute the receiving environment are as follows:

- Aquatic ecosystems – that aim to maintain or improve the ecological condition of waterbodies and their riparian zones;
- Visual amenity – that aim to protect the aesthetic quality of waters;
- Secondary contact recreation – that aims to maintain water quality for activities where there is a low probability of water being swallowed;
- Primary contact recreation – that aims to maintain water quality for activities where there is a high probability of water being swallowed;

- Livestock water supply – that aims to protect water quality to maximise production of healthy livestock;
- Homestead water supply - that aims to protect water quality for domestic use including drinking, cooking and bathing; and
- Aquatic foods – that aims to protect water quality for the production of aquatic foods for human consumption.

Another key document for managing water quality in the Murray Darling Basin is the Commonwealth *Water Act 2007*. However, this document does not identify any targets for the Murray Lower Darling water resource planning area. In 2020, the (then) Department of Planning, Industry and Environment published a document titled "*The Basin Plan: Water quality technical report for the Murray Lower Darling surface water resource plan area (SW8)"* (DPIE, 2020). This document identified a range of targets to protect the Murray Lower Darling water resource planning area from identified threats such as harmful algal blooms and salinity.

Whilst technically the water quality objectives and various quality targets are applicable to the Project, the existing hydrologic regime in the vicinity of the Mine Site is highly ephemeral, with no permanent natural water features present. Therefore, the water quality guidance identified above is provided as a guide only. This notwithstanding, the Applicant would endeavour to ensure the Project meets these water quality objectives or any others mandated by regulatory agencies.

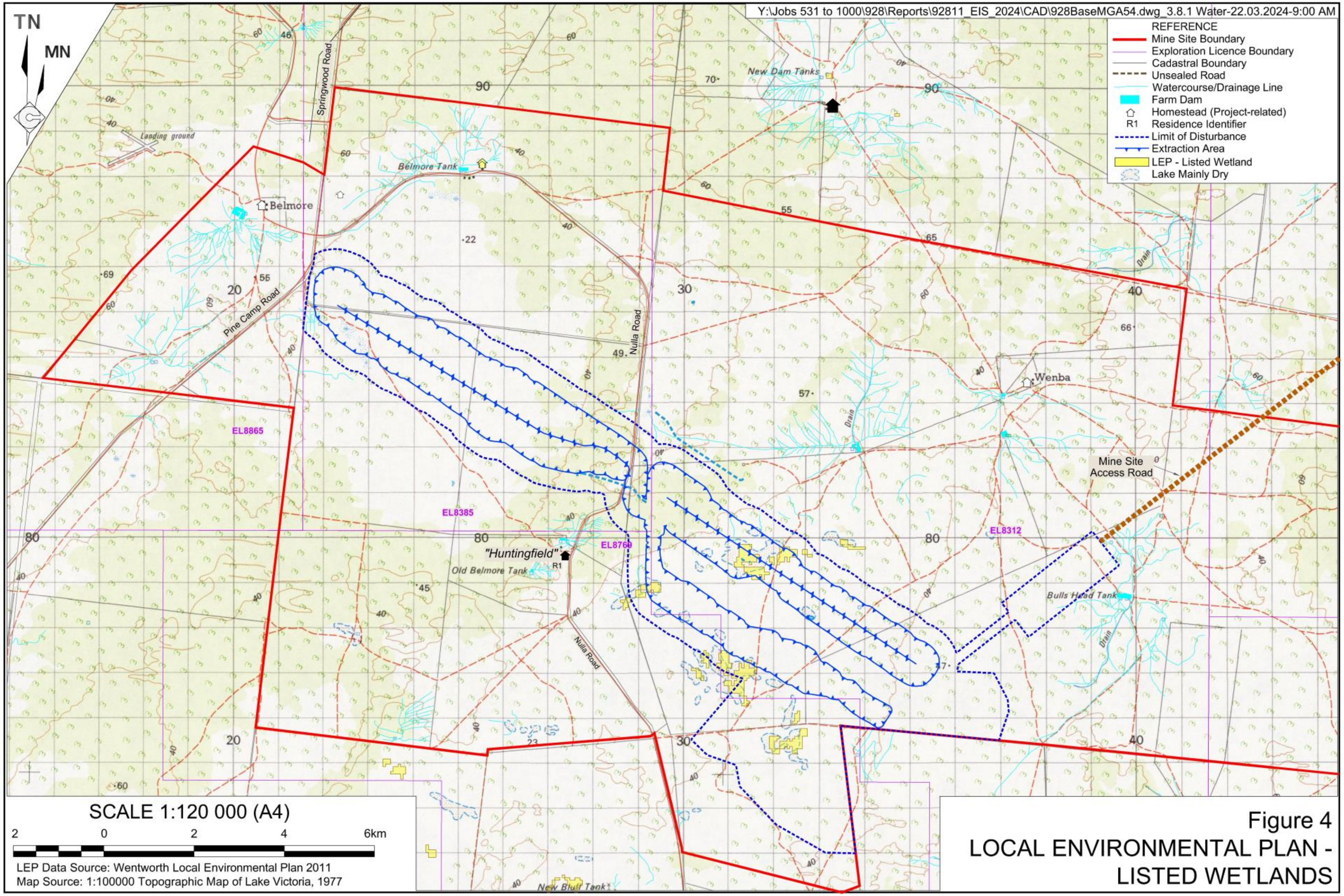


Figure 4
LOCAL ENVIRONMENTAL PLAN - LISTED WETLANDS



RWCorkery&co

# 3. Existing Environment

## 3.1 Climate

### 3.1.1 Introduction and Data Sources

This subsection provides a brief overview of the meteorological conditions surrounding the Mine Site focusing particularly on those aspects of the climate that are likely to influence the potential Project-related surface water impacts.

There are four Bureau of Meteorology (BoM) within 50km of the Mine Site (**Figure 5**) with either current or historic records, namely:

- Wentworth (Tarawi) – 22km from the Mine Site with rainfall records from 1 January 1966 until 15 February 2016;
- Wentworth (Nulla) – 25km from the Mine Site with rainfall records commencing 1 January 2017 until the present day;
- Wentworth (Toora) – 41km from the Mine Site with rainfall records from 1 January 1972 until 31 July 2016; and
- Lake Victoria – 49km from the Mine Site with rainfall records commencing 1 January 1922 until the present day and evaporation data from 1965 onwards.

The Applicant installed a meteorological station within the Mine Site in 2017. However, this station malfunctioned in December 2019 and was deemed inoperable with limited reliable data available after that date. Therefore, climate data for the SWA has been sourced from the Scientific Information for Landowners (SILO) database, managed by the Queensland Department of Environment and Science (DES). The program uses historic Bureau of Meteorology datasets and interpolation techniques to generate continuous daily time step synthetic climate data for any given location in Australia. The SILO dataset for the period 1 January 1889 to 31 December 2023 was generated for the Mine Site (Latitude -33.60, Longitude 141.30) on 30 January 2024.Climate data sourced from SILO is presented in **Table 4** whilst **Figure 6** provides a comparison of the SILO data with those of the BoM stations identified above.

Review of **Figure 6** identifies the mean monthly rainfall derived from the SILO rainfall data is generally consistent with that of Lake Victoria albeit with some minor variation. This is likely due to the longer-term (100-years) record for Lake Victoria capturing a greater temporal range of observation. This is highlighted by the variation observed from the 48-year record collected at Wentworth (Tarawi). The close relationship between the SILO and Lake Victoria Pan A evaporation data is attributed to the interpolation techniques employed by the SILO and the absence of other BoM stations collecting this data.

### 3.1.2 Temperature

The SILO data identifies that January is typically the hottest month, with an average maximum temperature of 33.2ºC. July is the coldest month with a mean maximum temperature of 16.1°C and a mean minimum temperature of 5.0°C.

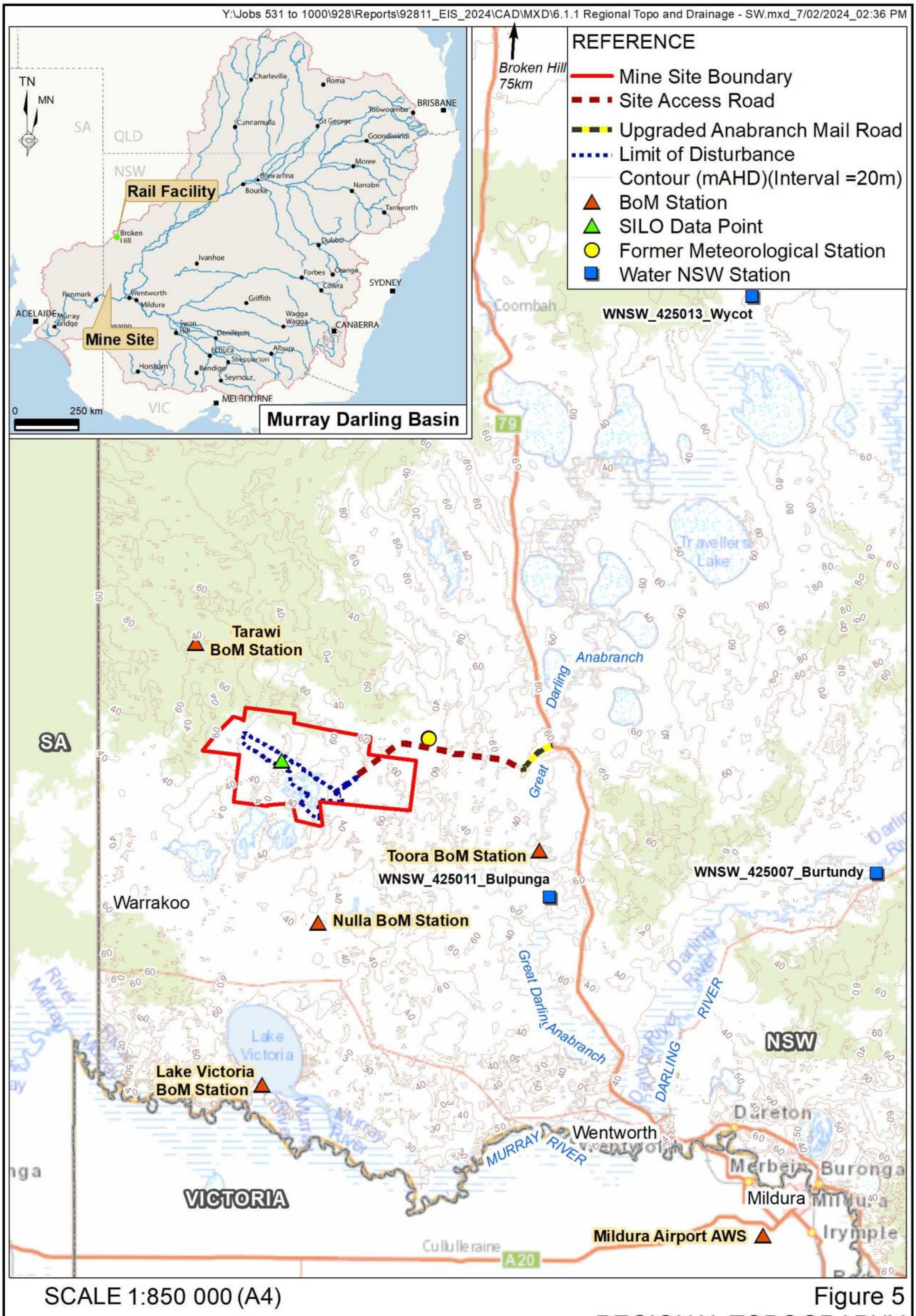


Figure 5
REGIONAL TOPOGRAPHY AND DRAINAGE

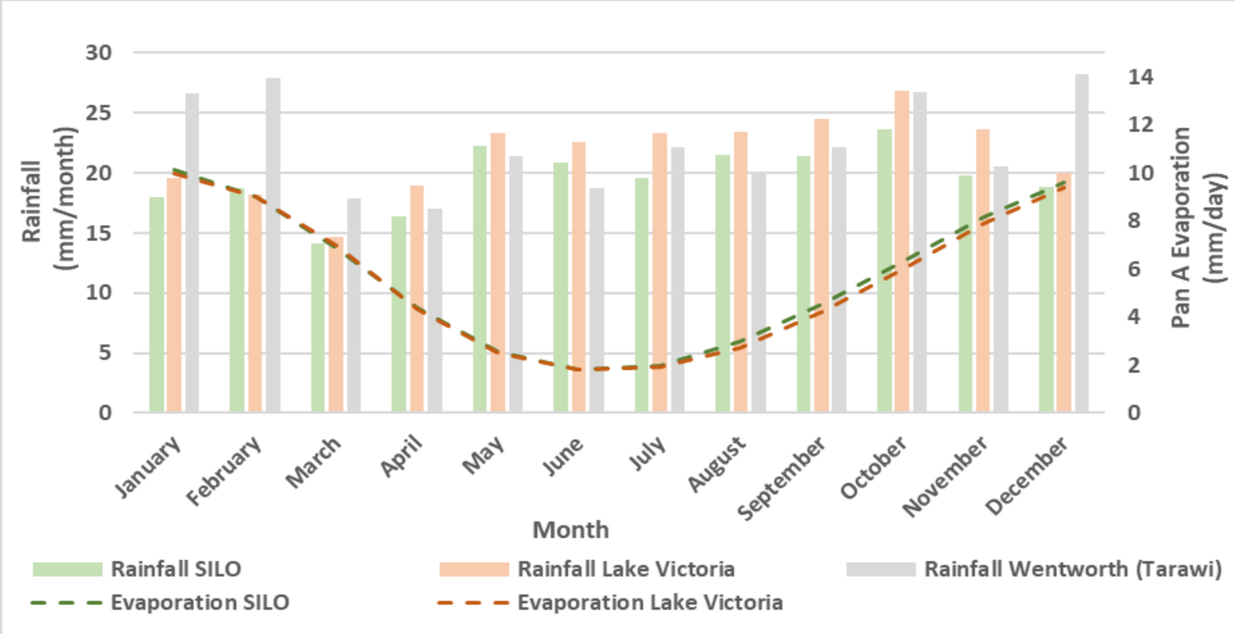


**FIGURE 6**
**Mean Monthly Rainfall and Mean Daily Evaporation Derived from SILO and BoM Station Data**

**Table 4**
**Climate Data**

| | Jan | Feb | Mar | April | May | June | July | Aug | Sept | Oct | Nov | Dec | Annual |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Temperature (C°) – SILO (1889 to present)** | | | | | | | | | | | | | |
| Mean maximum temperature | 33.2 | 32.5 | 29.2 | 24.3 | 19.8 | 16.5 | 16.1 | 18.1 | 21.5 | 25.1 | 28.7 | 31.4 | 24.7 |
| Mean minimum temperature | 17.3 | 17.0 | 14.4 | 10.7 | 7.9 | 5.7 | 5.0 | 5.9 | 8.2 | 10.8 | 13.7 | 15.7 | 11.0 |
| **Rainfall (mm) – SILO (1889 to present)** | | | | | | | | | | | | | |
| Mean rainfall | 18.0 | 18.7 | 14.1 | 16.4 | 22.3 | 20.8 | 19.5 | 21.5 | 21.4 | 23.6 | 19.8 | 18.9 | 235.1 |
| Highest rainfall | 119.1 | 214.1 | 110.5 | 118.1 | 103.2 | 89.5 | 62.2 | 84.3 | 101.0 | 122.0 | 82.6 | 188.7 | 592.6 |
| Lowest rainfall | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.0 | 0.1 | 0.4 | 0.0 | 0.0 | 0.0 | 53.1 |
| Highest daily rainfall | 53.4 | 93.8 | 53.7 | 32.8 | 35.6 | 37.3 | 27.0 | 31.7 | 37.1 | 48.1 | 49.4 | 111.7 | 111.7 |
| **Mean Monthly Evaporation (mm) – SILO (1889 to present)** | | | | | | | | | | | | | |
| Class A Pan | 314.3 | 254.8 | 213.9 | 131.2 | 78.7 | 54.1 | 61.4 | 92.1 | 135.9 | 194.7 | 244.7 | 297.9 | 2073.6 |
| Source: Queensland Department of Environment and Science | | | | | | | | | | | | | |

### 3.1.3 Rainfall

Review of **Table 4** identifies that mean annual rainfall at the Mine Site is 235.1mm. Rainfall distribution is relatively even throughout the year, although the autumn months collectively contribute the lowest amount to total annual rainfall with approximately 22% of the total average annual rainfall. On average, the driest month is March with 14.1mm of rainfall whilst the wettest month on average is October with 22.6mm (**Table 4**).

The driest year of the SILO record is 2019 with 53.1mm of rainfall. This accords with Lake Victoria's 2019 total of 66.4mm and the 47.2mm recorded at Wentworth (Nulla) for the same year. By contrast, the wettest year on the SILO record was 1973 with 592.6mm which corresponds with the 603.6mm recorded at Lake Victoria for that year.

The SILO data contains a maximum daily rainfall of 111.7mm on 13 December 1975. Maximum daily rainfall exceeds monthly average rainfall for all months, indicating that high intensity storms over a relatively short duration may occur, particularly in the summer months of December and February.

### 3.1.4 Evaporation

The mean Class A Pan evaporation data presented in **Table 4** has been derived from SILO data. Mean evaporation at the Mine Site is subsequently anticipated to be approximately 5.7mm per day throughout the year or 2 079mm per year. This is slightly higher than the annual evaporation recorded at Lake Victoria. Mean daily evaporation varies between approximately 1.8mm per day (54.1mm/month) in June and 10.1mm per day (314.3mm/month) in January.

## 3.2 Topography

### 3.2.1 Regional Topography

The Mine Site is situated within a relatively flat area of the central Murray Darling Basin (**Figure 5**). Regional topography is characterised by sequences of ridges and lunettes that rise to elevations between 50m above the Australian Height Datum (AHD) and 70m AHD. These ridges are interspersed with broad swales and drainage depressions with elevations between 30m AHD and 40m AHD.

### 3.2.2 Local Topography

Mine Site topography is a small-scale reflection of regional topography and is characterised by swales and drainage depressions. Within the Mine Site there are four depressions, the most significant two being the centrally situated Eastern and Western Salt Pans with two lesser depressions, namely the central and eastern depression (**Figure 7**). The floors of the two salt pans are approximately 25m AHD whilst the floors of the central and eastern depressions are at an elevation of approximately 30m AHD. The salt pans and depressions are interpreted to have been formed by deflation, with wind-blown sediments deposited as lunettes on the eastern side of each structure. The salt pans and depressions are surrounded by gently sloping land that rises to approximately 58m AHD east of the Eastern Salt Pan and approximately 53m AHD east of the Western Salt Pan.

At greater distances from the salt pans, the landforms are typically flat to undulating, with rises and swales typically between 70m AHD and 40m AHD respectively. Slopes typically average <1%, with localised areas of 5% slopes associated with the wind-blown lunettes adjacent to the Eastern and Western Salt Pans.

# 3.3 Regional and Mine Site Catchments

## 3.3.1 Regional Drainage

### *3.3.1.1 Rivers and Lakes*

As previously noted, the Mine Site is located within the Lower Darling River sub-basin of the broader Murray Darling Basin, which has an area of approximately one million square kilometres (BoM, 2013). This basin is drained by Australia's three longest rivers, the Murray, Darling and Murrumbidgee Rivers.

The Murray Darling Basin in the vicinity of the Mine Site is dominated by the Darling River. This river starts at the confluence of the Barwon and Culgoa Rivers, between Brewarrina and Bourke in northern NSW and flows in a southeasterly direction before merging with the Murray River at Wentworth. The Murray River then flows in a westerly and south-westerly direction before entering the Southern Ocean at Goolwa, in South Australia.

The Great Darling Anabranch, located approximately 20km east of the Mine Site, is a relict channel of the Darling River and flows in a generally southerly direction before also merging with the Murray River at Wentworth. The Great Darling Anabranch includes series of large shallow lakes such as Yelta, Wialia, Pine, Popio and Popiltah Lakes (**Figure 5**). These lakes, and many smaller drainage depressions, are believed to have been formed by wind transportation of dry exposed sediments in the base of the depression. These sediments commonly form lunettes of wind-blown material on the northeastern and eastern margins of the lakes, a reflection the dominant south-westerly wind patterns.

Lake Victoria, located approximately 30km to the south of the Mine Site, forms an integral component of the regulated Murray River system, with water levels controlled by a series of embankments and locks.

### *3.3.1.2 Regional Flooding*

The *Wentworth Shire Local Flood Plan* (SES, 2018) notes that the occurrence of flooding in the Darling River is usually either the result of summer rainfall in southern Queensland or winter rainfall in northern NSW. The Great Darling Anabranch may periodically act as a flood channel when the Darling River is in flood. During such periods, the series of large lakes identified in Section 3.3.1.1 would also fill, acting as floodplain storages. SES (2018) identifies specific flood risk areas in and around population centres such as Wentworth, which is situated at the junction of the Murray and Darling Rivers, and those of Gol Gol, Dareton and Buronga, all of which are located on the Murray River. SES (2018) identifies that Pooncarie, a minor population centre on the Darling River has been isolated but never inundated by floodwaters.

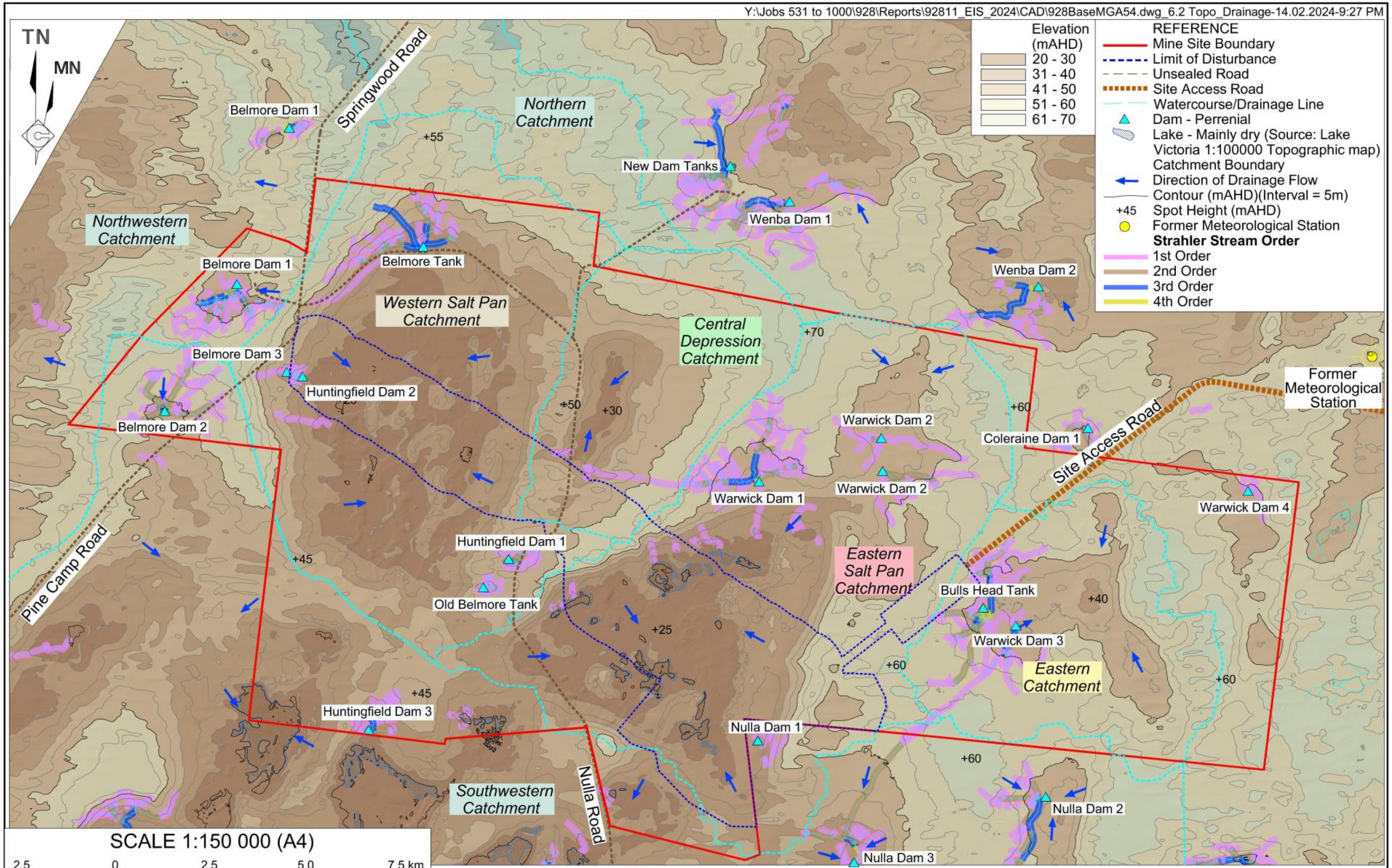


Figure 7
MINE SITE TOPOGRAPHY AND DRAINGE

### 3.3.1.3 Regional Land-use

Due to the low rainfall of the region, land-use is principally low intensity grazing. However, areas closer to more permanent water sources, such as the Darling River at Menindee, Lake Tandou on the Great Darling Anabranch and along the Murray River between Buronga and Wentworth are able to sustain more intensive agricultural activities such as irrigated cropping. Some areas are also set aside for conservation, such as the Tarawi Nature Reserve and the Nearie Lake Nature Reserve that are north and northeast of the Mine Site respectively (refer **Figure 5**).

### 3.3.1.4 Regional Water Quality

In 2020, land-use changes and flow regulation were identified as major issues and causes of water quality degradation in the Murray and Lower Darling water resource planning area by the (then) Department of Planning, Industry and Environment (DPIE, 2020). Harmful algal blooms are also considered a key threat to the Darling River and its tributaries downstream of Menindee Lakes. Such blooms occur as the result of low flow conditions, elevated water temperatures and nutrient loads (e.g. phosphorous and nitrogen).

Water quality datasets collected at monitoring stations operated by WaterNSW are available for the Darling River and Great Darling Anabranch at the locations shown on **Figure 5**, namely:

- Station 425007 (Burtundy) on the Darling River approximately 90km southeast of the Mine Site.
- Station 425013 (Wycot) on the Great Darling Anabranch approximately 95km northeast of the Mine Site; and
- Station 425011 (Bulpunga) on the Great Darling Anabranch approximately 45km southeast of the Mine Site.

However, the data is limited to electrical conductivity (EC) and temperature, with dissolved oxygen also measured at Station 425007 (Burtundy). **Table 5** presents a statistical summary of collected EC and dissolved oxygen data.

**Table 5**
**WaterNSW Monitoring Data Summary**

| Parameter | Statistic | Station[1] | | |
|---|---|---|---|---|
| | | 425007 | 425013 | 425011 |
| EC (µS/cm) | Minimum | 251.1 | 211.6 | 276.7 |
| | Median | 583.4 | 474.0 | 552.8 |
| | $95^{th}$ Percentile | 1,306.4 | 1,721.9 | 1,503.1 |
| | Maximum | 1,694.4 | 2,289.7 | 2,757.2 |
| Dissolved Oxygen (% saturation) | Median (2021/2022) | 95.9 / 71.4 | Not available | Not available |

Note 1: see **Figure 5**
Source: https://realtimedata.waternsw.com.au/water.stm

Review of **Table 5** identifies that EC values in both the Darling River and the Great Darling Anabranch are variable and with similar minimum and median values. However, the maximum recorded EC values in the Great Darling Anabranch are somewhat higher than that recorded for the Darling River and possibly reflect the disrupted flow regime in this watercourse.

As noted in Section 2.2.6, the Commonwealth *Water Act, 2007* does not identify water quality targets for the Murray Lower Darling water resource planning area. Therefore, DPIE (2020) nominated 830µS/cm as the 95th percentile target value for the Darling River at Station 425007 (Burtundy) for the purposes of long-term planning. DPIE (2020) also identifies that, for the protection of water dependent ecosystems, annual median dissolved oxygen (% saturation) be between 85 – 110%. **Table 5** identifies the 95th percentile EC target is exceeded at all monitoring stations whilst in 2022, annual median dissolved oxygen was below the target range.

## 3.3.2 Mine Site Drainage

### *3.3.2.1 Mine Site Catchments*

There are six surface water catchments either wholly or partly within the Mine Site boundary (**Figure 7**). The local drainage network of these catchments direct runoff internally, with no catchment outlet or downstream linkages. These internal drainage networks are also indistinct and discontinuous, terminating in dams that were historically constructed to support stock watering (**Figure 7**). This means that drainage depressions, such as the Eastern and Western Salt Pans will typically only receive overland flow when runoff occurs. Additional catchments occur on the eastern and northeastern boundary of the Mine Site, well removed from mining-related activities.  As a result, those catchments are not considered further.

Project-related disturbance would largely be confined to three catchments with the remaining three catchments largely outside of the Project's disturbance footprint. A brief description of all Mine Site catchments is as follows.

- Northwestern Catchment – the Mine Site covers a small section of this agricultural catchment which drains externally to the west.
- Southwestern Catchment – this catchment is partly situated within, and externally drains beyond, the southwestern and western sections of the Mine Site. Approximately 0.5km$^2$ of the northeastern section of this catchment would be disturbed by the Project.
- Western Salt Pan Catchment – this catchment is approximately 91km$^2$ in area as is mostly situated within the western section of the Mine Site and drains to the Western Salt Pan. Approximately 17km$^2$ of the central section of this catchment would be disturbed by Project-related activities.
- Central Depression Catchment– this catchment is approximately 36km$^2$ in area and is situated largely within the Mine Site. Project-related activities would disturb an approximately 5km$^2$ area in the southern section of this catchment.
- Eastern Salt Pan Catchment – this catchment is approximately 105km$^2$ in area and is situated in the central eastern section of the Mine Site. Catchment drainage is towards the Eastern Salt Pan. Approximately 33km$^2$ of this catchment would be disturbed by Project-related activities.

- Eastern Catchment – this catchment is approximately 42km$^2$ in area and is almost entirely within the easternmost section of the Mine Site with an approximately 0.6km$^2$ area within the proposed limit of disturbance.

#### 3.3.2.2 Mine Site Catchment Yield

Annual yields for those catchments draining within the Mine Site across a range of annual exceedance probabilities (AEP) are presented in **Table 6**. These yields have been estimated using SILO data and a 0.05 runoff coefficient which matches that of the Lake Victoria region baseline presented in the document *Climate Change Impacts on Surface Runoff and Recharge to Groundwater* (OEH, 2015).

**Table 6**
**Estimated Annual Catchment Yields**

| Catchment | Area (km$^2$) | Annual Yield (ML) | | | | |
|---|---|---|---|---|---|---|
| | | 99% AEP | 50% AEP | 20% AEP | 10% AEP | 1% AEP |
| Eastern Salt Pan | 105.5 | 381 | 1,183 | 1,630 | 1,893 | 2,584 |
| Western Salt Pan | 91.5 | 330 | 1,025 | 1,412 | 1,641 | 2,239 |
| Central | 36.0 | 130 | 404 | 557 | 647 | 883 |
| Eastern | 41.9 | 151 | 470 | 647 | 752 | 1,026 |

Whilst the relatively low estimated annual catchment yields presented in **Table 6** reflect the permeable nature of the surficial sediments; they are likely to overstate the actual volumes collected at a single geographical point in the catchment. This is due to the nature of the topography which generally collects runoff in multiple minor depressions between sand dunes and lunettes from where it seeps into the ground or is evaporated, thus preventing the cumulative concentration of overland flow at a single location.

#### 3.3.2.3 Mine Site Flooding

The Mine Site is not situated on land identified in the Wentworth LEP as being a "Flood Planning Area" (refer Section 3.3.1). Furthermore, as noted in Section 3.3.2.1, the Mine Site catchments are internally draining and lack connections or outlets with adjacent catchments. Therefore, when rainfall events of sufficient magnitude to generate runoff occur, the discharge is directed by topography to the base of a localised depression where it ponds until the collected water evaporates. In the flatter central areas of the larger topographic depressions within the Mine Site, this results in ponding of larger volumes of water which results in evaporative features like the Western and Eastern Salt Pans. Peak catchment discharge for those catchments where Project-related activities would disturb more than 1km$^2$ are presented in **Table 7**[1]. The values presented in **Table 7** have been calculated for a range of annual exceedance probability (AEP) rainfall events using the Bureau of Meteorology (BoM) Intensity Frequency and Duration data and the flood estimation methodology presented in *Zaman et al* (2012).

[1] Whilst Project-related activities would create disturbance sub-catchments at the peripheries of the existing Eastern and Southwestern catchments, the small sub-catchment areas (<6ha), undulating topography and low runoff coefficient means that peak discharge from these sub-catchments is minor.

**Table 7**
**Estimated Peak Catchment Discharge**

| Catchment | Sub-catchment (see **Figure 8**) | Area ($km^2$) | Peak Flow Estimate ($m^3$/sec) | | | |
|---|---|---|---|---|---|---|
| | | | 10% AEP | 5% AEP | 2% AEP | 1% AEP |
| Eastern Salt Pan | North | 51.4 | 6.7 | 9.5 | 15.2 | 21.5 |
| | East | 2.5 | 1.9 | 2.7 | 4.3 | 6.1 |
| | Southeast | 7.2 | 2.9 | 4.2 | 6.7 | 9.4 |
| | Southwest | 10.9 | 3.5 | 5.0 | 7.9 | 11.2 |
| | Disturbed | 33.4 | 5.6 | 7.9 | 12.7 | 18.0 |
| Western Salt Pan | North | 41.8 | 6.1 | 8.7 | 13.9 | 19.7 |
| | South | 32.6 | 5.5 | 7.9 | 12.5 | 17.8 |
| | Disturbed | 17.1 | 4.2 | 6.0 | 9.6 | 13.5 |
| Central | North | 31.0 | 5.4 | 7.7 | 12.4 | 17.5 |
| | Disturbed | 5.0 | 2.5 | 3.6 | 5.8 | 8.2 |

#### *3.3.2.4 Mine Site Land-use*

The prevailing land use within and surrounding the Mine Site is associated with low intensity grazing.

#### *3.3.2.5 Mine Site Water Quality*

Due to the highly ephemeral nature of the watercourses and relatively short flow paths and duration and impassability of roads following rainfall events, ambient water quality data is not available for the Mine Site. Standing water, collected in topographic depressions or farm dams is anticipated to have a chemical composition that reflects its rainfall source. However, once subjected to evaporative concentration over time, this standing water is expected to undergo an increase in dissolved ions that would be reflected in EC. Therefore, it is anticipated that surface water quality within the Mine Site would generally be similar to that monitored by WaterNSW in the Great Darling Anabranch and presented in **Table 5**.

# 4. Management and Mitigation Measures

## 4.1 Introduction

The proposed site water management system for the Project has been developed to ensure that:

- clean water from areas undisturbed by Project-related activities is prevented from entering disturbed areas; and
- uncontrolled discharge from areas disturbed by Project-related activities to receiving surface water environments is prevented.

The following sub-sections describe the range of measures and infrastructure for the proposed site water management system. These measures would be implemented to optimise the diversion of clean water and ensure that sediment-laden runoff or saline mine water from catchments disturbed by mining activities is appropriately managed. Accumulated sediment-laden water would either be directed to the dredge pond, used for mining-related purposes or permitted to infiltrate the surface or evaporate. In addition, water pumped from the construction pond to the Water Storage Dam would be returned to the dredge pond, as would decant from the Off Path Storage Facility.

## 4.2 Mine Site Water Classification

During operations there would be three classes of water that would be managed on the Site as follows.

- "Clean water" refers to runoff from those catchments unaffected by Project-related activities (regardless of water quality). This water would be prevented from entering disturbed areas of the Mine Site and mixing with other classes of water and discharged to the downstream environment.
- "Sediment-laden water" refers to runoff from disturbed or active sections of the Mine Site with the potential to contain suspended sediment but not elevated concentrations of salt. This runoff would be captured and managed on site.
- "Mine Water" refers to the saline water of the dredge pond that results from groundwater inflows to the Extraction Area or other water with elevated salt concentrations such as brine from the reverse osmosis plants.

## 4.3 Acid Generation Potential

With regards to acid sulphate soils risk, Sustainable Soils Management Pty Ltd (SSM) prepared the Land and Soil Capability Assessment for the Project (SSM, 2024). This assessment determined that that there is a low risk of acid sulphate soils within the Mine Site. Therefore, no specific measures are required to manage runoff from areas of acid sulphate soils.

In addition, RGS Environmental Consultants Pty Ltd (RGS, 2023) undertook an assessment of the acid generating potential of overburden, interburden and ore within the Mine Site (see Section 3.4.2.1). That assessment determined that interburden from immediately above the ore zone may be classified potentially acid forming – low capacity, meaning that while this material had the potential to form an acidic leachate if exposed to oxygen, the amount of acid that would be formed would be limited.

In light of the above, the following measures would be implemented to minimise the risk of generation of an acidic leachate.

- Preferentially place interburden from immediately above the ore zone below the water level along the trailing edge of the dredge pond. Where this is not practicable, place such material into the Off Path Storage Facility.
- Line and cap the Off Path Storage Facility with clay from the Blanchetown Clay to prevent oxygen ingress into the facility.

## 4.4 Mine Site Catchments

As noted in Section 3.3.2.1, surface water drainage within and adjacent to the Mine Site is divided into six catchments by topography (see **Figures 7 and 8**). **Table 8** presents the catchments introduced in Section 3.3.2.1 and describes the implications of the Project for each, including the creation of sub-catchments in each of the catchments disturbed by mining. **Table 8** also identifies the class of water (runoff) generated within each catchment or sub-catchment, the method of managing runoff (either flow bund / containment bund to prevent inflow or captured by containment bund to prevent discharge).

**Table 8**
**Mine Site Catchments**

| Catchment | Sub-catchment | Class | Area ($km^2$) | Management |
|---|---|---|---|---|
| Northwestern | None | Clean | >82.5[1] | None required |
| Southwestern | South | Clean | >236.7[1] | None required |
| | Disturbed | Sediment-laden / Mine | 0.5 | Containment bund, drainage retained for infiltration |
| Western Salt Pan | North | Clean | 41.8 | Flow bund to prevent clean water entering disturbed sub-catchment |
| | South | Clean | 32.6 | Flow bund to prevent clean water entering disturbed sub-catchment |
| | Disturbed | Sediment-laden / Mine | 17.1 | Containment bund, drainage directed to dredge pond |
| Central | North | Clean | 31.0 | None required |
| | Disturbed | Sediment-laden / Mine | 5.0 | Containment bund, drainage directed to dredge pond |
| Eastern Salt Pan | North | Clean | 51.4 | Flow bund to prevent clean water entering disturbed sub-catchment |
| | East | Clean | 2.5 | Containment bund, drainage retained for infiltration |
| | Southeast | Clean | 7.2 | Containment bund, drainage retained for infiltration |

| | | | | |
|---|---|---|---|---|
| | Southwest | Clean | 10.9 | Flow bund to prevent clean water entering disturbed sub-catchment |
| | Disturbed | Sediment-laden / Mine | 33.4 | Containment bund, drainage directed to dredge pond or Off Path Storage Facility. |
| Eastern | Eastern | Clean | 41.9 | None required |
| | Disturbed | Sediment-laden / Mine | 0.6 | Containment bund, drainage retained for infiltration |
| Note: * catchment extends beyond Mine Site. | | | | |

### 4.4.1 Site Water Management Infrastructure

#### *4.4.1.1 Clean Runoff Management*

The topography of the Western and Eastern Salt Pans generally directs runoff to the central sections of their respective catchments whilst runoff in the Central catchment is collected in the central depression. Each of these Mine Site catchments would be intersected by Project-related disturbance. Clean runoff from the Western and Eastern Salt Pans would be prevented from entering these disturbed sub-catchments via the construction of four flow bunds that would be located across sections of the basal areas of each salt pan's depression at the boundaries of the disturbance area. **Table 9** presents the impoundment volumes and water levels for the 1% Annual Exceedance Probability (AEP) 72-hour design rainfall event of each flow bund.

**Table 9**
**Clean Water Sub-catchment Flow Bunds: Nominal Design Water Levels, Depths and Impoundment Volumes**

| Sub-catchment | Area ($km^2$) | Water Level (mAHD) | Maximum Water Depth (m) | Impoundment Volume (ML) |
|---|---|---|---|---|
| Western Salt Pan North | 41.8 | 25.8 | 0.7 | 302 |
| Western Salt Pan South | 32.6 | 25.8 | 0.2 | 236 |
| Eastern Salt Pan North | 51.4 | 27.1 | 0.05 | 372 |
| Eastern Salt Pan Southwest | 10.9 | 25.3 | 1.0 | 79 |

These flow bunds would be constructed in the locations shown on **Figure 8** using compacted overburden, including clay sourced from the Blanchetown Clay, to meet the following nominal design criteria:

- Design rainfall event: .................................................. 1% AEP 72-hour (144mm)
- Maximum side slopes: .................................................................... 7:1 (H:V)
- Minimum crest width:........................................................................... 1m
- Minimum crest elevation: ........................................ 1% AEP 72-hour water level plus 1m freeboard.

A flow bund would not be required in the Central North sub-catchment.

Due to the limited disturbance in the Central, Eastern and Southwestern sub-catchments, only minor containment (exclusion bunds) with a. 0.5m height) would be required. These would be located at the limit of disturbance to prevent clean runoff entering and sediment-laded runoff leaving, disturbed sub-catchments.

As identified on **Figure 8**, the Eastern and Western Salt Pans provide significant storage across large basal areas that would result in dispersed zones of inundation both north and south of the disturbance area. Whilst these inundation areas are generally contiguous, it is apparent from **Figure 8**, that continuous flow bunds are not required to prevent the ingress of clean water to disturbance areas. Rather, as shown on **Figure 8**, flow bunds would only be constructed across key topographic low points.

Details of the bunds, including crest elevation, maximum height and the length of various sections, based on the nominal design criteria identified above are presented in **Table 10**.

**Table 10**
**Nominal Clean Water Flow Bund Elevation, Height and Length**

| Bund | Crest Elevation (mAHD) | Maximum Height (m) | Total Length (m) | Comment |
|---|---|---|---|---|
| Western Salt Pan North | 26.8 | 1.7 | 1,810 | Three sections of 341m, 598m and 871m |
| Western Salt Pan South | 26.8 | 1.2 | 2,284 | Three sections of 1,418m, 651m and 215m |
| Eastern Salt Pan North | 28.1 | 1.0 | 829 | Two sections of 406m and 422m |
| Eastern Salt Pan Southwest | 25.8 | 2.0 | 1,298 | Four sections of 52m, 160m, 789m and 297m |

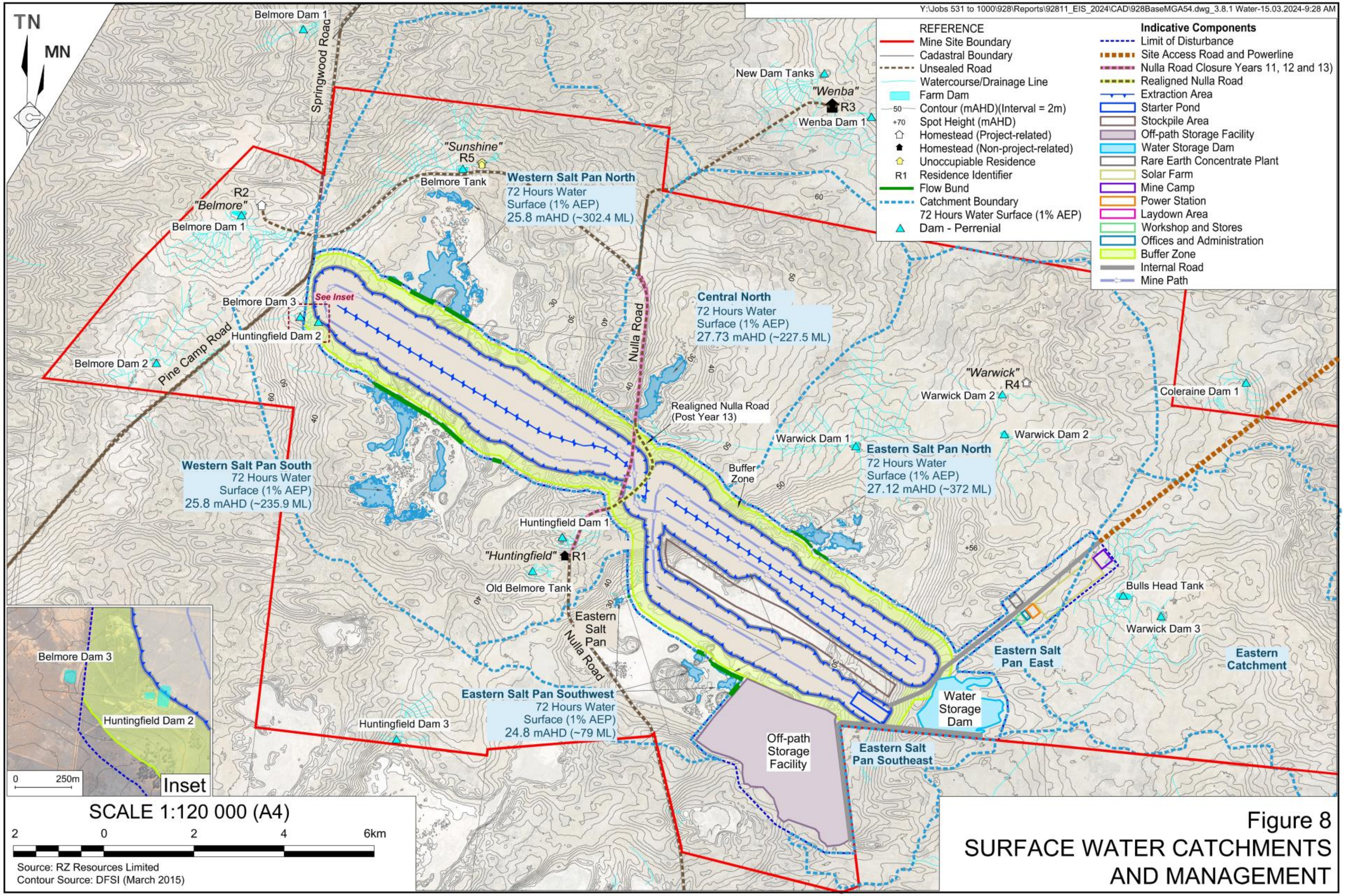


Figure 8
SURFACE WATER CATCHMENTS AND MANAGEMENT

As also shown on **Figure 8**, the undisturbed sub-catchments of the Central North, Western and Eastern Salt Pans retain substantial storage capacity following the 1% AEP 72-hour design rainfall event. This means that the flow bunds would be sufficient to prevent ingress of water to disturbance areas in higher intensity rainfall events. The Project would require the construction and use of flow bunds in the Eastern Salt Pan sub-catchments for the Project-life. However, the Western Salt Pan sub-catchment flow bunds would only be required from approximately Year 11 of operations. All bunds would be removed following the completion of rehabilitation.

#### 4.4.1.2 Sediment-laden Runoff Management

As noted in Section 3.3.2.1 and shown on **Figure 7**, watercourses within the Mine Site are discontinuous and indistinct. As surface runoff within the disturbance footprint would not collect in a drainage feature, it would be allowed to pond and infiltrate, evaporate or enter the dredge pond. To prevent sediment-laden runoff entering the receiving environment, containment bunds, flow bunds and/or roads would be progressively constructed at the perimeter of the disturbance area. Where installed, these containment bunds would be a minimum 0.5m high whilst roads would be constructed with a cross-fall towards the disturbance area. These roads would also be constructed with safety berms that would also act as bunds to prevent sediment-laden runoff from entering the receiving surface water environment.

As these measures would result in a closed water management system with the dredge pond receiving runoff from the disturbance area, no measures for the treatment and discharge of sediment-laden runoff are proposed.

#### 4.4.1.3 Mine Water Management

The dredge pond would be progressively developed with a geometry that would create an internally draining void. Dredge pond development would also occur in conjunction with the development of raised, level perimeter roads for overburden haulage and access. Water levels within the dredge pond would largely reflect that of the local groundwater setting (24.6mAHD, GEO-ENG, 2024) and thus below natural ground level. Dredge pond geometry, coupled with perimeter roads would ensure saline groundwater inflows remain within the dredge pond with no discharge of mine water to the receiving surface water environment.

In addition to the above, the following management measures would also be implemented to ensure that saline water, primarily groundwater with elevated concentrations of salt, and mine water, namely saline water that has been used for mining-related purposes, would be managed in a way that would ensure that it would not be discharged to land or natural drainage.

- Pumps and pipes would be fitted with leak detection equipment to ensure that should a leak or pipe failure occur, pumps would automatically cease to pump, thereby limiting the volume of potentially saline water that would be discharges.
- Water used for dust suppression purposes would be the minimum volume required to achieve the required level of dust suppression. To minimise the use of mine water for dust suppression, binding agents and low silt sheeting material would be utilised.

### 4.4.2 Sewage and Effluent Disposal

Sewage and effluent disposal would be managed on location through an approved water treatment system that would be situated within the Mine Camp and Workshop and Stores area. Treated wastewater would either be discharged to the sub-surface or to land.

### 4.4.3 Monitoring

#### *4.4.3.1 Surface Water Monitoring*

As no discharge is proposed from the disturbance areas nor are permanent watercourses a feature of the existing environment, no regular water quality or flow monitoring is proposed for the Project. Rather, where practicable water quality samples would be collected from the dredge pond and ponded areas upstream of clean water bunds following a >25mm rainfall event over a 24-hour period. Samples would be submitted to a NATA accredited laboratory for analysis of physico-chemical parameters and major ions and the results compared to assess any interaction.

#### *4.4.3.2 Water Management Infrastructure Monitoring*

Regular inspections would be undertaken of all water management infrastructure on the Mine Site. Inspections would be undertaken on a monthly basis and following a rainfall event of >25mm/24hr.

The inspections of water management infrastructure will record the following details.

- Ponded areas in bunded sub-catchments.
- Evidence of inflow and condition of clean water management bunds.
- Condition of sediment-laden bunds and road surfaces at boundary of the disturbance area.
- Presence of any oily film in the ponded water within the disturbance area.
- The general condition of the soil surface in the disturbed sub-catchments. This would include recording of any areas of active erosion and the level of any sedimentation.

In any areas where active erosion of water management mitigation measures are observed, repairs shall be scheduled to re-instate full function and consideration given to installation of additional erosion mitigation as required.

# 5. Impact Assessment

## 5.1 Introduction

Based on the implementation of the proposed water management measures for the Project as well as the monitoring of the proposed water management infrastructure, the potential surface water impacts of the Project would be as follows.

## 5.2 Water Availability

During the Project-life, all collected surface water runoff, including that required for construction of the Project or that which is re-used and recycled to meet the operational water demand of the Project, would occur under harvestable rights, as conferred under Section 53 of the WM Act. As the Mine Site is situated in the Western Division harvestable rights order area, all runoff may be captured and used for any purpose. Where Project-related disturbance does disrupt the prevailing hydrological regime of an existing catchment, it does not reduce flow to a downstream catchment with external water users, as all Mine Site catchments are internally draining.

**Figures 7** and **8** present the location of farm dams within and surrounding the Mine Site. In all cases, with the exception of Huntingfield Dam 2, the Project would not impact on the dams or their catchments. Huntingfield Dam 2 comprises two nested dams, with a smaller, upstream dam and a larger downstream dam. The Huntingfield Dam 2 is located approximately 250m from the western boundary of Huntingfield Station, with the Belmore 3 Dam located approximately 50m on the western side of the property boundary. The catchment for both dams is largely within Belmore Station. The Huntingfield 2 Dam is located within the proposed disturbance area and would be disturbed in Year 14 of the Project. To ensure continued access to water following rainfall events, the Applicant would implement the following.

- Negotiate a suitable agreement with the owner of Huntingfield Station in relation to the existing basic landholder rights, potentially including the following.
  - Reconstruct the Huntingfield 2 Dam, including surface water diversions, in an alternate location.
  - Provide an alternate supply of water.
  - Provide suitable compensation.
- Reconstruct the Huntingfield 2 Dam within the rehabilitated landform, including lining the dam with clay to limit seepage.

Therefore, the Applicant does not anticipate the loss of water availability to downstream users and the collection and use of runoff within the disturbance areas is permissible under the WM Act.

## 5.3 Flow and Watercourse Function

The Project would disturb sections of the existing Central, Western Salt Pan, Eastern Salt Pan, Eastern and Southwestern catchments. This disturbance represents the following proportions of each of the existing catchments.

- 19% of the Western Salt Pan Catchment.
- 32% of the Eastern Salt Pan Catchment.
- 14% of the Central Catchment,
- 1% of the Eastern Catchment.
- <1% of the Southwestern Catchment.

In the case of the Central and Western Salt Pan catchments, whilst there are a number of 1$^{st}$ order watercourses within the disturbance area, there are no areas of mapped wetland. Apart from the disturbance area, flow and watercourse function would be thus maintained in the undisturbed sub-catchments of the Western Salt Pan and Central catchments.

There are however 105ha of mapped wetland in the Eastern Salt Pan catchment that would be disturbed (**Figure 7**). NSW 1:100,000 topographic mapping identifies much of the mapped wetland areas as “Lake – mainly dry” (**Figure 4**). This means that the bunds in these areas can be considered “excluded works” under Clause 8, Schedule 1 of the *WM (General) Regulation 2018* as these areas are identified on topographic maps applying at 1 January 1999.

All disturbance areas would be reinstated during the rehabilitation and closure stage of the Project which would include the removal of all bunds.

Therefore, the impacts of the Project on watercourse flow and function would be relatively minor and confined to areas of disturbance. Impacts would be reduced by the proposed bunds that would continue to permit accumulation of clean runoff within undisturbed sub-catchments that would in turn sustain any areas of mapped wetland.

## 5.4 Water Quality

As the proposed water management strategy for the Project includes the use of treated water for dust suppression and the capture, storage and re-use of sediment-laden runoff, the likelihood of sediment-laden discharge from the Mine Site is considered to be low.

## 5.5 Flooding

As noted in Section 3.3.2.2, the Mine Site is not situated within a flood planning area or a zone where inundation from floodwater could be expected to occur. Subsequently, neither the development itself or neighbouring properties would be adversely impacted by floodwater.

# 6. Conclusion

Whilst the Project would reduce areas of mapped wetlands, flow accumulation in undisturbed sub-catchments, that represent the majority of existing catchments, would be unimpacted. The prevention of sediment-laden runoff and mine water from those catchments disturbed by Project-related activities would be retained to prevent impacts to the receiving surface water environment. Furthermore, the capture and use of runoff in disturbance areas is permissible under the WM Act, as is the construction of bunds in areas mapped as wetlands as these would be considered “excluded works” under the WM (General) Regulations.

This strategy to exclude inflow from undisturbed catchments, the capture, re-use and recycling of sediment-laden water, provides for the efficient use of water resources whilst simultaneously maintaining to the greatest extent practicable, the existing surface water environment.

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