

# Clean TeQ Sunrise Project Water Management Plan

2020-CTEQ-0000-66AA-0015

3 September 2019

REVISION 1

## CONTENTS

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1.	Introduction.....	1
1.1	Purpose and Scope.....	5
1.2	Structure of the Water Management Plan .....	8
2.	Water Management Plan Review and Update .....	9
3.	Statutory Requirements .....	10
3.1	Development Consent DA 374-11-00.....	10
3.2	Licences, Permits and Leases .....	11
3.3	Other Legislation, Policies and Guidance.....	12
4.	Performance Measures and Performance Indicators.....	16
5.	Water Management System Overview .....	20
5.1	Mine Water Storages.....	20
5.2	Sediment Dams.....	22
5.3	Diversion Systems.....	22
5.4	Other Surface Water Management Measures.....	22
6.	Monitoring Programs.....	23
7.	Contingency Plan .....	24
7.1	Adaptive Management .....	24
7.2	Specific Contingency Measures.....	24
8.	Review and Improvement of Environmental Performance.....	25
8.1	Annual Review .....	25
8.2	Independent Environmental Audit.....	25
9.	Reporting Protocols.....	27
9.1	Incident Reporting .....	27
9.2	Complaints.....	28
9.3	Non-Compliances with Statutory Requirements.....	29
9.4	Exceedances of Impact Assessment Criteria and/or Performance .....	29
10.	References .....	30

## FIGURES

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Figure 1	Regional Location
Figure 2	Mine and Processing Facility General Arrangement (Initial Construction Activities)
Figure 3	Mine and Processing Facility Conceptual General Arrangement
Figure 4	Borefields and Surface Water Extraction General Arrangement
Figure 5	Water Management Schematic

## **TABLES**

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Table 1	Specific WMP Requirements in Development Consent DA 374-11-00
Table 2	Mangement Plan (General) Requirements
Table 3	Water Management Performance Indicators – Construction
Table 4	EPL 21146 Surface Water Quality Limits

## **ATTACHMENTS**

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Attachment 1	Water Related Development Consent DA 374-11-00 Conditions
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## **APPENDICES**

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Appendix A	Water Balance
Appendix B	Surface Water Management Plan
Appendix C	Groundwater Management Plan

# 1. INTRODUCTION

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The Clean TeQ Sunrise Project (the Project)<sup>1</sup> is a nickel cobalt scandium open cut mining project situated near the village of Fifield, approximately 350 kilometres (km) west-northwest of Sydney, in New South Wales (NSW) (Figure 1).

The Project includes the establishment and operation of the following:

- mine (including the acid leach processing facility);
- limestone quarry;
- rail siding;
- gas pipeline;
- borefields, surface water extraction infrastructure and water pipeline;
- accommodation camp; and
- associated transport activities and transport infrastructure (e.g. the Fifield Bypass, road and intersection upgrades).

Clean TeQ Sunrise Pty Ltd owns the rights to develop the Project. Clean TeQ Sunrise Pty Ltd is a wholly owned subsidiary of Clean TeQ Holdings Limited (Clean TeQ).

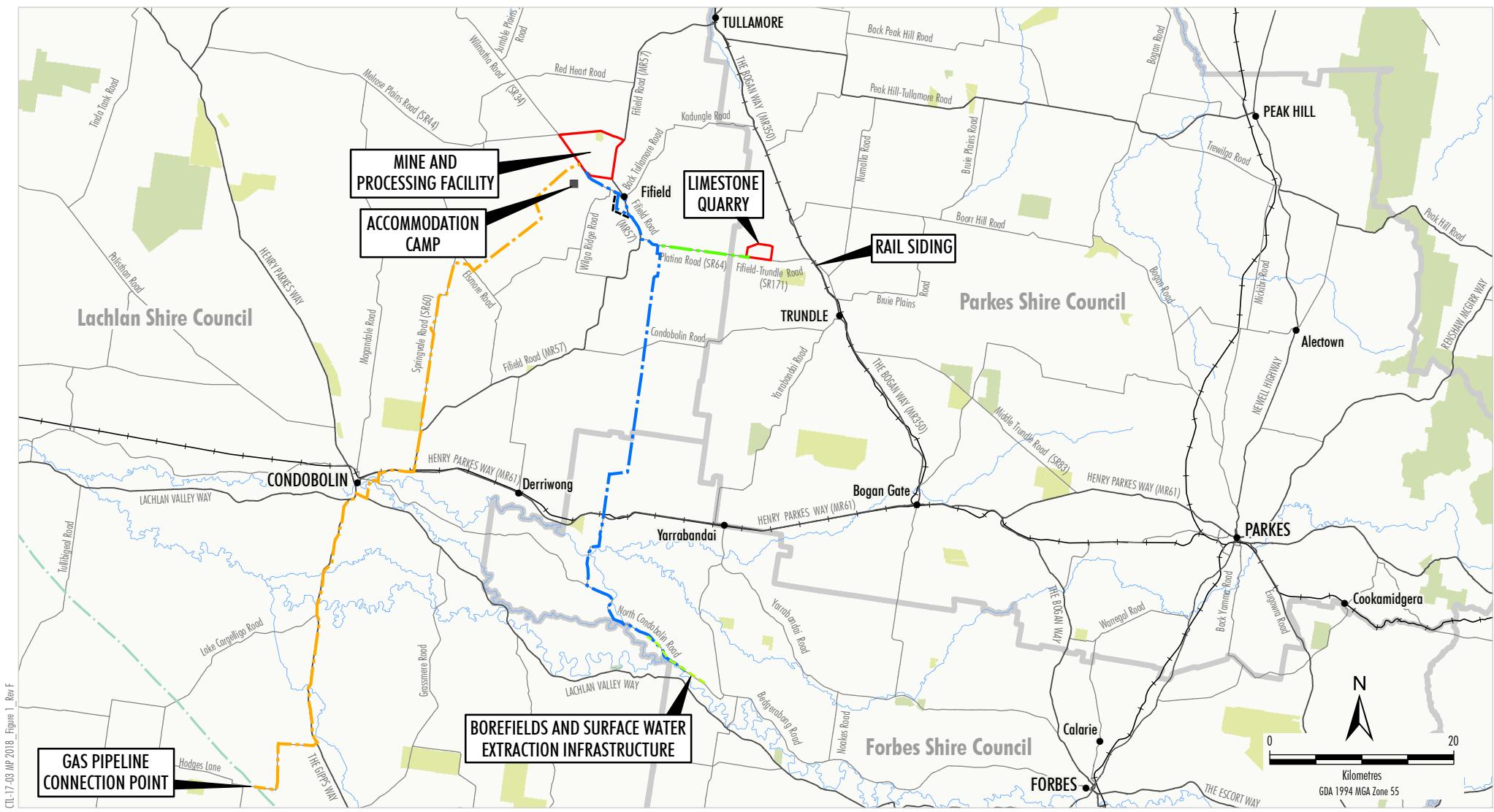
Development Consent DA 374-11-00 for the Project was issued under Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) in 2001. Six modifications to Development Consent DA 374-11-00 have since been granted under the EP&A Act:

- 2005 – to allow for an increase of the autoclave feed rate, limestone quarry extraction rate and adjustments to ore processing operations;
- 2006 – to allow for the reconfiguration of the borefields;
- 2017 – to allow for the production of scandium oxide;
- 2017 – to amend hazard study requirements;
- 2018 – to relocate the accommodation camp; and
- 2018 – to implement opportunities to improve the overall efficiency of the Project.

The general arrangement for the mine layout during the initial Project construction activities and full development are shown on Figures 2 and 3.

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<sup>1</sup> The Project was previously known as the Syerston Project.



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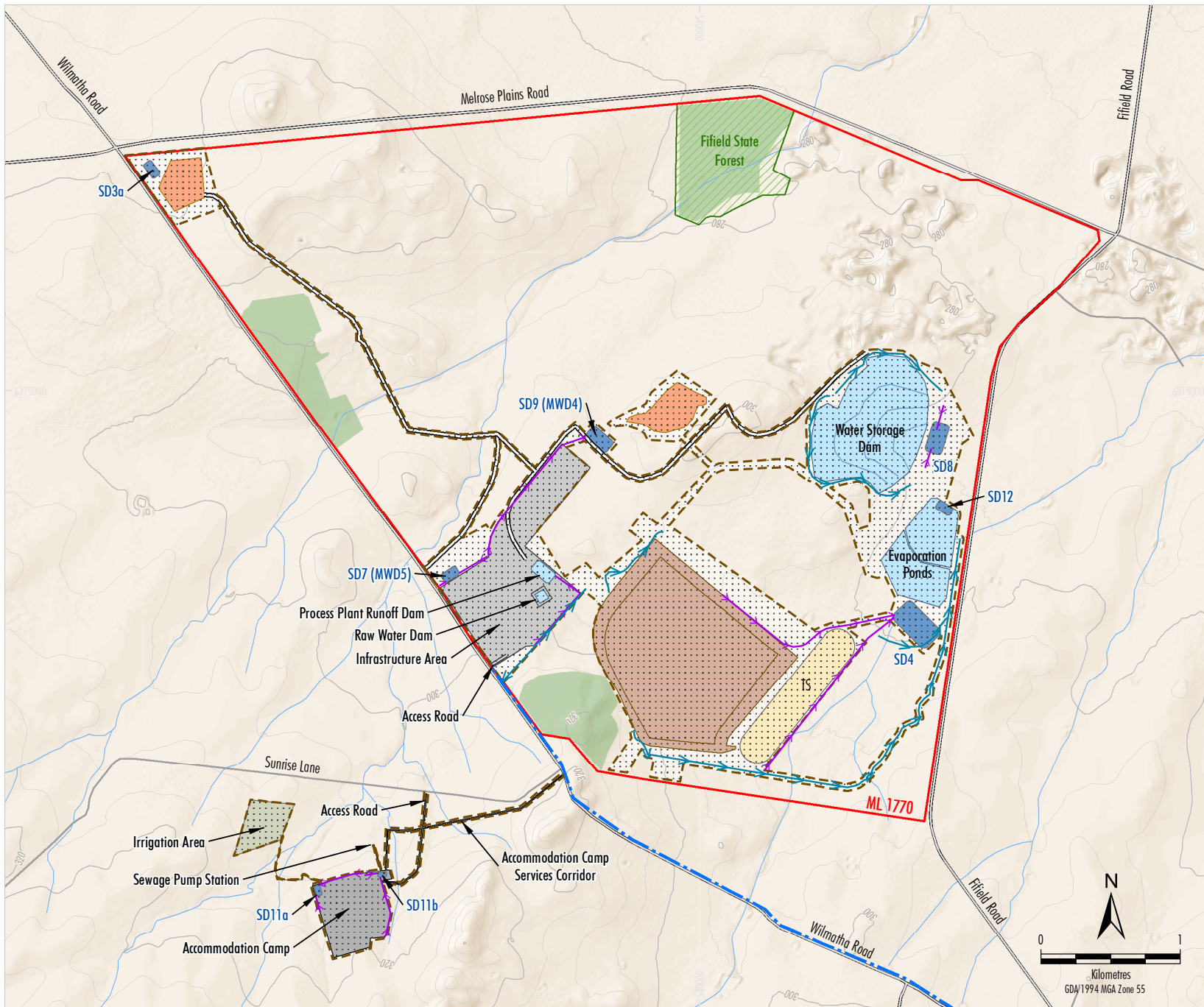


- LEGEND**
- National Park/Conservation Area
  - State Forest
  - Local Government Boundary
  - Railway
  - Existing Gas Pipeline
  - Mining Lease Boundary (ML)
  - Fifield Bypass
  - Gas Pipeline
  - Water Pipeline
  - Limestone Quarry Water Pipeline
  - Borefield Infrastructure Corridor

Source: Black Range Minerals (2000); Clean TeQ (2017, 2018); NSW Department of Industry (2018); NSW Land & Property Information (2017); Office of Environment and Heritage NSW (2017)

**CLEAN TEQ**  
Powering innovation  
**CLEAN TEQ SUNRISE PROJECT**  
 Regional Location


Figure 1

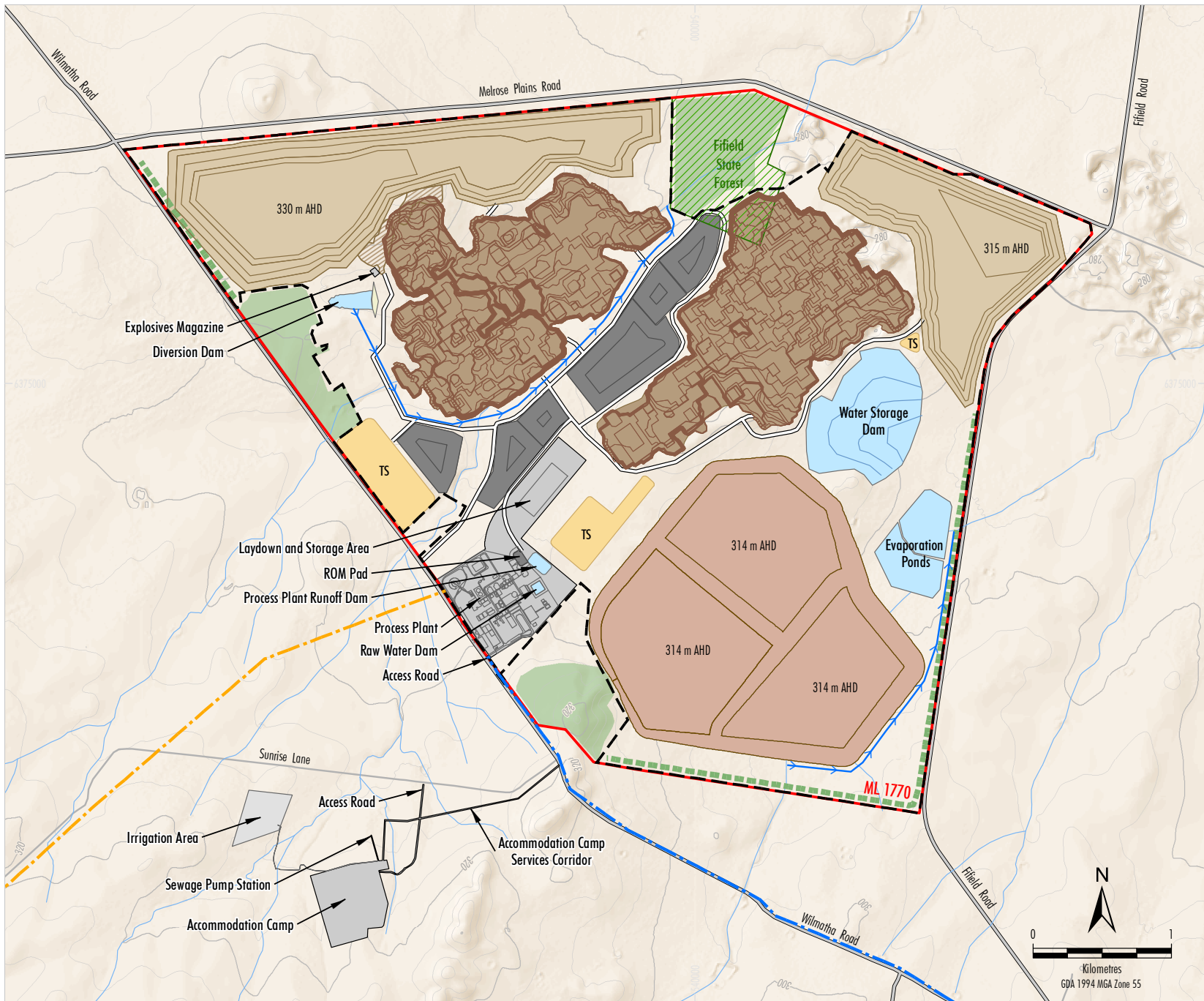


- LEGEND**
- State Forest
  - Mining Lease Boundary (ML)
  - Initial Construction Activities Surface Development Area
  - Tailings Storage Facility
  - Borrow Pit
  - TS Topsoil Stockpile
  - Infrastructure Area
  - Water Storage (Mine Water)
  - Sediment Dam (Mine Water)
  - Existing Open Woodland to be Maintained
  - Water Pipeline
  - Collection Drain (Sediment Water) #
  - Diversion Channel (Clean Water)

# No 'mine water' would be generated during the initial construction activities and therefore no 'mine water' collection drains are shown.


Source: Black Range Minerals (2000); Clean TeQ (2017, 2019); NSW Department of Industry (2018); NSW Land & Property Information (2017)

  
**CLEAN TEQ SUNRISE PROJECT**  
**Mine and Processing Facility**  
**General Arrangement**  
**(Initial Construction Activities)**  
**Figure 2**



- LEGEND**
- State Forest
  - Mining Lease Boundary (ML)
  - Approved Surface Development Area
  - Open Cut Pit (Scandium Oxide)
  - Open Cut Pit
  - Waste Rock Emplacement
  - Tailings Storage Facility
  - Topsoil Stockpile
  - Ore Stockpile
  - Mine Infrastructure Area
  - Diversion Structure
  - Vegetation Screening
  - Existing Open Woodland to be Maintained
  - Gas Pipeline
  - Water Pipeline

Source: Black Range Minerals (2000); Clean TeQ (2017, 2019); NSW Department of Industry (2018); NSW Land & Property Information (2017)

  
**CLEAN TEQ SUNRISE PROJECT**  
**Mine and Processing Facility**  
**Conceptual General Arrangement**



**Figure 3**

## 1.1 Purpose and Scope

This Water Management Plan (WMP) has been prepared by Clean TeQ in accordance with the requirements of Condition 30, Schedule 3 of Development Consent DA 374-11-00 (Table 1).

**Table 1** – Specific WMP Requirements in Development Consent DA 374-11-00

Development Consent DA 374-11-00 Schedule 3	Section where Addressed in this WMP
30. Prior to carrying out any development after 6 May 2017, the Applicant must prepare a Water Management Plan for the development in consultation with DoI Lands & Water and the EPA, and to the satisfaction of the Secretary. This plan must include:	This WMP
<p>(a) a Water Balance that:</p> <ul style="list-style-type: none"> <li>• includes details of: <ul style="list-style-type: none"> <li>– sources and security of water supply, including contingency planning for future reporting periods;</li> <li>– water use and management on site;</li> <li>– measures to prioritise the use of water in the following order <ul style="list-style-type: none"> <li>○ recycled water from the water treatment plant;</li> <li>○ other on-site sources (in accordance with harvestable rights provisions); and</li> <li>○ water extracted from the borefields and Lachlan River;</li> </ul> </li> <li>– reporting procedures, including the preparation of a site water balance for each calendar year; and</li> </ul> </li> <li>• describes the reasonable and feasible measures that would be implemented to minimise clean water use on site and maximise the reuse of recovered tailings water at the facility;</li> </ul>	Appendix A
<p>(b) a Surface Water Management Plan, that includes:</p> <ul style="list-style-type: none"> <li>• baseline data on water flows and quality in the watercourses that could be affected by the development (if available);</li> <li>• a detailed description of the water management system on-site, including the: <ul style="list-style-type: none"> <li>– clean water diversion systems;</li> <li>– erosion and sediment controls; and</li> <li>– water storages; and</li> <li>– irrigation area;</li> </ul> </li> <li>• objectives and performance criteria, including trigger levels for investigating any potential or actual adverse impacts associated with the development, including the: <ul style="list-style-type: none"> <li>– surface water flows and quality;</li> <li>– downstream flooding;</li> </ul> </li> <li>• a program to monitor and report on: <ul style="list-style-type: none"> <li>– the effectiveness of the water management system and tailings storage facility; and</li> <li>– surface water flows and water quality;</li> <li>– the performance measures listed in Table 9;</li> <li>– impacts on water users;</li> <li>– downstream flooding;</li> </ul> </li> <li>• a plan to respond to any exceedances of the trigger levels and/or performance criteria, and minimise and/or offset any adverse surface water impacts of the development;</li> </ul>	Appendix B
<p>(c) a Groundwater Management Plan, that includes:</p> <ul style="list-style-type: none"> <li>• baseline data on groundwater levels, yield and quality in the region and privately-owned groundwater bores that could be affected by the development in the vicinity of the borefields;</li> <li>• groundwater assessment criteria, including trigger levels for investigating any potentially adverse groundwater impacts associated with the development in the vicinity of the borefields;</li> <li>• a program to monitor and report on: <ul style="list-style-type: none"> <li>– groundwater inflows into the open cut pits, if relevant;</li> <li>– the seepage/leachate from the tailings storage facility and evaporation ponds; and</li> <li>– the impacts of the development on: <ul style="list-style-type: none"> <li>○ groundwater supply of any potentially affected landholders, particularly around the borefields;</li> <li>○ regional and local aquifers; and</li> <li>○ post-mining groundwater recovery;</li> </ul> </li> </ul> </li> <li>• a plan to respond to any exceedances of the groundwater assessment criteria, and mitigate any adverse impacts of the development;</li> </ul>	Appendix C



On 5 July 2018, the Secretary of the Department of Planning, and Environment (now the Department Planning, Industry and Environment [DPIE]) (the Secretary) approved the progressive submission of environmental management plans for the Project in accordance with Condition 12, Schedule 2 of Development Consent DA 374-11-00. The scope of this WMP is specifically related to the following initial Project construction activities:

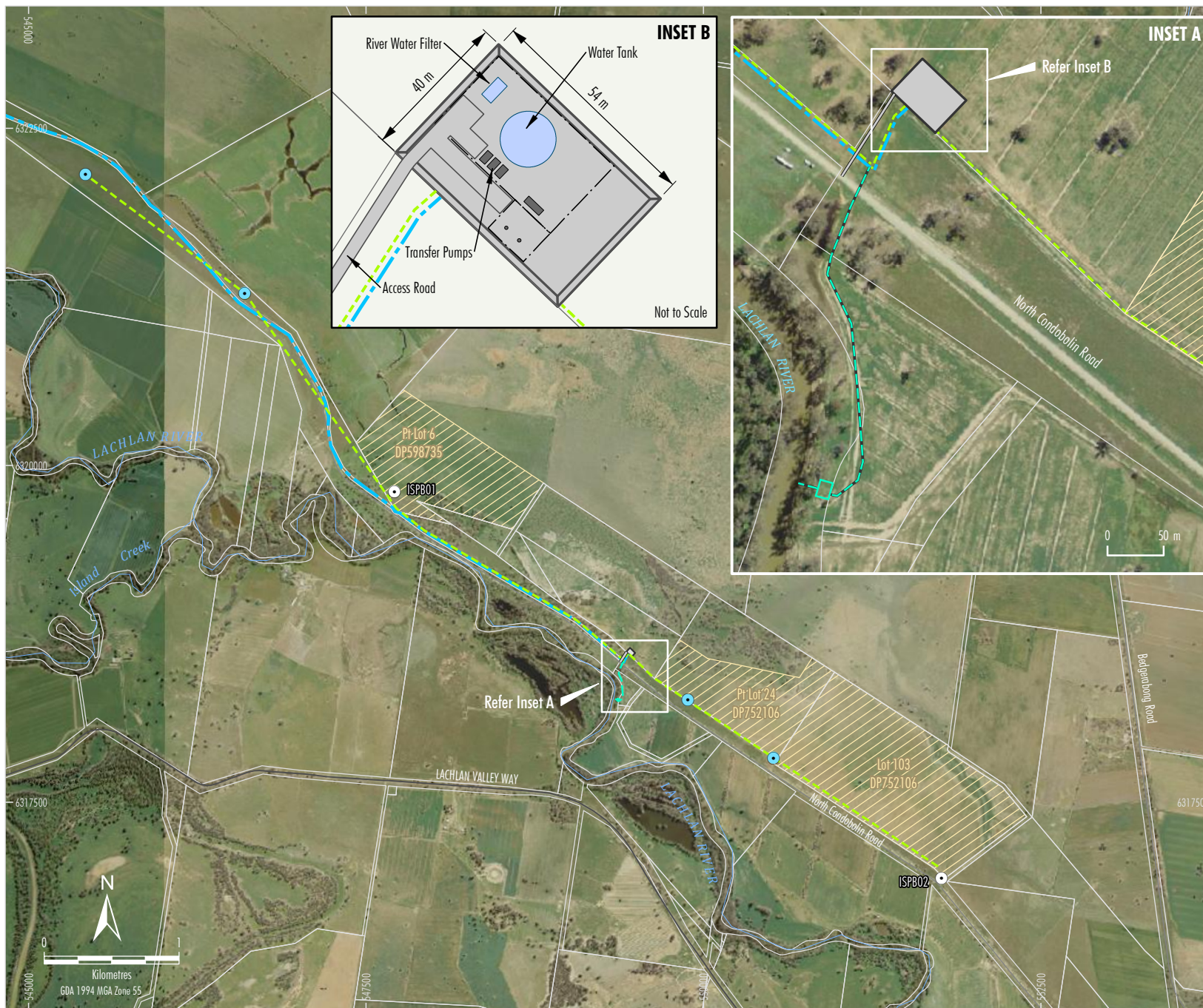
- development of the mine, including:
  - site establishment and earthworks;
  - construction of site access roads and haul roads;
  - processing facility earthworks;
  - establishment of temporary facilities required for construction activities (e.g. offices, lay down areas, communications infrastructure);
  - construction of the mine infrastructure area including the offices, workshops, warehouse, laboratory and amenities buildings, fuel storage areas, potable water treatment plant and car parking facilities;
  - construction of the tailings storage facility and evaporation pond;
  - construction of water management infrastructure including the raw water dam, water storage dam and sediment dams;
  - construction and operation of the concrete batch plant;
  - development of gravel and clay borrow pits (including blasting and crushing);
  - installation of appropriate fencing and barriers for public safety and security for mining and construction; and
  - other associated minor infrastructure, plant, equipment and activities.
- development and operation of the accommodation camp;
- installation of the borefields;
- installation and operation of the surface water extraction infrastructure and water pipeline<sup>2</sup>; and
- road upgrades.

The initial construction activities would not include any development of the limestone quarry, rail siding or gas pipeline.

The approximate extent of the initial Project construction activities at the mine site and accommodation camp are shown on Figure 2. The approved water pipeline alignment and borefields and surface water extraction general arrangement is shown on Figures 1 and 4 respectively.

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<sup>2</sup> The water pipeline includes the Fifield Bypass and Alternative Pipeline Route alignments.



- LEGEND**
- Property Boundary
  - Borefield Location
  - Water Pipeline
  - Borefield Infrastructure Corridor \*
  - Surface Water Infrastructure Corridor \*
  - Pump Station
  - Transfer Station
  - Access Road
  - Production Bore (constructed)
  - Production Bore (not constructed)
- \* Infrastructure Corridor includes linking pipeline, access road and electricity transmission line.

Source: Clean TeQ (2017, 2019); Ivanplats Syerston (2005); NSW Land & Property Information (2018)  
 NSW Imagery: © Department of Finance, Services & Innovation (2018)

**Figure 4**

## 1.2 Structure of the Water Management Plan

The remainder of this WMP is structured as follows:

- Section 2: Describes the review and update of the WMP.
- Section 3: Outlines the statutory requirements applicable to the WMP.
- Section 4: Details the performance measures and performance indicators that will be used to assess the Project.
- Section 5: Provides an overview of the Project water management system and measures.
- Section 6: Details the water monitoring programs for the Project.
- Section 7: Provides a Contingency Plan to manage any unpredicted impacts and their consequences.
- Section 8: Describes the program to review and report on the effectiveness of management measures and improvement of environmental performance.
- Section 9: Describes the protocol for management and reporting of incidents, complaints and non-compliances with statutory requirements.
- Section 10: Lists the references cited in this WMP.

In addition, the WMP includes the following three appendices in accordance with Condition 30, Schedule 3 of Development Consent DA 374-11-00:

- Water Balance (Appendix A);
- Surface Water Management Plan (SWMP) (Appendix B); and
- Groundwater Management Plan (GWMP) (Appendix C).

## 2. WATER MANAGEMENT PLAN REVIEW AND UPDATE

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This WMP has been provided to the NSW Environment Protection Authority (EPA) and the Department of Industry – Lands & Water (now the Natural Resources Access Regulator [NRAR]) for the purposes of consultation on 20 June 2018 and 25 June 2018, respectively, in accordance with Condition 30, Schedule 3 of Development Consent DA 374-11-00.

The NRAR provided comments on 27 September 2018 and 12 June 2019. These comments have been incorporated into this WMP. The EPA indicated on 19 October 2018 that it had no comments on the WMP.

Consistent with the Secretary's approval for the progressive submission of environmental management plans, this WMP would be re-submitted and approved prior to the commencement of activities not included in the scope of this WMP.

In accordance with Condition 6, Schedule 5 of Development Consent DA 374-11-00, this WMP will be reviewed, and if necessary revised (to the satisfaction of the Secretary), within three months of the submission of:

- an Annual Review (Condition 5, Schedule 5);
- an incident report (Condition 8, Schedule 5);
- an independent environmental audit (Condition 10, Schedule 5); or
- any modification to the conditions of Development Consent DA 374-11-00 (unless the conditions require otherwise).

The reviews would be undertaken to ensure the WMP is updated on a regular basis and to incorporate any recommended measures to improve the environmental performance of the Project.

Within 4 weeks of conducting a review of the WMP, the Secretary will be advised of the outcomes of the review and any revised documents submitted to the Secretary for approval.

If agreed with the Secretary, a revision to the WMP required under Development Consent DA 374-11-00 may be prepared without undertaking consultation with all parties nominated under the relevant condition of Development Consent DA 374-11-00.

The revision status of this WMP is indicated on the title page of each copy.

The approved WMP will be made publicly available on the Clean TeQ website, in accordance with Condition 12, Schedule 5 of Development Consent DA 374-11-00.

### 3. STATUTORY REQUIREMENTS

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Clean TeQ's statutory obligations relevant to water management are contained in:

- the conditions of Development Consent DA 374-11-00;
- relevant licences and permits, including conditions attached to mining leases; and
- other relevant legislation.

Obligations relevant to this WMP are described below.

#### 3.1 Development Consent DA 374-11-00

##### 3.1.1 WMP Requirements

Condition 30, Schedule 3 of Development Consent DA 374-11-00 requires the preparation of a WMP. Table 1 presents these requirements and indicates where they are addressed in this WMP.

A comprehensive list of all conditions in Development Consent DA 374-11-00 relevant to water is provided in Attachment 1, including:

- Water Supply (Condition 26, Schedule 3);
- Water Pollution (Condition 27, Schedule 3);
- Compensatory Water Supply (Condition 28, Schedule 3);
- Water Management Performance Measures (Condition 29, Schedule 3); and
- Water Management Plan (Conditions 30 and 31, Schedule 3).

In accordance with Condition 31, Schedule 3 of Development Consent DA 374-11-00, Clean TeQ will implement the Water Management Plan.

##### 3.1.2 Management Plan (General) Requirements

In addition to the WMP requirements prescribed in Condition 30, Schedule 3, Condition 4, Schedule 5 of Development Consent DA 374-11-00 outlines the management plan (general) requirements that are also applicable to the preparation of this WMP.

Table 2 presents these requirements and indicates where each is addressed within this WMP.

**Table 2 – Management Plan (General) Requirements**

Development Consent DA 374-11-00 Schedule 5	WMP Section
<b>Management Plan Requirements</b>	
4. <i>The Applicant must ensure that the management plans required under this consent are prepared in accordance with any relevant guidelines, are consistent with other plans prepared for other stakeholders, and include:</i>	
a) <i>detailed baseline data;</i>	Appendices A to C
b) <i>a description of:</i>	Section 3
• <i>the relevant statutory requirements (including any relevant approval, licence or lease conditions);</i>	Section 4 and Appendices A to C
• <i>any relevant limits or performance measures/criteria;</i>	Section 4 and Appendices A to C
• <i>the specific performance indicators that are proposed to be used to judge the performance of, or guide the implementation of, the development or any management measures;</i>	Section 4 and Appendices A to C
c) <i>a description of the measures that would be implemented to comply with the relevant statutory requirements, limits, or performance measures/criteria;</i>	Section 5 and Appendices A to C
d) <i>a program to monitor and report on the:</i>	Section 6 and Appendices A to C
• <i>impacts and environmental performance of the development;</i>	
• <i>effectiveness of any management measures (see c above);</i>	
e) <i>a contingency plan to manage any unpredicted impacts and their consequences</i>	Section 7 and Appendices A to C
f) <i>a program to investigate and implement ways to improve the environmental performance of the development over time;</i>	Section 8
g) <i>a protocol for managing and reporting any:</i>	Section 9.1 Section 9.2 Section 9.3
• <i>incidents;</i>	Sections 6 & 7 and Appendices A to C
• <i>complaints;</i>	
• <i>non-compliances with statutory requirements; and</i>	
• <i>exceedances of the impact assessment criteria and/or performance criteria; and</i>	
h) <i>a protocol for periodic review of the plan.</i>	Section 2
<i>Note: The Secretary may waive some of these requirements if they are unnecessary or unwarranted for particular management plans.</i>	

### 3.2 Licences, Permits and Leases

In addition to the requirements of Development Consent DA 374-11-00, all activities at or in association with the Project will be undertaken in accordance with the following licences, permits and leases which have been issued or are pending issue:

- Mining Lease 1770 sought and issued by the NSW Minister for Resources under the NSW *Mining Act, 1992*.
- Mining Operations Plan(s) submitted and approved by the NSW Division of Resources and Geoscience.
- Environment Protection Licence (EPL) 21146 issued by the EPA under the NSW *Protection of the Environment Operations Act 1997* (POEO Act).
- Water supply works, water use approvals and water access licences (WALs) issued by NRAR under the NSW *Water Management Act 2000* including:
  - Water Supply Works Approval 70CA614098 for the Project borefields.
  - WAL 32068 in the Upper Lachlan Alluvial Groundwater Source (Upper Lachlan Alluvial Zone 5 Management Zone) for 3,154 share components under the *Water Sharing Plan for the Lachlan Unregulated and Alluvial Water Sources 2012*.

- WAL 39837 in the Upper Lachlan Alluvial Groundwater Source (Upper Lachlan Alluvial Zone 5 Management Zone) for 766 share components under the *Water Sharing Plan for the Lachlan Unregulated and Alluvial Water Sources 2012*.
- WAL 28681 in the Lachlan Fold Belt Murray-Darling Basin (MDB) Groundwater Source (Lachlan Fold Belt MDB [Other] Management Zone), for 243 share components under the *Water Sharing Plan for the NSW Murray Darling Basin Fractured Rock Groundwater Sources 2011*.
- WAL 6679 in the Lachlan Regulated River Water Source, for 123 share components (General Security) under the *Water Sharing Plan for the Lachlan Regulated River Water Source 2016*.
- WAL 1798 in the Lachlan Regulated River Water Source, for 300 share components (General Security) under the *Water Sharing Plan for the Lachlan Regulated River Water Source 2016*.
- WAL 42370 in the Lachlan Regulated River Water Source, for zero share components (High Security) under the *Water Sharing Plan for the Lachlan Regulated River Water Source 2016*.
- Groundwater licences for monitoring bores under the *Water Management Act 2000*.
- Aboriginal Heritage Impact Permits (AHIPs #C0003049 and AHIP #C0003887) issued by the Office of Environment and Heritage (OEH) under the *NSW National Parks and Wildlife Act 1974*.
- Mining and workplace health and safety related approvals granted by the NSW Department of Industry and SafeWork NSW.
- Permits under the *Roads Act 1993*.
- Heavy Vehicle Authorisation Permit 119039 issued by the National Heavy Vehicle Regulator under the *Heavy Vehicle National Law NSW*.
- Crown Land Licences issued under the *Crown Land Management Act 2016*.

### 3.3 Other Legislation, Policies and Guidance

Clean TeQ will conduct the Project consistent with the requirements of Development Consent DA 374-11-00 and any other legislation that is applicable to an approved Part 4 Project under the EP&A Act.

In addition to the statutory obligations described in Sections 3.1 and 3.2, the following NSW Acts (and their Regulations) may be applicable to the conduct of the Project:

- *Aboriginal Land Rights Act 1983*;
- *Biodiversity Conservation Act 2016*;
- *Biosecurity Act 2015*;
- *Crown Land Management Act 2016*;
- *Contaminated Land Management Act 1997*;

- *Dams Safety Act 2015*;
- *Dangerous Goods (Road and Rail Transport) Act 2008*;
- *Energy and Utilities Administration Act 1987*;
- EP&A Act;
- *Fisheries Management Act 1994*;
- *Forestry Act 2012*;
- *Mining Act 1992*;
- *National Parks and Wildlife Act 1974*;
- *Pipelines Act 1967*;
- POEO Act;
- *Rail Safety (Adoption of National Law) Act 2012*;
- *Roads Act 1993*;
- *Soil Conservation Act 1938*;
- *Water Act 1912*;
- *Water Management Act 2000*;
- *Work Health and Safety Act 2011*; and
- *Work Health and Safety (Mines and Petroleum Sites) Act 2013*.

Commonwealth Acts which may also be applicable to the conduct of the Project include:

- *Environment Protection and Biodiversity Conservation Act 1999*; and
- *Native Title Act 1993*.

Relevant licences or approvals required under these Acts will be obtained as required.

Further details relating to the above NSW Acts regulated by NRAR and EPA, and other relevant water policy and guideline documentation relevant to this WMP is provided in the following sub-sections.

### **3.3.1 Water Management Act 2000**

As water sharing plans have commenced under the *Water Management Act 2000* for all surface and groundwater systems within which the Project lies, the *Water Management Act 2000* is relevant to water licensing considerations for the Project. The following water sharing plans have been commenced under the *Water Management Act, 2000* for all groundwater and surface water systems within which the Project lies, including:

#### Mine

- *Water Sharing Plan for the Macquarie Bogan Unregulated and Alluvial Water Sources 2012*; and



- *Water Sharing Plan for the NSW Murray Darling Basin Fractured Rock Groundwater Sources 2011.*

### Borefields

- *Water Sharing Plan for the Lachlan Regulated River Water Source 2016; and*
- *Water Sharing Plan for the Lachlan Unregulated and Alluvial Water Sources 2012.*

The *Water Management Act 2000* incorporates the provisions of various prior Acts relating to the management of surface and groundwater in NSW and provides a single statute for regulation of water access, use and works (e.g. pumps or bores) that affect the licensing of surface water and alluvial and non-alluvial (i.e. fractured rock and porous rock) groundwater in the vicinity of the Project.

### **3.3.2 Water Act 1912**

As water sharing plans have commenced under the *Water Management Act, 2000* for all groundwater and surface water systems within which the Project lies (Section 3.3.1), the *Water Act 1912* is not relevant to licensing considerations for the Project.

### **3.3.3 Protection of the Environment Operations Act 1997**

Clean TeQ holds EPL 21146 for the Project. A summary of the key surface water related conditions of EPL 21146 is provided in Section 4.

Unless EPL 21146 authorises otherwise, the Project will be carried out to comply with Section 120 of the POEO Act.

### **3.3.4 National Water Quality Management Strategy/ANZECC & ARMCANZ (2000)**

The National Water Quality Management Strategy is a joint national approach to improving water quality in Australian and New Zealand waterways. The ANZECC water quality guidelines (ANZECC & ARMCANZ, 2000) have been considered where applicable in the SWMP (Appendix B), GWMP (Appendix C) for the Project.

### **3.3.5 NSW Water Quality and River Flow Objectives**

The NSW Water Quality and River Flow Objectives have been developed to guide plans and actions to achieve healthy waterways in NSW, including the Macquarie-Bogan River catchment.

Each objective is based on providing the right water quality for the environment and the different beneficial uses of the water. They are based on measurable environmental values (EVs), which are those values or uses of water that the community believes are important for a healthy ecosystem for public benefit, welfare, safety or health. The target concentrations for each water quality objective (WQO) are based on ANZECC & ARMCANZ (2000).

### **3.3.6 Aquifer Interference Policy**

The *NSW Aquifer Interference Policy* (NSW Government, 2012) has been developed by the NSW Government as a component of the NSW Government's Strategic Regional Land Use Policy. The Aquifer Interference Policy applies statewide and details water licence and impact assessment requirements. The Aquifer Interference Policy has been developed to ensure equitable water sharing between various water users and proper licensing of water taken by aquifer interference activities such that the take is accounted for in the water budget and water sharing arrangements. The Aquifer Interference Policy also enhances existing regulation, contributing to a comprehensive framework to protect the rights of all water users and the environment in NSW.

The *NSW Aquifer Interference Policy* (NSW Government, 2012) includes minimal impact considerations relating to water table and groundwater pressure drawdown and changes in groundwater and surface water quality. Where relevant, these minimal impact considerations have informed the groundwater impact trigger levels (i.e. more than 2 m drawdown) (Section 5.1).

### **3.3.7 NSW Central West Local Strategic Plan**

*Local Land Services Central West Local Strategic Plan 2016-2021* has been considered where applicable in the development of this WMP. The Local Strategic Plan describes the climate and geography, communities, agriculture, biosecurity challenges and natural resources in the region.

### **3.3.8 Australian Standard 1940-2017**

Australian Standard (AS) 1940-2017 *The Storage and Handling of Flammable and Combustible Liquids* sets out requirements and recommendations for the safe storage and handling of flammable liquids of dangerous goods (Class 3) and also provides requirements and recommendations for the storage and handling of combustible liquids. It also provides minimum acceptable safety requirements for storage facilities, operating procedures, emergency planning and fire protection.

AS 1940-2017 have been considered where applicable in this Water Balance.

## 4. PERFORMANCE MEASURES AND PERFORMANCE INDICATORS

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Table 9 in Development Consent DA 374-11-00 prescribes the water management performance measures for the Project, as follows:

- **Water Management – General**
  - Maintain separation between clean and mine water management systems.
  - Minimise the use of clean water on-site.
- **Construction and Operation of Infrastructure**
  - Design, install and maintain erosion and sediment controls generally in accordance with the series *Managing Urban Stormwater: Soils and Construction including Volume 1, Volume 2A – Installation of Services and Volume 2C – Unsealed Roads*.
  - Design, install and maintain infrastructure within 40 m of watercourses generally in accordance with the *Guidelines for Controlled Activities on Waterfront Land* (DPI, 2012), or its latest version.
  - Design, install and maintain any creek crossings generally in accordance with the *Policy and Guidelines for Fish Habitat Conservation and Management* (DPI, 2013) and *Why Do Fish Need To Cross The Road? Fish Passage Requirements for Waterway Crossings* (NSW Fisheries, 2003), or their latest versions.
- **Clean Water Diversion Infrastructure**
  - Maximise the diversion of clean water around disturbed areas on-site.
  - Design, construct and maintain the clean water diversions to capture and convey the 100 year, peak flow rainfall event.
- **Sediment Dams (Mine and Limestone Quarry)**
  - Design, install and/or maintain the dams generally in accordance with the series *Managing Urban Stormwater: Soils and Construction – Volume 1 and Volume 2E Mines and Quarries*.
- **Mine and Limestone Quarry Water Storages**
  - Design, install and/or maintain mine and limestone water storage infrastructure to ensure no discharge of mine or limestone quarry water off-site (except in accordance with an EPL).
  - On-site storages (including mine infrastructure dams, groundwater storage and treatment dams) are suitably designed, installed and/or maintained to minimise permeability.
  - Ensure that the floor and side walls of the tailings storage facility, Evaporation Basin and Surge Dam are designed with a minimum of a 900 millimetres (mm) clay or modified soil liner with a permeability of no more than  $1 \times 10^{-9}$  metres per second (m/s), or a synthetic (plastic) liner of 1.5 mm minimum thickness with a permeability of no more than  $1 \times 10^{-14}$  m/s (or equivalent).

- Design, install and maintain a seepage interception system in the Tailings Storage Facility embankments in accordance with Dams Safety Committee (DSC) guidelines.
- Design, install and maintain the water storages to capture and convey the 100 year, 72-hour Average Recurrence Interval (ARI) rainfall event.
- Design, install and/or maintain the facilities to meet the requirements of the DSC.
- The design of the tailings storage facility should conform to:
  - o DSC3A – Consequence Categories for Dams (DSC); and
  - o DSC3F – Tailings Dams (DSC).
- **Chemical and Hydrocarbon Storage**
  - Chemical and hydrocarbon products to be stored in bunded areas in accordance with the relevant Australian Standards.
- **Irrigation Area**
  - Manage the irrigation area in accordance with the EPA’s *Environmental Guidelines: Use of Effluent by Irrigation*.

During construction activities, Clean TeQ will assess the Project against the specific water management performance indicators outlined in Table 3.

**Table 3 – Water Management Performance Indicators – Construction**

Performance Measure	Performance Indicators
<p><b>Water Management - General</b></p> <ul style="list-style-type: none"> <li>• Maintain separation between clean and mine water management systems.</li> <li>• Minimise the use of clean water on-site.</li> </ul>	<p>The water management system is constructed and maintained generally in accordance with the design described in the SWMP.</p> <p>Water use is consistent with the water use priority described in the Water Balance and in accordance with relevant Water Management Act 2000 approvals.</p>
<p><b>Construction and Operation of Infrastructure</b></p> <ul style="list-style-type: none"> <li>• Design, install and maintain erosion and sediment controls generally in accordance with the series <i>Managing Urban Stormwater: Soils and Construction</i> including <i>Volume 1, Volume 2A – Installation of Services and Volume 2C – Unsealed Roads</i>.</li> <li>• Design, install and maintain infrastructure within 40 m of watercourses generally in accordance with the <i>Guidelines for Controlled Activities on Waterfront Land</i> (DPI 2012), or its latest version.</li> <li>• Design, install and maintain any creek crossings generally in accordance with the <i>Policy and Guidelines for Fish Habitat Conservation and Management</i> (DPI, 2013) and <i>Why Do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings</i> (NSW Fisheries 2003), or their latest versions.</li> </ul>	<p>Suitably qualified person documents that erosion and sediment controls have been designed and installed generally in accordance with the series <i>Managing Urban Stormwater: Soils and Construction</i> including <i>Volume 1, Volume 2A – Installation of Services and Volume 2C – Unsealed Roads</i>.</p> <p>Suitably qualified person documents that key infrastructure within 40 m of watercourses is designed and installed generally in accordance with the <i>Guidelines for Controlled Activities on Waterfront Land</i> (DPI 2012), or its latest version.</p> <p>Suitably qualified person documents that creek crossings have been designed generally in accordance with the <i>Policy and Guidelines for Fish Habitat Conservation and Management</i> (DPI, 2013) and <i>Why Do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings</i> (NSW Fisheries 2003), or their latest versions.</p>
<p><b>Clean Water Diversion Infrastructure</b></p> <ul style="list-style-type: none"> <li>• Maximise the diversion of clean water around disturbed areas on-site.</li> <li>• Design, construct and maintain the clean water diversions to capture and convey the 100-year, peak flow rainfall event.</li> </ul>	<p>Suitably qualified person documents that clean water diversions are designed to maximise the diversion of clean water around disturbance areas.</p> <p>Suitably qualified person documents that clean water diversions are designed and constructed to capture and convey the 100-year, peak flow rainfall event.</p>

**Table 3 (Continued) – Water Management Performance Indicators – Construction**

Performance Measure	Performance Indicators
<p><b>Sediment Dams (Mine and Limestone Quarry)</b></p> <ul style="list-style-type: none"> <li>Design, install and/or maintain the dams generally in accordance with the series <i>Managing Urban Stormwater: Soils and Construction – Volume 1</i> and <i>Volume 2E Mines and Quarries</i>.</li> </ul>	<p>Suitably qualified person documents that sediment dams have been designed and installed generally in accordance with the series <i>Managing Urban Stormwater: Soils and Construction</i> including <i>Volume 1</i> and <i>Volume 2A – Installation of Services and 2E Mines and Quarries</i>.</p>
<p><b>Mine and Limestone Quarry Water Storages</b></p> <ul style="list-style-type: none"> <li>Design, install and/or maintain mine and limestone water storage infrastructure to ensure no discharge of mine or limestone quarry water off-site (except in accordance with an EPL).</li> <li>On-site storages (including mine infrastructure dams, groundwater storage and treatment dams) are suitably designed, installed and/or maintained to minimise permeability.</li> <li>Ensure that the floor and side walls of the tailings storage facility, evaporation basin and surge dam are designed with a minimum of a 900 mm clay or modified soil liner with a permeability of no more than <math>1 \times 10^{-9}</math> m/s, or a synthetic (plastic) liner of 1.5 mm minimum thickness with a permeability of no more than <math>1 \times 10^{-14}</math> m/s (or equivalent).</li> <li>Design, install and maintain a seepage interception system in the Tailings Storage Facility embankments in accordance with the DSC guidelines.</li> <li>Design, install and maintain the water storages to capture and convey the 100 year, 72-hour ARI rainfall event.</li> <li>Design, install and/or maintain the facilities to meet the requirements of the DSC.</li> <li>The design of the tailings storage facility should conform to: <ul style="list-style-type: none"> <li>DSC3A – Consequence Categories for Dams (DSC); and</li> <li>DSC3F – Tailings Dams (DSC).</li> </ul> </li> </ul>	<p>Suitably qualified person documents that the water management infrastructure is constructed and maintained generally in accordance with the design described in the Water Balance and SWMP.</p> <p>Mine water storages are constructed and maintained to minimise seepage.</p> <p>Suitably qualified person documents that the tailings storage facility, evaporation basin and surge dam mine water storages are designed and constructed to capture and convey the 100 year, 72-hour ARI rainfall event.</p> <p>The Dam Safety Committee approves the tailings storage facility design.</p> <p>Suitably qualified person documents that the mine water storages are designed and constructed to capture and convey the 100 year, 72-hour ARI rainfall event.</p> <p>The Dam Safety Committee approves the design of relevant water storages (i.e. prescribed structures).</p> <p>The Dam Safety Committee approves the tailings storage facility design.</p>
<p><b>Chemical and Hydrocarbon Storage</b></p> <ul style="list-style-type: none"> <li>Chemical and hydrocarbon products to be stored in bunded areas in accordance with the relevant Australian Standards.</li> </ul>	<p>Suitably qualified person documents that chemical and hydrocarbon storages are designed and constructed in accordance with the relevant Australian Standards.</p>
<p><b>Irrigation Area</b></p> <ul style="list-style-type: none"> <li>Manage the irrigation area in accordance with the EPA's <i>Environmental Guidelines: Use of Effluent by Irrigation</i>.</li> </ul>	<p>The irrigation area is designed and maintained so as not to cause irrigation water runoff from the irrigation area.</p>

In addition, EPL 21146 includes surface water quality limits for receiving waters at the mine site and surface water quality limits for waters discharged from the sediment dams (Table 4).

**Table 4 – EPL 21146 Surface Water Quality Limits**

Parameter	Units	Limit
<b>Receiving Waters</b>		
Electrical Conductivity (EC)	µS/cm	2,200
pH	pH units	6.5 – 8.5
Total Suspended Solids	mg/L	50
Iron (Fe)	mg/L	3.7
Nickel (Ni)	mg/L	0.008
<b>Stormwater (Sediment Dam) Discharges<sup>1</sup></b>		
Electrical Conductivity (EC)	µS/cm	2,200
pH	pH units	6.5 – 8.5
Total Suspended Solids	mg/L	50 <sup>2</sup>
Turbidity	Nephelometric Turbidity Units	50

µS/cm = micro Siemens per centimetre; mg/L = milligrams per litre.

- <sup>1</sup> Limits do not apply when the discharge occurs solely as a result of rainfall measured at the site which exceeds a total of 50.7 mm of rainfall over any consecutive 5 day period (Condition L2.5 of EPL 21145).
- <sup>2</sup> Limit is not deemed to be exceeded where the water sample complies with the turbidity limit at the time of discharge and the EPA is advised of any total suspended solid exceedances within 3 working days of the completion of the total suspended solids testing (Condition L2.6).

## 5. WATER MANAGEMENT SYSTEM OVERVIEW

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Consistent with the general water management and clean water diversion infrastructure performance measures for the Project (Section 4), the key objectives of the water management system are to control runoff from the development/construction areas and the operational areas, while diverting up-catchment water around these areas, and to minimise the use of clean water on-site.

The water management system will include both permanent features that will continue to operate post-closure (e.g. northern and southern diversion channels) and temporary structures during mining operations (e.g. sediment dams).

An internal drainage system will be constructed to collect and contain water generated within the development/construction areas and operation areas.

Sediment control structures such as sediment dams and sediment fences will be employed where necessary within and downstream of disturbance areas.

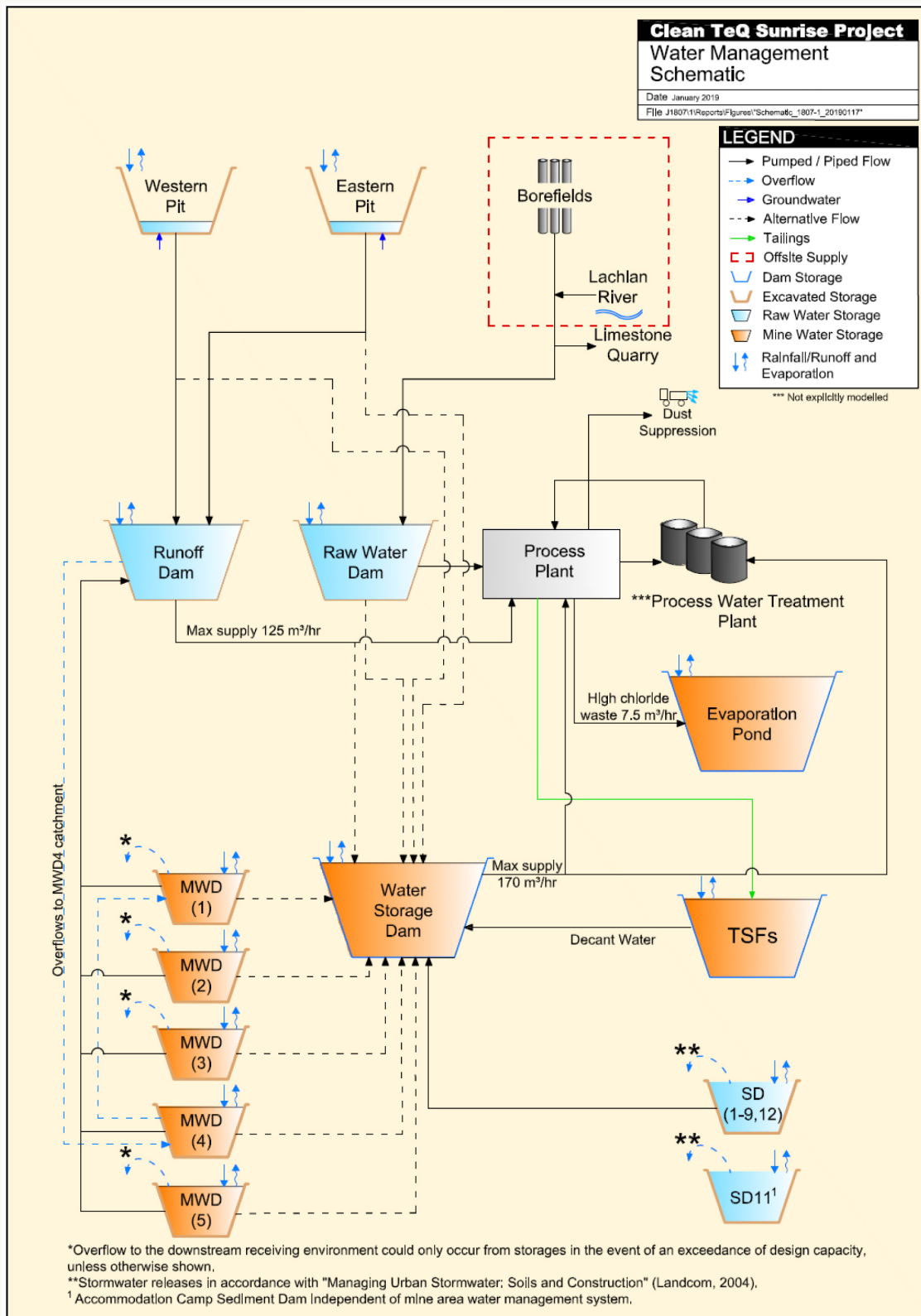
The water management system for the initial construction activities is presented on Figure 2. The water management system will be progressively developed during the construction and operation phases as diversion and containment requirements change. The water management system for the mine site at full development is presented on Figure 3. The water management schematic is shown on Figure 5 and a summary of the water management system is provided in this section.

### 5.1 Mine Water Storages

The following mine water storages will be constructed during the initial construction activities (Figure 2):

- tailings storage facility;
- evaporation pond;
- water storage dam;
- mine water dams and runoff dam; and
- raw water dam.

Additional details on the design and operation of these water storages is provided in the Water Balance (Appendix A) and the SWMP (Appendix B).



CL-17-03-AP 2018\_WBMP\_001C

Source: HEC (2019)

Figure 5



## 5.2 Sediment Dams

Consistent with the relevant performance measures (Section 4), the sediment dams will be designed, installed and maintained generally in accordance with the series *Managing Urban Stormwater: Soils and Construction* including *Volume 1* (Landcom, 2004) and *Volume 2E Mines and Quarries* (DECC, 2008c).

Water collected from the disturbance footprint (e.g. internal haul roads and waste dumps) will be temporarily contained in the sediment dams to minimise potential water quality impacts. Where opportunities arise, water will be recycled for dust suppression or use in the processing facility, or otherwise released in accordance with the requirements of EPL 21146.

Additional details on the design and operation of the sediment dams is provided in the Water Balance (Appendix A) and the SWMP (Appendix B).

## 5.3 Diversion Systems

The diversion system consists of clean water diversions and collection drains. The clean water diversions will collect and divert clean water around disturbed areas. The collection drains will collect and convey runoff from disturbed areas to mine water dams (“mine water”) (Section 5.1) or sediment dams (“sediment water”) (Section 5.2). Consistent with the relevant performance measures (Section 4), the diversion system will:

- maintain separation between clean and mine water management systems; and
- maximise the diversion of clean water around disturbed areas on site.

Additional details on the design and operation of the diversion system is provided in the Water Balance (Appendix A) and the SWMP (Appendix B).

## 5.4 Other Surface Water Management Measures

The water management system at the mine site is designed to minimise any potential water quality impacts and is described in the Water Balance (Appendix A). The overall objective of the surface water management system is to contain any potentially contaminated water generated within development/construction and operational areas while diverting all other water around these areas. In summary, this objective is achieved by:

- minimising disturbance areas;
- containment and recycling (including priority re-use of accumulated waters stored);
- collection of runoff from the stockpiles and emplacements to sediment dams designed and managed in accordance with relevant guidelines;
- progressive stabilisation and revegetation of disturbed areas; and
- installation of appropriate erosion and sediment controls.

## 6. MONITORING PROGRAMS

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Monitoring programs have been developed and are described in the Water Balance (Appendix A), SWMP (Appendix B) and GWMP (Appendix C).

## 7. CONTINGENCY PLAN

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In the event a water management performance measure for the Project (detailed in Section 4) has not been met or a performance indicator is considered to have been exceeded, Clean TeQ will implement the following Contingency Plan:

- The Clean TeQ Environmental Superintendent will report the likely exceedance in accordance with Section 9.1.
- Clean TeQ will identify an appropriate course of action with respect to the identified potential impacts or environmental consequences (if any), in consultation with specialists and relevant government agencies, as necessary. For example, contingency measures, such as, but not limited to, those described in Section 7.2.
- Clean TeQ will submit the proposed course of action to the DPIE for approval.
- Clean TeQ will implement the approved course of action to the satisfaction of the DPIE.

### 7.1 Adaptive Management

In accordance with Condition 3, Schedule 5 of Development Consent DA 374-11-00, where any exceedance of the criteria and/or performance measures outlined in Schedule 3 of Development Consent DA 374-11-00 occurs, at the earliest opportunity Clean TeQ will:

- take all reasonable and feasible measures to ensure that the exceedance ceases and does not recur;
- consider all reasonable and feasible options for remediation and submit a report to the DPIE describing these options and preferred remediation measures; and
- implement remediation measures as directed by the Secretary of the DPIE.

### 7.2 Specific Contingency Measures

Specific contingency measures for an exceedance of the water management performance measures would include:

- The conduct of additional monitoring (e.g. increase in monitoring frequency or additional sampling), which would inform further specific contingency measures.
- Implementation of adaptive management strategies (e.g. on-site reconfiguration) to better maintain separation of clean and mine waters, diversion of clean waters, storage 'as-built' designs and avoid discharge of mine waters (except in accordance with an EPL).
- Provision of equivalent water supply or compensation for an impacted privately-owned bore.
- The provision of a suitable offset (e.g. improvement works) if there was an environmental consequence and/or adverse surface water impacts were to result.

Clean TeQ will also implement any preferred contingency measures identified to address an incident as directed by the Secretary (Sections 7.1 and 9.1).

## 8. REVIEW AND IMPROVEMENT OF ENVIRONMENTAL PERFORMANCE

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### 8.1 Annual Review

In accordance with Condition 5, Schedule 5 of Development Consent DA 374-11-00, Clean TeQ will review the environmental performance of the Project by the end of March each year (for the previous calendar year) to the satisfaction of the Secretary.

In relation to water management, the Annual Review will (where relevant):

- describe the development that was carried out in the relevant calendar year, and the development that is proposed to be carried out during the following calendar year;
- include a comprehensive review of the monitoring results and complaints records of the development over the past year, which includes a comparison of these results against the:
  - relevant statutory requirements, limits or performance measures/criteria;
  - monitoring results of previous years; and
  - relevant predictions in the Syerston Nickel Cobalt Project Environmental Impact Statement (Black Range Minerals, 2000) and subsequent environmental assessments;
- identify any non-compliance over the last year, and describe what actions were (or are being) taken to ensure compliance;
- identify any trends in the monitoring data over the life of the development;
- identify any discrepancies between the predicted and actual impacts of the development, and analyse the potential cause of any significant discrepancies; and
- describe what measures will be implemented over the next year to improve the environmental performance of the development.

The Annual Review will be made publicly available on the Clean TeQ website.

### 8.2 Independent Environmental Audit

In accordance with Condition 10, Schedule 5 of Development Consent DA 374-11-00, an independent environmental audit of the Project will be conducted by a suitably qualified, experienced and independent team of experts whose appointment has been endorsed by the Secretary.

The independent environmental audit will assess the environmental performance of the Project and review the adequacy of this WMP. If necessary, appropriate measures or actions to improve the environmental performance of the Project or this WMP will be recommended.

An independent environmental audit will be conducted within one year of the commencement of the development under this consent, after 6 May 2017.

The independent environmental audit, and Clean TeQ's response to the recommendations in the audit, will be made publicly available on the Clean TeQ website, in accordance with Condition 12, Schedule 5 of Development Consent DA 374-11-00.

## 9. REPORTING PROTOCOLS

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In accordance with Condition 4(g), Schedule 5 of Development Consent DA 374-11-00, Clean TeQ has developed protocols for managing and reporting the following:

- incidents;
- complaints;
- non-compliances with statutory requirements; and
- exceedances of the impact assessment criteria and/or performance criteria.

These protocols are described in detail in Clean TeQ's Environmental Management Strategy.

In accordance with Condition 9, Schedule 5 of Development Consent DA 374-11-00, Clean TeQ will provide regular reporting on the environmental performance of the Project on the Clean TeQ website. The Annual Review will be made publicly available on the Clean TeQ website to address this requirement.

### 9.1 Incident Reporting

An incident is defined as a set of circumstances that causes or threatens to cause material harm to the environment and/or breaches or exceeds the limits or performance measures/criteria in Development Consent DA 374-11-00.

In the event that review of surface or ground water monitoring data indicates an incident has occurred, the incident will be reported in accordance with Condition 8, Schedule 5 of Development Consent DA 374-11-00. Clean TeQ will notify the Secretary and any other relevant agencies including the relevant Council immediately after it becomes aware of the incident. Clean TeQ will also notify any affected landholders of any incident that has caused, or threatens to cause, material harm to the environment.

Within seven days of the date of the incident, Clean TeQ will provide the Secretary and any other relevant agencies with a detailed report on the incident and such further reports as may be requested. The report will:

- describe the date, time and nature of the exceedance/incident;
- identify the cause (or likely cause) of the exceedance/incident;
- describe what action has been taken to date; and
- describe reasonable and feasible options to address the incident and identify the preferred option to address the incident (Section 7.1).

## 9.2 Complaints

Clean TeQ will maintain a Community Complaints Line (tel: 1800 952 277) and email address ([community@cleanteq.com](mailto:community@cleanteq.com)) for the sole purpose of receiving community contacts and complaints. The Community Complaints Line number will be available on the website and included in Clean TeQ's advertising and community communication tools. The Community Complaints line will be staffed 24 hours a day, seven days a week during construction and operations. Clean TeQ will respond to callers on the next business day. If the issue is urgent a member of the leadership team will be contacted immediately.

Clean TeQ has developed a procedure that outlines its commitment to receiving, resolving and recording complaints received from the community. Detailed records of each complaint resolution are kept in Clean TeQ's record management systems.

Complaints will be investigated within 24 hours of receipt. The cause of the complaint will be analysed and actions to resolve the complaint taken as soon as possible. In complex cases where resolution will take more than 48 hours, Clean TeQ will commit to update the community member regularly until the complaint is resolved.

In accordance with Condition 12(a), Schedule 5 of Development Consent DA 374-11-00, a complaints register will be made available on the Clean TeQ website and updated monthly.

### **9.3 Non-Compliances with Statutory Requirements**

A protocol for managing and reporting non-compliances with statutory requirements has been developed as a component of Clean TeQ's Environmental Management Strategy and is described below.

Compliance with all approvals plans and procedures is the responsibility of all personnel (staff and contractors) employed on or in association with Clean TeQ and the Project.

The Clean TeQ Environmental Superintendent will undertake regular inspections, internal audits and initiate directions identifying any remediation/rectification work required, and areas of actual or potential non-compliance.

As described in Section 9.1, Clean TeQ will report incidents in accordance with Condition 8, Schedule 5 of Development Consent DA 374-11-00 and in accordance with the protocol for industry notification of pollution incidents under Part 5.7 of the POEO Act.

Clean TeQ will notify the Secretary and any other relevant agencies including the relevant Council immediately after the authorised person becomes aware of the incident which causes or threatens to cause material harm to the environment. Within seven days of the date of the incident, Clean TeQ will provide the Secretary and any other relevant agencies with a detailed report on the incident and such further reports as may be requested.

A review of compliance with all conditions in Development Consent DA 374-11-00, Mining Lease 1770 and all other approvals and licences will be undertaken prior to (and included within) each Annual Review (Section 8.1).

Additionally, in accordance with Condition 10, Schedule 5 of Development Consent DA 374-11-00, an independent environmental audit (Section 8.2) would be conducted by a suitably qualified, experienced and independent team of experts whose appointment has been endorsed by the Secretary to assess whether Clean TeQ is complying with the requirements in Development Consent DA 374-11-00, and any other relevant approvals, EPLs, and/or mining leases.

### **9.4 Exceedances of Impact Assessment Criteria and/or Performance**

A protocol for managing and reporting exceedances of impact assessment criteria and/or performance criteria is provided in Section 4.



## 10. REFERENCES

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- Australian and New Zealand Environment and Conservation Council (ANZECC) and Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ) (2000) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality – The Guidelines*. National Water Quality Management Strategy. October 2000.
- Black Range Minerals (2000) *Syerston Nickel-Cobalt Project Environmental Impact Statement*. October 2000.
- Department of Primary Industries (DPI) Fisheries NSW (2013) *Policy and Guidelines for Fish Habitat Conservation and Management*. June 2013.
- Department of Primary Industries (DPI) Office of Water (2012) *Controlled Activities on Waterfront Land – Guidelines for Riparian Corridors on Waterfront Land*. July 2012.
- Fairfull, S. and Witheridge, G. (2003) *Why Do Fish Need To Cross The Road? Fish Passage Requirements for Waterway Crossings*. NSW Fisheries, January 2003.

# ATTACHMENT 1

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Water Related Development Consent DA 374-11-00 Conditions

**Table A-1 – Water Related Development Consent DA 374-11-00 Conditions**

<p style="text-align: center;"><b>Development Consent DA 374-11-00 Schedule 3</b></p>	<p style="text-align: center;"><b>Section Where Addressed in this WMP Section</b></p>
<p><b>Water Supply</b>                      26. <i>The Applicant must ensure that it has sufficient water for all stages of the development, and if necessary, adjust the scale of development on site to match its available water supply.</i>  <i>Note: Under the Water Act 1912 and/or the Water Management Act 2000, the Applicant is required to obtain the necessary water licences for the development.</i></p>	<p style="text-align: center;">Appendix A</p>
<p><b>Water Pollution</b>                      27. <i>Unless an EPL authorises otherwise, the Applicant must comply with Section 120 of the POEO Act.</i></p>	<p style="text-align: center;">Section 3.3.3</p>
<p><b>Compensatory Water Supply</b>                      28. <i>The Applicant must provide a compensatory water supply to anyone whose basic landholder water rights (as defined in the Water Management Act 2000) are adversely and directly impacted as a result of the development. This supply must be provided in consultation with DoI Lands &amp; Water, and to the satisfaction of the Secretary.</i>  <i>The compensatory water supply measures must provide an alternative long-term supply of water that is equivalent to the loss attributable to the development. Equivalent water supply must be provided (at least on an interim basis) as soon as possible after the loss is identified, unless otherwise agreed with the landowner.</i>  <i>If the Applicant and the landowner cannot agree on the measures to be implemented, or there is a dispute about the implementation of these measures, then either party may refer the matter to the Secretary for resolution</i>  <i>If the Applicant is unable to provide an alternative long-term supply of water, then the Applicant must provide alternative compensation to the satisfaction of the Secretary.</i></p>	<p style="text-align: center;">Appendix C</p>

**Table A-1 (Continued) – Water Related Development Consent DA 374-11-00 Conditions**

<b>Development Consent DA 374-11-00 Schedule 3</b>		<b>Section Where Addressed in this WMP Section</b>																
<p><b>Water Management Performance Measures</b> 29. The Applicant must ensure the development on site complies with the performance measures in Table 9, to the satisfaction of the Secretary.</p> <p><b>Table 9: Water Management Performance Measures</b></p> <table border="1"> <thead> <tr> <th style="text-align: center;"><b>Feature</b></th> <th style="text-align: center;"><b>Performance Measure</b></th> </tr> </thead> <tbody> <tr> <td>Water Management General</td> <td> <ul style="list-style-type: none"> <li>Maintain separation between clean and mine water management systems</li> <li>Minimise the use of clean water on site</li> </ul> </td> </tr> <tr> <td>Construction and operation of infrastructure</td> <td> <ul style="list-style-type: none"> <li>Design, install and maintain erosion and sediment controls generally in accordance with the series <i>Managing Urban Stormwater: Soils and Construction</i> including Volume 1, Volume 2A – Installation of Services and Volume 2C – Unsealed Roads.</li> <li>Design, install and maintain infrastructure within 40 m of watercourses generally in accordance with the Guidelines for Controlled Activities on Waterfront Land (DPI 2012), or its latest version;</li> <li>Design, install and maintain any creek crossings generally in accordance with the Policy and Guidelines for Fish Habitat Conservation and Management (DPI, 2013) and Why Do Fish Need To Cross The Road? 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**Table A-1 (Continued) – Water Related Development Consent DA 374-11-00 Conditions**

<p align="center"><b>Development Consent DA 374-11-00 Schedule 3</b></p>	<p align="center"><b>Section Where Addressed in this WMP Section</b></p>
<p><b>Water Management Plan</b></p> <p>30. Prior to carrying out any development after 6 May 2017, the Applicant must prepare a Water Management Plan for the development in consultation with DoI Lands &amp; Water and the EPA, and to the satisfaction of the Secretary. This plan must include:</p> <p>(a) a Water Balance that:</p> <ul style="list-style-type: none"> <li>• includes details of: <ul style="list-style-type: none"> <li>– sources and security of water supply, including contingency planning for future reporting periods;</li> <li>– water use and management on site;</li> <li>– measures to prioritise the use of water in the following order: <ul style="list-style-type: none"> <li>○ recycled water from the water treatment plant;</li> <li>○ other on-site sources (in accordance with harvestable rights provisions); and</li> <li>○ water extracted from the borefields and Lachlan River;</li> </ul> </li> <li>– reporting procedures, including the preparation of a site water balance for each calendar year; and</li> </ul> </li> <li>• describes the reasonable and feasible measures that would be implemented to minimise clean water use on site and maximise the reuse of recovered tailings water at the facility;</li> </ul>	<p align="center">This WMP</p> <p align="center">Appendix A</p>
<p>(b) a Surface Water Management Plan, that includes:</p> <ul style="list-style-type: none"> <li>• baseline data on water flows and quality in the watercourses that could be affected by the development (if available);</li> <li>• a detailed description of the water management system on-site, including the: <ul style="list-style-type: none"> <li>– clean water diversion systems;</li> <li>– erosion and sediment controls; and</li> <li>– water storages; and</li> <li>– irrigation area;</li> </ul> </li> <li>• objectives and performance criteria, including trigger levels for investigating any potential or actual adverse impacts associated with the development, including the: <ul style="list-style-type: none"> <li>– surface water flows and quality;</li> <li>– downstream flooding;</li> </ul> </li> <li>• a program to monitor and report on: <ul style="list-style-type: none"> <li>– the effectiveness of the water management system and tailings storage facility; and</li> <li>– surface water flows and water quality;</li> <li>– the performance measures listed in Table 9;</li> <li>– impacts on water users;</li> <li>– downstream flooding;</li> </ul> </li> <li>• a plan to respond to any exceedances of the trigger levels and/or performance criteria, and minimise and/or offset any adverse surface water impacts of the development;</li> </ul> <p>(c) a Groundwater Management Plan, that includes:</p> <ul style="list-style-type: none"> <li>• baseline data on groundwater levels, yield and quality in the region and privately-owned groundwater bores that could be affected by the development in the vicinity of the borefields;</li> <li>• groundwater assessment criteria, including trigger levels for investigating any potentially adverse groundwater impacts associated with the development in the vicinity of the borefields;</li> <li>• a program to monitor and report on: <ul style="list-style-type: none"> <li>- groundwater inflows into the open cut pits, if relevant;</li> <li>- the seepage/leachate from the tailings storage facility and evaporation ponds; and</li> <li>- the impacts of the development on: <ul style="list-style-type: none"> <li>■ groundwater supply of any potentially affected landholders, particularly around the borefields;</li> <li>■ regional and local aquifers; and</li> <li>■ post-mining groundwater recovery;</li> </ul> </li> </ul> </li> <li>• a plan to respond to any exceedances of the groundwater assessment criteria, and mitigate any adverse impacts of the development;</li> </ul>	<p align="center">Appendix B</p> <p align="center">Appendix C</p>
<p>31. The Applicant must implement the approved Water Management Plan for the development.</p>	<p align="center">This WMP (once approved)</p>

# APPENDIX A

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Water Balance

# Clean TeQ Sunrise Project Water Balance

2020-CTEQ-0000-66AA-0016

3 September 2019

REVISION 1

# CONTENTS

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1.	Introduction.....	1
1.1	Purpose and Scope.....	5
1.2	Structure of the Water Balance.....	6
2.	Water Balance Review and Update.....	8
2.1	Site Water Balance – Calendar Year Review.....	9
3.	Statutory Requirements.....	10
3.1	Development Consent DA 374-11-00.....	10
3.2	Licences, Permits and Leases.....	11
3.3	Other Legislation, Policies and Guidance.....	12
4.	Baseline Data.....	15
4.1	Meteorology Information.....	15
4.2	Topographical Information.....	16
4.3	Hydrological Information.....	17
4.4	Hydrogeological Information.....	17
5.	Performance Measures and Performance Indicators.....	18
6.	Water Management System.....	22
6.1	Water Management and Related Infrastructure.....	22
6.2	Water Sources.....	29
6.3	Water Use.....	33
7.	Water Balance.....	34
7.1	Water Supply Reliability.....	34
7.2	On-Site Containment.....	36
8.	Monitoring Programs.....	37
9.	Contingency Plan.....	38
9.1	Adaptive Management.....	38
9.2	Specific Contingency Measures.....	38
10.	Review and Improvement of Environmental Performance.....	39
10.1	Annual Review.....	39
10.2	Independent Environmental Audit.....	39
11.	Reporting Protocols.....	41
11.1	Incident Reporting.....	41
11.2	Complaints.....	42
11.3	Non-Compliances with Statutory Requirements.....	42
11.4	Exceedances of Impact Assessment Criteria and/or Performance.....	43
12.	References.....	44



## FIGURES

---

Figure 1	Regional Location
Figure 2	Mine and Processing Facility General Arrangement (Initial Construction Activities)
Figure 3	Mine and Processing Facility Conceptual General Arrangement
Figure 4	Borefields and Surface Water Extraction General Arrangement
Figure 5	Water Management Schematic
Figure 6	Simulated Annual Off-site Water Demand

## TABLES

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Table 1	Water Balance Requirements in Development Consent DA 374-11-00
Table 2	Mangement Plan (General) Requirements
Table 3	Monthly Average Rainfall and Pan Evaporation (SILO Data Drill Data)
Table 4	Water Management Performance Indicators – Construction
Table 5	Sediment Dam Design Criteria and Capacities
Table 6	Diversion System Design Criteria
Table 7	Maximum Harvestable Right Dam Capacity
Table 8	Summary of Predicted Annual Off-Site Water Demand and Current and Required Entitlements

# 1. INTRODUCTION

---

The Clean TeQ Sunrise Project (the Project)<sup>1</sup> is a nickel cobalt scandium open cut mining project situated near the village of Fifield, approximately 350 kilometres (km) west-northwest of Sydney, in New South Wales (NSW) (Figure 1).

The Project includes the establishment and operation of the following:

- mine (including the acid leach processing facility);
- limestone quarry;
- rail siding;
- gas pipeline;
- borefields, surface water extraction infrastructure and water pipeline;
- accommodation camp; and
- associated transport activities and transport infrastructure (e.g. the Fifield Bypass, road and intersection upgrades).

Clean TeQ Sunrise Pty Ltd owns the rights to develop the Project. Clean TeQ Sunrise Pty Ltd is a wholly owned subsidiary of Clean TeQ Holdings Limited (Clean TeQ).

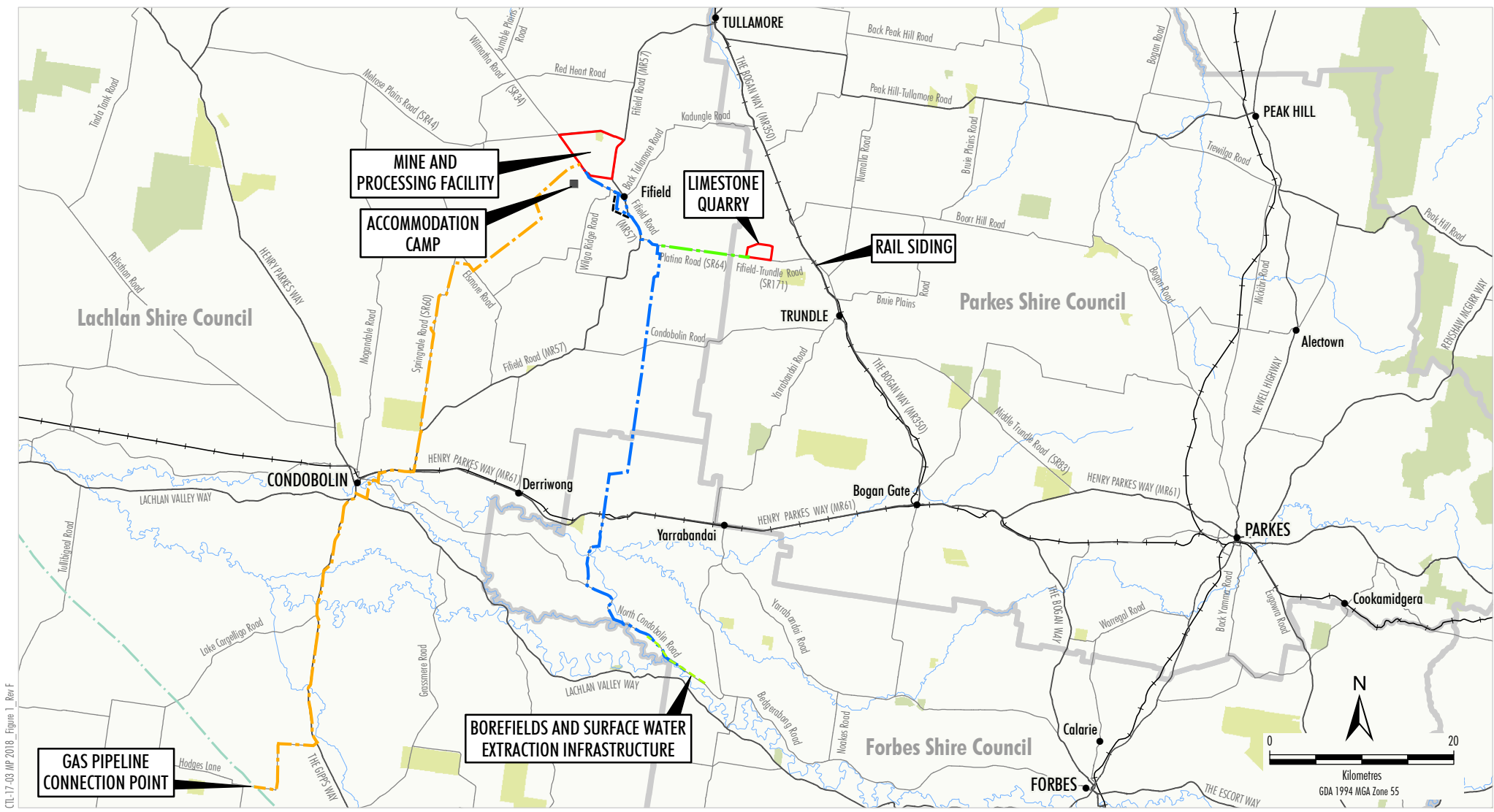
Development Consent DA 374-11-00 for the Project was issued under Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) in 2001. Six modifications to Development Consent DA 374-11-00 have since been granted under the EP&A Act:

- 2005 – to allow for an increase of the autoclave feed rate, limestone quarry extraction rate and adjustments to ore processing operations;
- 2006 – to allow for the reconfiguration of the borefields;
- 2017 – to allow for the production of scandium oxide;
- 2017 – to amend hazard study requirements;
- 2018 – to relocate the accommodation camp; and
- 2018 – to implement opportunities to improve the overall efficiency of the Project.

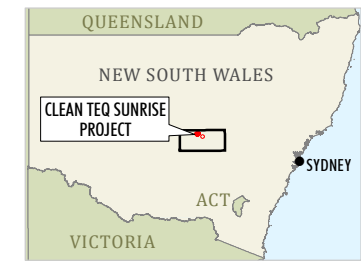
The general arrangement for the mine layout during the initial Project construction activities and full development are shown on Figures 2 and 3.

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<sup>1</sup> The Project was previously known as the Syerston Project.



CLT-17\_03\_MP 2018\_Figure 1\_Rev F

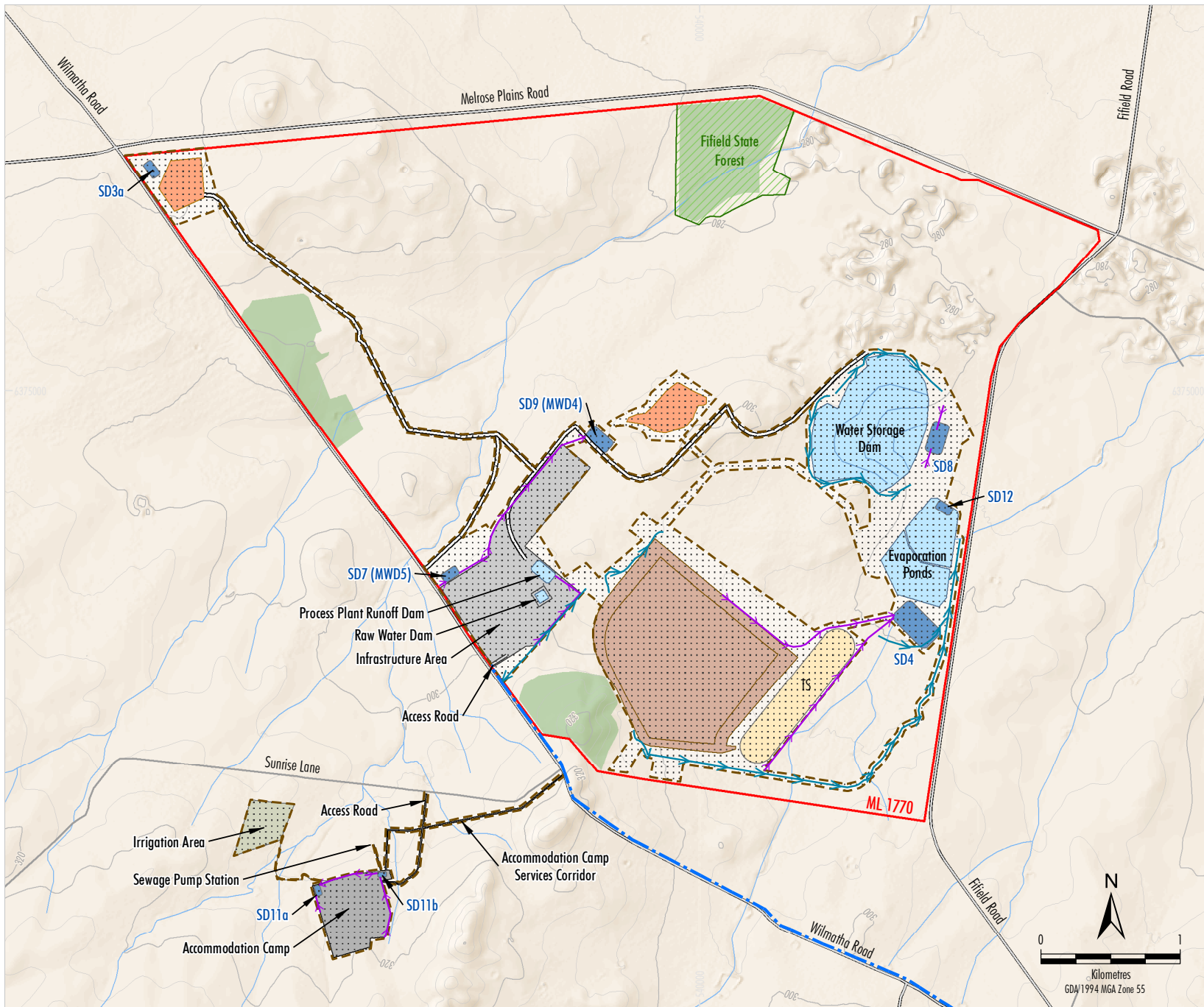


- LEGEND**
- National Park/Conservation Area
  - State Forest
  - Local Government Boundary
  - Railway
  - Existing Gas Pipeline
  - Mining Lease Boundary (ML)
  - Fifield Bypass
  - Gas Pipeline
  - Water Pipeline
  - Limestone Quarry Water Pipeline
  - Borefield Infrastructure Corridor

Source: Black Range Minerals (2000); Clean Teq (2017, 2018); NSW Department of Industry (2018); NSW Land & Property Information (2017); Office of Environment and Heritage NSW (2017)

  
**CLEAN TEQ SUNRISE PROJECT**  
 Regional Location

Figure 1



- LEGEND**
- State Forest
  - Mining Lease Boundary (ML)
  - Initial Construction Activities
  - Surface Development Area
  - Tailings Storage Facility
  - Borrow Pit
  - Topsoil Stockpile
  - Infrastructure Area
  - Water Storage (Mine Water)
  - Sediment Dam (Mine Water)
  - Existing Open Woodland to be Maintained
  - Water Pipeline
  - Collection Drain (Sediment Water) #
  - Diversion Channel (Clean Water)

# No 'mine water' would be generated during the initial construction activities and therefore no 'mine water' collection drains are shown.

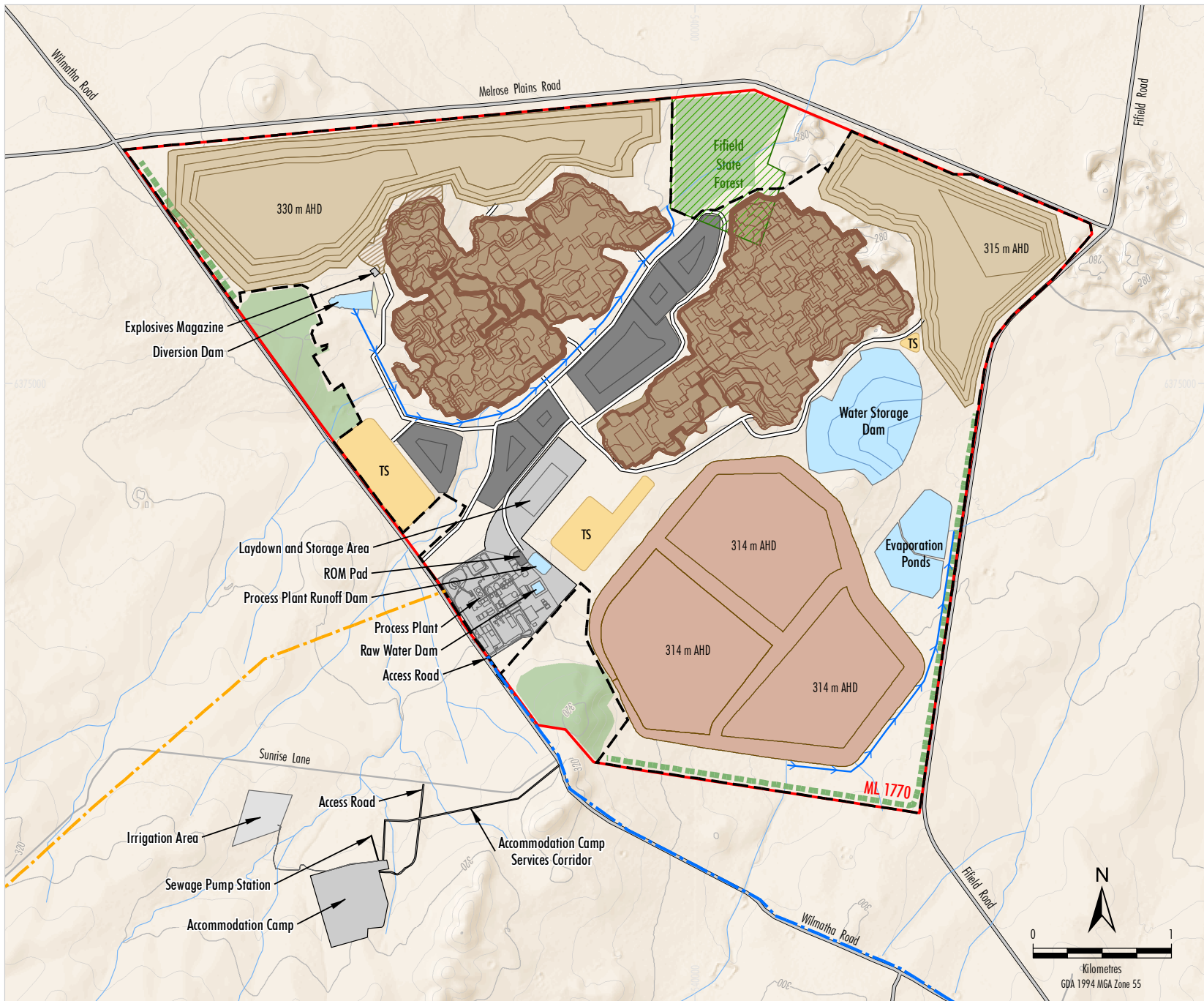
Source: Black Range Minerals (2000); Clean TeQ (2017, 2019); NSW Department of Industry (2018); NSW Land & Property Information (2017)

**CLEAN  
TEQ**  
Powering innovation

CLEAN TEQ SUNRISE PROJECT


**Mine and Processing Facility  
General Arrangement  
(Initial Construction Activities)**

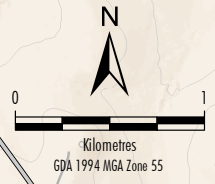
**Figure 2**



- LEGEND**
- State Forest
  - Mining Lease Boundary (ML)
  - Approved Surface Development Area
  - Open Cut Pit (Scandium Oxide)
  - Open Cut Pit
  - Waste Rock Emplacement
  - Tailings Storage Facility
  - Topsoil Stockpile
  - Ore Stockpile
  - Mine Infrastructure Area
  - Diversion Structure
  - Vegetation Screening
  - Existing Open Woodland to be Maintained
  - Gas Pipeline
  - Water Pipeline

Source: Black Range Minerals (2000); Clean TeQ (2017, 2019); NSW Department of Industry (2018); NSW Land & Property Information (2017)

  
**CLEAN TEQ SUNRISE PROJECT**  
**Mine and Processing Facility**  
**Conceptual General Arrangement**



**Figure 3**

## 1.1 Purpose and Scope

This Water Balance been prepared by Clean TeQ in accordance with the requirements of Condition 30(a), Schedule 3 of Development Consent DA 374-11-00 (Table 1) and is a component of the Water Management Plan (WMP) (Appendix A of the WMP).

**Table 1** – Water Balance Requirements in Development Consent DA 374-11-00

Development Consent DA 374-11-00 Schedule 3	Section Where Addressed in this Water Balance
30. <i>Prior to carrying out any development after 6 May 2017, the Applicant must prepare a Water Management Plan for the development in consultation with Dol Lands &amp; Water and the EPA, and to the satisfaction of the Secretary. This plan must include:</i>	The WMP
<p>(a) <i>a Water Balance that:</i></p> <ul style="list-style-type: none"> <li>• <i>includes details of:</i> <ul style="list-style-type: none"> <li>– <i>sources and security of water supply, including contingency planning for future reporting periods;</i></li> <li>– <i>water use and management on site;</i></li> <li>– <i>measures to prioritise the use of water in the following order:</i> <ul style="list-style-type: none"> <li>○ <i>recycled water from the water treatment plant;</i></li> <li>○ <i>other on-site sources (in accordance with harvestable rights provisions); and</i></li> <li>○ <i>water extracted from the borefields and Lachlan River;</i></li> </ul> </li> <li>– <i>reporting procedures, including the preparation of a site water balance for each calendar year; and</i></li> </ul> </li> <li>• <i>describes the reasonable and feasible measures that would be implemented to minimise clean water use on site and maximise the reuse of recovered tailings water at the facility;</i></li> </ul>	<p>This Water Balance</p> <p>Sections 6.2, 7.1 &amp; 9</p> <p>Sections 6.1 and 6.3 Section 6.2</p> <p>Sections 2.1 &amp; 11</p> <p>Section 6</p>

On 5 July 2018, the Secretary of the Department of Planning, and Environment (now the Department Planning, Industry and Environment [DPIE]) (the Secretary) approved the progressive submission of environmental management plans for the Project in accordance with Condition 12, Schedule 2 of Development Consent DA 374-11-00. The scope of this Water Balance is specifically related to the following initial Project construction activities:

- development of the mine, including:
  - site establishment and earthworks;
  - construction of site access roads and haul roads;
  - processing facility earthworks;
  - establishment of temporary facilities required for construction activities (e.g. offices, lay down areas, communications infrastructure);
  - construction of the mine infrastructure area including the offices, workshops, warehouse, laboratory and amenities buildings, fuel storage areas, potable water treatment plant and car parking facilities;
  - construction of the tailings storage facility and evaporation pond;
  - construction of water management infrastructure including the raw water dam, water storage dam and sediment dams;
  - construction and operation of the concrete batch plant;
  - development of gravel and clay borrow pits (including blasting and crushing);

- installation of appropriate fencing and barriers for public safety and security for mining and construction; and
- other associated minor infrastructure, plant, equipment and activities;
- development and operation of the accommodation camp;
- development and operation of the borefields, surface water extraction infrastructure and water pipeline<sup>2</sup>; and
- road upgrades.

The initial construction activities would not include any development of the limestone quarry, rail siding or gas pipeline.

The approximate extent of the initial Project construction activities at the mine site and accommodation camp is shown on Figure 2. The approved water pipeline alignment and borefields and surface water extraction general arrangement is shown on Figures 1 and 4 respectively.

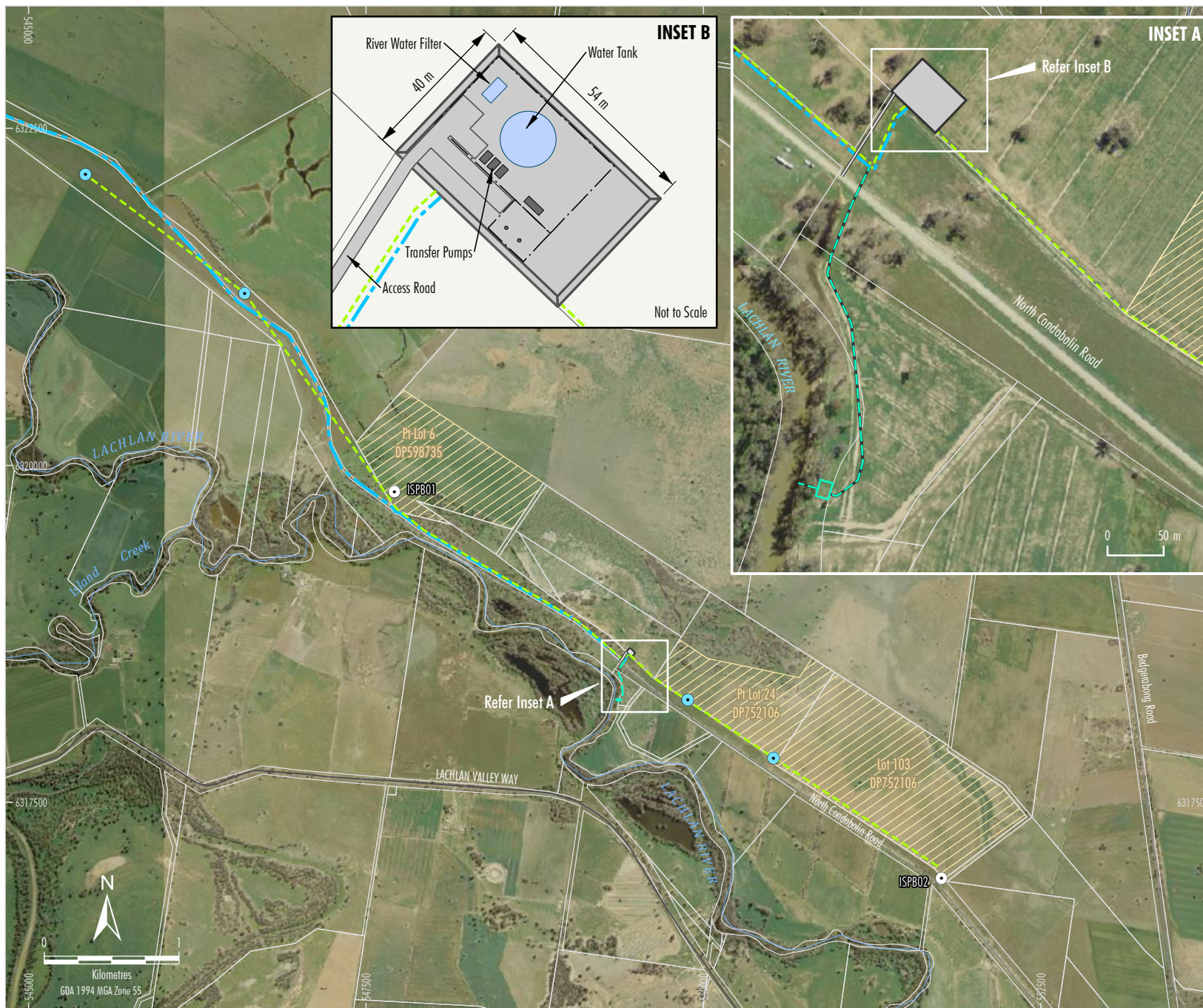
## 1.2 Structure of the Water Balance

The remainder of this Water Balance is structured as follows:

- Section 2: Describes the review and update of the Water Balance.
- Section 3: Outlines the statutory requirements applicable to the Water Balance.
- Section 4: Provides the baseline data.
- Section 5: Details the performance measures and performance indicators that will be used to assess the Project.
- Section 6: Provides a description of the Project water management system including details of the water sources, water use and water management at the Project.
- Section 7: Describes the Project water balance and presents the reliability and security of water supply, including contingency planning for future reporting periods.
- Section 8: Details the Water Balance monitoring program.
- Section 9: Provides a contingency plan to manage any unpredicted impacts and their consequences.
- Section 10: Describes the program to review and report on the effectiveness of management measures and improvement of environmental performance.
- Section 11: Describes the protocol for management and reporting of incidents, complaints and non-compliances with statutory requirements.
- Section 12: Lists the references cited in this Water Balance.

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<sup>2</sup> The water pipeline includes the Fifield Bypass and Alternative Pipeline Route alignments.



- LEGEND**
- Property Boundary
  - Borefield Location
  - Water Pipeline
  - Borefield Infrastructure Corridor \*
  - Surface Water Infrastructure Corridor \*
  - Pump Station
  - Transfer Station
  - Access Road
  - Production Bore (constructed)
  - Production Bore (not constructed)
- \* Infrastructure Corridor includes linking pipeline, access road and electricity transmission line.

Source: Clean TeQ (2017, 2019); Ivanplats Syerston (2005); NSW Land & Property Information (2018)  
 NSW Imagery: © Department of Finance, Services & Innovation (2018)

Figure 4



## 2. WATER BALANCE REVIEW AND UPDATE

---

This Water Balance has been provided to the NSW Environment Protection Authority (EPA) and the Department of Industry – Lands & Water (now the Natural Resources Access Regulator [NRAR]) for the purposes of consultation on 20 June 2018 and 25 June 2018, respectively, in accordance with Condition 30, Schedule 3 of Development Consent DA 374-11-00.

The NRAR provided comments on 27 September 2018 and 12 June 2019. These comments have been incorporated into this Water Balance. The EPA indicated on 19 October 2018 that it had no comments on the Water Balance.

Consistent with the Secretary's approval for the progressive submission of environmental management plans, this Water Balance would be re-submitted and approved prior to the commencement of activities not included in the scope of this Water Balance.

In accordance with Condition 6, Schedule 5 of Development Consent DA 374-11-00, this Water Balance will be reviewed, and if necessary revised (to the satisfaction of the Secretary), within three months of the submission of:

- an Annual Review (Condition 5, Schedule 5);
- an incident report (Condition 8, Schedule 5);
- an independent environmental audit (Condition 10, Schedule 5); or
- any modification to the conditions of Development Consent DA 374-11-00 (unless the conditions require otherwise).

The reviews would be undertaken to ensure the Water Balance is updated on a regular basis and to incorporate any recommended measures to improve the environmental performance of the Project.

Within 4 weeks of conducting a review of the Water Balance, the Secretary will be advised of the outcomes of the review and any revised documents submitted to the Secretary for approval.

If agreed with the Secretary, a revision to the Water Balance required under Development Consent DA 374-11-00 may be prepared without undertaking consultation with all parties nominated under the relevant condition of Development Consent DA 374-11-00.

The revision status of this Water Balance is indicated on the title page of each copy.

The approved Water Balance will be made publicly available on the Clean TeQ website, in accordance with Condition 12, Schedule 5 of Development Consent DA 374-11-00.

## **2.1 Site Water Balance – Calendar Year Review**

In accordance with Condition 30(a), Schedule 3 of Development Consent DA 374-11-00, a revised water balance will be prepared for each calendar year. The revised water balance will incorporate the latest site layout and water inventory and recent monitoring data (e.g. water demand, open pit inflows) to update the water balance model predictions. The water balance review will include a comparison of monitoring data against previous model predictions. The results of the annual water balance reviews will be reported in the Annual Review (Section 10.1).

### 3. STATUTORY REQUIREMENTS

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Clean TeQ's statutory obligations relevant to the site water balance are contained in:

- the conditions of Development Consent DA 374-11-00;
- relevant licences and permits, including conditions attached to mining leases; and
- other relevant legislation.

Obligations relevant to this Water Balance are described below.

#### 3.1 Development Consent DA 374-11-00

##### 3.1.1 Water Balance Requirements

Condition 30(a), Schedule 3 of Development Consent DA 374-11-00 requires the preparation of a Water Balance. Table 1 presents these requirements and indicates where they are addressed in this Water Balance.

In accordance with the requirements of Condition 30, Schedule 3 of Development Consent DA 374-11-00 (Table 1), this Water Balance is included as a component of the WMP (Appendix A of the WMP).

In accordance with Condition 31, Schedule 3 of Development Consent DA 374-11-00, Clean TeQ will implement the Water Management Plan (including the Water Balance).

##### 3.1.2 Management Plan (General) Requirements

In addition to the Water Balance requirements prescribed in Condition 30(a), Schedule 3, Condition 4, Schedule 5 of Development Consent DA 374-11-00 outlines the management plan (general) requirements that are also applicable to the preparation of this Water Balance.

Table 2 presents these requirements and indicates where each is addressed within this Water Balance.

**Table 2 – Management Plan (General) Requirements**

<b>Development Consent DA 374-11-00 Schedule 5</b>	<b>Water Balance Section</b>
<b>Management Plan Requirements</b>	
4. <i>The Applicant must ensure that the management plans required under this consent are prepared in accordance with any relevant guidelines, are consistent with other plans prepared for other stakeholders, and include:</i>	
a) <i>detailed baseline data;</i>	Section 4
b) <i>a description of:</i> <ul style="list-style-type: none"> <li>• <i>the relevant statutory requirements (including any relevant approval, licence or lease conditions);</i></li> <li>• <i>any relevant limits or performance measures/criteria;</i></li> <li>• <i>the specific performance indicators that are proposed to be used to judge the performance of, or guide the implementation of, the development or any management measures;</i></li> </ul>	Section 3 Section 5 Section 5
c) <i>a description of the measures that would be implemented to comply with the relevant statutory requirements, limits, or performance measures/criteria;</i>	Section 6
d) <i>a program to monitor and report on the:</i> <ul style="list-style-type: none"> <li>• <i>impacts and environmental performance of the development;</i></li> <li>• <i>effectiveness of any management measures (see c above);</i></li> </ul>	Sections 8, 10 & 12
e) <i>a contingency plan to manage any unpredicted impacts and their consequences;</i>	Section 9
f) <i>a program to investigate and implement ways to improve the environmental performance of the development over time;</i>	Section 10
g) <i>a protocol for managing and reporting any:</i> <ul style="list-style-type: none"> <li>• <i>incidents;</i></li> <li>• <i>complaints;</i></li> <li>• <i>non-compliances with statutory requirements; and</i></li> <li>• <i>exceedances of the impact assessment criteria and/or performance criteria; and</i></li> </ul>	Section 11.1 Section 11.2 Section 11.3 Sections 8 to 10
h) <i>a protocol for periodic review of the plan.</i>	Section 2
<i>Note: The Secretary may waive some of these requirements if they are unnecessary or unwarranted for particular management plans.</i>	

### 3.2 Licences, Permits and Leases

In addition to the requirements of Development Consent DA 374-11-00, all activities at or in association with the Project will be undertaken in accordance with the following licences, permits and leases which have been issued or are pending issue:

- Mining Lease 1770 sought and issued by the NSW Minister for Resources under the NSW *Mining Act 1992*.
- Mining Operations Plan(s) submitted and approved by the NSW Division of Resources and Geoscience.
- Environment Protection Licence (EPL) 21146 issued by the EPA under the NSW *Protection of the Environment Operations Act 1997* (POEO Act).
- Water supply works, water use approvals and water access licences (WALs) issued by NRAR under the NSW *Water Management Act 2000* including:
  - Water Supply Works Approval 70CA614098 for the Project borefields.

- WAL 32068 in the Upper Lachlan Alluvial Groundwater Source (Upper Lachlan Alluvial Zone 5 Management Zone) for 3,154 share components under the *Water Sharing Plan for the Lachlan Unregulated and Alluvial Water Sources 2012*.
- WAL 39837 in the Upper Lachlan Alluvial Groundwater Source (Upper Lachlan Alluvial Zone 5 Management Zone) for 766 share components under the *Water Sharing Plan for the Lachlan Unregulated and Alluvial Water Sources 2012*.
- WAL 28681 in the Lachlan Fold Belt Murray-Darling Basin (MDB) Groundwater Source (Lachlan Fold Belt MDB [Other] Management Zone), for 243 share components under the *Water Sharing Plan for the NSW Murray Darling Basin Fractured Rock Groundwater Sources 2011*.
- WAL 6679 in the Lachlan Regulated River Water Source, for 123 share components (General Security) under the *Water Sharing Plan for the Lachlan Regulated River Water Source 2016*.
- WAL 1798 in the Lachlan Regulated River Water Source, for 300 share components (General Security) under the *Water Sharing Plan for the Lachlan Regulated River Water Source 2016*.
- WAL 42370 in the Lachlan Regulated River Water Source, for zero share components (High Security) under the *Water Sharing Plan for the Lachlan Regulated River Water Source 2016*.
- Groundwater licences for monitoring bores under the *Water Management Act 2000*.
- Aboriginal Heritage Impact Permits (AHIPs) (AHIP #C0003049 and AHIP #C0003887) issued by the Office of Environment and Heritage under the NSW *National Parks and Wildlife Act 1974*.
- Mining and workplace health and safety related approvals granted by the NSW Department of Industry and SafeWork NSW.
- Permits under the *Roads Act 1993*.
- Heavy Vehicle Authorisation Permit 119039 issued by the National Heavy Vehicle Regulator under the *Heavy Vehicle National Law NSW*.
- Crown Land Licences issued under the *Crown Land Management Act 2016*.

### 3.3 Other Legislation, Policies and Guidance

Clean TeQ will conduct the Project consistent with the requirements of Development Consent DA 374-11-00 and any other legislation that is applicable to an approved Part 4 project under the EP&A Act.

In addition to the statutory obligations described in Sections 3.1 and 3.2, the following NSW Acts (and their Regulations) may be applicable to the conduct of the Project:

- *Aboriginal Land Rights Act 1983*;
- *Biodiversity Conservation Act 2016*;

- *Biosecurity Act 2015;*
- *Crown Land Management Act 2016;*
- *Contaminated Land Management Act 1997;*
- *Dams Safety Act 2015;*
- *Dangerous Goods (Road and Rail Transport) Act 2008;*
- *Energy and Utilities Administration Act 1987;*
- EP&A Act;
- *Fisheries Management Act 1994;*
- *Forestry Act 2012;*
- *Mining Act 1992;*
- *National Parks and Wildlife Act 1974;*
- *Pipelines Act 1967;*
- POEO Act;
- *Rail Safety (Adoption of National Law) Act 2012;*
- *Roads Act 1993;*
- *Soil Conservation Act, 1938;*
- *Water Act 1912;*
- *Water Management Act 2000;*
- *Work Health and Safety Act 2011;* and
- *Work Health and Safety (Mines and Petroleum Sites) Act 2013.*

Commonwealth Acts which may also be applicable to the conduct of the Project include:

- *Environment Protection and Biodiversity Conservation Act 1999;* and
- *Native Title Act 1993.*

Relevant licences or approvals required under these Acts will be obtained as required.

### **3.3.1 Water Management Act 2000**

As water sharing plans have commenced under the *Water Management Act 2000* for all surface and groundwater systems within which the Project lies, the *Water Management Act 2000* is relevant to water licensing considerations for the Project. The following water sharing plans have been commenced under the *Water Management Act, 2000* for all groundwater and surface water systems within which the Project lies, including:

#### Mine

- *Water Sharing Plan for the Macquarie Bogan Unregulated and Alluvial Water Sources 2012.*

- *Water Sharing Plan for the NSW Murray Darling Basin Fractured Rock Groundwater Sources 2011.*

#### Lachlan River Surface Water Extraction

- *Water Sharing Plan for the Lachlan Regulated River Water Source 2016.*

#### Borefields

- *Water Sharing Plan for the Lachlan Unregulated and Alluvial Water Sources 2012.*

### **3.3.2 Water Act 1912**

As water sharing plans have commenced under the *Water Management Act 2000* for all surface water systems within which the Project lies (Section 3.3.1), the *Water Act 1912* is not relevant to licensing considerations for the Project.

### **3.3.3 Protection of the Environment Operations Act 1997**

Clean TeQ holds EPL 21146 for the Project.

In accordance with Condition 27, Schedule 3 of Development Consent DA 374-11-00, unless EPL 21146 authorises otherwise, the Project will be carried out to comply with Section 120 of the POEO Act.

## 4. BASELINE DATA

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### 4.1 Meteorology Information

The Project is located in the central southern region of the Macquarie-Bogan catchment with an average annual rainfall in the order of 500 millimetres (mm).

Pan evaporation in the Macquarie-Bogan catchment has a strong east-westerly gradient and varies from 900 millimetres per year (mm/year) in the south-east to 2,200 mm/year in the north-west. The Project is located in the region of approximately 1,800 mm/year pan evaporation (Golder Associates, 2017).

The nearest regional rainfall gauging station maintained by the Australian Bureau of Meteorology (BoM) is located at Murrumbogie (#050028), approximately 17 km south-east of the Project. This regional station has 134 years of near complete rainfall records between the years 1883 to 2018 with few data gaps.

The nearest regional pan evaporation station is located at the Condobolin Agricultural Research Station (#050052), approximately 40 km to the south-west of the Project with evaporation data from 1975 to present.

#### **SILO Data Drill**

Rainfall and evaporation data records were obtained from the Department of Science, Information Technology and Innovation's SILO Data Drill (SILO) for the Project. SILO accesses grids of data interpolated from point observations by the BoM. SILO data formats are available for any location in Australia and are suitable for statistical and modelling applications as data records are long and continuous (without data gaps).

A data set comprising 130 years of rainfall and pan evaporation data (1889 to 2018 inclusive) was obtained for the site location from SILO Data Drill and is provided in Table 3.

**Table 3** – Monthly Average Rainfall and Pan Evaporation (SILO Data Drill Data)

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
Average Rainfall (mm)	49	43	42	37	38	40	35	35	32	41	40	41	475
Average Pan Evaporation (mm)	293	232	199	122	73	46	49	75	112	171	225	283	1,880

Source: Hydro Engineering & Consulting (HEC) (2019)



Based on the SILO rainfall and evaporation records, the Project is located in an area with an average annual rainfall of 475 mm/year and annual evaporation of 1,880 mm/year (HEC, 2019). The average monthly rainfall indicates rainfall is distributed evenly throughout the year with a slight summer maximum and higher rainfall variability between the months of December and March.

Rainfall records are indicative of a dry (borderline semi-arid) climate which is confirmed by the location of the Project on the Köppen climate classification system as borderline semi-arid with a hot summer (Golder Associates, 2017).

Pan evaporation is seasonally dependent, with average annual variations from 46 millimetres per month (mm/month) in the winter months to 293 mm/month in summer months (HEC, 2019).

### ***Project Meteorological Station***

In accordance with Condition 25, Schedule 3 of Development Consent DA 374-11-00, prior to carrying out any development under Development Consent DA 374-11-00 after 6 May 2017, Clean TeQ will operate a suitable meteorological station in the vicinity of the mine that complies with the requirements in the *Approved Methods for the Sampling and Analysis of Air Pollutants in New South Wales* (EPA, 2007).

The meteorological station was installed in November 2018, prior to carrying out any development under Development Consent DA 374-11-00 after 6 May 2017.

## **4.2 Topographical Information**

The mine site is situated to the northern side of a low-lying ridgeline which separates the Macquarie-Bogan catchment from the Lachlan catchment to the south. The topography of the mine site and surrounds consists of gentle to moderate sloping grazing and farming land which generally slopes towards the north-east. Elevations vary from 326 metres Australian Height Datum (m AHD) in the south to 274 m AHD to the north-east.

Remnant magnesite mining features are present in the north-east corner of the Project site, altering the natural topography with spoil piles and shallow pits.

A number of runoff-harvesting and in-stream dams exist at the Project location and in the nearby surrounding farming area.

### **4.3 Hydrological Information**

Baseline data for streamflow, surface water quality and surface water users are presented in detail in the Surface Water Management Plan (SWMP) (included as Appendix B of the WMP).

### **4.4 Hydrogeological Information**

Baseline data for geology, groundwater resources, groundwater levels and quality, groundwater dependent ecosystems and groundwater users are presented in detail in the Groundwater Management Plan (included as Appendix C of the WMP).

## 5. PERFORMANCE MEASURES AND PERFORMANCE INDICATORS

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Table 9 in Development Consent DA 374-11-00 prescribes the water management performance measures for the Project, as follows:

- **Water Management – General**
  - Maintain separation between clean and mine water management systems.
  - Minimise the use of clean water on-site.
- **Construction and Operation of Infrastructure**
  - Design, install and maintain erosion and sediment controls generally in accordance with the series *Managing Urban Stormwater: Soils and Construction including Volume 1* (Landcom, 2004), *Volume 2A – Installation of Services* (Department of Environment and Climate Change [DECC], 2008a) and *Volume 2C – Unsealed Roads* (DECC 2008b).
  - Design, install and maintain infrastructure within 40 metres (m) of watercourses generally in accordance with the *Guidelines for Controlled Activities on Waterfront Land* (Department of Primary Industries [DPI], 2012), or its latest version.
  - Design, install and maintain any creek crossings generally in accordance with the Policy and *Guidelines for Fish Habitat Conservation and Management* (DPI, 2013) and *Why Do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings* (Fairfull, S. and Witheridge, G., 2003), or their latest versions.
- **Clean Water Diversion Infrastructure**
  - Maximise the diversion of clean water around disturbed areas on-site.
  - Design, construct and maintain the clean water diversions to capture and convey the 100 year, peak flow rainfall event.
- **Sediment Dams (Mine and Limestone Quarry)**
  - Design, install and/or maintain the dams generally in accordance with the series *Managing Urban Stormwater: Soils and Construction – Volume 1* (Landcom, 2004) and *Volume 2E Mines and Quarries* (DECC, 2008c).
- **Mine and Limestone Quarry Water Storages**
  - Design, install and/or maintain mine and limestone water storage infrastructure to ensure no discharge of mine or limestone quarry water off-site (except in accordance with an EPL).
  - On-site storages (including mine infrastructure dams, groundwater storage and treatment dams) are suitably designed, installed and/or maintained to minimise permeability.

- Ensure that the floor and side walls of the tailings storage facility, Evaporation Basin and Surge Dam are designed with a minimum of a 900 mm clay or modified soil liner with a permeability of no more than  $1 \times 10^{-9}$  metres per second (m/s), or a synthetic (plastic) liner of 1.5 mm minimum thickness with a permeability of no more than  $1 \times 10^{-14}$  m/s (or equivalent).
- Design, install and maintain a seepage interception system in the Tailings Storage Facility embankments in accordance with Dams Safety Committee (DSC) guidelines.
- Design, install and maintain the water storages to capture and convey the 100 year, 72-hour Average Recurrence Interval (ARI) rainfall event.
- Design, install and/or maintain the facilities to meet the requirements of the DSC.
- The design of the tailings storage facility should conform to:
  - DSC3A – Consequence Categories for Dams (DSC, 2015); and
  - DSC3F – Tailings Dams (DSC, 2012).
- **Chemical and Hydrocarbon Storage**
  - Chemical and hydrocarbon products to be stored in bunded areas in accordance with the relevant Australian Standards.
- **Irrigation Area**
  - Manage the irrigation area in accordance with the EPA's *Environmental Guidelines: Use of Effluent by Irrigation* (Department of Environment and Conservation [DEC], 2004).

During construction activities, Clean TeQ will assess the Project against the specific water management performance indicators outlined in Table 4.

**Table 4 – Water Management Performance Indicators – Construction**

Performance Measure	Performance Indicators
<p><b>Water Management - General</b></p> <ul style="list-style-type: none"> <li>Maintain separation between clean and mine water management systems.</li> <li>Minimise the use of clean water on-site.</li> </ul>	<p>The water management system is constructed and maintained generally in accordance with the design described in the SWMP.</p> <p>Water use is consistent with the water use priority described in the Water Balance and in accordance with relevant Water Management Act 2000 approvals.</p>
<p><b>Construction and Operation of Infrastructure</b></p> <ul style="list-style-type: none"> <li>Design, install and maintain erosion and sediment controls generally in accordance with the series <i>Managing Urban Stormwater: Soils and Construction</i> including <i>Volume 1, Volume 2A – Installation of Services and Volume 2C – Unsealed Roads</i>.</li> <li>Design, install and maintain infrastructure within 40 m of watercourses generally in accordance with the <i>Guidelines for Controlled Activities on Waterfront Land</i> (DPI 2012), or its latest version.</li> <li>Design, install and maintain any creek crossings generally in accordance with the <i>Policy and Guidelines for Fish Habitat Conservation and Management</i> (DPI, 2013) and <i>Why Do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings</i> (NSW Fisheries 2003), or their latest versions.</li> </ul>	<p>Suitably qualified person documents that erosion and sediment controls have been designed and installed generally in accordance with the series <i>Managing Urban Stormwater: Soils and Construction</i> including <i>Volume 1, Volume 2A – Installation of Services and Volume 2C – Unsealed Roads</i>.</p> <p>Suitably qualified person documents that key infrastructure within 40 m of watercourses is designed and installed generally in accordance with the <i>Guidelines for Controlled Activities on Waterfront Land</i> (DPI 2012), or its latest version.</p> <p>Suitably qualified person documents that creek crossings have been designed generally in accordance with the <i>Policy and Guidelines for Fish Habitat Conservation and Management</i> (DPI, 2013) and <i>Why Do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings</i> (NSW Fisheries 2003), or their latest versions.</p>
<p><b>Clean Water Diversion Infrastructure</b></p> <ul style="list-style-type: none"> <li>Maximise the diversion of clean water around disturbed areas on-site.</li> <li>Design, construct and maintain the clean water diversions to capture and convey the 100-year, peak flow rainfall event.</li> </ul>	<p>Suitably qualified person documents that clean water diversions are designed to maximise the diversion of clean water around disturbance areas.</p> <p>Suitably qualified person documents that clean water diversions are designed and constructed to capture and convey the 100-year, peak flow rainfall event.</p>
<p><b>Sediment Dams (Mine and Limestone Quarry)</b></p> <ul style="list-style-type: none"> <li>Design, install and/or maintain the dams generally in accordance with the series <i>Managing Urban Stormwater: Soils and Construction – Volume 1 and Volume 2E Mines and Quarries</i>.</li> </ul>	<p>Suitably qualified person documents that sediment dams have been designed and installed generally in accordance with the series <i>Managing Urban Stormwater: Soils and Construction</i> including <i>Volume 1 and Volume 2A – Installation of Services and 2E Mines and Quarries</i>.</p>
<p><b>Mine and Limestone Quarry Water Storages</b></p> <ul style="list-style-type: none"> <li>Design, install and/or maintain mine and limestone water storage infrastructure to ensure no discharge of mine or limestone quarry water off-site (except in accordance with an EPL).</li> <li>On-site storages (including mine infrastructure dams, groundwater storage and treatment dams) are suitably designed, installed and/or maintained to minimise permeability.</li> <li>Ensure that the floor and side walls of the tailings storage facility, evaporation basin and surge dam are designed with a minimum of a 900 mm clay or modified soil liner with a permeability of no more than <math>1 \times 10^{-9}</math> m/s, or a synthetic (plastic) liner of 1.5 mm minimum thickness with a permeability of no more than <math>1 \times 10^{-14}</math> m/s (or equivalent).</li> <li>Design, install and maintain a seepage interception system in the Tailings Storage Facility embankments in accordance with the DSC guidelines.</li> <li>Design, install and maintain the water storages to capture and convey the 100 year, 72-hour ARI rainfall event.</li> <li>Design, install and/or maintain the facilities to meet the requirements of the DSC.</li> <li>The design of the tailings storage facility should conform to: <ul style="list-style-type: none"> <li>DSC3A – Consequence Categories for Dams (DSC); and</li> <li>DSC3F – Tailings Dams (DSC).</li> </ul> </li> </ul>	<p>Suitably qualified person documents that the water management infrastructure is constructed and maintained generally in accordance with the design described in the Water Balance and SWMP.</p> <p>Mine water storages are constructed and maintained to minimise seepage.</p> <p>Suitably qualified person documents that the tailings storage facility, evaporation basin and surge dam mine water storages are designed and constructed to capture and convey the 100 year, 72-hour ARI rainfall event.</p> <p>The Dam Safety Committee approves the tailings storage facility design.</p> <p>Suitably qualified person documents that the mine water storages are designed and constructed to capture and convey the 100 year, 72-hour ARI rainfall event.</p> <p>The Dam Safety Committee approves the design of relevant water storages (i.e. prescribed structures).</p> <p>The Dam Safety Committee approves the tailings storage facility design.</p>

**Table 4** (Continued) – Water Management Performance Indicators – Construction

Performance Measure	Performance Indicators
<p><b>Chemical and Hydrocarbon Storage</b></p> <ul style="list-style-type: none"> <li>Chemical and hydrocarbon products to be stored in bunded areas in accordance with the relevant Australian Standards.</li> </ul>	<p>Suitably qualified person documents that chemical and hydrocarbon storages are designed and constructed in accordance with the relevant Australian Standards.</p>
<p><b>Irrigation Area</b></p> <ul style="list-style-type: none"> <li>Manage the irrigation area in accordance with the <i>EPA's Environmental Guidelines: Use of Effluent by Irrigation</i>.</li> </ul>	<p>The irrigation area is designed and maintained so as not to cause irrigation water runoff from the irrigation area.</p>

## 6. WATER MANAGEMENT SYSTEM

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Consistent with the general water management and clean water diversion infrastructure performance measures for the Project (Section 5), the key objectives of the water management system are to control runoff from the development/construction areas and the operational areas, while diverting up-catchment water around these areas, and to minimise the use of clean water on-site.

The water management system will include both permanent features that will continue to operate post-closure (e.g. northern and southern diversion channels) and temporary structures during mining operations (e.g. sediment dams).

An internal drainage system will be constructed to collect and contain water generated within the development/construction areas and operation areas.

Sediment control structures such as sediment dams and sediment fences will be employed where necessary within and downstream of disturbance areas. Consistent with the relevant performance measures (Section 5), the erosion and sediment controls will be designed, installed and maintained generally in accordance with the series *Managing Urban Stormwater: Soils and Construction* including *Volume 1* (Landcom, 2004), *Volume 2A – Installation of Services* (DECC, 2008a) and *Volume 2C – Unsealed Roads* (DECC, 2008b).

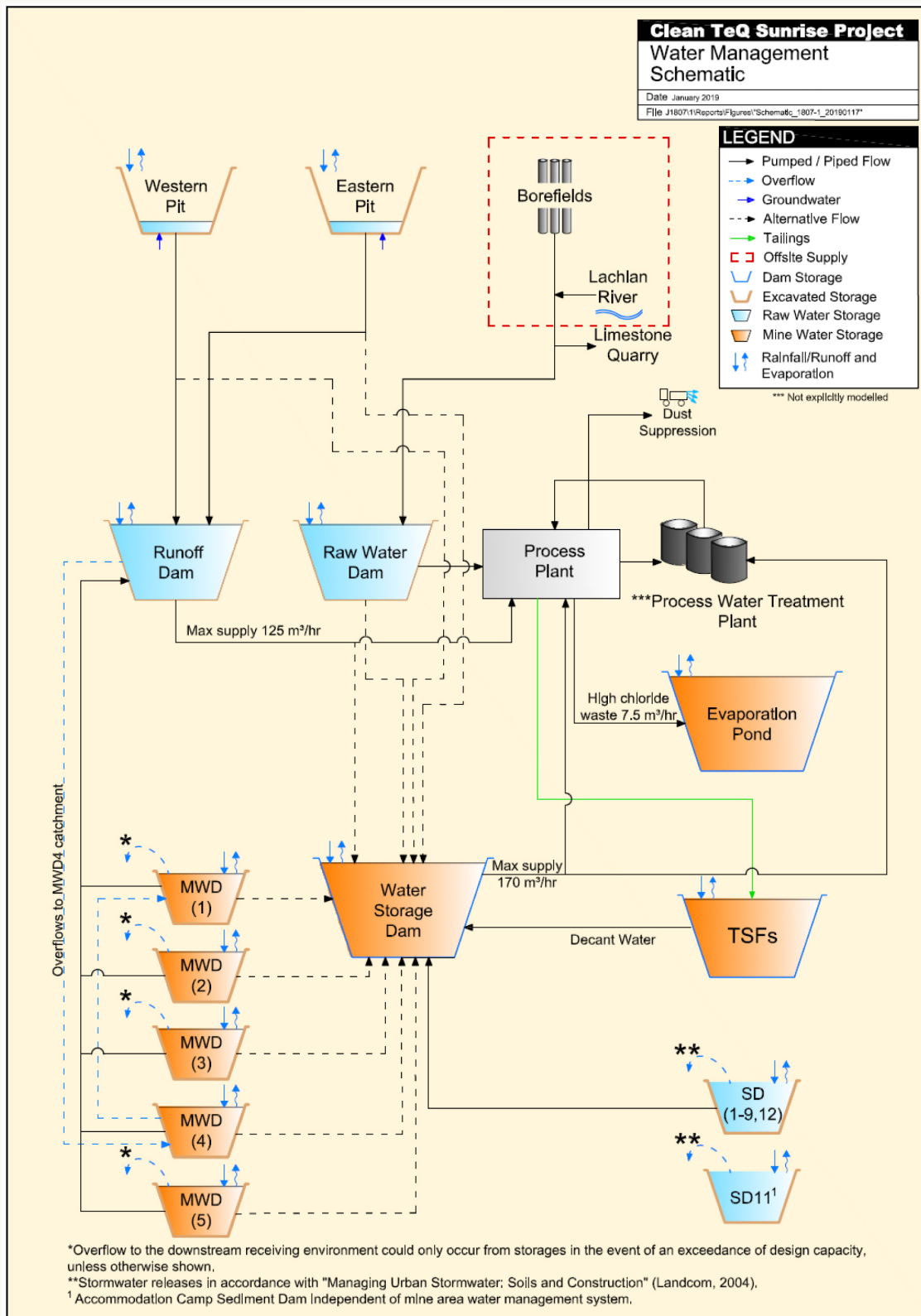
The water management system will be progressively developed during the construction and operation phases as diversion and containment requirements change. The water management schematic is shown on Figure 5 and a summary of the water management system is provided in Section 6.1.

### 6.1 Water Management and Related Infrastructure

#### 6.1.1 Mine Water Storages

The following mine water storages will be constructed during the initial construction activities (Figure 2):

- tailings storage facility;
- evaporation pond;
- water storage dam;
- mine water dams and runoff dam; and
- raw water dam.



CL-17-03-AP 2018\_WBMP\_001C

Source: HEC (2019)

Figure 5



### ***Tailings Storage Facility***

Consistent with the relevant performance measures (Section 5):

- the tailings storage facility will be designed, installed and maintained to ensure no discharge of mine water off-site (except in accordance with an EPL);
- the floor and side walls of the tailings storage facility will be designed with a minimum of a 900 mm clay or modified soil liner with a permeability of no more than  $1 \times 10^{-9}$  m/s, or a synthetic (plastic) liner of 1.5 mm minimum thickness with a permeability of no more than  $1 \times 10^{-14}$  m/s (or equivalent);
- a seepage interception system will be designed, installed and maintained in the tailings storage facility embankments in accordance with DSC guidelines;
- the tailings storage facility will be designed, installed and maintained to meet the requirements of the DSC; and
- the tailings storage facility design will conform with:
  - DSC3A – Consequence Categories for Dams (DSC, 2015); and
  - DSC3F – Tailings Dams (DSC, 2012).

All tailings generated in the processing facility will be pumped to and stored in the tailings storage facility. The tailings slurry will be deposited through a series of spigots located at the perimeter of the cells and a decant pond will be maintained in the centre of each cell. Decant water will be piped to the water storage dam for reuse in the processing facility.

The capacity of the tailings storage facility will progressively increase over the Project life as lifts are completed and the cells are developed.

The tailings storage facility will not be used to harvest runoff from land as it will be used to contain tailings and mine water or effluent in accordance with best management practice.

### ***Evaporation Pond***

Consistent with the relevant performance measures (Section 5):

- the evaporation pond will be designed, installed and maintained to ensure no discharge of mine water off-site (except in accordance with an EPL); and
- the floor and side walls of the evaporation pond will be designed with a minimum of a 900 mm clay or modified soil liner with a permeability of no more than  $1 \times 10^{-9}$  m/s, or a synthetic (plastic) liner of 1.5 mm minimum thickness with a permeability of no more than  $1 \times 10^{-14}$  m/s (or equivalent).

It is noted that return water would not be used from the chloride waste inflow contained separately in the evaporation pond.

The evaporation pond will have a capacity of approximately 281 million litres (ML) at full development.

The evaporation pond will be a 'turkeys nest' dam and will not be used to harvest runoff from land as it will be used to contain mine water or effluent in accordance with best management practice.

### ***Water Storage Dam***

Consistent with the relevant performance measures (Section 5):

- the water storage dam will be designed, installed and maintained to ensure no discharge of mine water off-site (except in accordance with an EPL);
- the water storage dam will be suitably designed, installed and/or maintained to minimise seepage; and
- the water storage dam will be designed, installed and maintained to meet the requirements of the DSC (if required under the provisions of the *Dams Safety Act 1978*).

The water storage dam will have a capacity of approximately 1,230 ML.

The water storage dam will be a 'turkeys nest' dam and will not be used to harvest runoff from land as it will be used to contain mine water or effluent in accordance with best management practice.

### ***Mine Water Dams and Runoff Dam***

Consistent with the relevant performance measures (Section 5):

- the mine water dams and runoff dam will be suitably designed, installed and/or maintained to minimise seepage; and
- the runoff dam will be designed, installed and maintained to capture and convey the 100 year, 72-hour ARI rainfall event.

Water collected from the disturbance footprint of the ore stockpile areas will be temporarily contained in mine water dams. Water collected from the disturbance footprint of the processing facility area will be temporarily contained in the runoff dam. Water collected in the mine water dams and runoff dam will be reused in the mine site water system.

It is noted that MWD4 and MWD5 will initially be used as sediment dams during the construction of the processing plant infrastructure area (i.e. SD9 and SD7 – Figure 2). They will become mine water dams once ore stockpiling commences.

Based the requirement for the mine water dams to be designed, installed and maintained to capture and convey the 100 year, 72-hour ARI rainfall event, the preliminary design capacities for the mine water dams will range from approximately 19 ML to 116 ML. Based on the same design requirement, the preliminary design capacity for the runoff dam will be approximately 34 ML. Although the mine water dam capacities may vary from those listed above based on final design, they will however be sized in accordance with the design criteria outlined above (i.e. 100 year, 72-hour ARI rainfall event).

### **Raw Water Dam**

Consistent with the relevant performance measures (Section 5):

- the raw water dam will be suitably designed, installed and/or maintained to minimise seepage; and
- the raw water dam will be designed, installed and maintained to capture and convey the 100 year, 72-hour ARI rainfall event.

The raw water dam will have a capacity of approximately 15 ML.

The raw water dam will be used as buffer storage for water supplied to the site from the external sources (e.g. borefields). The raw water dam will be a ‘turkeys nest’ dam and will not be used to harvest runoff from land.

### **6.1.2 Sediment Dams**

Consistent with the relevant performance measures (Section 5), the sediment dams will be designed, installed and maintained generally in accordance with the series *Managing Urban Stormwater: Soils and Construction* including *Volume 1* (Landcom, 2004) and *Volume 2E Mines and Quarries* (DECC, 2008c).

Water collected from the disturbance footprint (e.g. internal haul roads and waste dumps) will be temporarily contained in the sediment dams to minimise potential water quality impacts. Where opportunities arise, water will be recycled for dust suppression or use in the processing facility, or otherwise released in accordance with the requirements of EPL 21146.

A summary of the capacity of the sediment dams is provided in Table 5 based on preliminary designs. Although the sediment dam capacities may vary from those in Table 5 based on final design, they will however be sized in accordance with the design criteria outlined in Table 5.

**Table 5 – Sediment Dam Design Criteria and Capacities**

Sediment Dam	Design Criteria <sup>1</sup>	Approximate Capacity
SD3a	<ul style="list-style-type: none"> <li>Type F sediment basin.</li> <li>95<sup>th</sup> percentile 5 day duration rainfall event of 50.7 mm (Dubbo 5 day rainfall depth in Table 6.3a of Landcom [2004]).</li> <li>A volumetric runoff coefficient of 0.74 assuming soil hydrologic Group D (Table F2 of Landcom [2004]).</li> <li>Allowance for sediment storage zone capacity equal to 50% of calculated settling zone capacity.</li> </ul>	1 ML
SD4		118 ML
SD7		32 ML <sup>2</sup>
SD8		23 ML
SD9		91 ML <sup>2</sup>
SD11a		7 ML
SD11b		5 ML
SD12		5 ML

Source: HEC (2019)

<sup>1</sup> In accordance with *Managing Urban Stormwater: Soils and Construction including Volume 1* (Landcom, 2004) and *Volume 2E Mines and Quarries* (DECC, 2008c).

<sup>2</sup> Sizing based on mine water dam design criteria (Section 6.1.1) as the sediment dam would eventually be used as a mine water dam.

### 6.1.3 Diversion Systems

The diversion system consists of clean water diversions and collection drains. The clean water diversions will collect and divert clean water around disturbed areas. The collection drains will collect and convey runoff from disturbed areas to mine water dams (“mine water”) (Section 6.1.1) or sediment dams (“sediment water”) (Section 6.1.2). Consistent with the relevant performance measures (Section 5), the diversion system will:

- maintain separation between clean and mine water management systems; and
- maximise the diversion of clean water around disturbed areas on site.

A summary of the diversion system design criteria is provided in Table 6.

**Table 6 – Diversion System Design Criteria**

Diversion System Component	Design Criteria
Clean Water Diversions	1 in 100 year, peak flow rainfall event <sup>1</sup>
Collection Drains	1 in 5 year, peak flow rainfall event (less than 1 year duration) <sup>2</sup>
	1 in 20 year, peak flow rainfall event (greater than 3 years duration) <sup>2</sup>

<sup>1</sup> In accordance with Table 9 of Development Consent DA 374-11-00.

<sup>2</sup> In accordance with *Volume 2E Mines and Quarries* (DECC, 2008c).

The permanent clean water diversions (i.e. the southern and northern diversions) will be designed, constructed and rehabilitated to be safe, stable and non-polluting. The design would consider long term stability and compatibility with existing hydrological features, landforms and vegetation. The NRAR's (2018) *Guidelines for controlled activities on waterfront land – Riparian corridors* will also be considered during the design and construction of the permanent clean water diversions. In particular, the principles of natural stream design outlined in the NRAR's (2018) *Guidelines for controlled activities on waterfront land – Riparian corridors* will be considered in the design and construction of the permanent clean water diversions.

#### **6.1.4 Chemical and Hydrocarbon Storages**

Consistent with the relevant performance measures (Section 5), chemical and hydrocarbon products will be stored in bunded areas in accordance with the relevant Australian Standards, including AS 1940-2017 *The Storage and Handling of Flammable and Combustible Liquids*.

#### **6.1.5 Other Infrastructure**

Consistent with the relevant performance measures (Section 5):

- any infrastructure within 40 m of watercourses will be designed, installed and maintained generally in accordance with the *Guidelines for controlled activities on waterfront land – Riparian corridors* (NRAR, 2012), or its latest version; and
- any creek crossings will be designed, installed and maintained generally in accordance with the *Policy and Guidelines for Fish Habitat Conservation and Management* (DPI, 2013) and *Why Do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings* (Fairfull, S. and Witheridge, G., 2003), or their latest versions.

#### **6.1.6 Irrigation Area**

Wastewater generated at the accommodation camp will be collected and treated at an on-site wastewater treatment plant. The wastewater treatment plant will consist of anaerobic and aerobic treatment and final disinfection of treated effluent. The wastewater treatment plant would be installed and operated in accordance with Lachlan Shire Council requirements.

The treated wastewater produced from the wastewater treatment plant will be pumped to the irrigation area via the irrigation water pipeline (Figure 2).

The irrigation application area will be approximately 3.5 hectares (ha) and will be divided into irrigation zones. Up to 100,000 litres per day of treated wastewater will be pumped to the irrigation area. Sprinklers will be used to evenly distribute the treated wastewater at a maximum rate of approximately 3 millimetres per square metre per day. This application rate is conservative and will minimise risk of surface pooling and runoff (True Water Australia, 2018).

True Water Australia (2018) conducted a nutrient balance for the irrigation area and concluded that the irrigation area is of sufficient size for the expected nutrient load (i.e. nutrient loading will not be a limiting factor to irrigation).

Consistent with the relevant performance measure (Section 5), the accommodation camp irrigation area would be managed in accordance with the *Environmental Guidelines: Use of Effluent by Irrigation* (DEC, 2004) and the irrigation rate would be controlled so as not to:

- cause irrigation water runoff from the irrigation area; or
- exceed the capacity of the soil in the irrigation area to effectively absorb the applied nutrient, salt, organic material and hydraulic loads.

## 6.2 Water Sources

Water will be supplied at the mine from a number of, and varying, sources during the life of the Project, including the following in order of priority (when available):

- recycled water from the processing facility and tailings storage facility;
- mine dewatering (in-pit and advance);
- internal runoff collection at the mine site (including harvestable rights); and
- off-site supply (i.e. borefields and surface water extraction from the Lachlan River).

Clean TeQ will source water from the Project borefields and surface water extraction from the Lachlan River in accordance with relevant *Water Management Act 2000* approvals to meet the off-site water demand.

Prior to the commissioning of the water pipeline, water for construction activities will be sourced from runoff collected in existing farm dams (in accordance with harvestable rights) and from the short-term road transport of water to the mine site (e.g. from a bulk water supplier or an alternative water source with appropriate licences under the *Water Management Act 2000*).

In accordance with Condition 26, Schedule 3 of the Development Consent DA 374-11-00, Clean TeQ will ensure that it has sufficient water for all stages of the development, and if necessary, adjust the scale of Project to match its available water supply.

### **6.2.2 Recycled Water**

All tailings generated in the processing facility will be pumped to and stored in the tailings storage facility. The tailings slurry will be deposited through a series of spigots located at the perimeter of the cells and a decant pond will be maintained in the centre of each cell. Decant water will be piped to the water storage dam.

Water stored in the water storage dam (including tailings storage facility decant water) will be pumped to the processing facility for reuse. Some of this water will be treated in a water treatment plant before being reused in the processing facility.

The water treatment plant will allow for the maximisation of the reuse of recovered decant water (tailings water) at the processing facility.

### **6.2.3 Mine Dewatering**

In-pit dewatering associated with groundwater inflows is expected to be negligible (less than 0.2 million litres per year [ML/year]) over the life of the Project (Golder Associates, 2017). Notwithstanding, any groundwater inflows collected in the open pits will be transferred to the runoff dam for reuse in the processing facility.

Clean TeQ currently holds WAL 28681 in the Lachlan Fold Belt MDB Groundwater Source (Lachlan Fold Belt MDB [Other] Management Zone), for 243 share components under the *Water Sharing Plan for the NSW Murray Darling Basin Fractured Rock Groundwater Sources 2011* for the mine pit should the deepest areas intercept any groundwater.

### **6.2.4 Internal Runoff Collection (Harvestable Rights)**

None of the main water storages proposed on-site (i.e. tailings storage facility, water storage dam, or evaporation pond) or the raw water dam will be used to harvest runoff from land.

Water collected from the disturbance footprint of the ore stockpile areas will be temporarily contained in mine water dams. Water collected from the disturbance footprint of the processing facility area will be temporarily contained in the runoff dam. In addition, water collected from the disturbance footprint (e.g. internal haul roads and waste dumps) will be temporarily contained in the sediment dams to minimise potential water quality impacts. Where opportunities arise, water will be recycled for use in the mine water system (e.g. reuse in the processing facility).

A number of runoff-harvesting and in-stream dams exist on-site and in the nearby surrounding lands owned by Clean TeQ. Clean TeQ will also use water from these dams where opportunities arise in accordance with Clean TeQ's maximum harvestable right (refer below).

The mine and accommodation camp are located within the mapped extent of the Upper Bogan River Water Source under the *Water Sharing Plan for the Macquarie Bogan Unregulated and Alluvial Water Sources 2012*. Small sections of Clean TeQ owned land are also located in the Gunningbland and Yarrabandai Water Source under the *Water Sharing Plan for the Lachlan Unregulated and Alluvial Water Sources 2012*.

Clean TeQ would not require licensing for surface waters at the mine as (1) exemptions under the *Water Management (General) Regulation 2018* would apply; and (2) the runoff water captured by undisturbed areas between the clean water diversions and the ultimate extent of the Project disturbance boundary would be within the estimated harvestable right available to Clean TeQ (based on total contiguous landholdings) (refer below).

Clean TeQ's maximum harvestable right dam capacity (MHRDC) based on the ownership of contiguous Clean TeQ-owned lands in the vicinity of the mine site is presented in Table 7 for both of these Water Sharing Plans. The runoff-harvesting and in-stream dams on-site and in the nearby surrounding lands owned by Clean TeQ are also summarised in Table 7.

**Table 7 – Maximum Harvestable Right Dam Capacity**

Water Sharing Plan	Clean TeQ Owned Land Area (ha)	Maximum Harvestable Right Dam Capacity (ML)	Existing Clean TeQ Dams	
			Number	Volume (ML)
<i>Water Sharing Plan for the Macquarie Bogan Unregulated and Alluvial Water Sources 2012</i>	3,730	205	51	21
<i>Water Sharing Plan for the Lachlan Unregulated and Alluvial Water Sources 2012</i>	746	41	6	2

The mine water storages (Section 6.1.1) and sediment dams (Section 6.1.2) are not required to be considered under harvestable rights as they will be used to contain mine water or effluent in accordance with best management practice in accordance with the *Water Management (General) Regulation 2018*.

Based on Table 7, Clean TeQ's existing dam capacity is well within the MHRDC for both Water Sharing Plans. For the mine and accommodation camp (both located in the *Water Sharing Plan for the Macquarie Bogan Unregulated and Alluvial Water Sources 2012*), subtracting the capacity of dams (21 ML) from the harvestable right (205 ML) leaves an available harvestable rights volume of 184 ML.



Any runoff from disturbed mine areas that is captured on-site is not required to be considered under harvestable rights in accordance with the *Water Management (General) Regulation 2018*. Water that falls on undisturbed areas of the site and is not diverted around the site water management system but captured and used for operational purposes, cannot cumulatively exceed the available harvestable rights volume of 184 ML.

### **6.2.5 Borefield**

The borefield will be a key water source for the Project. The borefields layout is shown on Figure 4.

The borefield will extract groundwater from within Zone 5 of the Upper Lachlan Alluvial Groundwater Source which is administered by the *Water Sharing Plan for the Lachlan Unregulated and Alluvial Water Sources 2012* under the *Water Management Act 2000*.

Clean TeQ currently holds WAL 32068 in the Upper Lachlan Alluvial Groundwater Source (Upper Lachlan Alluvial Zone 5 Management Zone) for 3,154 share components under the *Water Sharing Plan for the Lachlan Unregulated and Alluvial Water Sources 2012* for the borefields. The borefields will be operated in accordance with the conditions of WAL 32068.

A second WAL 39837 is also held by Clean TeQ for an additional 766 share components in the Upper Lachlan Alluvial Groundwater Source (Upper Lachlan Alluvial Zone 5 Management Zone).

### **6.2.6 Lachlan River Surface Water Extraction**

The surface water extraction from the Lachlan River will be a key water source for the Project. The surface water extraction infrastructure layout is shown on Figure 4.

For the extraction from the Lachlan River, Clean TeQ currently holds WAL 6679 and WAL 1798 in the Lachlan Regulated River Water Source, for 123 and 300 share components (General Security) under the *Water Sharing Plan for the Lachlan Regulated River Water Source 2016*, respectively. In addition, Clean TeQ currently holds WAL 42370 (zero High Security share components) in the Lachlan River Regulated River Source, for subsequent trading of water on the open market under the *Water Sharing Plan for the Lachlan Regulated River Water Source 2016*.

Based on the available share components in the Lachlan Regulated River Water Source, history of available water determinations orders and recent water trading statistics, while the water market is variable (availability subject to significant rainfall events), it is mature (administered since 2004) and has significant depth of available shares for trading (Clean TeQ, 2017).

## 6.3 Water Use

The main water demand (usage) at the mine will be associated with the processing facility once commissioned and operating. Other water demand requirements include water for construction activities (e.g. moisture for compaction control), dust suppression, cooling water and other potable and non-potable uses. The water demand (usage) will fluctuate with climatic conditions and as the extent of the mining operation changes over time. Fluctuations in water consumption have been accounted for in the water balance model (Section 7).

Approximately 900 ML/year will be required during the approximate two-year construction phase of the Project.

## 7. WATER BALANCE

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A predictive model of the performance of the Project water management system has been developed by HEC (2019).

The water balance model simulates a 23 year period (i.e. 2 year construction period and 21 year operations period). The model simulates 130, 23 year “realizations”, derived using a climatic data set from 1889 to 2018<sup>3</sup>. The first realization uses climatic data from 1889 to 1911, the second 1890 to 1912, the third 1891 to 1913, and so on. This method effectively includes all historical climatic events in the water balance model, including high, low and median rainfall periods. The results from all realizations were used to generate water storage volume estimates and other relevant water balance statistics.

Key results from the water balance are provided in this section.

### 7.1 Water Supply Reliability

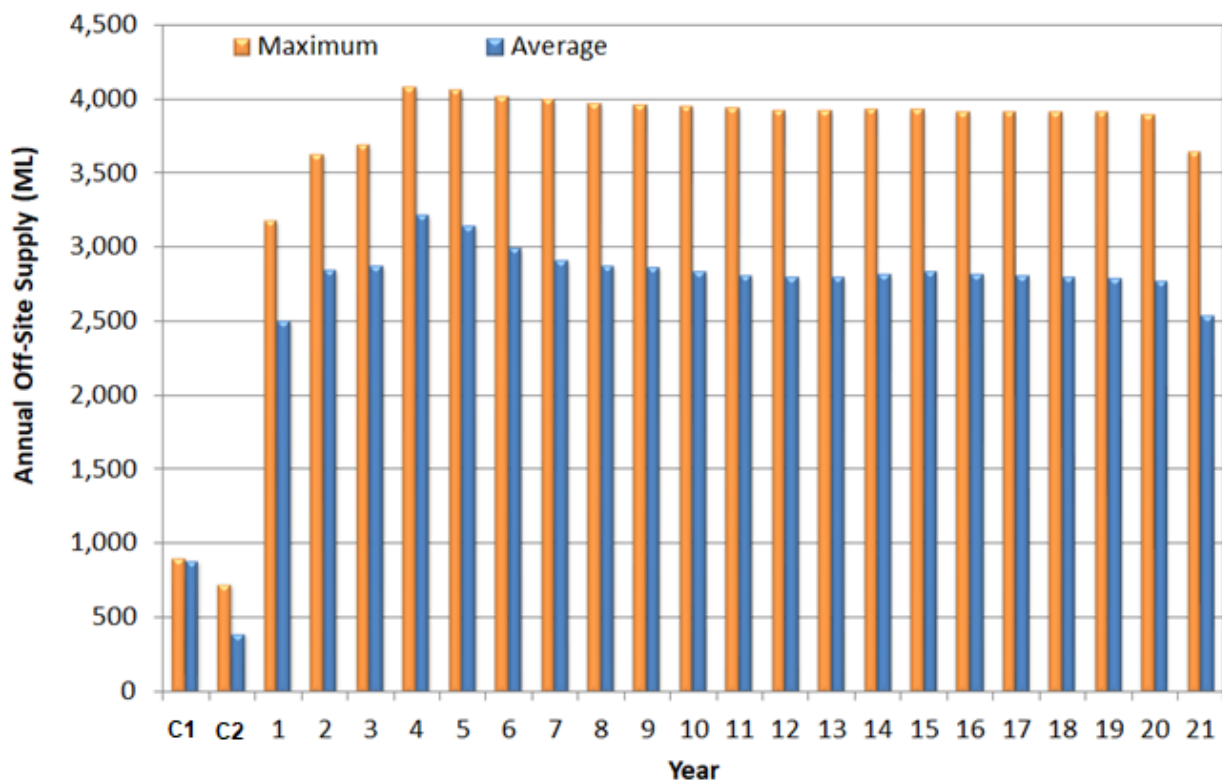
#### ***Construction and Operations Phases***

The predicted average and maximum total off-site water demand (i.e. water required from the borefields and/or Lachlan River) over the life of the Project is presented in Figure 6.

The predicted average and maximum annual off-site water demand during the construction phase is approximately 640 ML/year and 900 ML/year, respectively. Clean TeQ currently holds groundwater and surface water entitlements (Sections 6.2.5 and 6.2.6) greater than the predicted average and maximum annual off-site water demand during the construction phase.

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<sup>3</sup> Additional climate data after 2018 was generated by “wrapping” data from the beginning of the climate data set to after 2018. In this way, data from the beginning and end of the data set was used in the same number of realizations as all other data.



Source: HEC (2019)

**Figure 6** – Simulated Annual Off-site Water Demand

The predicted average and maximum annual off-site water demand during the operations phase is approximately 2,800 ML/year and 4,080 ML/year, respectively. Clean TeQ currently holds groundwater and surface water entitlements (Sections 6.2.5 and 6.2.6) greater than the predicted average annual off-site water demand during the operations phase based on the results of the simulated 130 realizations (HEC, 2019). Clean TeQ will obtain additional surface water entitlements so that it has sufficient water entitlements for the maximum annual off-site water demand during the operations phase. The Lachlan River surface water extraction required to meet the predicted maximum annual off-site water demand is approximately 930 ML/year (HEC, 2019).

Clean TeQ currently holds WAL 42370 (zero High Security share components) in the Lachlan River Regulated River Source, for subsequent trading of water on the open market under the *Water Sharing Plan for the Lachlan Regulated River Water Source 2016*. In accordance with Condition 26, Schedule 3 of Development Consent DA 374-11-00, Clean TeQ will obtain sufficient water entitlements for the Project, and if necessary, adjust the scale of the Project to match its available water supply.

A summary of the predicted annual off-site water demand and current and required entitlements is provided in Table 8.

**Table 8** – Summary of Predicted Annual Off-Site Water Demand and Current and Required Entitlements

Project Phase	Predicted Annual Off-Site Water Demand	Current Entitlements	Additional Entitlements Required
Construction	Average = 640 ML/year Maximum = 900 ML/year	<ul style="list-style-type: none"> <li>Upper Lachlan Alluvial Groundwater Source (Upper Lachlan Alluvial Zone 5 Management Zone) under the <i>Water Sharing Plan for the Lachlan Unregulated and Alluvial Water Sources 2012</i> – <b>3,154 share components</b>.</li> <li>Lachlan Regulated River Water Source (General Security) under the <i>Water Sharing Plan for the Lachlan Regulated River Water Source 2016</i> – <b>423 share components</b>.</li> <li>Lachlan Regulated River Water Source (High Security) under the <i>Water Sharing Plan for the Lachlan Regulated River Water Source 2016</i> – <b>0 share components for trading</b>.</li> </ul>	<ul style="list-style-type: none"> <li><b>No additional entitlements required</b> for the predicted average or maximum annual off-site water demand.</li> </ul>
Operations	Average = 2,800 ML/year Maximum = 4,080 ML/year		<ul style="list-style-type: none"> <li><b>No additional entitlements required</b> for the predicted average annual off-site water demand.</li> <li><b>Sufficient entitlements to supply 930 ML</b> from the Lachlan Regulated River Water Source under the <i>Water Sharing Plan for the Lachlan Regulated River Water Source 2016</i> required.</li> </ul>

### Post-Closure Phase

Water demand during the post-closure phase is expected to be primarily related to groundwater inflows into the final voids which is expected to be less than 0.2 ML/year (Golder Associates, 2017). As described in Section 6.2.3, Clean TeQ currently holds WAL 28681 in the Lachlan Fold Belt MDB Groundwater Source (Lachlan Fold Belt MDB [Other] Management Zone), for 243 share components under the *Water Sharing Plan for the NSW Murray Darling Basin Fractured Rock Groundwater Sources 2011*.

## 7.2 On-Site Containment

The risk of overflow from the mine site was evaluated as part of the water balance.

No overflows were predicted from the tailings storage facility, evaporation pond and water storage dam over the 23 year simulation period for all of the 130 realizations (HEC, 2019) consistent with the water management performance measures.

## 8. MONITORING PROGRAMS

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During the initial construction activities, construction water demands will be monitored and available water supply sources utilised as necessary.

Upon completion of construction and commissioning of water management infrastructure, Clean TeQ will monitor the following aspects of the water management system:

- mine water storage and raw water dam levels and volumes (stored and freeboard), including development of storage curves;
- mine pit dewatering (groundwater inflows) (where measurable from pumping records) to prepare a water balance of the mine pits;
- water received at the mine from the borefields and/or surface water extraction;
- potable water supply;
- dust suppression water demands; and
- processing water inputs and outputs including:
  - feed tonnage and moisture contents;
  - product tonnages and moisture contents;
  - high chloride stream to the evaporation ponds; and
  - tailings tonnages and solid:water ratios.

The appropriate monitoring frequencies and methods will be determined by Clean TeQ as required.

In addition, Clean TeQ will continue to undertake meteorological monitoring at the mine site in accordance with Condition 25, Schedule 3 of Development Consent DA 374-11-00.

A summary of the water management system monitoring information will be provided in the Annual Review (Section 10.1).

## 9. CONTINGENCY PLAN

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In the event a water management performance measure for the Project (detailed in Section 5) has not have been met or a performance indicator is considered to have been exceeded, Clean TeQ will implement the following Contingency Plan:

- The Clean TeQ Environmental Superintendent will report the incident in accordance with Section 11.1.
- Clean TeQ will identify an appropriate course of action with respect to the identified potential impacts or environmental consequences (if any), in consultation with specialists and relevant government agencies, as necessary. For example, contingency measures, such as, but not limited to, those described in Section 9.2.
- Clean TeQ will submit the proposed course of action to the DPIE for approval.
- Clean TeQ will implement the approved course of action to the satisfaction of the DPIE.

### 9.1 Adaptive Management

In accordance with Condition 3, Schedule 5 of Development Consent DA 374-11-00, where any exceedance of the criteria and/or performance measures outlined in Schedule 3 of Development Consent DA 374-11-00 occurs, at the earliest opportunity Clean TeQ will:

- take all reasonable and feasible measures to ensure that the exceedance ceases and does not recur;
- consider all reasonable and feasible options for remediation and submit a report to the DPIE describing these options and preferred remediation measures; and
- implement remediation measures as directed by the Secretary of the DPIE.

### 9.2 Specific Contingency Measures

Specific contingency measures for an exceedance of the water management performance measures would include:

- The conduct of additional monitoring (e.g. increase in monitoring frequency or additional sampling), which would inform further specific contingency measures.
- Implementation of adaptive management strategies (e.g. on-site reconfiguration) to better maintain separation of clean and mine waters, diversion of clean waters, storage 'as-built' designs and avoid discharge of mine waters (except in accordance with EPL 21146).
- The provision of a suitable offset (e.g. improvement works) if there was an environmental consequence and/or adverse surface water impacts were to result.

Clean TeQ will also implement any preferred contingency measures identified to address an incident as directed by the Secretary (Sections 9.1 and 11.1).

## 10. REVIEW AND IMPROVEMENT OF ENVIRONMENTAL PERFORMANCE

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### 10.1 Annual Review

In accordance with Condition 5, Schedule 5 of Development Consent DA 374-11-00, Clean TeQ will review the environmental performance of the Project by the end of March each year (for the previous calendar year) to the satisfaction of the Secretary.

In relation to water management, the Annual Review will (where relevant):

- describe the development that was carried out in the relevant calendar year, and the development that is proposed to be carried out during the following calendar year;
- include a comprehensive review of the monitoring results and complaints records of the development over the past year, which includes a comparison of these results against the:
  - relevant statutory requirements, limits or performance measures/criteria;
  - monitoring results of previous years; and
  - relevant predictions in the Syerston Nickel Cobalt Project Environmental Impact Statement (Black Range Minerals, 2000) and subsequent environmental assessments;
- identify any non-compliance over the last year, and describe what actions were (or are being) taken to ensure compliance;
- identify any trends in the monitoring data over the life of the development;
- identify any discrepancies between the predicted and actual impacts of the development, and analyse the potential cause of any significant discrepancies; and
- describe what measures will be implemented over the next year to improve the environmental performance of the development.

The Annual Review will be made publicly available on the Clean TeQ website.

### 10.2 Independent Environmental Audit

In accordance with Condition 10, Schedule 5 of Development Consent DA 374-11-00, an independent environmental audit of the Project will be conducted by a suitably qualified, experienced and independent team of experts whose appointment has been endorsed by the Secretary.

The independent environmental audit will assess the environmental performance of the Project and review the adequacy of this SWMP. If necessary, appropriate measures or actions to improve the environmental performance of the Project or this SWMP will be recommended.



An independent environmental audit will be conducted within one year of the commencement of the development under this consent, after 6 May 2017. The independent environmental audit, and Clean TeQ's response to the recommendations in the audit, will be made publicly available on the Clean TeQ website, in accordance with Condition 12, Schedule 5 of Development Consent DA 374-11-00.

## 11.REPORTING PROTOCOLS

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In accordance with Condition 4(g), Schedule 5 of Development Consent DA 374-11-00, Clean TeQ has developed protocols for managing and reporting the following:

- incidents;
- complaints;
- non-compliances with statutory requirements; and
- exceedances of the impact assessment criteria and/or performance criteria.

These protocols are described in detail in Clean TeQ's Environmental Management Strategy.

In accordance with Condition 9, Schedule 5 of Development Consent DA 374-11-00, Clean TeQ will provide regular reporting on the environmental performance of the Project on the Clean TeQ website. The Annual Review will be made publicly available on the Clean TeQ website to address this requirement.

### 11.1 Incident Reporting

An incident is defined as a set of circumstances that causes or threatens to cause material harm to the environment and/or breaches or exceeds the limits or performance measures/criteria in Development Consent DA 374-11-00.

In the event that review of surface or ground water monitoring data indicates an incident has occurred, the incident will be reported in accordance with Condition 8, Schedule 5 of Development Consent DA 374-11-00. Clean TeQ will notify the Secretary and any other relevant agencies including the relevant Council immediately after it becomes aware of the incident. Clean TeQ will also notify any affected landholders of any incident that has caused, or threatens to cause, material harm to the environment.

Within seven days of the date of the incident, Clean TeQ will provide the Secretary and any other relevant agencies with a detailed report on the incident and such further reports as may be requested. The report will:

- describe the date, time and nature of the exceedance/incident;
- identify the cause (or likely cause) of the exceedance/incident;
- describe what action has been taken to date; and
- describe reasonable and feasible options to address the incident and identify the preferred option to address the incident (Section 11.1).

## 11.2 Complaints

Clean TeQ will maintain a Community Complaints Line (tel: 1800 952 277) and email address ([community@cleanteq.com](mailto:community@cleanteq.com)) for the sole purpose of receiving community contacts and complaints. The Community Complaints Line number will be available on the website and included in Clean TeQ's advertising and community communication tools. The Community Complaints Line will be staffed 24 hours a day, seven days a week during construction and operations. Clean TeQ will respond to callers on the next business day. If the issue is urgent a member of the leadership team will be contacted immediately.

Clean TeQ has developed a procedure that outlines its commitment to receiving, resolving and recording complaints received from the community. Detailed records of each complaint resolution are kept in Clean TeQ's record management systems.

Complaints will be investigated within 24 hours of receipt. The cause of the complaint will be analysed and actions to resolve the complaint taken as soon as possible. In complex cases where resolution will take more than 48 hours, Clean TeQ will commit to update the community member regularly until the complaint is resolved.

In accordance with Condition 12(a), Schedule 5 of Development Consent DA 374-11-00, a complaints register will be made available on the Clean TeQ website and updated monthly.

## 11.3 Non-Compliances with Statutory Requirements

A protocol for managing and reporting non-compliances with statutory requirements has been developed as a component of Clean TeQ's Environmental Management Strategy and is described below.

Compliance with all approvals plans and procedures is the responsibility of all personnel (staff and contractors) employed on or in association with Clean TeQ and the Project.

The Clean TeQ Environmental Superintendent will undertake regular inspections, internal audits and initiate directions identifying any remediation/rectification work required, and areas of actual or potential non-compliance.

As described in Section 11.1, Clean TeQ will report incidents in accordance with Condition 8, Schedule 5 of Development Consent DA 374-11-00 and in accordance with the protocol for industry notification of pollution incidents under Part 5.7 of the POEO Act.

Clean TeQ will notify the Secretary and any other relevant agencies including the relevant Council immediately after the authorised person becomes aware of the incident which causes or threatens to cause material harm to the environment. Within seven days of the date of the incident, Clean TeQ will provide the Secretary and any other relevant agencies with a detailed report on the incident and such further reports as may be requested.

A review of compliance with all conditions in Development Consent DA 374-11-00, Mining Lease 1770 and all other approvals and licences will be undertaken prior to (and included within) each Annual Review (Section 10.1).

Additionally, in accordance with Condition 10, Schedule 5 of Development Consent DA 374-11-00, an independent environmental audit (Section 10.2) would be conducted by a suitably qualified, experienced and independent team of experts whose appointment has been endorsed by the Secretary to assess whether Clean TeQ is complying with the requirements in Development Consent DA 374-11-00, and any other relevant approvals, EPLs, and/or mining leases.

#### **11.4 Exceedances of Impact Assessment Criteria and/or Performance**

A protocol for managing and reporting exceedances of impact assessment criteria and/or performance criteria is provided in Section 5.

## 12. REFERENCES

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- Clean TeQ (2017) *Syerston Project Modification 4 Environmental Assessment*.
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# APPENDIX B

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Surface Water Management Plan

# Clean TeQ Sunrise Project Surface Water Management Plan

2020-CTEQ-0000-66AA-0018

28 October 2019

REVISION 1

# CONTENTS

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1.	Introduction.....	1
1.1	Purpose and Scope.....	5
1.2	Structure of the Surface Water Management Plan.....	6
2.	Surface Water Management Plan Review and Update .....	9
3.	Statutory Requirements .....	10
3.1	Development Consent DA 374-11-00.....	10
3.2	Licences, Permits and Leases .....	11
3.3	Other Legislation, Policies and Guidance.....	12
4.	Hydrological Setting and Baseline Data .....	16
4.1	Mine Site.....	16
4.2	Borefields and Surface Water Extraction Infrastructure .....	19
5.	Performance Measures and Performance Indicators.....	22
5.1	Trigger Levels for Investigation .....	25
6.	Water Management System .....	28
6.1	Water Management and Related Infrastructure .....	28
6.2	Other Surface Water Management Measures.....	34
6.4	Surface Water Licensing .....	35
7.	Surface Water Monitoring Program .....	37
7.1	Baseline Monitoring.....	37
7.2	Construction Monitoring .....	37
7.3	Operations Monitoring.....	40
8.	Contingency Plan .....	41
8.1	Adaptive Management .....	41
8.2	Specific Contingency Measures.....	41
9.	Review and Improvement of Environmental Performance.....	42
9.1	Annual Review .....	42
9.2	Independent Environmental Audit.....	42
10.	Reporting Protocols.....	44
10.1	Incident Reporting .....	44
10.2	Complaints.....	45
10.3	Non-Compliances with Statutory Requirements.....	45
10.4	Exceedances of Impact Assessment Criteria and/or Performance.....	46
11.	References .....	47



## FIGURES

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Figure 1	Regional Location
Figure 2	Mine and Processing Facility General Arrangement (Initial Construction Activities)
Figure 3	Mine and Processing Facility Conceptual General Arrangement
Figure 4	Borefields and Surface Water Extraction General Arrangement
Figure 5	Local Hydrology and Baseline Surface Water Quality Monitoring – Mine Site
Figure 6	Surface Water Monitoring Locations – Mine Site

## TABLES

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Table 1	SWMP Requirements in Development Consent DA 374-11-00
Table 2	Management Plan (General) Requirements
Table 3	Bogan River Gauging Stations
Table 4	Surface Water Quality Monitoring Results – Mine Site
Table 5	Surface Water Quality Monitoring Results – Surface Water Infrastructure (Lachlan River)
Table 6	Water Management Performance Indicators – Construction
Table 7	EPL 21146 Surface Water Quality Limits
Table 8	ANZECC & ARMCANZ (2000) Guideline (Acceptable Limits) Values for Key Water Quality Parameters
Table 9	Sediment Dam Design Criteria and Capacities
Table 10	Diversion System Design Criteria
Table 11	Maximum Harvestable Right Dam Capacity

## ATTACHMENTS

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Attachment 1	Erosion and Sediment Control Plans
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# 1. INTRODUCTION

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The Clean TeQ Sunrise Project (the Project)<sup>1</sup> is a nickel cobalt scandium open cut mining project situated near the village of Fifield, approximately 350 kilometres (km) west-northwest of Sydney, in New South Wales (NSW) (Figure 1).

The Project includes the establishment and operation of the following (Figure 1):

- mine (including the acid leach processing facility);
- limestone quarry;
- rail siding;
- gas pipeline;
- borefields, surface water extraction infrastructure and water pipeline;
- accommodation camp; and
- associated transport activities and transport infrastructure (e.g. the Fifield Bypass, road and intersection upgrade).

Clean TeQ Sunrise Pty Ltd owns the rights to develop the Project. Clean TeQ Sunrise Pty Ltd is a wholly owned subsidiary of Clean TeQ Holdings Limited (Clean TeQ).

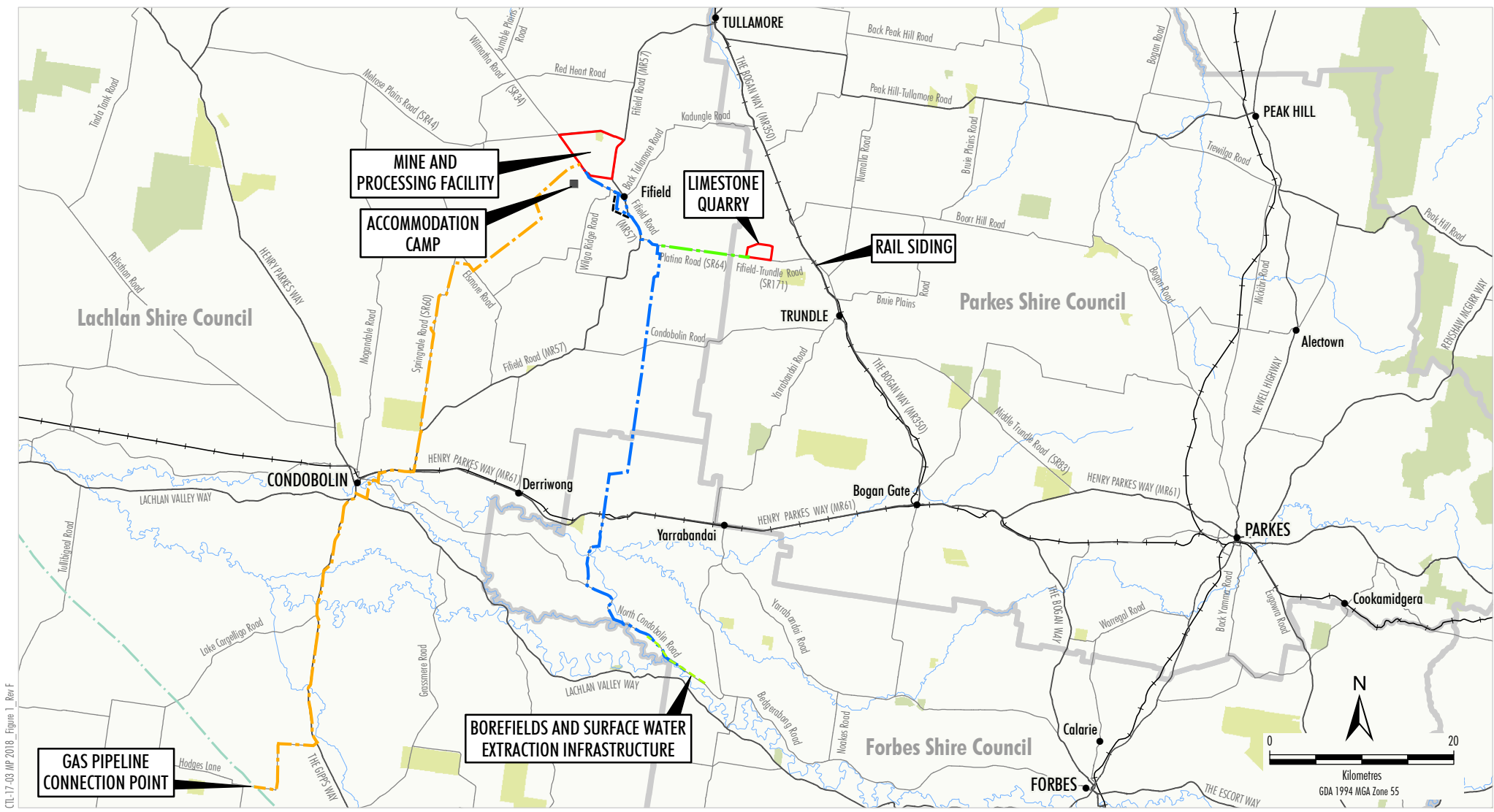
Development Consent DA 374-11-00 for the Project was issued under Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) in 2001. Six modifications to Development Consent DA 374-11-00 have since been granted under the EP&A Act:

- 2005 – to allow for an increase of the autoclave feed rate, limestone quarry extraction rate and adjustments to ore processing operations;
- 2006 – to allow for the reconfiguration of the borefields;
- 2017 – to allow for the production of scandium oxide;
- 2017 – to amend hazard study requirements;
- 2018 – to relocate the accommodation camp; and
- 2018 – to implement opportunities to improve the overall efficiency of the Project.

The general arrangement for the mine layout during the initial Project construction activities and full development are shown on Figures 2 and 3.

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<sup>1</sup> The Project was previously known as the Syerston Project.



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**GAS PIPELINE CONNECTION POINT**

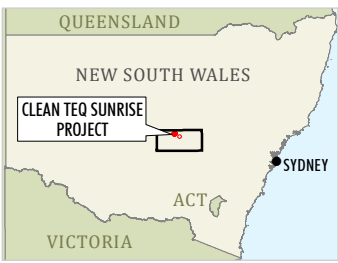
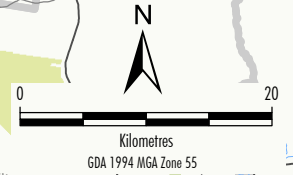
**MINE AND PROCESSING FACILITY**

**ACCOMMODATION CAMP**

**LIMESTONE QUARRY**

**RAIL SIDING**

**BOREFIELDS AND SURFACE WATER EXTRACTION INFRASTRUCTURE**

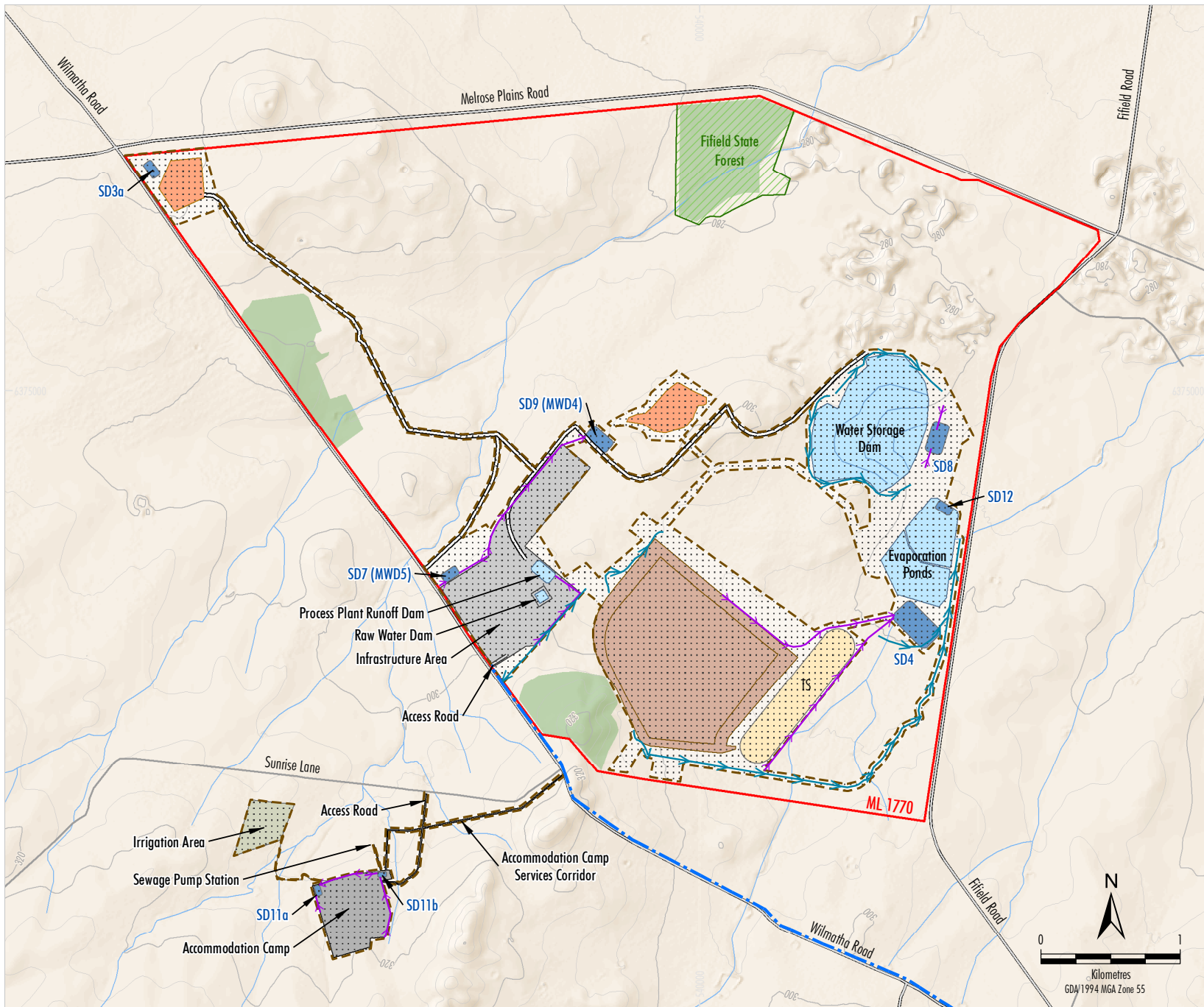


- LEGEND**
- National Park/Conservation Area
  - State Forest
  - Local Government Boundary
  - Railway
  - Existing Gas Pipeline
  - Mining Lease Boundary (ML)
  - Fifield Bypass
  - Gas Pipeline
  - Water Pipeline
  - Limestone Quarry Water Pipeline
  - Borefield Infrastructure Corridor

Source: Black Range Minerals (2000); Clean Teq (2017, 2018); NSW Department of Industry (2018); NSW Land & Property Information (2017); Office of Environment and Heritage NSW (2017)

**CLEAN TEQ**  
Powering innovation  
**CLEAN TEQ SUNRISE PROJECT**  
**Regional Location**


**Figure 1**

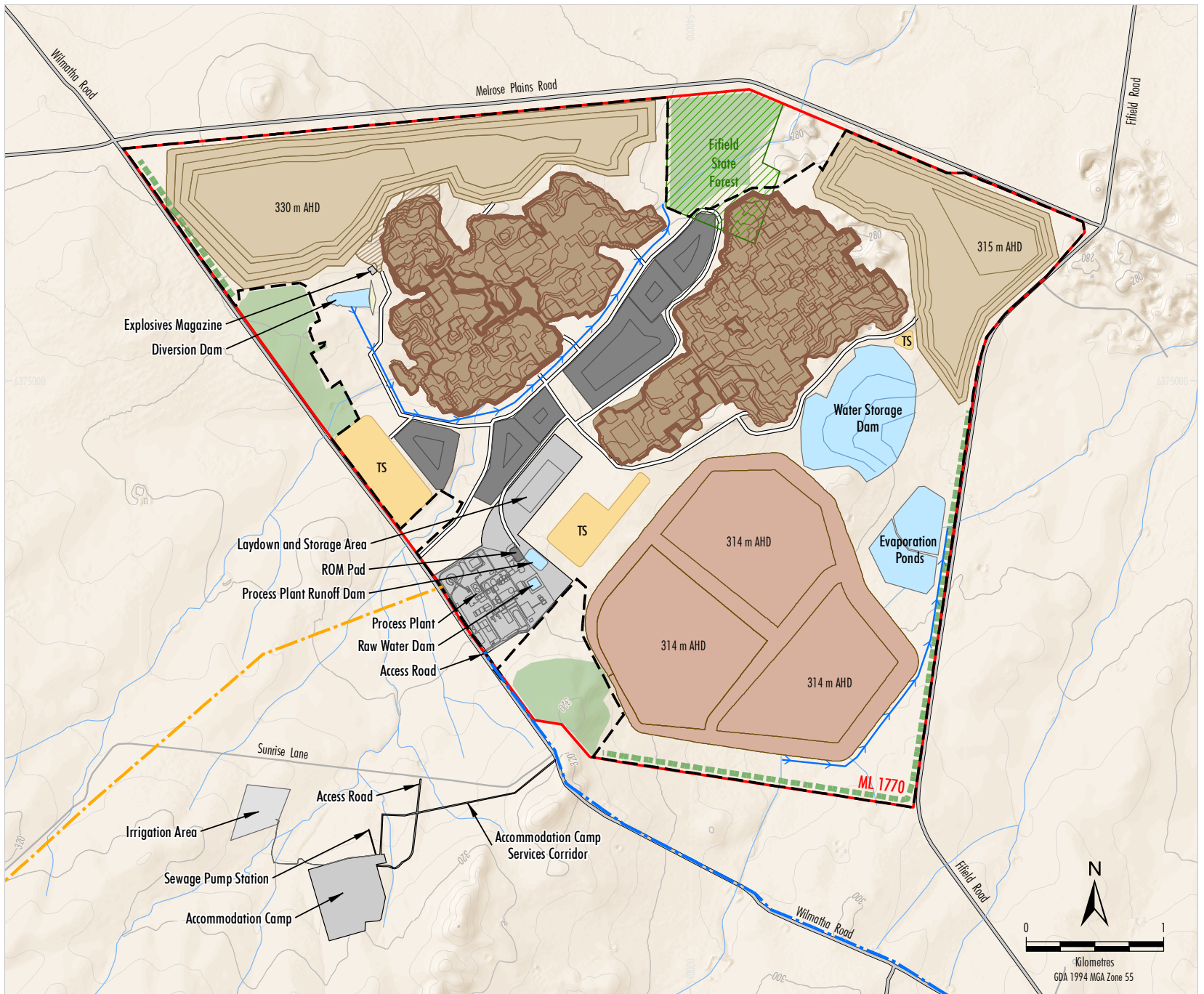


- LEGEND**
- State Forest
  - Mining Lease Boundary (ML)
  - Initial Construction Activities Surface Development Area
  - Tailings Storage Facility
  - Borrow Pit
  - TS Topsoil Stockpile
  - Infrastructure Area
  - Water Storage (Mine Water)
  - Sediment Dam (Mine Water)
  - Existing Open Woodland to be Maintained
  - Water Pipeline
  - Collection Drain (Sediment Water) #
  - Diversion Channel (Clean Water)

# No 'mine water' would be generated during the initial construction activities and therefore no 'mine water' collection drains are shown.

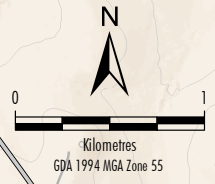
Source: Black Range Minerals (2000); Clean TeQ (2017, 2019); NSW Department of Industry (2018); NSW Land & Property Information (2017)

  
**CLEAN TEQ SUNRISE PROJECT**  
**Mine and Processing Facility**  
**General Arrangement**  
**(Initial Construction Activities)**  
**Figure 2**



- LEGEND**
- State Forest
  - Mining Lease Boundary (ML)
  - Approved Surface Development Area
  - Open Cut Pit (Scandium Oxide)
  - Open Cut Pit
  - Waste Rock Emplacement
  - Tailings Storage Facility
  - Topsoil Stockpile
  - Ore Stockpile
  - Mine Infrastructure Area
  - Diversion Structure
  - Vegetation Screening
  - Existing Open Woodland to be Maintained
  - Gas Pipeline
  - Water Pipeline

Source: Black Range Minerals (2000); Clean TeQ (2017, 2019); NSW Department of Industry (2018); NSW Land & Property Information (2017)



**Figure 3**

## 1.1 Purpose and Scope

This Surface Water Management Plan (SWMP) has been prepared by Clean TeQ in accordance with the requirements of Condition 30(b), Schedule 3 of Development Consent DA 374-11-00 (Table 1) and is a component of the Water Management Plan (WMP) (Appendix B of the WMP).

**Table 1 – SWMP Requirements in Development Consent DA 374-11-00**

Development Consent DA 374-11-00 Schedule 3	Section where Addressed in this SWMP
30. Prior to carrying out any development after 6 May 2017, the Applicant must prepare a Water Management Plan for the development in consultation with DoI Lands & Water and the EPA, and to the satisfaction of the Secretary. This plan must include:	The WMP
<p>b) a Surface Water Management Plan, that includes:</p> <ul style="list-style-type: none"> <li>• baseline data on water flows and quality in the watercourses that could be affected by the development (if available);</li> <li>• a detailed description of the water management system on-site, including the: <ul style="list-style-type: none"> <li>– clean water diversion systems;</li> <li>– erosion and sediment controls; and</li> <li>– water storages; and</li> <li>– irrigation area;</li> </ul> </li> <li>• objectives and performance criteria, including trigger levels for investigating any potential or actual adverse impacts associated with the development, including the: <ul style="list-style-type: none"> <li>– surface water flows and quality;</li> <li>– downstream flooding;</li> </ul> </li> <li>• a program to monitor and report on: <ul style="list-style-type: none"> <li>– the effectiveness of the water management system and tailings storage facility; and</li> <li>– surface water flows and water quality;</li> <li>– the performance measures listed in Table 9;</li> <li>– impacts on water users;</li> <li>– downstream flooding;</li> </ul> </li> <li>• a plan to respond to any exceedances of the trigger levels and/or performance criteria, and minimise and/or offset any adverse surface water impacts of the development;</li> </ul>	<p>This SWMP</p> <p>Section 4</p> <p>Section 6 and the Site Water Balance (SWB)</p> <p>Section 5</p> <p>Sections 7 to 9</p> <p>Sections 7 to 9</p>
31. The Applicant must implement the approved Water Management Plan for the development.	Section 3.1.1

On 5 July 2018, the Secretary of the Department of Planning, and Environment (now the Department Planning, Industry and Environment [DPIE]) (the Secretary) approved the progressive submission of environmental management plans for the Project in accordance with Condition 12, Schedule 2 of Development Consent DA 374-11-00. The scope of this SWMP is specifically related to the following initial Project construction activities:

- development of the mine, including:
  - site establishment and earthworks;
  - construction of site access roads and haul roads;
  - processing facility earthworks;
  - establishment of temporary facilities required for construction activities (e.g. offices, lay down areas, communications infrastructure);

- construction of the mine infrastructure area including the offices, workshops, warehouse, laboratory and amenities buildings, fuel storage areas, potable water treatment plant and car parking facilities;
  - construction of the tailings storage facility and evaporation pond;
  - construction of water management infrastructure including the raw water dam, water storage dam and sediment dams;
  - construction and operation of the concrete batch plant;
  - development of gravel and clay borrow pits (including blasting and crushing);
  - installation of appropriate fencing and barriers for public safety and security for mining and construction; and
  - other associated minor infrastructure, plant, equipment and activities;
- development and operation of the accommodation camp;
  - development and operation of the borefields, surface water extraction infrastructure and water pipeline<sup>2</sup>; and
  - road upgrades.

The initial construction activities would not include any development of the limestone quarry, rail siding or gas pipeline.

The approximate extent of the initial Project construction activities at the mine site and accommodation camp are shown on Figure 2. The approved water pipeline alignment, borefields and surface water extraction general arrangement is shown on Figures 1 and 4 respectively.

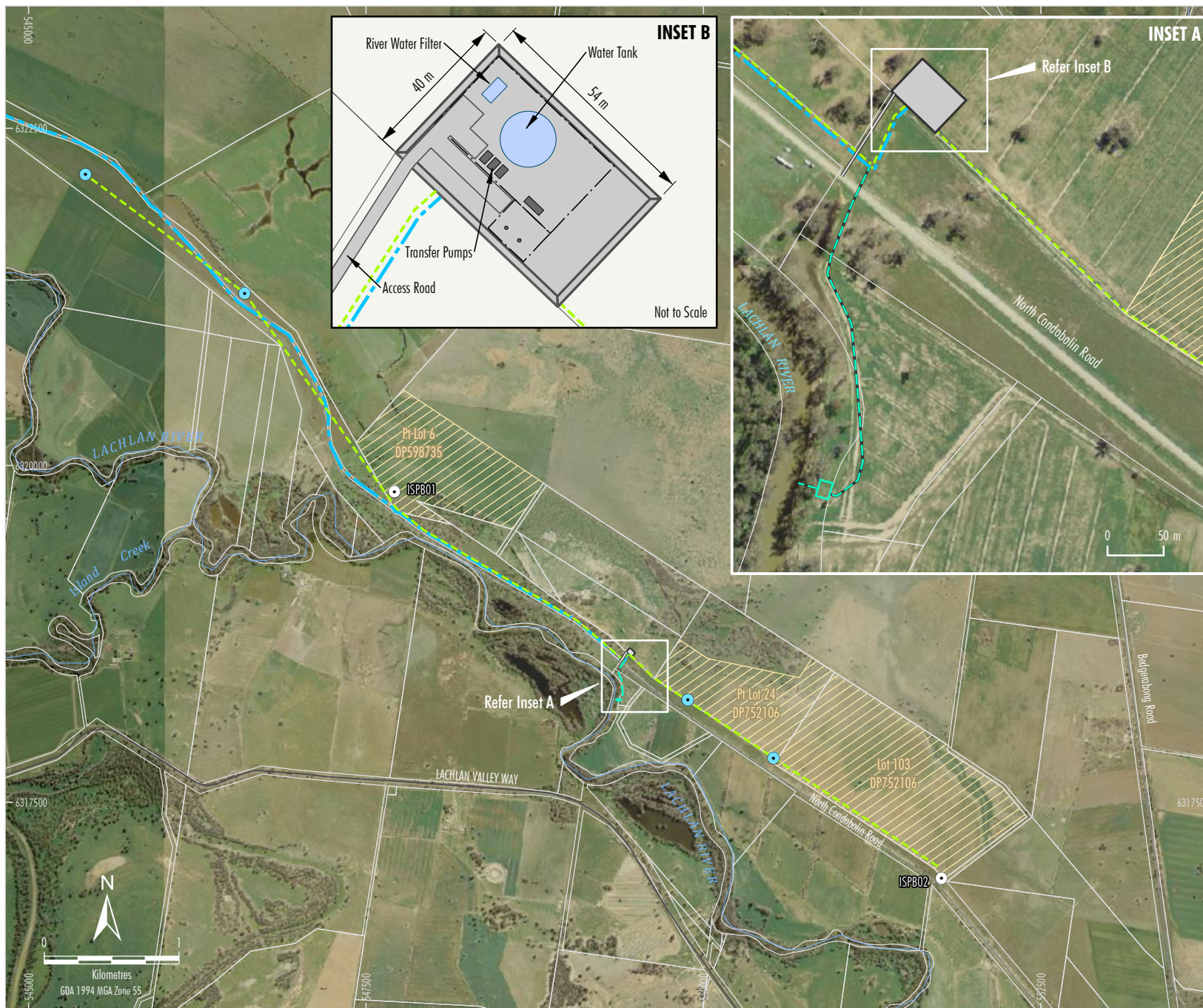
## 1.2 Structure of the Surface Water Management Plan

The remainder of this SWMP is structured as follows:

- Section 2: Describes the review and update of the SWMP.
- Section 3: Outlines the statutory requirements applicable to the SWMP.
- Section 4: Provides an overview of the hydrological setting and baseline data.
- Section 5: Details the performance measures and performance indicators that will be used to assess the Project, including trigger levels.
- Section 6: Provides a description of the Project water management system and other surface water management measures.
- Section 7: Details the surface water monitoring program.
- Section 8: Provides a Contingency Plan to manage any unpredicted impacts and their consequences.

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<sup>2</sup> The water pipeline includes the Fifield Bypass and Alternative Pipeline Route alignments.



- LEGEND**
- Property Boundary
  - Borefield Location
  - Water Pipeline
  - Borefield Infrastructure Corridor \*
  - Surface Water Infrastructure Corridor \*
  - Pump Station
  - Transfer Station
  - Access Road
  - Production Bore (constructed)
  - Production Bore (not constructed)
- \* Infrastructure Corridor includes linking pipeline, access road and electricity transmission line.

Source: Clean TeQ (2017, 2019); Ivanplats Syerston (2005); NSW Land & Property Information (2018)  
 NSW Imagery: © Department of Finance, Services & Innovation (2018)

**Figure 4**



- Section 9: Describes the program to review and report on the effectiveness of management measures and improvement of environmental performance.
- Section 10: Describes the protocol for management and reporting of incidents, complaints and non-compliances with statutory requirements.
- Section 11: Lists the references cited in this SWMP.

## 2. SURFACE WATER MANAGEMENT PLAN REVIEW AND UPDATE

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This SWMP has been provided to the NSW Environment Protection Authority (EPA) and the Department of Industry – Lands & Water (now the Natural Resources Access Regulator [NRAR]) for the purposes of consultation on 20 June 2018 and 25 June 2018, respectively, in accordance with Condition 30, Schedule 3 of Development Consent DA 374-11-00.

The NRAR provided comments on 26 September 2018 and 12 June 2019. These comments have been incorporated into this SWMP. The EPA indicated on 19 October 2018 that it had no comments on the SWMP.

Consistent with the Secretary's approval for the progressive submission of environmental management plans, the SWMP would be re-submitted and approved prior to the commencement of activities not included in the scope of this SWMP.

In accordance with Condition 6, Schedule 5 of Development Consent DA 374-11-00, this SWMP will be reviewed, and if necessary revised (to the satisfaction of the Secretary), within three months of the submission of:

- an Annual Review (Condition 5, Schedule 5);
- an incident report (Condition 8, Schedule 5);
- an independent environmental audit (Condition 10, Schedule 5); or
- any modification to the conditions of Development Consent DA 374-11-00 (unless the conditions require otherwise).

The reviews would be undertaken to ensure the SWMP is updated on a regular basis and to incorporate any recommended measures to improve the environmental performance of the Project.

Within 4 weeks of conducting a review of the SWMP, the Secretary will be advised of the outcomes of the review and any revised documents submitted to the Secretary for approval.

If agreed with the Secretary, a revision to the SWMP required under Development Consent DA 374-11-00 may be prepared without undertaking consultation with all parties nominated under the relevant condition of Development Consent DA 374-11-00.

The revision status of this SWMP is indicated on the title page of each copy.

The approved SWMP will be made publicly available on the Clean TeQ website, in accordance with Condition 12, Schedule 5 of Development Consent DA 374-11-00.

### 3. STATUTORY REQUIREMENTS

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Clean TeQ's statutory obligations relevant to surface water management are contained in:

- the conditions of Development Consent DA 374-11-00;
- relevant licences and permits, including conditions attached to mining leases; and
- other relevant legislation.

Obligations relevant to this SWMP are described below.

#### 3.1 Development Consent DA 374-11-00

##### 3.1.1 SWMP Requirements

Condition 30(b), Schedule 3 of Development Consent DA 374-11-00 requires the preparation of a SWMP. Table 1 presents these requirements and indicates where they are addressed in this SWMP.

In accordance with the requirements of Condition 30, Schedule 3 of Development Consent DA 374-11-00 (Table 1), this SWMP is included as a component of the WMP (Appendix B of the WMP).

In accordance with Condition 31, Schedule 3 of Development Consent DA 374-11-00, Clean TeQ will implement the Water Management Plan (including the SWMP).

##### 3.1.2 Management Plan (General) Requirements

In addition to the SWMP requirements prescribed in Condition 30(b), Schedule 3, Condition 4, Schedule 5 of Development Consent DA 374-11-00 outlines the management plan (general) requirements that are also applicable to the preparation of this SWMP.

Table 2 presents these requirements and indicates where each is addressed within this SWMP. As noted, the Secretary may waive some of these requirements if they are unnecessary or unwarranted for particular management plans.

**Table 2 – Management Plan (General) Requirements**

Development Consent DA 374-11-00 Schedule 5	SWMP Section
<b>Management Plan Requirements</b>	
<p>4. The Applicant must ensure that the management plans required under this consent are prepared in accordance with any relevant guidelines, are consistent with other plans prepared for other stakeholders, and include:</p> <p>a) detailed baseline data;</p> <p>b) a description of:</p> <ul style="list-style-type: none"> <li>• the relevant statutory requirements (including any relevant approval, licence or lease conditions);</li> <li>• any relevant limits or performance measures/criteria;</li> <li>• the specific performance indicators that are proposed to be used to judge the performance of, or guide the implementation of, the development or any management measures;</li> </ul> <p>c) a description of the measures that would be implemented to comply with the relevant statutory requirements, limits, or performance measures/criteria;</p> <p>d) a program to monitor and report on the:</p> <ul style="list-style-type: none"> <li>• impacts and environmental performance of the development;</li> <li>• effectiveness of any management measures (see c above);</li> </ul>	<p>Section 4</p> <p>Section 3</p> <p>Section 5</p> <p>Section 5</p> <p>Section 6</p> <p>Sections 7 to 9</p>
<p>e) a contingency plan to manage any unpredicted impacts and their consequences;</p> <p>f) a program to investigate and implement ways to improve the environmental performance of the development over time;</p> <p>g) a protocol for managing and reporting any:</p> <ul style="list-style-type: none"> <li>• incidents;</li> <li>• complaints;</li> <li>• non-compliances with statutory requirements; and</li> <li>• exceedances of the impact assessment criteria and/or performance criteria; and</li> </ul> <p>h) a protocol for periodic review of the plan.</p> <p><i>Note: The Secretary may waive some of these requirements if they are unnecessary or unwarranted for particular management plans.</i></p>	<p>Section 8</p> <p>Section 9</p> <p>Section 10.1</p> <p>Section 10.2</p> <p>Section 10.3</p> <p>Sections 7 to 9</p> <p>Section 2</p>

### 3.2 Licences, Permits and Leases

In addition to the requirements of Development Consent DA 374-11-00, all activities at or in association with the Project will be undertaken in accordance with the following licences, permits and leases which have been issued or are pending issue:

- Mining Lease 1770 sought and issued by the NSW Minister for Resources under the NSW *Mining Act, 1992*.
- Mining Operations Plan(s) submitted and approved by the NSW Division of Resources and Geoscience.
- Environment Protection Licence (EPL) 21146 issued by the EPA under the NSW *Protection of the Environment Operations Act 1997* (POEO Act).
- Water supply works, water use approvals and water access licences (WALs) issued by NRAR under the NSW *Water Management Act 2000* including:
  - Water Supply Works Approval 70CA614098 for the Project borefields.

- WAL 32068 in the Upper Lachlan Alluvial Groundwater Source (Upper Lachlan Alluvial Zone 5 Management Zone) for 3,154 share components under the *Water Sharing Plan for the Lachlan Unregulated and Alluvial Water Sources 2012*.
  - WAL 39837 in the Upper Lachlan Alluvial Groundwater Source (Upper Lachlan Alluvial Zone 5 Management Zone) for 766 share components under the *Water Sharing Plan for the Lachlan Unregulated and Alluvial Water Sources 2012*.
  - WAL 28681 in the Lachlan Fold Belt Murray-Darling Basin (MDB) Groundwater Source (Lachlan Fold Belt MDB [Other] Management Zone), for 243 share components under the *Water Sharing Plan for the NSW Murray Darling Basin Fractured Rock Groundwater Sources 2011*.
  - WAL 6679 in the Lachlan Regulated River Water Source, for 123 share components (General Security) under the *Water Sharing Plan for the Lachlan Regulated River Water Source 2016*.
  - WAL 1798 in the Lachlan Regulated River Water Source, for 300 share components (General Security) under the *Water Sharing Plan for the Lachlan Regulated River Water Source 2016*.
  - WAL 42370 in the Lachlan Regulated River Water Source, for zero share components (High Security) under the *Water Sharing Plan for the Lachlan Regulated River Water Source 2016*.
- Groundwater licences for monitoring bores under the *Water Management Act 2000*.
  - Aboriginal Heritage Impact Permits (AHIPs) (AHIP #C0003049 and AHIP #C0003887) issued by the Office of Environment and Heritage (OEH) under the *NSW National Parks and Wildlife Act 1974*.
  - Mining and workplace health and safety related approvals granted by the NSW Department of Industry and SafeWork NSW.
  - Permits under the *Roads Act 1993*.
  - Heavy Vehicle Authorisation Permit 119039 issued by the National Heavy Vehicle Regulator under the *Heavy Vehicle National Law NSW*.
  - Crown Land Licences issued under the *Crown Land Management Act 2016*.

### 3.3 Other Legislation, Policies and Guidance

Clean TeQ will conduct the Project consistent with the requirements of Development Consent DA 374-11-00 and any other legislation that is applicable to an approved Part 4 Project under the EP&A Act.

In addition to the statutory obligations described in Sections 3.1 and 3.2, the following NSW Acts (and their Regulations) may be applicable to the conduct of the Project:

- *Aboriginal Land Rights Act 1983;*
- *Biodiversity Conservation Act 2016;*
- *Biosecurity Act 2015;*
- *Crown Land Management Act 2016;*
- *Contaminated Land Management Act 1997;*
- *Dams Safety Act 2015;*
- *Dangerous Goods (Road and Rail Transport) Act 2008;*
- *Energy and Utilities Administration Act 1987;*
- EP&A Act;
- *Fisheries Management Act 1994;*
- *Forestry Act 2012;*
- *Mining Act 1992;*
- *National Parks and Wildlife Act 1974;*
- *Pipelines Act 1967;*
- POEO Act;
- *Rail Safety (Adoption of National Law) Act 2012;*
- *Roads Act 1993;*
- *Soil Conservation Act 1938;*
- *Water Act 1912;*
- *Water Management Act 2000;*
- *Work Health and Safety Act 2011; and*
- *Work Health and Safety (Mines and Petroleum Sites) Act 2013.*

Commonwealth Acts which may also be applicable to the conduct of the Project include:

- *Environment Protection and Biodiversity Conservation Act 1999; and*
- *Native Title Act 1993.*

Relevant licences or approvals required under these Acts will be obtained as required.

Further details relating to the above NSW Acts regulated by NRAR and EPA, and other relevant water policy and guideline documentation relevant to this SWMP is provided in the following sub-sections.

### **3.3.1 Water Management Act 2000**

As water sharing plans have commenced under the *Water Management Act 2000* for all surface water systems within which the Project lies, the *Water Management Act 2000* is relevant to surface water licensing considerations for the Project. The following water sharing plans have been commenced under the *Water Management Act, 2000* for all surface water systems within which the Project lies, including:

#### Mine

- *Water Sharing Plan for the Macquarie Bogan Unregulated and Alluvial Water Sources 2012.*

#### Lachlan River Surface Water Extraction

- *Water Sharing Plan for the Lachlan Regulated River Water Source 2016.*

The *Water Management Act 2000* incorporates the provisions of various prior Acts relating to the management of surface and groundwater in NSW and provides a single statute for regulation of water access, use and works (e.g. pumps or bores) that affect the licensing of surface water and alluvial and non-alluvial (i.e. fractured rock and porous rock) groundwater in the vicinity of the Project.

### **3.3.2 Water Act 1912**

As water sharing plans have commenced under the *Water Management Act, 2000* for all surface water systems within which the Project lies (Section 3.3.1), the *Water Act 1912* is not relevant to licensing considerations for the Project.

### **3.3.3 Protection of the Environment Operations Act 1997**

Clean TeQ holds EPL 21146 for the Project. A summary of the key surface water related conditions of EPL 21146 is provided in Section 5.

Unless EPL 21146 authorises otherwise, the Project will be carried out to comply with Section 120 of the POEO Act.

### **3.3.4 National Water Quality Management Strategy/ANZECC & ARM CANZ (2000)**

The *National Water Quality Management Strategy* is a joint national approach to improving water quality in Australian and New Zealand waterways. The ANZECC water quality guidelines (ANZECC & ARM CANZ, 2000) have been considered where applicable in this SWMP (Sections 4 and 7).

### **3.3.5 NSW Water Quality and River Flow Objectives**

The *NSW Water Quality and River Flow Objectives* have been developed to guide plans and actions to achieve healthy waterways in NSW, including the Macquarie-Bogan River catchment.

Each objective is based on providing the right water quality for the environment and the different beneficial uses of the water. They are based on measurable environmental values (EVs), which are those values or uses of water that the community believes are important for a healthy ecosystem for public benefit, welfare, safety or health. The target concentrations for each water quality objective (WQO) are based on ANZECC & ARMCANZ (2000). ANZECC & ARMCANZ (2000) has been considered where applicable in this SWMP (Sections 4 and 7).

### **3.3.6 NSW Central West Local Strategic Plan**

*Local Land Services Central West Local Strategic Plan 2016-2021* has been considered where applicable in the development of this SWMP. The Local Strategic Plan describes the climate and geography, communities, agriculture, biosecurity challenges and natural resources in the region.

### **3.3.7 Australian Standard 1940-2017**

Australian Standard (AS) 1940-2017 *The Storage and Handling of Flammable and Combustible Liquids* sets out requirements and recommendations for the safe storage and handling of flammable liquids of dangerous goods (Class 3) and also provides requirements and recommendations for the storage and handling of combustible liquids. It also provides minimum acceptable safety requirements for storage facilities, operating procedures, emergency planning and fire protection.

AS 1940-2017 have been considered where applicable in this SWMP.



## 4. HYDROLOGICAL SETTING AND BASELINE DATA

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### 4.1 Mine Site

#### *Regional Hydrology*

The mine site and accommodation camp are located in the Macquarie-Bogan catchment which covers an area of approximately 74,800 square kilometres (km<sup>2</sup>) within the Murray-Darling Basin. Regional north-west-flowing rivers (Bogan, Macquarie, Castlereagh, Namoi and Barwon) drain an extensive floodplain north of the site.

NRAR operates 91 river flow gauging stations within the Macquarie-Bogan catchment recording flows on a continuous basis, with 6 stations located along the Bogan River. Flows along the Bogan River generally increase with distance downstream as a result of regulated water supplies entering from Albert Priest Canal, Gunningbar Creek and Duck Creek.

Gauging stations along the Bogan River relevant to understanding the regional hydrology are presented in Table 3.

**Table 3** – Bogan River Gauging Stations

Gauging Station	Catchment Area (km <sup>2</sup> )	Mean Daily Flow (ML)	Distance from Bullock Creek Confluence (km)	Period of Record
Upstream of Bullock Creek Confluence				
Peak Hill	1,036	60	60	1967-2017
Downstream of Bullock Creek Confluence				
Dandaloo	5,440	174	20	1971-2017
Neurie Plain	14,760	221	100	1959-2017
Gongolgon	27,970	532	280	1945-2017

ML = megalitres.

#### *Local Hydrology*

The mine site and accommodation camp are located in the upper headwaters of Bullock Creek in proximity to the township of Tullamore to the north-east. The headwaters of the Lachlan River catchment are located to the south of the mine site and accommodation camp areas.

Surface water from the mine site and accommodation camp drains into Bullock Creek to the north-east, which flows in a north-easterly direction and discharges to the Bogan River.

## *Ephemeral Drainage Lines*

A catchment area (approximately 2,700 hectares [ha]) to the south-west of the mine site contributes to three ephemeral drainage lines which enter Mining Lease 1770 (Figure 5). The accommodation camp is located in the catchment of one of these ephemeral drainage lines (Figure 5).

These drainage lines lose definition north-east of the site (Figure 5) due to a combination of flat terrain and interruption by remnant mining operations in the area.

## **Surface Water Quality**

Water Quality Objectives (WQOs) have been developed for NSW rivers and estuaries which provide guideline levels to assist water quality planning and management (NSW Government, 2006). WQOs with accompanying trigger values apply to the following objectives: aquatic ecosystems, visual amenity, recreation, livestock and irrigation, drinking water, and aquatic foods.

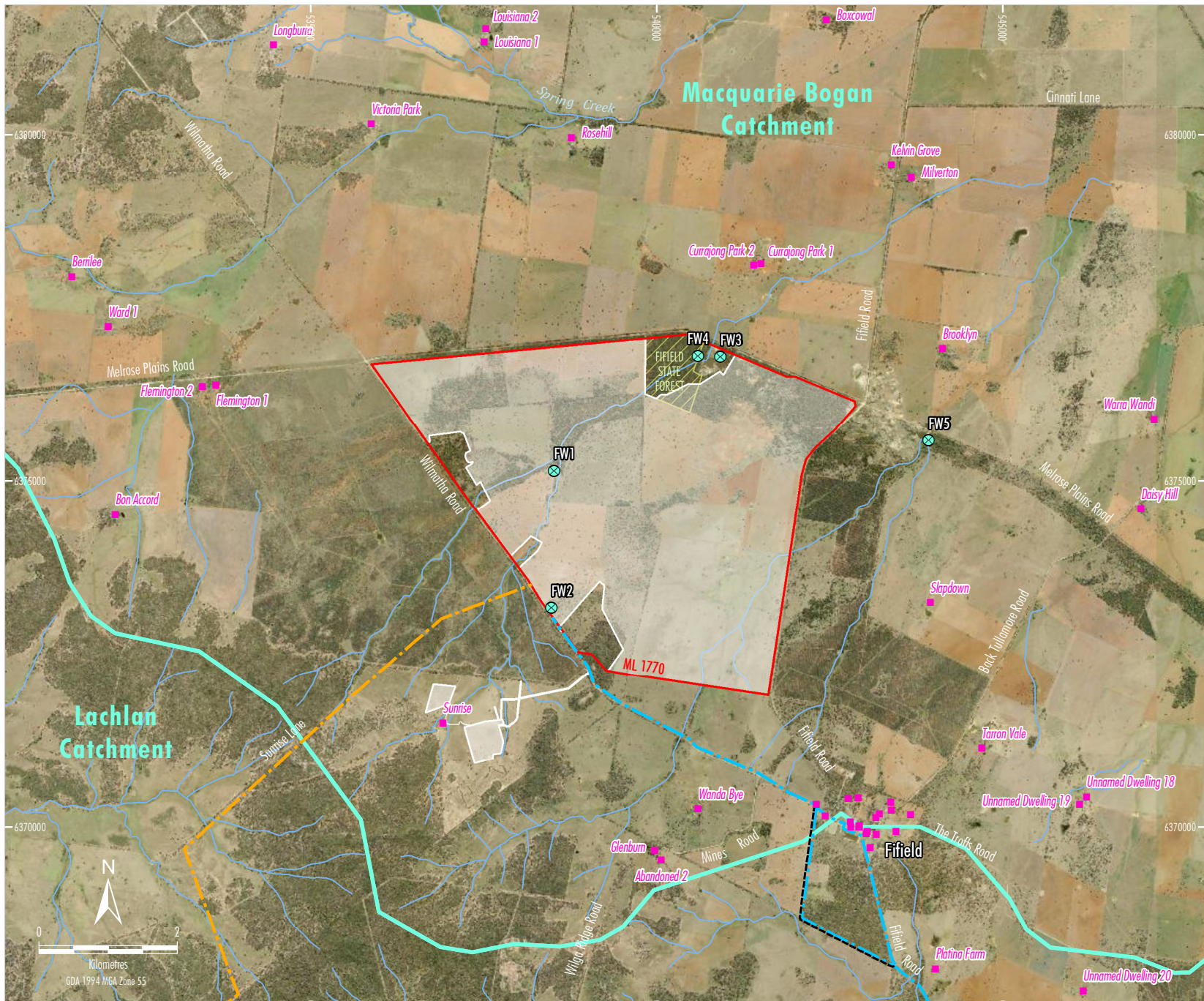
A baseline surface water quality monitoring program was commenced in 1997 at monitoring sites FW1, FW2 and FW3 at the mine site and surrounds (Figure 5). Monitoring sites FW4 and FW5 were added to the monitoring program in May 2000. Table 4 presents a statistical summary of the recorded data.

**Table 4 – Surface Water Quality Monitoring Results – Mine Site**

Parameter	Units	Monitoring Results (FW1-FW5)
Electrical Conductivity (EC)	µS/cm	42 to 395
pH	pH units	7.01 to 8.95
Sodium (Na)	mg/L	3 to 48
Potassium (K)	mg/L	2 to 13
Calcium (Ca)	mg/L	<1 to 22
Magnesium (Mg)	mg/L	1 to 22
Iron (Fe)	mg/L	<0.1 to 3.7
Chloride (Cl)	mg/L	<1 to 32
Sulphate (SO <sub>4</sub> )	mg/L	<1 to 6
Bicarbonate (HCO <sub>3</sub> )	mg/L	22 to 184
Carbonate (CO <sub>3</sub> )	mg/L	<1 to 48
Arsenic (As)	mg/L	<0.01
Cadmium (Cd)	mg/L	<0.001 to 0.017
Copper (Cu)	mg/L	<0.001 to 0.006
Nickel (Ni)	mg/L	<0.001 to 0.004
Lead (Pb)	mg/L	<0.001 to 0.002
Zinc (Zn)	mg/L	<0.001 to 0.031
Suspended Solids	mg/L	4 to 40

Source: Black Range Minerals (2000)

µS/cm = micro Siemens per centimetre; mg/L = milligrams per litre.



- LEGEND**
- State Forest
  - Mining Lease Boundary (ML)
  - Approved Surface Development Area
  - Fifeild Bypass
  - Gas Pipeline
  - Water Pipeline
  - Dwelling
  - Baseline Surface Water Quality Monitoring Location
  - Surface Water Catchment Boundary

Source: Black Range Minerals (2005); Clean TeQ (2017, 2018); ENRS (2019); NSW Department of Industry (2017); NSW Land and Property Information (2017); Office of Environment and Heritage NSW (2017); NSW Department of Primary Industries - Water (2018) NSW Imagery: © Department of Finance, Services & Innovation (2018)



**CLEAN TEQ SUNRISE PROJECT**  
**Local Hydrology and Baseline**  
**Surface Water Quality Monitoring -**  
**Mine Site**

**Figure 5**

### ***Surface Water Users***

Given the ephemeral nature of the drainage lines in the vicinity of the mine site, there are no known surface water users immediately upstream or downstream with a WAL.

As identified in Coffey (2016a), surface water users in the region are predominately associated with the regulated Lachlan and Macquarie Rivers and to a lesser extent, the unregulated Lachlan water sources.

### ***Flooding***

The local group of west and north-west flowing rivers (Bogan, Macquarie, Castlereagh, Namoi and Barwon Rivers) drain an extensive floodplain north of the mine site at low gradients (less than 1 in 5,000), historically producing large areas of inundation in wet years. The mine site is located some 30 metres (m) to 70 m above the estimated upper extent of this floodplain (Golder Associates Pty Ltd, 2000).

Flood events in the vicinity of the mine site and accommodation camp are relatively minor and short in duration as the mine site and accommodation camp are located in the headwaters of the catchment.

## **4.2 Borefields and Surface Water Extraction Infrastructure**

### ***Regional Hydrology***

The borefields and surface water extraction infrastructure are located adjacent to the Lachlan River and alluvial plain, approximately 65 km south of the mine site, within the Lachlan River catchment.

Flow in the Lachlan River is regulated. The main regulating storage is Wyangala Dam, located at the junction of Abercrombie and Lachlan Rivers 48 km upstream of Cowra. The volume and temporal pattern of flow in the river has changed significantly since the construction of Wyangala Dam and the increasing extraction of water for irrigation and other purposes. Since regulation, no-flow periods in the upper parts of the catchment have largely disappeared, and short-duration flow events are more attenuated.

Flow in the Lachlan River reaches a maximum at Forbes but then begins decreasing due to losses to the alluvial expanses west of Forbes. This is caused by recharge of alluvial expanses in the more arid westerly regions, from streamflow generated in the topographically higher (eastern) part of the catchment where rainfall is higher and alluvial tracts are less significant.

Despite the Lachlan River being a tributary of the Murrumbidgee River, the losses make the Lachlan River a quasi-terminal system with little water flowing past the Great Cumbung Swamp at its end. Flow from the Lachlan River to the Murrumbidgee River only occurs during large flood events.

### ***Local Hydrology***

The topography of the borefields and surface water extraction infrastructure area along the Lachlan River and immediate surrounds is highly advantageous for gravity-driven irrigation. Besides the Lachlan River itself, surface drainage systems include ephemeral streams, irrigation channels (artificial, but ephemeral, watercourses), swamps and intermittent lakes.

The area to the south of the Lachlan River (to Lake Cowal) hosts the Jemalong Irrigation District covering 93,000 ha. Jemalong Irrigation Limited manages the licensed diversion of flows from the Lachlan River at Jemalong Gap.

### ***Surface Water Quality***

Water quality sampling in the Lachlan River in the vicinity of the surface water infrastructure was conducted in August 2017 (Coffey, 2017). Table 5 presents a summary of the surface water quality data.

### ***Surface Water Users***

The extraction of surface water from the Lachlan River in the vicinity of the surface water infrastructure is managed in accordance with the *Water Sharing Plan for the Lachlan Regulated River Water Source 2016*.

It was estimated at the time of commencement of the *Water Sharing Plan for the Lachlan Regulated River Source 2016*, the share components of regulated river (high security) access licences authorised to take water from the Lachlan Regulated River Water Source total 27,680 unit shares.

It was estimated at the time of commencement of the *Water Sharing Plan for the Lachlan Regulated River Source 2016*, the share components of regulated river (general security) access licences authorised to take water from the Lachlan Regulated River Water Source total 592,801 unit shares.

**Table 5 – Surface Water Quality Monitoring Results – Surface Water Infrastructure (Lachlan River)**

Parameter	Units	Monitoring Results (FW1-FW5)
Electrical Conductivity (EC)	µS/cm	484
pH	pH units	7.2
Sodium (Na)	mg/L	35
Potassium (K)	mg/L	2
Calcium (Ca)	mg/L	24
Magnesium (Mg)	mg/L	17
Iron (Fe)	mg/L	1.92
Chloride (Cl)	mg/L	61
Sulphate (SO <sub>4</sub> )	mg/L	26
Bicarbonate (HCO <sub>3</sub> )	mg/L	93
Carbonate (CO <sub>3</sub> )	mg/L	<1
Arsenic (As)	mg/L	0.001
Cadmium (Cd)	mg/L	<0.0001
Copper (Cu)	mg/L	0.003
Nickel (Ni)	mg/L	0.002
Lead (Pb)	mg/L	0.001
Zinc (Zn)	mg/L	<0.005
Suspended Solids	mg/L	94

Source: Coffey (2017)

µS/cm = micro Siemens per centimetre; mg/L = milligrams per litre.

## ***Flooding***

The borefields and surface water extraction infrastructure are located in the Lachlan River floodplain.

The pump station at the Lachlan River and all associated infrastructure would be constructed to be at an elevation higher than the 1 in 25 year flood event (Golder Associates, 2017).

## 5. PERFORMANCE MEASURES AND PERFORMANCE INDICATORS

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Table 9 in Development Consent DA 374-11-00 prescribes the water management performance measures for the Project, as follows:

- **Water Management – General**
  - Maintain separation between clean and mine water management systems.
  - Minimise the use of clean water on-site.
- **Construction and Operation of Infrastructure**
  - Design, install and maintain erosion and sediment controls generally in accordance with the series *Managing Urban Stormwater: Soils and Construction including Volume 1* (Landcom, 2004), *Volume 2A – Installation of Services* (Department of Environment and Climate Change [DECC], 2008a) and *Volume 2C – Unsealed Roads* (DECC 2008b).
  - Design, install and maintain infrastructure within 40 metres (m) of watercourses generally in accordance with the *Guidelines for Controlled Activities on Waterfront Land* (Department of Primary Industries [DPI], 2012), or its latest version.
  - Design, install and maintain any creek crossings generally in accordance with the Policy and *Guidelines for Fish Habitat Conservation and Management* (DPI, 2013) and *Why Do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings* (Fairfull, S. and Witheridge, G., 2003), or their latest versions.
- **Clean Water Diversion Infrastructure**
  - Maximise the diversion of clean water around disturbed areas on-site.
  - Design, construct and maintain the clean water diversions to capture and convey the 100 year, peak flow rainfall event.
- **Sediment Dams (Mine and Limestone Quarry)**
  - Design, install and/or maintain the dams generally in accordance with the series *Managing Urban Stormwater: Soils and Construction – Volume 1* (Landcom, 2004) and *Volume 2E Mines and Quarries* (DECC, 2008c).
- **Mine and Limestone Quarry Water Storages**
  - Design, install and/or maintain mine and limestone water storage infrastructure to ensure no discharge of mine or limestone quarry water off-site (except in accordance with an EPL).
  - On-site storages (including mine infrastructure dams, groundwater storage and treatment dams) are suitably designed, installed and/or maintained to minimise permeability.

- Ensure that the floor and side walls of the tailings storage facility, Evaporation Basin and Surge Dam are designed with a minimum of a 900 millimetres (mm) clay or modified soil liner with a permeability of no more than  $1 \times 10^{-9}$  metres per second (m/s), or a synthetic (plastic) liner of 1.5 mm minimum thickness with a permeability of no more than  $1 \times 10^{-14}$  m/s (or equivalent).
- Design, install and maintain a seepage interception system in the Tailings Storage Facility embankments in accordance with Dams Safety Committee (DSC) guidelines.
- Design, install and maintain the water storages to capture and convey the 100 year, 72-hour Average Recurrence Interval (ARI) rainfall event.
- Design, install and/or maintain the facilities to meet the requirements of the DSC.
- The design of the tailings storage facility should conform to:
  - DSC3A – Consequence Categories for Dams (DSC); and
  - DSC3F – Tailings Dams (DSC).
- **Chemical and Hydrocarbon Storage**
  - Chemical and hydrocarbon products to be stored in bunded areas in accordance with the relevant Australian Standards.
- **Irrigation Area**
  - Manage the irrigation area in accordance with the EPA’s *Environmental Guidelines: Use of Effluent by Irrigation* (Department of Environment and Conservation [DEC], 2004).

During construction activities, Clean TeQ will assess the Project against the specific water management performance indicators outlined in Table 6.

**Table 6 – Water Management Performance Indicators – Construction**

Performance Measure	Performance Indicators
<p><b>Water Management - General</b></p> <ul style="list-style-type: none"> <li>• Maintain separation between clean and mine water management systems.</li> <li>• Minimise the use of clean water on-site.</li> </ul>	<p>The water management system is constructed and maintained generally in accordance with the design described in the SWMP.</p> <p>Water use is consistent with the water use priority described in the Water Balance and in accordance with relevant Water Management Act 2000 approvals.</p>
<p><b>Construction and Operation of Infrastructure</b></p> <ul style="list-style-type: none"> <li>• Design, install and maintain erosion and sediment controls generally in accordance with the series <i>Managing Urban Stormwater: Soils and Construction</i> including <i>Volume 1, Volume 2A – Installation of Services and Volume 2C – Unsealed Roads</i>.</li> <li>• Design, install and maintain infrastructure within 40 m of watercourses generally in accordance with the <i>Guidelines for Controlled Activities on Waterfront Land</i> (DPI 2012), or its latest version.</li> <li>• Design, install and maintain any creek crossings generally in accordance with the <i>Policy and Guidelines for Fish Habitat Conservation and Management</i> (DPI, 2013) and <i>Why Do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings</i> (NSW Fisheries 2003), or their latest versions.</li> </ul>	<p>Suitably qualified person documents that erosion and sediment controls have been designed and installed generally in accordance with the series <i>Managing Urban Stormwater: Soils and Construction</i> including <i>Volume 1, Volume 2A – Installation of Services and Volume 2C – Unsealed Roads</i>.</p> <p>Suitably qualified person documents that key infrastructure within 40 m of watercourses is designed and installed generally in accordance with the <i>Guidelines for Controlled Activities on Waterfront Land</i> (DPI 2012), or its latest version.</p> <p>Suitably qualified person documents that creek crossings have been designed generally in accordance with the <i>Policy and Guidelines for Fish Habitat Conservation and Management</i> (DPI, 2013) and <i>Why Do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings</i> (NSW Fisheries 2003), or their latest versions.</p>



**Table 6 (Continued) – Water Management Performance Indicators – Construction**

Performance Measure	Performance Indicators
<p><b>Clean Water Diversion Infrastructure</b></p> <ul style="list-style-type: none"> <li>Maximise the diversion of clean water around disturbed areas on-site.</li> </ul>	<p>Suitably qualified person documents that clean water diversions are designed to maximise the diversion of clean water around disturbance areas.</p>
<ul style="list-style-type: none"> <li>Design, construct and maintain the clean water diversions to capture and convey the 100-year, peak flow rainfall event.</li> </ul>	<p>Suitably qualified person documents that clean water diversions are designed and constructed to capture and convey the 100-year, peak flow rainfall event.</p>
<p><b>Sediment Dams (Mine and Limestone Quarry)</b></p> <ul style="list-style-type: none"> <li>Design, install and/or maintain the dams generally in accordance with the series <i>Managing Urban Stormwater: Soils and Construction – Volume 1</i> and <i>Volume 2E Mines and Quarries</i>.</li> </ul>	<p>Suitably qualified person documents that sediment dams have been designed and installed generally in accordance with the series <i>Managing Urban Stormwater: Soils and Construction</i> including <i>Volume 1</i> and <i>Volume 2A – Installation of Services and 2E Mines and Quarries</i>.</p>
<p><b>Mine and Limestone Quarry Water Storages</b></p> <ul style="list-style-type: none"> <li>Design, install and/or maintain mine and limestone water storage infrastructure to ensure no discharge of mine or limestone quarry water off-site (except in accordance with an EPL).</li> <li>On-site storages (including mine infrastructure dams, groundwater storage and treatment dams) are suitably designed, installed and/or maintained to minimise permeability.</li> <li>Ensure that the floor and side walls of the tailings storage facility, evaporation basin and surge dam are designed with a minimum of a 900 mm clay or modified soil liner with a permeability of no more than <math>1 \times 10^{-9}</math> m/s, or a synthetic (plastic) liner of 1.5 mm minimum thickness with a permeability of no more than <math>1 \times 10^{-14}</math> m/s (or equivalent).</li> <li>Design, install and maintain a seepage interception system in the Tailings Storage Facility embankments in accordance with the DSC guidelines.</li> <li>Design, install and maintain the water storages to capture and convey the 100 year, 72-hour ARI rainfall event.</li> <li>Design, install and/or maintain the facilities to meet the requirements of the DSC.</li> <li>The design of the tailings storage facility should conform to: <ul style="list-style-type: none"> <li>DSC3A – Consequence Categories for Dams (DSC); and</li> <li>DSC3F – Tailings Dams (DSC).</li> </ul> </li> </ul>	<p>Suitably qualified person documents that the water management infrastructure is constructed and maintained generally in accordance with the design described in the Water Balance and SWMP.</p> <p>Mine water storages are constructed and maintained to minimise seepage.</p> <p>Suitably qualified person documents that the tailings storage facility, evaporation basin and surge dam mine water storages are designed and constructed to capture and convey the 100 year, 72-hour ARI rainfall event.</p> <p>The Dam Safety Committee approves the tailings storage facility design.</p> <p>Suitably qualified person documents that the mine water storages are designed and constructed to capture and convey the 100 year, 72-hour ARI rainfall event.</p> <p>The Dam Safety Committee approves the design of relevant water storages (i.e. prescribed structures).</p> <p>The Dam Safety Committee approves the tailings storage facility design.</p>
<p><b>Chemical and Hydrocarbon Storage</b></p> <ul style="list-style-type: none"> <li>Chemical and hydrocarbon products to be stored in bunded areas in accordance with the relevant Australian Standards.</li> </ul>	<p>Suitably qualified person documents that chemical and hydrocarbon storages are designed and constructed in accordance with the relevant Australian Standards.</p>
<p><b>Irrigation Area</b></p> <ul style="list-style-type: none"> <li>Manage the irrigation area in accordance with the <i>EPA's Environmental Guidelines: Use of Effluent by Irrigation</i>.</li> </ul>	<p>The irrigation area is designed and maintained so as not to cause irrigation water runoff from the irrigation area.</p>

In addition, EPL 21146 includes surface water quality limits for receiving waters at the mine site and surface water quality limits for waters discharged from the sediment dams (Table 7).

**Table 7 – EPL 21146 Surface Water Quality Limits**

Parameter	Units	Limit
<b>Receiving Waters</b>		
Electrical Conductivity (EC)	µS/cm	2,200
pH	pH units	6.5 – 8.5
Total Suspended Solids	mg/L	50
Iron (Fe)	mg/L	3.7
Nickel (Ni)	mg/L	0.008
<b>Stormwater (Sediment Dam) Discharges<sup>1</sup></b>		
Electrical Conductivity (EC)	µS/cm	2,200
pH	pH units	6.5 – 8.5
Total Suspended Solids	mg/L	50 <sup>2</sup>
Turbidity	Nephelometric Turbidity Units	50

µS/cm = micro Siemens per centimetre; mg/L = milligrams per litre.

<sup>1</sup> Limits do not apply when the discharge occurs solely as a result of rainfall measured at the site which exceeds a total of 50.7 mm of rainfall over any consecutive 5 day period (Condition L2.5 of EPL 21146).

<sup>2</sup> Limit is not deemed to be exceeded where the water sample complies with the turbidity limit at the time of discharge and the EPA is advised of any total suspended solid exceedances within 3 working days of the completion of the total suspended solids testing (Condition L2.6).

## 5.1 Trigger Levels for Investigation

Surface water impact trigger levels for surface water flows, quality and downstream flooding have been considered and where applicable developed using the available baseline data (Section 4).

### 5.1.1 Mine Site

#### **Surface Water Flows**

While monitoring of licensed discharge points is proposed as part of the surface water monitoring program (Section 7), given the ephemeral nature of drainage lines entering Mining Lease 1770, a surface water flow impact trigger level is not proposed for the mine site.

#### **Surface Water Quality**

The ANZECC & ARMCANZ (2000) guidelines recommend that wherever possible, site-specific data is used to define trigger values for physical and chemical factors which can adversely impact the environment. Trigger values are not regarded as assessment criteria; rather they are used as an indicator of potential impacts and to initiate investigations into the surface water quality as reported by the monitoring program.

In the event that suitable site-specific trigger values cannot be developed, the default (acceptable limit) values defined by ANZECC & ARMCANZ (2000) for upland rivers in slightly to moderately disturbed ecosystems in south-east Australia are provided in Table 8.

**Table 8** – ANZECC & ARMCANZ (2000) Guideline (Acceptable Limits) Values for Key Water Quality Parameters

Water Quality Value	Acceptable Limit
pH Range	6.5 – 8.0
Electrical Conductivity ( $\mu\text{S}/\text{cm}$ )	30 – 350
Turbidity (mg/L)	2 – 25

The approach recommended by ANZECC & ARMCANZ (2000) for developing site-specific trigger values for slightly to moderately disturbed ecosystems is to formulate trigger values based on the 80<sup>th</sup> percentile of the site-specific monitoring data. The objective of this approach is to develop conservative, site-specific trigger values for use as a means to improve water quality in highly disturbed ecosystems.

However, comparison of the baseline monitoring results to the ANZECC & ARMCANZ (2000) guideline values in the ephemeral drainage lines surrounding the mine site (Table 4) show that there is potential to exceed the ANZECC & ARMCANZ (2000) default trigger values for pH, EC and turbidity.

The baseline monitoring results (Table 4) also indicate major ions and metals range from below detection to moderate to high concentrations. These results demonstrate the variability of water quality in such ephemeral conditions.

Therefore, surface water quality trigger levels for investigation will be based on the limits included in EPL 21146 (Table 7).

### ***Downstream Flooding***

As described in Section 4, the mine site is located some 30 m to 70 m above the estimated upper extent of the floodplain associated with the Bogan, Macquarie, Castlereagh, Namoi and Barwon Rivers. Flood events in the vicinity of the mine site and accommodation camp are relatively minor and short in duration as the mine site and accommodation camp are located in the headwaters of the catchment.

Three ephemeral drainage lines enter ML 1770 from the south-west (Figure 5). The two most northern drainage lines merge and then exit ML 1770 in the north and the southern drainage line exits ML 1770 in the east (Figure 5). These drainage lines lose definition north-east of ML 1770 (Figure 5) due to a combination of flat terrain and interruption by remnant mining operations in the area.

Two permanent clean water diversions (i.e. the southern and northern diversions) will be developed to collect and divert clean water in the three ephemeral drainage lines around disturbed areas at the mine site (Figure 3). As described in Section 6.1.3, these diversions will be designed, constructed and rehabilitated to be safe, stable and non-polluting. The design would consider long term stability and compatibility with existing hydrological features, landforms and vegetation. The NRAR's (2018) *Controlled Activities on Waterfront Land – Guidelines for Riparian Corridors on Waterfront Land* will also be considered during the design and construction of the permanent clean water diversions. In particular, the principles of natural stream design outlined in the NRAR's (2018) *Controlled Activities on Waterfront Land – Guidelines for Riparian Corridors on Waterfront Land* will be considered in the design and construction of the permanent clean water diversions.

In addition, although Clean TeQ will maximise the diversion of clean water around disturbed areas on-site (Section 5), the mine site is expected to reduce flows downstream of ML 1770 as runoff from disturbed areas will generally be collected and retained on-site in accordance with best practice management.

Given the above, no significant impacts on downstream flooding are predicted during the initial Project construction activities and therefore a downstream flooding impact trigger level is not proposed for the mine site.

### **5.1.2 Borefields and Surface Water Extraction Infrastructure**

The surface water extraction infrastructure will be located on the Lachlan River. As described in Section 4.2, the Lachlan River is a regulated watercourse and therefore surface water flows are driven by releases from Wyangala Dam which is the main regulating storage on the Lachlan River.

The surface water extraction infrastructure will be designed, installed and maintained generally in accordance with the *Guidelines for Controlled Activities on Waterfront Land* (Natural Resources Access Regulator [NRAR], 2018) and surface water extraction will be undertaken in accordance with relevant approvals under the *Water Management Act 2000*.

Given the above, the surface water extraction infrastructure is not expected to have a significant impact on surface water flows, surface water quality or flooding in the Lachlan River and a surface water impact trigger level is not proposed for the surface water extraction infrastructure.

## 6. WATER MANAGEMENT SYSTEM

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Consistent with the general water management and clean water diversion infrastructure performance measures for the Project (Section 5), the key objectives of the water management system are to control runoff from the development/construction areas and the operation areas, while diverting up-catchment water around these areas, and to minimise the use of clean water on-site.

The water management system will include both permanent features that will continue to operate post-closure (e.g. northern and southern diversion channels) and temporary structures during mining operations (e.g. sediment dams).

An internal drainage system will be constructed to collect and contain water generated within the development/construction areas and operation areas.

Sediment control structures such as sediment dams and sediment fences will be employed where necessary within and downstream of disturbance areas. Consistent with the relevant performance measure (Section 5) the erosion and sediment controls will be designed, installed and maintained generally in accordance with the series *Managing Urban Stormwater: Soils and Construction* including *Volume 1* (Landcom, 2004), *Volume 2A – Installation of Services* (DECC, 2008a) and *Volume 2C – Unsealed Roads* (DECC, 2008b).

The water management system will be progressively developed during the construction and operation phases as diversion and containment requirements change. The water management system layout for the initial construction activities is provided in Figure 2 and a summary of the water management system is provided in Section 6.1.

Erosion and sediment control plans are provided in Attachment 1.

### 6.1 Water Management and Related Infrastructure

#### 6.1.1 Mine Water Storages

The following mine water storages will be constructed during the initial construction activities (Figure 2):

- tailings storage facility;
- evaporation pond;
- water storage dam;
- mine water dams and runoff dam; and
- raw water dam.

## ***Tailings Storage Facility***

Consistent with the relevant performance measures (Section 5):

- the tailings storage facility will be designed, installed and maintained to ensure no discharge of mine water off-site;
- the floor and side walls of the tailings storage facility will be designed with a minimum of a 900 mm clay or modified soil liner with a permeability of no more than  $1 \times 10^{-9}$  m/s, or a synthetic (plastic) liner of 1.5 mm minimum thickness with a permeability of no more than  $1 \times 10^{-14}$  m/s (or equivalent);
- a seepage interception system will be designed, installed and maintained in the tailings storage facility embankments in accordance with DSC guidelines;
- the tailings storage facility will be designed, installed and maintained to meet the requirements of the DSC; and
- the tailings storage facility design will conform with:
  - DSC3A – Consequence Categories for Dams (DSC, 2015); and
  - DSC3F – Tailings Dams (DSC, 2012).

All tailings generated in the process plant will be pumped to and stored in the tailings storage facility. The tailings slurry will be deposited through a series of spigots located at the perimeter of the cells and a decant pond will be maintained in the centre of each cell. Decant water will be piped to the water storage dam for reuse in the process plant.

The capacity of the tailings storage facility will progressively increase over the Project life as lifts are completed and the cells are developed.

The tailings storage facility will be a 'turkeys nest' dam and will not be used to harvest runoff as it will be used to contain tailings and mine water or effluent in accordance with best management practice.

## ***Evaporation Pond***

Consistent with the relevant performance measures (Section 5):

- the evaporation pond will be designed, installed and maintained to ensure no discharge of mine water off-site; and
- the floor and side walls of the evaporation pond will be designed with a minimum of a 900 mm clay or modified soil liner with a permeability of no more than  $1 \times 10^{-9}$  m/s, or a synthetic (plastic) liner of 1.5 mm minimum thickness with a permeability of no more than  $1 \times 10^{-14}$  m/s (or equivalent).

It is noted that return water would not be used from the chloride waste inflow contained separately in the evaporation pond.

The evaporation pond will have a capacity of approximately 281 million litres (ML) at full development.

The evaporation pond will be a 'turkeys nest' dam and will not be used to harvest runoff from land as it will be used to contain mine water or effluent in accordance with best management practice.

### ***Water Storage Dam***

Consistent with the relevant performance measures (Section 5):

- the water storage dam will be designed, installed and maintained to ensure no discharge of mine water off-site;
- the water storage dam will be suitably designed, installed and/or maintained to minimise seepage; and
- the water storage dam will be designed, installed and maintained to meet the requirements of the DSC (if required under the provisions of the *Dams Safety Act 1978*).

The water storage dam will have a capacity of approximately 1,230 ML.

The water storage dam will be a 'turkeys nest' dam and will not be used to harvest runoff from land as it will be used to contain mine water or effluent in accordance with best management practice.

### ***Mine Water Dams and Runoff Dam***

Consistent with the relevant performance measures (Section 5):

- the mine water dams and runoff dam will be suitably designed, installed and/or maintained to minimise seepage; and
- the runoff dam will be designed, installed and maintained to capture and convey the 100 year, 72-hour ARI rainfall event.

Water collected from the disturbance footprint of the ore stockpile areas will be temporarily contained in mine water dams. Water collected from the disturbance footprint of the processing facility area will be temporarily contained in the runoff dam. Water collected in the mine water dams and runoff dam will be reused in the mine site water system.

Based the requirement for the mine water dams to be designed, installed and maintained to capture and convey the 100 year, 72-hour ARI rainfall event, the preliminary design capacities for the mine water dams will range from approximately 19 ML to 116 ML. Based on the same design requirement, the preliminary design capacity for the runoff dam will be approximately 34 ML.

### **Raw Water Dam**

Consistent with the relevant performance measures (Section 5):

- the raw water dam will be suitably designed, installed and/or maintained to minimise seepage; and
- the raw water dam will be designed, installed and maintained to capture and convey the 100 year, 72-hour ARI rainfall event.

The raw water dam will have a capacity of approximately 15 ML.

The raw water dam will be used as buffer storage for water supplied to the site from the external sources (e.g. borefields). The raw water dam will be a ‘turkeys nest’ dam and will not be used to harvest runoff from land.

### **6.1.2 Sediment Dams**

Consistent with the relevant performance measures (Section 5) the sediment dams will be designed, installed and maintained generally in accordance with the series *Managing Urban Stormwater: Soils and Construction* including *Volume 1* (Landcom, 2004) and *Volume 2E Mines and Quarries* (DECC, 2008c).

Water collected from the disturbance footprint (e.g. internal haul roads and waste dumps) will be temporarily contained in the sediment dams to minimise potential water quality impacts. Where opportunities arise, water will be recycled for dust suppression or use in the process plant, or otherwise released in accordance with the requirements of EPL 21146.

A summary of the capacity of the sediment dams is provided in Table 9 based on preliminary designs. Although the sediment dam capacities may vary from those in Table 9 based on final design, they will however be sized in accordance with the design criteria outlined in Table 9. The as-constructed design details of the sediment dams and maintenance levels will be included in a subsequent revision of this SWMP.



**Table 9 – Sediment Dam Design Criteria and Capacities**

Sediment Dam	Design Criteria <sup>1</sup>	Approximate Capacity
SD3a	<ul style="list-style-type: none"> <li>Type F sediment basin.</li> <li>95<sup>th</sup> percentile 5 day duration rainfall event of 50.7 mm (Dubbo 5 day rainfall depth in Table 6.3a of Landcom, 2004).</li> <li>A volumetric runoff coefficient of 0.74 assuming soil hydrologic Group D (Table F2 of Landcom [2004]).</li> <li>Allowance for sediment storage zone capacity equal to 50% of calculated settling zone capacity.</li> </ul>	1 ML
SD4		118 ML
SD7		32 ML <sup>2</sup>
SD8		23 ML
SD9		91 ML <sup>2</sup>
SD11a		7 ML
SD11b		5 ML
SD12		5 ML

Source: Hydro Engineering & Consulting (2019)

<sup>1</sup> In accordance with *Managing Urban Stormwater: Soils and Construction including Volume 1* (Landcom, 2004) and *Volume 2E Mines and Quarries* (DECC, 2008c).

<sup>2</sup> Sizing based on mine water dam design criteria (Section 6.1.1) as the sediment dam would eventually be used as a mine water dam.

### 6.1.3 Diversion Systems

The diversion system consists of clean water diversions and collection drains. The clean water diversions will collect and divert clean water around disturbed areas. The collection drains will collect and convey runoff from disturbed areas to mine water dams (“mine water”) (Section 6.1.1) or sediment dams (“sediment water”) (Section 6.1.2). Consistent with the relevant performance measures (Section 5), the diversion system will:

- maintain separation between clean and mine water management systems; and
- maximise the diversion of clean water around disturbed areas on site.

The diversion system layout for the initial construction activities is provided in Figure 2.

A summary of the diversion system design criteria is provided in Table 10.

**Table 10 – Diversion System Design Criteria**

Diversion System Component	Design Criteria
Clean Water Diversions	1 in 100 year, peak flow rainfall event <sup>1</sup>
Collection Drains	1 in 5 year, peak flow rainfall event (less than 1 year duration) <sup>2</sup>
	1 in 20 year, peak flow rainfall event (greater than 3 years duration) <sup>2</sup>

<sup>1</sup> In accordance with Table 9 of Development Consent DA 374-11-00.

<sup>2</sup> In accordance with *Volume 2E Mines and Quarries* (DECC, 2008c).

The diversion system (including inflow, channel and outflow) will be designed, constructed and maintained to capture and convey the design flows summarised in Table 10. The majority of the diversion system will be grass-lined with only minor sections requiring rip-rap protection (Hydro Engineering & Consulting, 2019). The inlet and outlets of the diversion system will be designed, constructed and maintained generally in accordance with the series *Managing Urban Stormwater: Soils and Construction – Volume 1* (Landcom, 2004) and *Volume 2E Mines and Quarries* (DECC, 2008c).

The permanent clean water diversions (i.e. the southern and northern diversions) will be designed, constructed and rehabilitated to be safe, stable and non-polluting. The design would consider long term stability and compatibility with existing hydrological features, landforms and vegetation. The NRAR's (2018) *Controlled Activities on Waterfront Land – Guidelines for Riparian Corridors on Waterfront Land* will also be considered during the design and construction of the permanent clean water diversions. In particular, the principles of natural stream design outlined in the NRAR's (2018) *Controlled Activities on Waterfront Land – Guidelines for Riparian Corridors on Waterfront Land* will be considered in the design and construction of the permanent clean water diversions.

#### **6.1.4 Chemical and Hydrocarbon Storages**

Consistent with the relevant performance measures (Section 5), chemical and hydrocarbon products will be stored in bunded areas in accordance with the relevant Australian Standards, including AS 1940-2017 *The Storage and Handling of Flammable and Combustible Liquids*.

#### **6.1.5 Other Infrastructure**

Consistent with the relevant performance measures (Section 5):

- any infrastructure within 40 m of watercourses will be designed, installed and maintained generally in accordance with the *Guidelines for controlled activities on waterfront land – Riparian corridors* (NRAR, 2012), or its latest version; and
- any creek crossings will be designed, installed and maintained generally in accordance with the *Policy and Guidelines for Fish Habitat Conservation and Management* (DPI, 2013) and *Why Do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings* (Fairfull, S. and Witheridge, G., 2003), or their latest versions.

#### **6.1.6 Irrigation Area**

Wastewater generated at the accommodation camp will be collected and treated at an on-site wastewater treatment plant. The wastewater treatment plant will consist of anaerobic and aerobic treatment and final disinfection of treated effluent. The wastewater treatment plant would be installed and operated in accordance with Lachlan Shire Council requirements.

The treated wastewater produced from the wastewater treatment plant will be pumped to the irrigation area via the irrigation water pipeline (Figure 2).

The irrigation application area will be approximately 3.5 ha and will be divided into irrigation zones. Up to 100,000 litres per day of treated wastewater will be pumped to the irrigation area. Sprinklers will be used to evenly distribute the treated wastewater at a maximum rate of approximately 3 millimetres per square metre per day. This application rate is conservative and will minimise risk of surface pooling and runoff (True Water Australia, 2018).

True Water Australia (2018) conducted a nutrient balance for the irrigation area and concluded that the irrigation area is of sufficient size for the expected nutrient load (i.e. nutrient loading will not be a limiting factor to irrigation).

Consistent with the relevant performance measure (Section 5), the accommodation camp irrigation area would be managed in accordance with the *Environmental Guidelines: Use of Effluent by Irrigation* (Department of Environment and Conservation, 2004) and the irrigation rate would be controlled so as not to:

- cause irrigation water runoff from the irrigation area; or
- exceed the capacity of the soil in the irrigation area to effectively absorb the applied nutrient, salt, organic material and hydraulic loads.

## 6.2 Other Surface Water Management Measures

The water management system at the mine site is designed to minimise any potential water quality impacts and is described in the Water Balance (Appendix A of the WMP). The overall objective of the surface water management system is to contain any potentially contaminated water generated within development/construction and operational areas while diverting all other water around these areas. In summary, this objective is achieved by:

- minimising disturbance areas;
- containment and recycling (including priority re-use of accumulated waters stored);
- collection of runoff from the stockpiles and emplacements to sediment dams designed and managed in accordance with relevant guidelines;
- progressive stabilisation and revegetation of disturbed areas; and
- installation of appropriate erosion and sediment controls.

The surface water monitoring program is described in Section 7.

## 6.4 Surface Water Licensing

### **Water Access Licences**

The mine and accommodation camp are located within the mapped extent of the Upper Bogan River Water Source under the *Water Sharing Plan for the Macquarie Bogan Unregulated and Alluvial Water Sources 2012*. Notwithstanding the above, small sections of Clean TeQ owned land are also located in the Gunningbland and Yarrabandai Water Source under the *Water Sharing Plan for the Lachlan Unregulated and Alluvial Water Sources 2012*.

Clean TeQ would not require licensing for surface waters at the mine as (1) exemptions under the *Water Management (General) Regulation 2018* would apply; and (2) the runoff water captured by undisturbed areas between the clean water diversions and the ultimate extent of the Project disturbance boundary would be within the estimated harvestable right available to Clean TeQ (based on total contiguous landholdings) (refer below).

For the extraction from the Lachlan River, Clean TeQ currently holds WAL 6679 and WAL 1798 in the Lachlan Regulated River Water Source, for 123 and 300 share components (General Security) under the *Water Sharing Plan for the Lachlan Regulated River Water Source 2016*, respectively. In addition, Clean TeQ currently holds WAL 42370 (zero High Security share components) in the Lachlan River Regulated River Source, for subsequent trading of water on the open market under the *Water Sharing Plan for the Lachlan Regulated River Water Source 2016*.

### **Harvestable Right**

As described above, Clean TeQ owned land in the vicinity of the mine and accommodation camp are located within the Upper Bogan River Water Source under the *Water Sharing Plan for the Macquarie Bogan Unregulated and Alluvial Water Sources 2012* and the Gunningbland and Yarrabandai Water Source under the *Water Sharing Plan for the Lachlan Unregulated and Alluvial Water Sources 2012*.

Clean TeQ's maximum harvestable right dam capacity (MHRDC) based on the ownership of contiguous Clean TeQ-owned lands in the vicinity of the mine site is presented in Table 11 for both of these Water Sharing Plans. A number of runoff-harvesting and in-stream dams exist on-site and in the nearby surrounding lands owned by Clean TeQ and these are also summarised in Table 11.

**Table 11** – Maximum Harvestable Right Dam Capacity

Water Sharing Plan	Clean TeQ Owned Land Area (ha)	Maximum Harvestable Right Dam Capacity (ML)	Existing Clean TeQ Dams	
			Number	Volume (ML)
<i>Water Sharing Plan for the Macquarie Bogan Unregulated and Alluvial Water Sources 2012</i>	3,730	205	51	21
<i>Water Sharing Plan for the Lachlan Unregulated and Alluvial Water Sources 2012</i>	746	41	6	2

The mine water storages (Section 6.1.1) and sediment dams (Section 6.1.2) are not required to be considered under harvestable rights as they will be used to contain mine water or effluent in accordance with best management practice in accordance with the *Water Management (General) Regulation 2018*.

Based on Table 11, Clean TeQ's existing dam capacity is well within the MHRDC for both Water Sharing Plans. For the mine and accommodation camp (both located in the *Water Sharing Plan for the Macquarie Bogan Unregulated and Alluvial Water Sources 2012*), subtracting the capacity of dams (21 ML) from the harvestable right (205 ML) leaves an available harvestable rights volume of 184 ML.

Any runoff from disturbed mine areas that is captured on-site is not required to be considered under harvestable rights in accordance with the *Water Management (General) Regulation 2018*. Water that falls on undisturbed areas of the site and is not diverted around the site water management system but captured and used for operational purposes, cannot cumulatively exceed the available harvestable rights volume of 184 ML.

Where the opportunities arise, run-off harvested on-site will be used for the Project.

## 7. SURFACE WATER MONITORING PROGRAM

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The surface water monitoring program for the Project is described in the following subsections.

As described in the Water Balance (Appendix A of the WMP), Clean TeQ will also monitor the following aspects of the water management system (upon completion of construction and commissioning of water management infrastructure):

- mine water storage and raw water dam levels and volumes (stored and freeboard), including development of storage curves;
- mine pit inflows/dewatering (where measurable from pumping records) to prepare a water balance of the mine pits;
- water received at the mine from the borefields and/or surface water extraction;
- potable water supply;
- dust suppression water demands; and
- processing water inputs and outputs including:
  - feed tonnage and moisture contents;
  - product tonnages and moisture contents;
  - high chloride stream to the evaporation ponds; and
  - tailings tonnages and solid:water ratios.

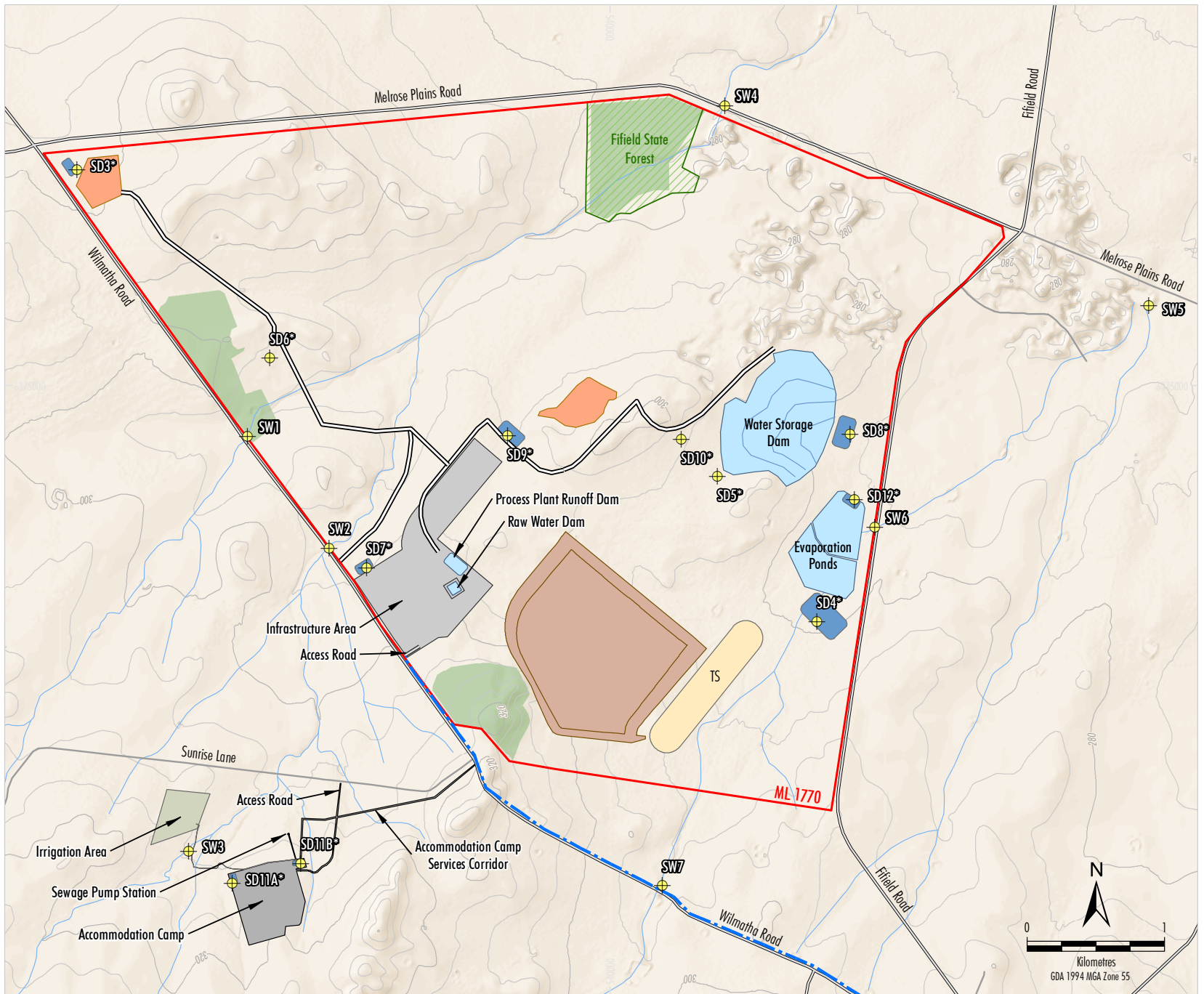
The appropriate monitoring frequencies and methods will be determined by Clean TeQ as required.

### 7.1 Baseline Monitoring

Baseline surface water monitoring at the mine site is described in Section 4.1. Surface water monitoring upslope and down-slope of the disturbance footprint during construction is proposed as described in Section 7.2.

### 7.2 Construction Monitoring

During construction, surface water quality monitoring would be conducted at sites along the ephemeral drainage lines (SW1 to SW7) (when flowing) for pH, electrical conductivity (EC), suspended solids, anions (SO<sub>4</sub>, alkalinity), cations (Na, K, Ca, Mg) and selected metals (Al, As, Cd, Cu, Co, Cr, Fe, Mn, Ni, Pb, Zn) and nutrients. Sampling would be conducted within 24 hours of a rainfall event and weekly thereafter (where safe access is available). The proposed locations of the surface water quality monitoring sites (SW1 to SW7) are shown on Figure 6.



- LEGEND**
- State Forest
  - Mining Lease Boundary (ML)
  - Tailings Storage Facility
  - Borrow Pit
  - Topsoil Stockpile
  - Infrastructure Area
  - Water Storage
  - Sediment Dam
  - Existing Open Woodland to be Maintained
  - Water Pipeline
  - Proposed Surface Water Quality Monitoring Location

**NOTE**  
 \* Monitoring to commence once Sediment Dam has been constructed.

Source: Black Range Minerals (2000); Clean TeQ (2017, 2019); NSW Department of Industry (2018); NSW Land & Property Information (2017)

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**Surface Water Monitoring Locations  
- Mine Site**

**Figure 6**

In addition, surface water quality monitoring would be conducted at all sediment dams (Figure 6) during discharge events for pH, EC, suspended solids, turbidity (Section 7.2.1).

Erosion and sediment control structures will be inspected on a regular basis and following rainfall events in order to assess the structural integrity and effectiveness of the control structures and any pumping requirements. Results of this monitoring would be used to evaluate necessary ameliorative measures.

### **7.2.1 Chemical and Hydrocarbon Storages**

Chemical and hydrocarbon storages will be inspected on a regular basis in order to assess compliance with the relevant Australian Standards, including AS 1940-2017 *The Storage and Handling of Flammable and Combustible Liquids*. Results of this monitoring would be used to evaluate necessary ameliorative measures.

### **7.2.2 Licensed Discharge Points**

EPL 21146 lists the sediment dams (Figure 6) as licensed discharged.

Surface water quality monitoring would be conducted at these licensed discharged points when discharging for pH, EC, suspended solids and turbidity in accordance with EPL 21146.

### **7.2.3 Irrigation Area**

Monitoring of the accommodation camp irrigation area would include:

- irrigation water volume monitoring, including application rates, times, duration and areas;
- regular visual monitoring for signs of runoff, waterlogging and erosion;
- annual soil characteristics monitoring; and
- annual vegetation monitoring (e.g. review of pasture condition in terms of biomass, species composition and ground cover).



#### **7.2.4 Downstream Flooding**

As described in Section 5.1.1, no significant impacts on downstream flooding are predicted during the initial Project construction activities. Notwithstanding the above, the following downstream flooding monitoring is proposed:

- flow observations at SW4 and SW6 undertaken at the same time as surface water quality monitoring (Section 7.2); and
- annual channel stability monitoring at SW4 and SW6, including:
  - documenting locations and dimensions of significant erosive or depositional features so that any subsequent changes can be evaluated;
  - establishing photographic points at representative locations, so that photos can be taken of multiple inspections in a repeatable manner; and
  - written descriptions of the stream at each of the photographic points, focussing on evidence of erosion and exposed soils.

#### **7.3 Operations Monitoring**

The surface water monitoring program for operations will be developed in a subsequent revision of this SWMP.

Water quality samples from the tailings storage facility, evaporation pond, water storage dam and runoff would be collected and analysed for pH, EC, suspended solids, anions (SO<sub>4</sub>, alkalinity), cations (Na, K, Ca, Mg) and selected metals (Al, As, Cd, Cu, Co, Cr, Fe, Mn, Ni, Pb, Zn).

## 8. CONTINGENCY PLAN

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In the event a water management performance measure for the Project (detailed in Section 5) has not been met or a performance indicator is considered to have been exceeded, Clean TeQ will implement the following Contingency Plan:

- The Clean TeQ Environmental Superintendent will report the incident in accordance with Section 10.1.
- Clean TeQ will identify an appropriate course of action with respect to the identified potential impacts or environmental consequences (if any), in consultation with specialists and relevant government agencies, as necessary. For example, contingency measures, such as, but not limited to, those described in Section 8.2.
- Clean TeQ will submit the proposed course of action to the DPIE for approval.
- Clean TeQ will implement the approved course of action to the satisfaction of the DPIE.

### 8.1 Adaptive Management

In accordance with Condition 3, Schedule 5 of Development Consent DA 374-11-00, where any exceedance of the criteria and/or performance measures outlined in Schedule 3 of Development Consent DA 374-11-00 occurs, at the earliest opportunity Clean TeQ will:

- take all reasonable and feasible measures to ensure that the exceedance ceases and does not recur;
- consider all reasonable and feasible options for remediation and submit a report to the DPIE describing these options and preferred remediation measures; and
- implement remediation measures as directed by the Secretary of the DPIE.

### 8.2 Specific Contingency Measures

Specific contingency measures for an exceedance of the water management performance measures would include:

- The conduct of additional monitoring (e.g. increase in monitoring frequency or additional sampling), which would inform further specific contingency measures.
- Implementation of adaptive management strategies (e.g. on-site reconfiguration) to better maintain separation of clean and mine waters, diversion of clean waters, storage 'as-built' designs and avoid discharge of mine waters (except in accordance with an EPL).
- The provision of a suitable offset (e.g. improvement works) if there was an environmental consequence and/or adverse surface water impacts were to result.

Clean TeQ will also implement any preferred contingency measures identified to address an incident as directed by the Secretary (Section 10.1).

## 9. REVIEW AND IMPROVEMENT OF ENVIRONMENTAL PERFORMANCE

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### 9.1 Annual Review

In accordance with Condition 5, Schedule 5 of Development Consent DA 374-11-00, Clean TeQ will review the environmental performance of the Project by the end of March each year (for the previous calendar year) to the satisfaction of the Secretary.

In relation to water management, the Annual Review will (where relevant):

- describe the development that was carried out in the relevant calendar year, and the development that is proposed to be carried out during the following calendar year;
- include a comprehensive review of the monitoring results and complaints records of the development over the past year, which includes a comparison of these results against the:
  - relevant statutory requirements, limits or performance measures/criteria;
  - monitoring results of previous years; and
  - relevant predictions in the Project Environmental Impact Statement (Black Range Minerals, 2000) and subsequent environmental assessments;
- identify any non-compliance over the last year, and describe what actions were (or are being) taken to ensure compliance;
- identify any trends in the monitoring data over the life of the development;
- identify any discrepancies between the predicted and actual impacts of the development, and analyse the potential cause of any significant discrepancies; and
- describe what measures will be implemented over the next year to improve the environmental performance of the development.

The Annual Review will be made publicly available on the Clean TeQ website.

### 9.2 Independent Environmental Audit

In accordance with Condition 10, Schedule 5 of Development Consent DA 374-11-00, an independent environmental audit of the Project will be conducted by a suitably qualified, experienced and independent team of experts whose appointment has been endorsed by the Secretary.

The independent environmental audit will assess the environmental performance of the Project and review the adequacy of this SWMP. If necessary, appropriate measures or actions to improve the environmental performance of the Project or this SWMP will be recommended.

An independent environmental audit will be conducted within one year of the commencement of the development under this consent, after 6 May 2017. The independent environmental audit, and Clean TeQ's response to the recommendations in the audit, will be made publicly available on the Clean TeQ website, in accordance with Condition 12, Schedule 5 of Development Consent DA 374-11-00.

## 10.REPORTING PROTOCOLS

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In accordance with Condition 4(g), Schedule 5 of Development Consent DA 374-11-00, Clean TeQ has developed protocols for managing and reporting the following:

- incidents;
- complaints;
- non-compliances with statutory requirements; and
- exceedances of the impact assessment criteria and/or performance criteria.

These protocols are described in detail in Clean TeQ's Environmental Management Strategy.

In accordance with Condition 9, Schedule 5 of Development Consent DA 374-11-00, Clean TeQ will provide regular reporting on the environmental performance of the Project on the Clean TeQ website. The Annual Review will be made publicly available on the Clean TeQ website to address this requirement.

### 10.1 Incident Reporting

An incident is defined as a set of circumstances that causes or threatens to cause material harm to the environment and/or breaches or exceeds the limits or performance measures/criteria in Development Consent DA 374-11-00.

In the event that review of surface water monitoring data indicates an incident has occurred, the incident will be reported in accordance with Condition 8, Schedule 5 of Development Consent DA 374-11-00. Clean TeQ will notify the Secretary and any other relevant agencies including the relevant Council immediately after it becomes aware of the incident. Clean TeQ will also notify any affected landholders of any incident that has caused, or threatens to cause, material harm to the environment.

Within seven days of the date of the incident, Clean TeQ will provide the Secretary and any other relevant agencies with a detailed report on the incident and such further reports as may be requested. The report will:

- describe the date, time and nature of the exceedance/incident;
- identify the cause (or likely cause) of the exceedance/incident;
- describe what action has been taken to date; and
- describe reasonable and feasible options to address the incident and identify the preferred option to address the incident (Section 8.1).

## 10.2 Complaints

Clean TeQ will maintain a Community Complaints Line (tel: 1800 952 277) and email address ([community@cleanteq.com](mailto:community@cleanteq.com)) for the sole purpose of receiving community contacts and complaints. The Community Complaints Line number will be available on the website and included in Clean TeQ's advertising and community communication tools. The Community Complaints line will be staffed 24 hours a day, seven days a week during construction and operations. Clean TeQ will respond to callers on the next business day. If the issue is urgent a member of the leadership team will be contacted immediately.

Clean TeQ has developed a procedure that outlines its commitment to receiving, resolving and recording complaints received from the community. Detailed records of each complaint resolution are kept in Clean TeQ's record management systems.

Complaints will be investigated within 24 hours of receipt. The cause of the complaint will be analysed and actions to resolve the complaint taken as soon as possible. In complex cases where resolution will take more than 48 hours, Clean TeQ will commit to update the community member regularly until the complaint is resolved.

In accordance with Condition 12(a), Schedule 5 of Development Consent DA 374-11-00, a complaints register will be made available on the Clean TeQ website and updated monthly.

## 10.3 Non-Compliances with Statutory Requirements

A protocol for managing and reporting non-compliances with statutory requirements has been developed as a component of Clean TeQ's Environmental Management Strategy and is described below.

Compliance with all approvals plans and procedures is the responsibility of all personnel (staff and contractors) employed on or in association with Clean TeQ and the Project.

The Clean TeQ Environmental Superintendent will undertake regular inspections, internal audits and initiate directions identifying any remediation/rectification work required, and areas of actual or potential non-compliance.

As described in Section 10.1, Clean TeQ will report incidents in accordance with Condition 8, Schedule 5 of Development Consent DA 374-11-00 and in accordance with the protocol for industry notification of pollution incidents under Part 5.7 of the POEO Act.

Clean TeQ will notify the Secretary and any other relevant agencies including the relevant Council immediately after the authorised person becomes aware of the incident which causes or threatens to cause material harm to the environment. Within seven days of the date of the incident, Clean TeQ will provide the Secretary and any other relevant agencies with a detailed report on the incident and such further reports as may be requested.

A review of compliance with all conditions in Development Consent DA 374-11-00, Mining Lease 1770 and all other approvals and licences will be undertaken prior to (and included within) each Annual Review (Section 9.1).

Additionally, in accordance with Condition 10, Schedule 5 of Development Consent DA 374-11-00, an independent environmental audit (Section 9.2) would be conducted by a suitably qualified, experienced and independent team of experts whose appointment has been endorsed by the Secretary to assess whether Clean TeQ is complying with the requirements in Development Consent DA 374-11-00, and any other relevant approvals, EPLs, and/or mining leases.

#### **10.4 Exceedances of Impact Assessment Criteria and/or Performance**

A protocol for managing and reporting exceedances of impact assessment criteria and/or performance criteria is provided in Section 8.

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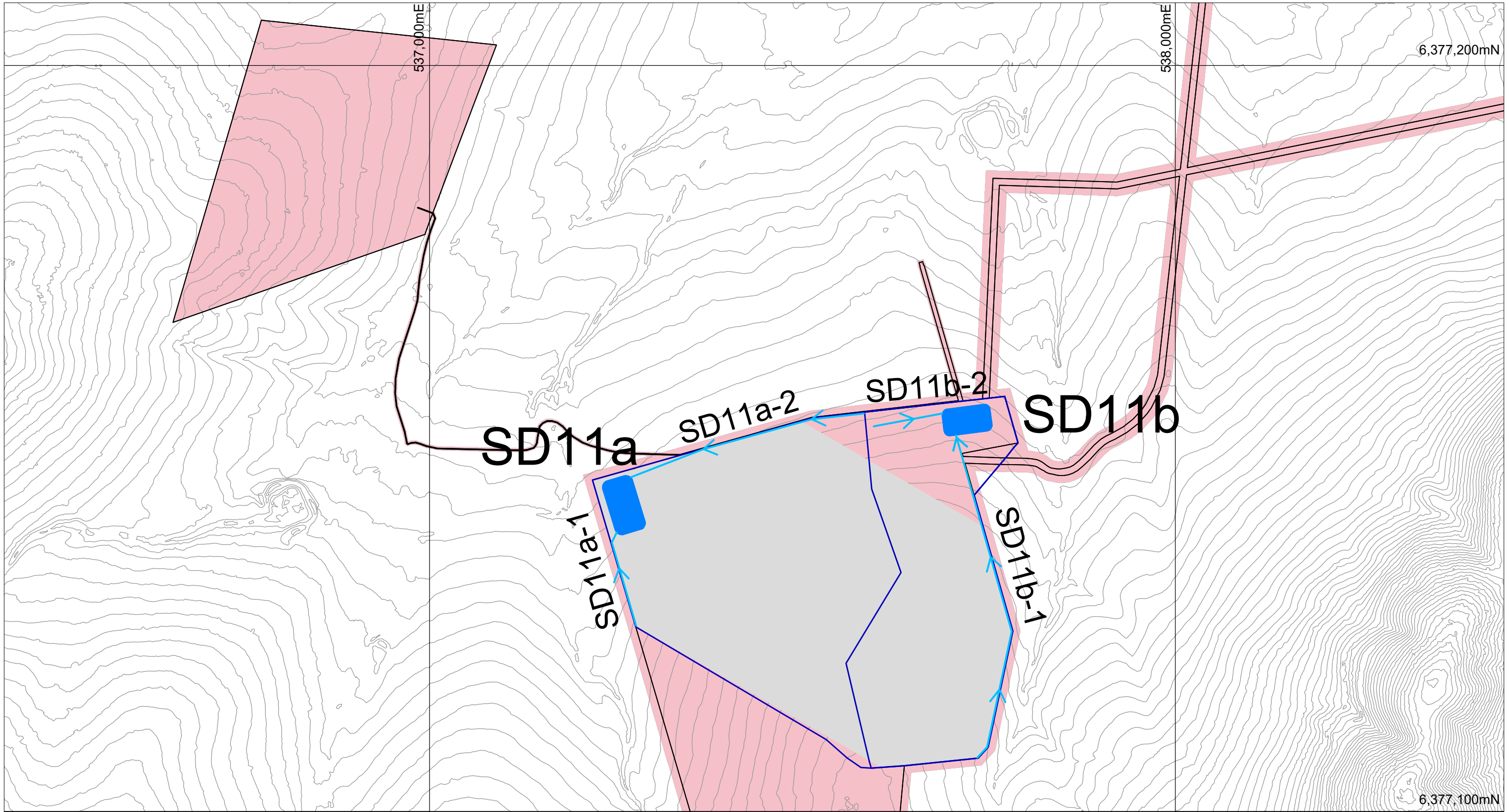
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# ATTACHMENT 1

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Erosion and Sediment Control Plans

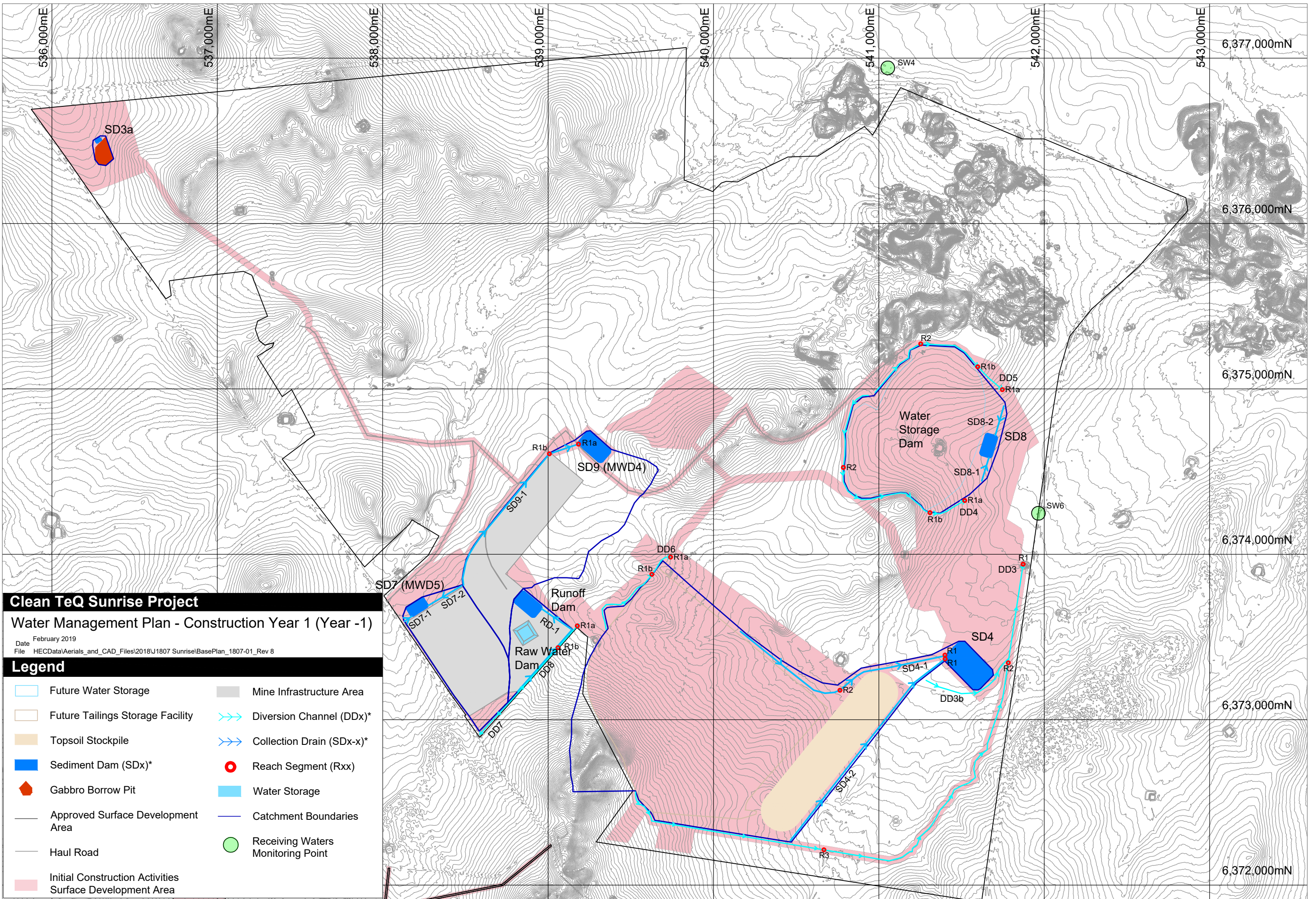


**Clean TeQ Sunrise Project**  
**Water Management Plan - Accommodation Camp**  
 Date February 2019  
 File HECData\Aerials\_and\_CAD\_Files\2018\J1807 Sunrise\BasePlan\_1807-01\_Rev 5

**Legend**

Approved Surface Development Area	Sediment Dam (SDx)*
Accommodation Camp Infrastructure Area	Collection Drain (SDx-x)*
Initial Construction Activities Surface Development Area	Catchment Boundaries

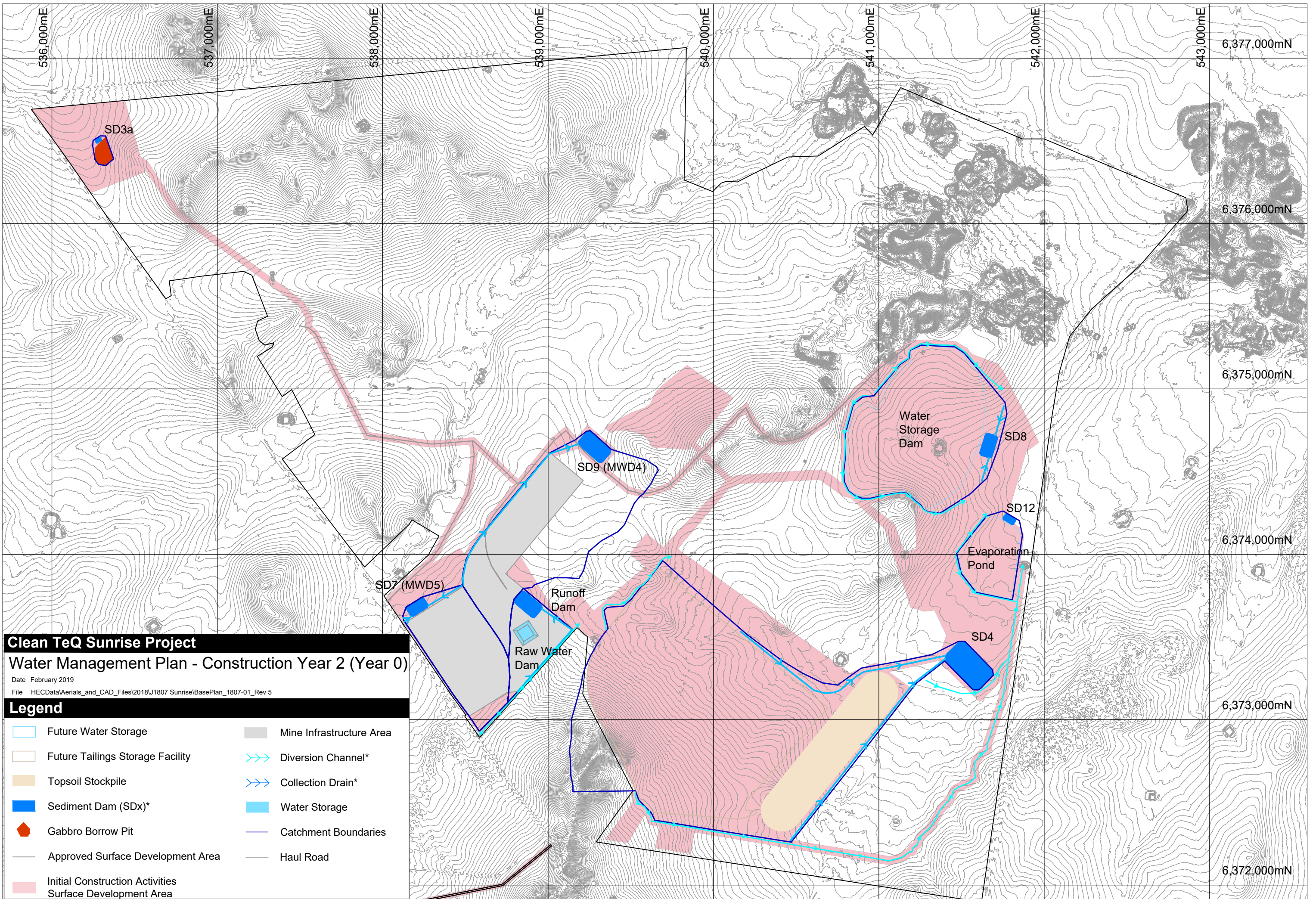
\*Layout is indicative only and subject to detailed design



**Clean TeQ Sunrise Project**  
**Water Management Plan - Construction Year 1 (Year -1)**  
 Date February 2019  
 File HECDData\Aerials\_and\_CAD\_Files\2018U1807 Sunrise\BasePlan\_1807-01\_Rev 8

Legend			
	Future Water Storage		Mine Infrastructure Area
	Future Tailings Storage Facility		Diversion Channel (DDx)*
	Topsoil Stockpile		Collection Drain (SDx-x)*
	Sediment Dam (SDx)*		Reach Segment (Rxx)
	Gabbro Borrow Pit		Water Storage
	Approved Surface Development Area		Catchment Boundaries
	Haul Road		Receiving Waters Monitoring Point
	Initial Construction Activities Surface Development Area		

\*Layout is indicative only and subject to detailed design



**Clean TeQ Sunrise Project**  
**Water Management Plan - Construction Year 2 (Year 0)**

Date February 2019  
 File HECData\Aerials\_and\_CAD\_Files\2018\J1807 Sunrise\BsePlan\_1807-01\_Rev 5

Legend			
	Future Water Storage		Mine Infrastructure Area
	Future Tailings Storage Facility		Diversion Channel*
	Topsoil Stockpile		Collection Drain*
	Sediment Dam (SDx)*		Water Storage
	Gabbro Borrow Pit		Catchment Boundaries
	Approved Surface Development Area		Haul Road
	Initial Construction Activities		
	Surface Development Area		

\*Layout is indicative only and subject to detailed design

# APPENDIX C

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Groundwater Management Plan

**Clean TeQ Sunrise Project  
Groundwater Management Plan  
2020-CTEQ-0000-66AA-0017**

11 December 2019

REVISION 1

# CONTENTS

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1.	Introduction.....	1
1.1	Purpose and Scope.....	5
1.2	Structure of the Groundwater Management Plan .....	6
2.	Groundwater Management Plan Review and Update.....	9
2.1	Consultation.....	9
2.2	Review and Update .....	9
3.	Statutory Requirements .....	11
3.1	Development Consent .....	11
3.2	Licences, Permits and Leases.....	14
3.3	Other Legislation, Policies and Guidelines.....	15
4.	Hydrogeological Setting and Baseline Data .....	19
4.1	Mine Site.....	19
4.2	Borefields .....	24
5.	Performance Measures and Performance Indicators.....	35
5.1	Trigger Levels for Investigation .....	35
6.	Groundwater Management Measures .....	38
6.1	Mine Site.....	38
6.2	Borefield Numerical Model Review.....	41
6.3	Preventative Actions.....	43
6.4	Groundwater Users – Management of Complaints.....	44
6.5	Compensatory Action.....	44
6.6	Groundwater Licensing.....	45
7.	Monitoring Programs.....	47
7.1	Mine Site.....	47
7.2	Borefields .....	49
8.	Contingency Plan.....	54
8.1	Adaptive Management.....	54
8.2	Specific Contingency Measures.....	54
9.	Review and Improvement of Environmental Performance.....	56
9.1	Annual Review.....	56
9.2	Independent Environmental Audit .....	56
10.	Reporting Protocols.....	58
10.1	Incident Reporting.....	58
10.2	Complaints .....	59
10.3	Non-Compliances with Statutory Requirements.....	59
10.4	Exceedances of Impact Assessment Criteria and/or Performance .....	60
11.	References .....	61



## FIGURES

---

Figure 1	Regional Location
Figure 2	Mine and Processing Facility General Arrangement (Initial Construction Activities)
Figure 3	Mine and Processing Facility Conceptual General Arrangement
Figure 4	Borefields and Surface Water Extraction General Arrangement
Figure 5	Existing Project Groundwater Monitoring Network and Groundwater Users – Mine Site
Figure 6	Existing Project Network – Borefields
Figure 7	Location of Existing Select Monitoring Bores and Surface Water Flow Gauges – Borefields
Figure 8	Groundwater Monitoring Program – Mine Site
Figure 9	Groundwater Monitoring Program – Borefields

## TABLES

---

Table 1	GWMP Requirements in Development Consent DA 374-11-00
Table 2	Management Plan (General) Requirements
Table 3	Groundwater Level Measurements – Mine Site
Table 4	Summary of Hydraulic Testing – Mine Site
Table 5	Lachlan Formation – Borefields Production and Pumping Bores and Monitoring Wells
Table 6	Summary of Laboratory Analysis of Groundwater Samples Collected in 2006 and 2017
Table 7	Water Management Performance Indicators – Construction
Table 8	Groundwater Quality Categories: Electrical Conductivity
Table 9	Mine Site Groundwater Monitoring Program
Table 10	Borefield Groundwater Monitoring Program
Table 11	Proposed Water Level Monitoring – Borefields [At Full Development]

## CHARTS

---

Chart 1	Hydrographs for Monitoring Bores ISMW01 and ISMW02
Chart 2	Hydrographs for Nested Piezometers at GW036083 and GW036526
Chart 3	Observed Drawdown in the Lachlan Formation (2001 to 2010)
Chart 4	Groundwater Level Observations at GW036087
Chart 5	Borefields Groundwater Quality – Electrical Conductivity versus Depth
Chart 6	Modelled Drawdowns in the Cowra and Lachlan Formations (Coffey Geosciences, 2005b)

## ATTACHMENTS

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Attachment 1 Mine Site Water Quality Results

Attachment 2 Bore Census (2018) and Registered Bore (2019) Records for Borefields and Surrounds

# 1. INTRODUCTION

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The Clean TeQ Sunrise Project (the Project)<sup>1</sup> is a nickel cobalt scandium open cut mining project situated near the village of Fifield, approximately 350 kilometres (km) west-northwest of Sydney, in New South Wales (NSW) (Figure 1).

The Project includes the establishment and operation of the following (Figure 1):

- mine (including the high pressure acid leach processing facility);
- limestone quarry;
- rail siding;
- gas pipeline;
- borefields, surface water extraction infrastructure and water pipeline;
- accommodation camp; and
- associated transport activities and transport infrastructure (e.g. the Fifield Bypass, road and construction upgrades).

Clean TeQ Sunrise Pty Ltd owns the rights to develop the Project. Clean TeQ Sunrise Pty Ltd is a wholly owned subsidiary of Clean TeQ Holdings Limited (Clean TeQ).

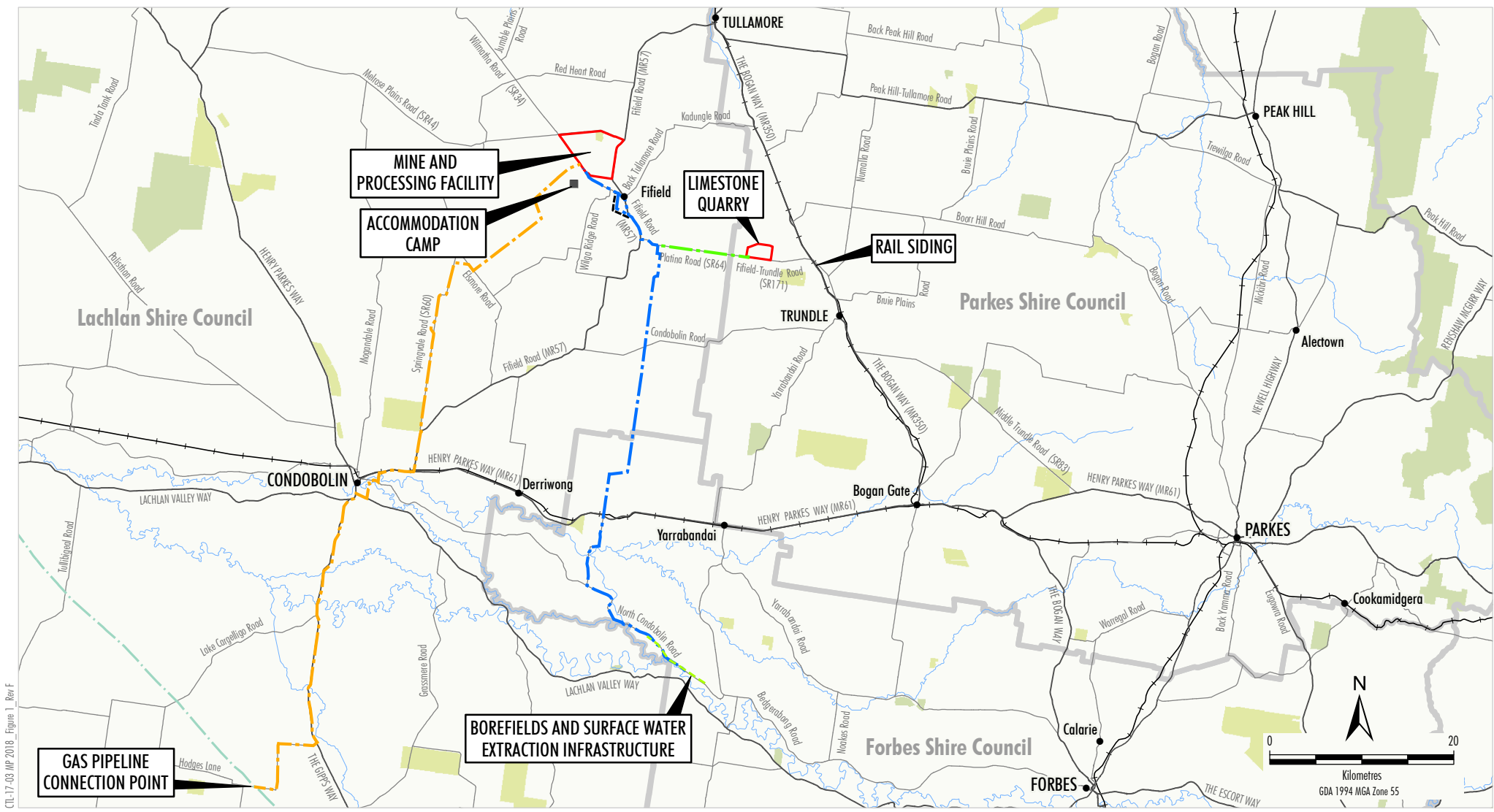
Development Consent DA 374-11-00 for the Project was issued under Part 4 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) in 2001. Six modifications to Development Consent DA 374-11-00 have since been granted under the EP&A Act:

- 2005 – to allow for an increase of the autoclave feed rate, limestone quarry extraction rate and adjustments to ore processing operations;
- 2006 – to allow for the reconfiguration of the borefields;
- 2017 (May) – to allow for the production of scandium oxide;
- 2017 (December) – to amend hazard study requirements;
- 2018 (May) – to relocate the accommodation area; and
- 2018 (December) – to implement opportunities to improve the overall efficiency of the Project.

The general arrangement for the mine layout during the initial Project construction activities and full development are shown on Figures 2 and 3.

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<sup>1</sup> The Project was previously known as the Syerston Project.



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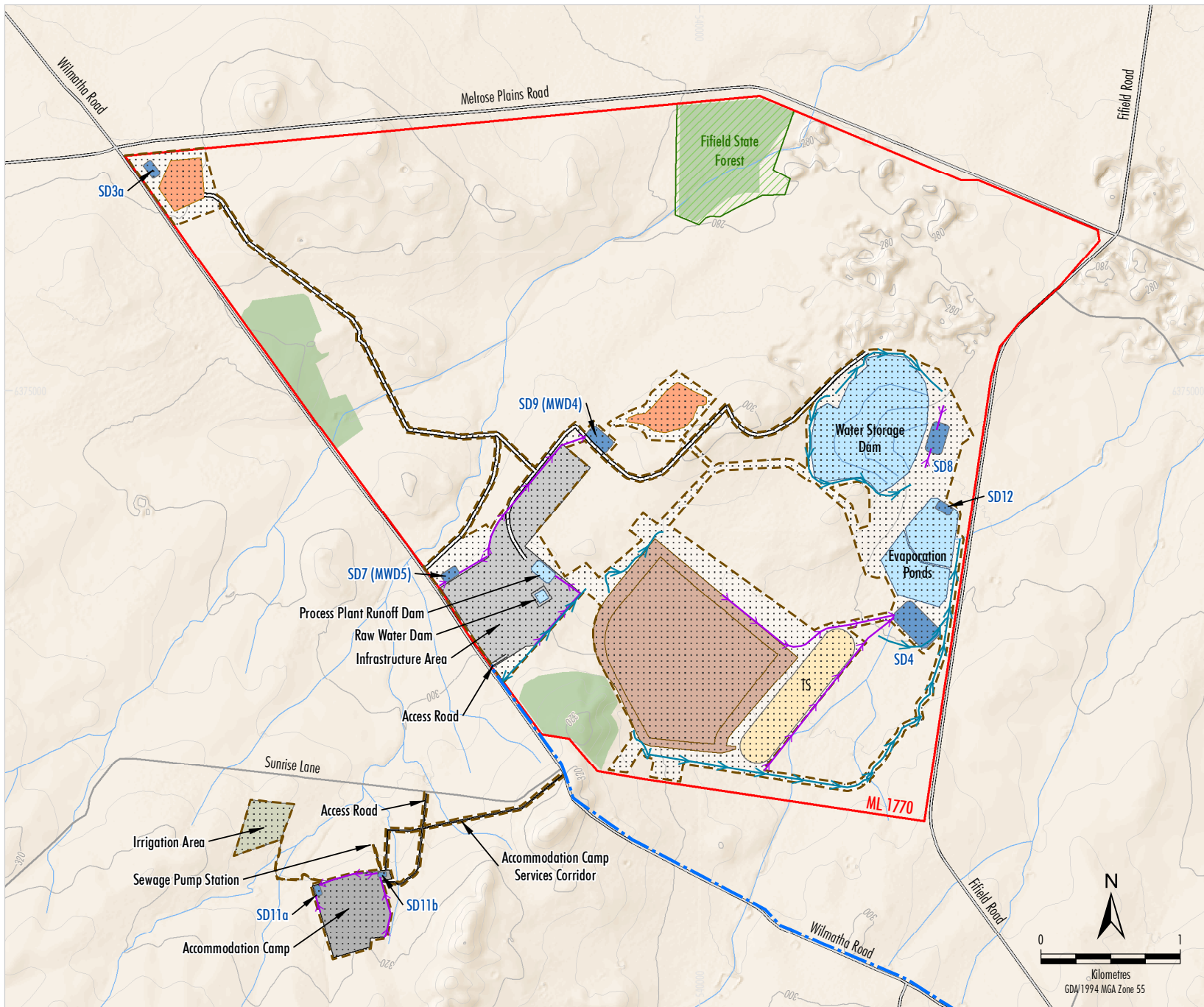


- LEGEND**
- National Park/Conservation Area
  - State Forest
  - Local Government Boundary
  - Railway
  - Existing Gas Pipeline
  - Mining Lease Boundary (ML)
  - Fiffeld Bypass
  - Gas Pipeline
  - Water Pipeline
  - Limestone Quarry Water Pipeline
  - Borefield Infrastructure Corridor

Source: Black Range Minerals (2000); Clean TeQ (2017, 2018); NSW Department of Industry (2018); NSW Land & Property Information (2017); Office of Environment and Heritage NSW (2017)

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**CLEAN TEQ SUNRISE PROJECT**  
Regional Location

**Figure 1**



- LEGEND**
- State Forest
  - Mining Lease Boundary (ML)
  - Initial Construction Activities
  - Surface Development Area
  - Tailings Storage Facility
  - Borrow Pit
  - Topsoil Stockpile
  - Infrastructure Area
  - Water Storage
  - Sediment Dam
  - Existing Open Woodland to be Maintained
  - Water Pipeline
  - Collection Drain
  - Diversion Channel

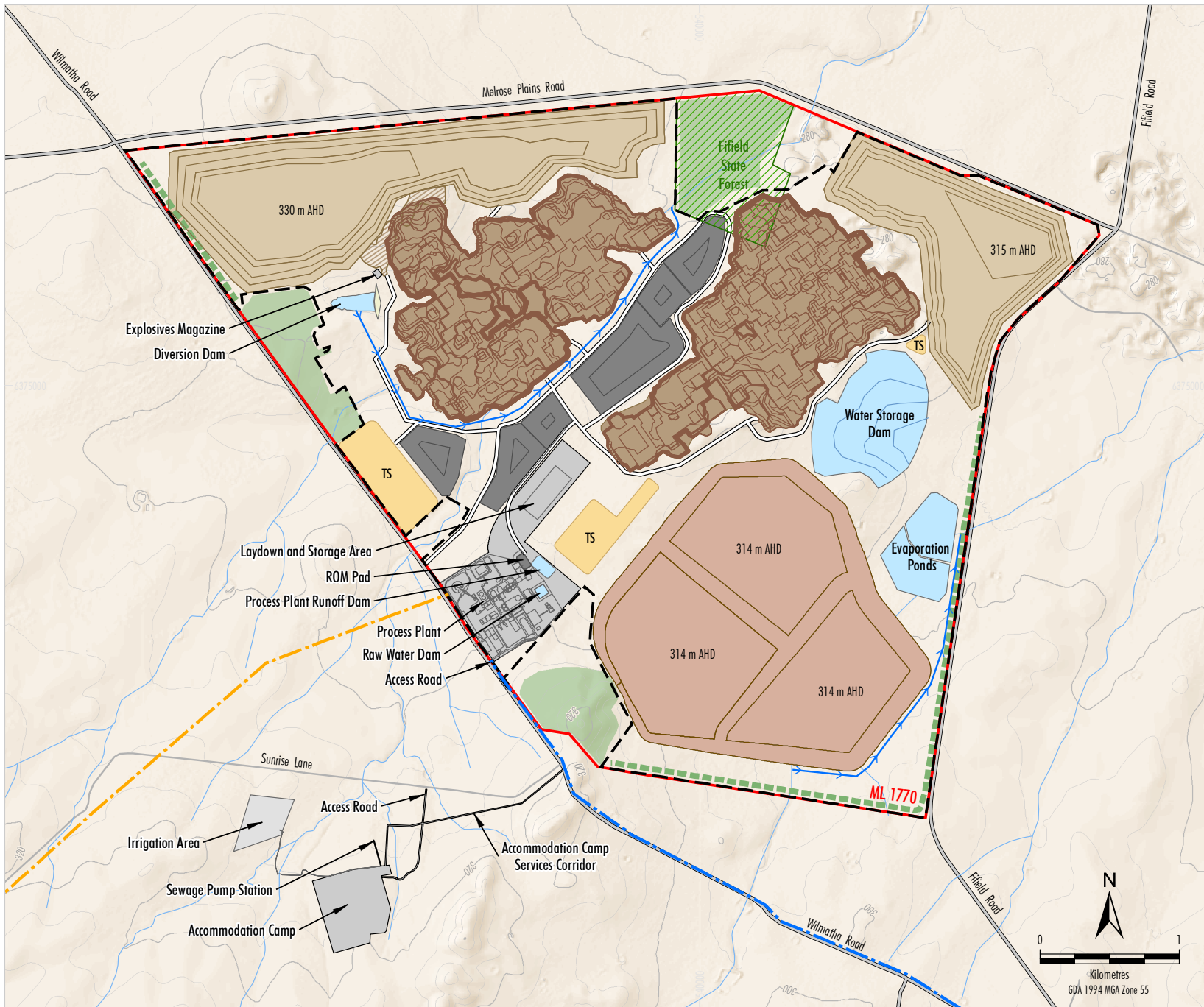
Source: Black Range Minerals (2000); Clean TeQ (2017, 2019); NSW Department of Industry (2018); NSW Land & Property Information (2017)

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CLEAN TEQ SUNRISE PROJECT

**Mine and Processing Facility  
General Arrangement  
(Initial Construction Activities)**

**Figure 2**



- LEGEND**
- State Forest
  - Mining Lease Boundary (ML)
  - Approved Surface Development Area
  - Open Cut Pit (Scandium Oxide)
  - Open Cut Pit
  - Waste Rock Emplacement
  - Tailings Storage Facility
  - Topsoil Stockpile
  - Ore Stockpile
  - Mine Infrastructure Area
  - Diversion Structure
  - Vegetation Screening
  - Existing Open Woodland to be Maintained
  - Gas Pipeline
  - Water Pipeline

Source: Black Range Minerals (2000); Clean TeQ (2017, 2019); NSW Department of Industry (2018); NSW Land & Property Information (2017)

  
**CLEAN TEQ SUNRISE PROJECT**  
**Mine and Processing Facility**  
**Conceptual General Arrangement**



**Figure 3**

## 1.1 Purpose and Scope

This Groundwater Management Plan (GWMP) has been prepared by Clean TeQ in accordance with the requirements of Condition 30(c), Schedule 3 of Development Consent DA 374-11-00 (Table 1).

**Table 1** – GWMP Requirements in Development Consent DA 374-11-00

Development Consent DA 374-11-00 Schedule 3	Section Where Addressed in this GWMP
30. Prior to carrying out any development after 6 May 2017, the Applicant must prepare a Water Management Plan for the development in consultation with DoL Lands & Water and the EPA, and to the satisfaction of the Secretary. This plan must include:	The Water Management Plan (WMP)
c) a Groundwater Management Plan, that includes: <ul style="list-style-type: none"> <li>• baseline data on groundwater levels, yield and quality in the region and privately-owned groundwater bores that could be affected by the development in the vicinity of the borefields;</li> <li>• groundwater assessment criteria, including trigger levels for investigating any potentially adverse groundwater impacts associated with the development in the vicinity of the borefields;</li> <li>• a program to monitor and report on:               <ul style="list-style-type: none"> <li>- groundwater inflows into the open cut pits, if relevant;</li> <li>- the seepage/leachate from the tailings storage facility and evaporation ponds; and</li> <li>- the impacts of the development on:                   <ul style="list-style-type: none"> <li>▪ groundwater supply of any potentially affected landholders, particularly around the borefields;</li> <li>▪ regional and local aquifers; and</li> <li>▪ post-mining groundwater recovery;</li> </ul> </li> </ul> </li> <li>• a plan to respond to any exceedances of the groundwater assessment criteria, and mitigate any adverse impacts of the development;</li> </ul>	This GWMP  Section 4  Section 5  Section 7 to 9  Sections 7 to 9
31. The Applicant must implement the approved Water Management Plan for the development.	Section 3.1.1

On 5 July 2018, the Secretary of the Department of Planning, and Environment (now the Department Planning, Industry and Environment [DPIE]) (the Secretary) approved the progressive submission of environmental management plans for the Project in accordance with Condition 12, Schedule 2 of Development Consent DA 374-11-00. The scope of this GWMP is specifically related to the following initial Project construction activities:

- development of the mine, including:
  - site establishment and earthworks;
  - construction of site access roads and haul roads;
  - processing facility earthworks;
  - establishment of temporary facilities required for construction activities (e.g. offices, lay down areas, communications infrastructure);
  - construction of the mine infrastructure area including the offices, workshops, warehouse, laboratory and amenities buildings, fuel storage areas, potable water treatment plant and car parking facilities;
  - construction of the tailings storage facility and evaporation pond;
  - construction of water management infrastructure including the raw water dam, water storage dam and sediment dams;
  - construction and operation of the concrete batch plant;

- development of gravel and clay borrow pits (including blasting and crushing);
- installation of appropriate fencing and barriers for public safety and security for mining and construction; and
- other associated minor infrastructure, plant, equipment and activities.
- development and operation of the accommodation camp;
- installation of the borefields, surface water extraction infrastructure and water pipeline<sup>2</sup>; and
- road upgrades.

The initial construction activities would not include any development of the limestone quarry, rail siding or gas pipeline.

No groundwater or surface water extraction would occur as part of the initial Project construction activities under this version GWMP. The GWMP will be updated prior to groundwater extraction from the borefields (Section 2).

The approximate extent of the initial Project construction activities at the mine site and accommodation camp are shown on Figure 2. The approved water pipeline alignment and borefields and surface water extraction general arrangement is shown on Figures 1 and 4 respectively.

## 1.2 Structure of the Groundwater Management Plan

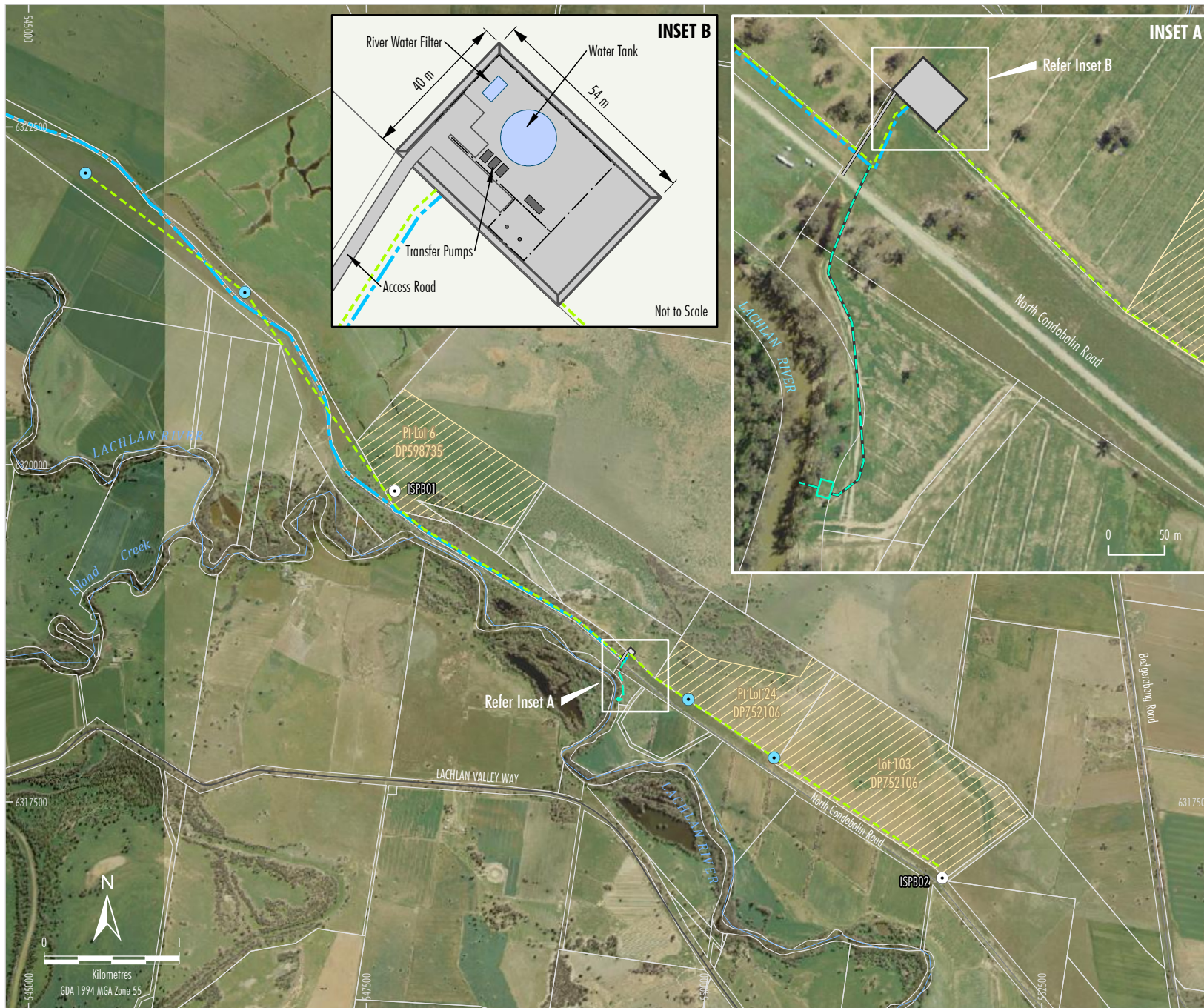
The remainder of this GWMP is structured as follows:

- Section 2: Describes the review and update of the GWMP.
- Section 3: Outlines the statutory requirements applicable to the GWMP.
- Section 4: Provides an overview of the hydrogeological setting and baseline data.
- Section 5: Details the performance measures and performance indicators that will be used to assess the Project, including trigger levels.
- Section 6: Provides a description of the Project borefields layout and other groundwater management measures.
- Section 7: Details the groundwater monitoring program.
- Section 8: Provides a Contingency Plan to manage any unpredicted impacts and their consequences.
- Section 9: Describes the program to review and report on the effectiveness of management measures and improvement of environmental performance.

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<sup>2</sup> The water pipeline includes the Fifield Bypass and Alternative Pipeline Route alignments.





- LEGEND**
- Property Boundary
  - Borefield Location
  - Water Pipeline
  - Borefield Infrastructure Corridor \*
  - Surface Water Infrastructure Corridor \*
  - Pump Station
  - Transfer Station
  - Access Road
  - Production Bore (constructed)
  - Production Bore (not constructed)
- \* Infrastructure Corridor includes linking pipeline, access road and electricity transmission line.

Source: Clean TeQ (2017, 2019); Ivanplats Syerston (2005); NSW Land & Property Information (2018)  
 NSW Imagery: © Department of Finance, Services & Innovation (2018)

Figure 4

- Section 10: Describes the protocol for management and reporting of incidents, complaints and non-compliances with statutory requirements.
- Section 11: Lists the references cited in this GWMP.

## 2. GROUNDWATER MANAGEMENT PLAN REVIEW AND UPDATE

---

### 2.1 Consultation

This GWMP was provided to the NSW Environment Protection Authority (EPA) and the Department of Industry – Lands & Water (DoI - L&W) for the purposes of consultation on 20 June 2018 and 25 June 2018, respectively, in accordance with Condition 30, Schedule 3 of Development Consent DA 374-11-00.

The DoI – L&W provided comments on 26 September 2018. These comments have been incorporated into this GWMP. The EPA indicated on 19 October 2018 that it had no comments on the GWMP.

The revised GWMP, incorporating the DoI – L&W’s review comments, was provided to the DoI – L&W on 4 March 2019. The DoI – L&W indicated on 12 April 2019 that it had no further comments on this GWMP.

### 2.2 Review and Update

Consistent with the Secretary’s approval for the progressive submission of environmental management plans, the GWMP would be re-submitted and approved prior to the commencement of activities not included in the scope of this GWMP. This GWMP includes construction of the remaining four approved production bores and no extraction from the two existing production bores. The GWMP will be updated prior to groundwater extraction from the borefields in the following stages:

- Construction Stage (after the initial construction phase) – allow for the extraction of up to 900 million litres per year (ML/year) from the two existing production bores.
- Operations Stage – allow for the extraction of more than 900 ML/year from the approved six production bores.

In accordance with Condition 6, Schedule 5 of Development Consent DA 374-11-00, this GWMP will be reviewed, and if necessary revised (to the satisfaction of the Secretary), within three months of the submission of:

- an Annual Review (Condition 5, Schedule 5);
- an incident report (Condition 8, Schedule 5);
- an independent environmental audit (Condition 10, Schedule 5); or
- any modification to the conditions of Development Consent DA 374-11-00 (unless the conditions require otherwise).

The reviews would be undertaken to ensure the GWMP is updated on a regular basis and to incorporate any recommended measures to improve the environmental performance of the Project.

Within four weeks of conducting a review of the GWMP, the Secretary will be advised of the outcomes of the review and any revised documents submitted to the Secretary for approval.

If agreed with the Secretary, a revision to the GWMP required under Development Consent DA 374-11-00 may be prepared without undertaking consultation with all parties nominated under the relevant condition of Development Consent DA 374-11-00.

The revision status of this GWMP is indicated on the title page of each copy.

The approved GWMP will be made publicly available on the Clean TeQ website, in accordance with Condition 12, Schedule 5 of Development Consent DA 374-11-00.

### 3. STATUTORY REQUIREMENTS

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Clean TeQ's statutory obligations relevant to groundwater management are contained in:

- the conditions of Development Consent DA 374-11-00;
- relevant licences and permits, including conditions attached to mining leases; and
- other relevant legislation.

Obligations relevant to this GWMP are described below.

#### 3.1 Development Consent

##### 3.1.1 GWMP Requirements

Condition 30(c), Schedule 3 of Development Consent DA 374-11-00 requires the preparation of a GWMP. Table 1 presents these requirements and indicates where they are addressed in this GWMP.

In accordance with the requirements of Condition 30, Schedule 3 of Development Consent DA 374-11-00 (Table 1), this GWMP is included as a component of the WMP (Appendix C of the WMP).

In accordance with Condition 31, Schedule 3 of Development Consent DA 374-11-00, Clean TeQ will implement the Water Management Plan (including the GWMP).

##### 3.1.2 Management Plan (General) Requirements

In addition to the GWMP requirements prescribed in Condition 30(c), Schedule 3; Condition 4, Schedule 5 of Development Consent DA 374-11-00 outlines the management plan (general) requirements that are also applicable to the preparation of this GWMP.

Table 2 presents these requirements and indicates where each is addressed within this GWMP. As noted, the Secretary may waive some of these requirements if they are unnecessary or unwarranted for particular management plans.

**Table 2 – Management Plan (General) Requirements**

Development Consent DA 374-11-00 Schedule 5	GWMP Section
<b>Management Plan Requirements</b>	
4. <i>The Applicant must ensure that the management plans required under this consent are prepared in accordance with any relevant guidelines, are consistent with other plans prepared for other stakeholders, and include:</i>	
a) <i>detailed baseline data;</i>	Section 4
b) <i>a description of:</i>	
• <i>the relevant statutory requirements (including any relevant approval, licence or lease conditions);</i>	Section 3
• <i>any relevant limits or performance measures/criteria;</i>	Section 5
• <i>the specific performance indicators that are proposed to be used to judge the performance of, or guide the implementation of, the development or any management measures;</i>	Section 5
c) <i>a description of the measures that would be implemented to comply with the relevant statutory requirements, limits, or performance measures/criteria;</i>	Section 6
d) <i>a program to monitor and report on the:</i>	
• <i>impacts and environmental performance of the development;</i>	Sections 7 to 9
• <i>effectiveness of any management measures (see c above);</i>	
e) <i>a contingency plan to manage any unpredicted impacts and their consequences;</i>	Section 8
f) <i>a program to investigate and implement ways to improve the environmental performance of the development over time;</i>	Section 9
g) <i>a protocol for managing and reporting any:</i>	
• <i>incidents;</i>	Section 10.1
• <i>complaints;</i>	Section 10.2
• <i>non-compliances with statutory requirements; and</i>	Section 10.3
• <i>exceedances of the impact assessment criteria and/or performance criteria; and</i>	Sections 10.4
h) <i>a protocol for periodic review of the plan.</i>	Section 2
<i>Note: The Secretary may waive some of these requirements if they are unnecessary or unwarranted for particular management plans.</i>	

### 3.1.3 Water Management Performance Measures

Table 9 in Development Consent DA 374-11-00 prescribes the water management performance measures for the Project, as follows:

- **Water Management – General**
  - Maintain separation between clean and mine water management systems.
  - Minimise the use of clean water on-site.
- **Construction and Operation of Infrastructure**
  - Design, install and maintain erosion and sediment controls generally in accordance with the series *Managing Urban Stormwater: Soils and Construction including Volume 1* (Landcom, 2004), *Volume 2A – Installation of Services* (Department of Environment and Climate Change [DECC], 2008a) and *Volume 2C – Unsealed Roads* (DECC 2008b).
  - Design, install and maintain infrastructure within 40 metres (m) of watercourses generally in accordance with the *Guidelines for Controlled Activities on Waterfront Land* (Department of Primary Industries [DPI], 2012), or its latest version.

- Design, install and maintain any creek crossings generally in accordance with the Policy and *Guidelines for Fish Habitat Conservation and Management* (DPI, 2013) and *Why Do Fish Need to Cross the Road? Fish Passage Requirements for Waterway Crossings* (Fairfull, S. and Witheridge, G., 2003), or their latest versions.
- **Clean Water Diversion Infrastructure**
  - Maximise the diversion of clean water around disturbed areas on-site.
  - Design, construct and maintain the clean water diversions to capture and convey the 100 year, peak flow rainfall event.
- **Sediment Dams (Mine and Limestone Quarry)**
  - Design, install and/or maintain the dams generally in accordance with the series *Managing Urban Stormwater: Soils and Construction – Volume 1* (Landcom, 2004) and *Volume 2E Mines and Quarries* (DECC, 2008c).
- **Mine and Limestone Quarry Water Storages**
  - Design, install and/or maintain mine and limestone water storage infrastructure to ensure no discharge of mine or limestone quarry water off-site (except in accordance with an EPL).
  - On-site storages (including mine infrastructure dams, groundwater storage and treatment dams) are suitably designed, installed and/or maintained to minimise permeability.
  - Ensure that the floor and side walls of the tailings storage facility, Evaporation Basin and Surge Dam are designed with a minimum of a 900 mm clay or modified soil liner with a permeability of no more than  $1 \times 10^{-9}$  metres per second (m/s), or a synthetic (plastic) liner of 1.5 mm minimum thickness with a permeability of no more than  $1 \times 10^{-14}$  m/s (or equivalent).
  - Design, install and maintain a seepage interception system in the Tailings Storage Facility embankments in accordance with Dams Safety Committee (DSC) guidelines.
  - Design, install and maintain the water storages to capture and convey the 100 year, 72-hour Average Recurrence Interval (ARI) rainfall event.
  - Design, install and/or maintain the facilities to meet the requirements of the DSC.
  - The design of the tailings storage facility should conform to:
    - DSC3A – Consequence Categories for Dams (DSC, 2015); and
    - DSC3F – Tailings Dams (DSC, 2012).
- **Chemical and Hydrocarbon Storage**
  - Chemical and hydrocarbon products to be stored in bunded areas in accordance with the relevant Australian Standards.
- **Irrigation Area**
  - Manage the irrigation area in accordance with the EPA's *Environmental Guidelines: Use of Effluent by Irrigation* (Department of Environment and Conservation [DEC], 2004).

Clean TeQ will undertake the Project in accordance with these performance measures.

### 3.1.4 Notification Requirements

In accordance with Condition 10, Schedule 2 of Development Consent DA 374-11-00, Clean TeQ will notify the DPIE, LSC, FSC and PSC in writing of the day which the:

- commissioning of the borefields starts;
- development of the water pipeline starts; and
- commissioning of the water pipeline starts.

## 3.2 Licences, Permits and Leases

In addition to the requirements of Development Consent DA 374-11-00, all activities at or in association with the Project will be undertaken in accordance with the following licences, permits and leases which have been issued or are pending issue:

- Mining Lease 1770 sought and issued by the NSW Minister for Resources under the NSW *Mining Act, 1992*.
- Mining Operations Plan(s) submitted and approved by the NSW Division of Resources and Geoscience.
- Environment Protection Licence (EPL) 21146 issued by the EPA under the NSW *Protection of the Environment Operations Act 1997* (POEO Act).
- Water supply works, water use approvals and water access licences (WALs) issued by Dol – L&W under the NSW *Water Management Act 2000* including:
  - Water Supply Works Approval 70CA614098 for the Project borefields.
  - WAL 32068 in the Upper Lachlan Alluvial Groundwater Source (Upper Lachlan Alluvial Zone 5 Management Zone) for 3,154 share components under the *Water Sharing Plan for the Lachlan Unregulated and Alluvial Water Sources 2012*.
  - WAL 39837 in the Upper Lachlan Alluvial Groundwater Source (Upper Lachlan Alluvial Zone 5 Management Zone) for 766 share components under the *Water Sharing Plan for the Lachlan Unregulated and Alluvial Water Sources 2012*.
  - WAL 28681 in the Lachlan Fold Belt Murray-Darling Basin (MDB) Groundwater Source (Lachlan Fold Belt MDB [Other] Management Zone), for 243 share components under the *Water Sharing Plan for the NSW Murray Darling Basin Fractured Rock Groundwater Sources 2011*.
  - WAL 6679 in the Lachlan Regulated River Water Source, for 123 share components (General Security) under the *Water Sharing Plan for the Lachlan Regulated River Water Source 2016*.



- WAL 1798 in the Lachlan Regulated River Water Source, for 300 share components (General Security) under the *Water Sharing Plan for the Lachlan Regulated River Water Source 2016*.
- WAL 42370 in the Lachlan Regulated River Water Source, for zero share components (High Security) under the *Water Sharing Plan for the Lachlan Regulated River Water Source 2016*.
- Groundwater licences for monitoring bores under the *Water Management Act 2000*.
- Aboriginal Heritage Impact Permits (AHIP #C0003049 and AHIP #C0003887) issued by the Office of Environment and Heritage (OEH) under the NSW *National Parks and Wildlife Act 1974*.
- Mining and workplace health and safety related approvals granted by the NSW Department of Industry and SafeWork NSW.
- Permits under the *Roads Act 1993*.
- Heavy Vehicle Authorisation Permit 119039 issued by the National Heavy Vehicle Regulator under the *Heavy Vehicle National Law NSW*.
- Crown Land Licences issued under the *Crown Land Management Act 2016*.

### 3.3 Other Legislation, Policies and Guidelines

Clean TeQ will conduct the Project consistent with the requirements of Development Consent DA 374-11-00 and any other legislation that is applicable to an approved Part 4 Project under the EP&A Act.

In addition to the statutory obligations described in Sections 3.1 and 3.2, the following NSW Acts (and their Regulations) may be applicable to the conduct of the Project:

- *Aboriginal Land Rights Act 1983*;
- *Biodiversity Conservation Act 2016*;
- *Biosecurity Act 2015*;
- *Crown Land Management Act 2016*;
- *Contaminated Land Management Act 1997*;
- *Dams Safety Act 2015*;
- *Dangerous Goods (Road and Rail Transport) Act 2008*;
- *Energy and Utilities Administration Act 1987*;
- EP&A Act;
- *Fisheries Management Act 1994*;
- *Forestry Act 2012*;
- *Local Government Act 1993*;
- *Mining Act 1992*;
- *National Parks and Wildlife Act 1974*;

- *Pipelines Act 1967;*
- *POEO Act;*
- *Rail Safety (Adoption of National Law) Act 2012;*
- *Roads Act 1993;*
- *Soil Conservation Act 1938;*
- *Water Act 1912;*
- *Water Management Act 2000;*
- *Work Health and Safety Act 2011; and*
- *Work Health and Safety (Mines and Petroleum Sites) Act 2013.*

Commonwealth Acts which may also be applicable to the conduct of the Project include:

- *Environment Protection and Biodiversity Conservation Act 1999; and*
- *Native Title Act 1993.*

Relevant licences or approvals required under these Acts will be obtained as required.

Further details relating to the above NSW Acts regulated by DoI – L&W and EPA, and other relevant water policy and guideline documentation relevant to this GWMP is provided in the following sub-sections.

### **3.3.1 Water Management Act 2000**

As water sharing plans have commenced under the *Water Management Act 2000* for all groundwater systems within which the Project lies, the *Water Management Act 2000* is relevant to groundwater licensing considerations for the Project. The following water sharing plans have commenced under the *Water Management Act 2000* for all groundwater systems within which the Project lies:

#### Mine (including Processing Facility)

- *Water Sharing Plan for the NSW Murray Darling Basin Fractured Rock Groundwater Sources 2011.*

#### Borefields

- *Water Sharing Plan for the Lachlan Unregulated and Alluvial Water Sources 2012.*

The *Water Management Act 2000* incorporates the provisions of various prior Acts relating to the management of surface and groundwater in NSW and provides a single statute for regulation of water access, use and works (e.g. pumps or bores) that affect the licensing of surface water and alluvial and non-alluvial (i.e. fractured rock and porous rock) groundwater in the vicinity of the Project.

### **3.3.2 Water Act 1912**

As water sharing plans have commenced under the *Water Management Act 2000* for all groundwater systems within which the Project lies (Section 3.3.1), the *Water Act 1912* is not relevant to groundwater licensing considerations for the Project.

### **3.3.3 Protection of the Environment Operations Act 1997**

Clean TeQ holds EPL 21146 for the Project.

In accordance with Condition 27, Schedule 3 of Development Consent DA 374-11-00, unless EPL 21146 authorises otherwise, the Project will be carried out to comply with Section 120 of the POEO Act.

### **3.3.4 Aquifer Interference Policy**

The *NSW Aquifer Interference Policy* (NSW Government, 2012) has been developed by the NSW Government as a component of the NSW Government's Strategic Regional Land Use Policy. The Aquifer Interference Policy applies statewide and details water licence and impact assessment requirements. The Aquifer Interference Policy has been developed to ensure equitable water sharing between various water users and proper licensing of water taken by aquifer interference activities such that the take is accounted for in the water budget and water sharing arrangements. The Aquifer Interference Policy also enhances existing regulation, contributing to a comprehensive framework to protect the rights of all water users and the environment in NSW.

The *NSW Aquifer Interference Policy* (NSW Government, 2012) includes minimal impact considerations relating to water table and groundwater pressure drawdown and changes in groundwater and surface water quality. Where relevant, these minimal impact considerations have informed the groundwater impact trigger levels (i.e. more than 2 m drawdown) (Section 5.1).

### **3.3.6 National Water Quality Management Strategy/ANZECC & ARMCANZ (2000)**

The National Water Quality Management Strategy is a joint national approach to improving water quality in Australian and New Zealand waterways. The ANZECC water quality guidelines (ANZECC & ARMCANZ, 2000) have been considered where applicable in this GWMP (Section 5.1.2).

### **3.3.7 Australian Standard 1940-2017**

Australian Standard (AS) 1940-2017 *The Storage and Handling of Flammable and Combustible Liquids* sets out requirements and recommendations for the safe storage and handling of flammable liquids of dangerous goods (Class 3) and also provides requirements and recommendations for the storage and handling of combustible liquids. It also provides minimum acceptable safety requirements for storage facilities, operating procedures, emergency planning and fire protection.

AS 1940-2017 have been considered where applicable in this GWMP.

## 4. HYDROGEOLOGICAL SETTING AND BASELINE DATA

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### 4.1 Mine Site

#### 4.1.1 Local Geology

Previous hydrogeological investigations for the Project have encountered the following geological formations within the mine site and immediate surrounds (Golder Associates [Golder], 2017):

- Laterite;
- Ultrabasic intrusive rocks (pyroxenite, gabbro, diorite); and
- Residual soils/alluvial (including palaeochannel deposits).

Residual soil/alluvial covers up to 2 m of low-lying area of the mine site (Golder, 2017). In addition, an unsaturated palaeochannel exists through the mine site in a north-easterly direction (encountered in several boreholes [GAM 07, GAM 09 and GAM 16 – Section 4.1.2]). The palaeochannel is up to 1,500 m wide and 35 m deep and comprises silts, clays, gravels, quartz and rock fragments (Golder, 2017).

The residual soil/alluvium is generally underlain by highly and slightly weathered ultrabasic intrusive rocks including pyroxenite, gabbro and diorite. The average thickness of the highly and slightly weathered rock stratum are reported as 11 m and 13 m, respectively (Golder, 2017).

The mine site is formed predominantly of an oblate Dunite core intrusion approximately 2 km north-south by 3 km east-west which is surrounded by ultramafic and mafic rocks (gabbro, diorite and olivine pyroxenite) and Laterite. The deposit targeted for mining contains resource grade nickel and cobalt mineralisation within the Laterite profile overlying the Dunite core intrusion.

The Girilambone Group forms the basement rock beneath the three geological formations. The bedrock is mostly dominated by fine quartz sandstone, siltstones and shale, mostly metamorphoses to quartzite, phyllite and schist (Golder, 2017). The occurrence of groundwater within the bedrock (slightly weathered and fresh rock) is expected to be limited to secondary permeability such as joints, fault/shear zones or other geological discontinuities in the rock mass (Coffey, 2018a).

#### 4.1.2 Groundwater Levels

A number of groundwater monitoring sites have been established at the mine site and surrounds and are shown on Figure 5. Generally, groundwater levels are 30 m to 60 m below ground level and follow the surface topography, being highest in the western area of the mine site. The open cut pits will have an average depth of 35 m with localised deeper areas up to approximately 55 m.

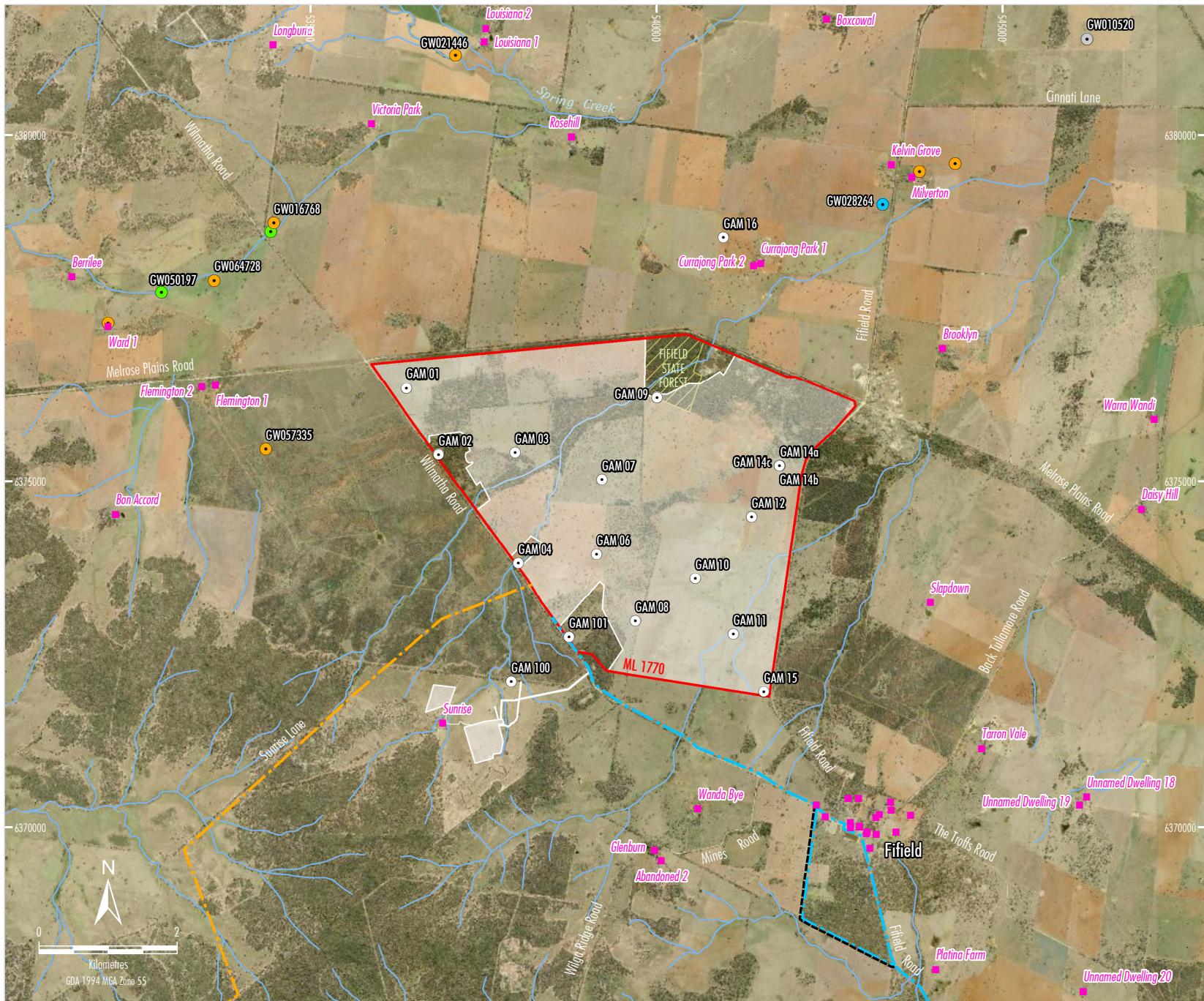
Four groundwater level measurements (December 2016, June 2017, June 2018 and September 2018) were recorded at the monitoring sites and the results are summarised in Table 3. Continuous loggers have been installed in these monitoring sites.

**Table 3** – Groundwater Level Measurements – Mine Site

Bore ID	Easting (m)	Northing (m)	TOC (mAHD)	Standing Water Level Measurement (mAHD)			
				Dec 2016	Jun 2017	Jun 2018	Sep 2018
GAM 01	536383	6376352	301.79	272.87	276.38	274.33	273.75
GAM 02	536851	6375388	301.00	268.64	268.97	269.90	269.91
GAM 03	537953	6375460	293.98	247.28	247.73	248.47	248.54
GAM 04	538007	6373817	293.36	263.73	264.13	264.03	263.81
GAM 06	539132	6373939	295.12	249.14	249.67	250.42	250.37
GAM 07	539211	6375016	289.81	-	242.55	243.32	243.45
GAM 08	539695	6372982	294.33	244.38	248.58	244.39	244.36
GAM 09	540003	6376210	280.30	237.98	238.69	239.68	239.67
GAM 10	540563	6373602	283.83	249.53	249.82	250.78	250.43
GAM 11	541109	6372792	282.96	241.86	242.32	243.62	243.69
GAM 12	541376	6374443	281.08	250.31	251.99	252.38	252.15
GAM 14a	541787	6375224	283.42	243.8	244.59	245.32	244.82
GAM 14b	541782	6375225	283.53	231.28	232.3	233.71	233.88
GAM 14c	541776	6375225	283.69	250.88	250.63	249.80	249.46
GAM 15	541551	6371961	294.83	239.12	239.68	240.57	240.55
GAM 16	540976	6378523	273.54	216.19	216.79	218.42	218.07
GAM 100	537901	6372105	307.37	-	-	257.15	257.20
GAM 101	538740	6372750	308.29	-	-	257.12	257.12

mAHD – metres Australian Height Datum

Groundwater enters the mine site from the west and flows either south-east towards the paleochannel or north-east following the lowering topography. A groundwater divide is interpreted to exist beneath the topographical ridge in the (centre) eastern area of the site (Golder, 2017).



**LEGEND**

- State Forest
- Mining Lease Boundary (ML)
- Approved Surface Development Area
- Fife Road Bypass
- Gas Pipeline
- Water Pipeline
- Dwelling
- Project Monitoring Bore
- Private Bores
- Stock
- Stock, Irrigation
- Stock, Domestic
- Unknown Purpose

Source: Black Range Minerals (2005); Clean TeQ (2017, 2018); ENRS (2019); NSW Department of Industry (2017); NSW Land and Property Information (2017); Office of Environment and Heritage NSW (2017)  
NSW Imagery: © Department of Finance, Services & Innovation (2018)

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**CLEAN TEQ SUNRISE PROJECT**  
**Existing Project Groundwater Monitoring  
Network and Groundwater Users -  
Mine Site**

**Figure 5**

### 4.1.3 Groundwater Yield

Groundwater at the mine site and surrounds is typically low yielding as indicated by hydraulic testing. The hydraulic testing (falling head) was conducted and analysed on five of the existing groundwater monitoring locations at the mine site and the results summarised in Table 4. The hydraulic conductivities are generally very low and the potential yield of the fractured rock aquifer is expected to be low (in the order of 0.1 L/s or less (Golder, 2017)).

**Table 4** – Summary of Hydraulic Testing – Mine Site

Bore ID	Formation Tested	Test Interval (mbTOC)	Aquifer Thickness (m)	K (Average) [metres/second]
GAM 06	Pyroxenite, fresh rock, some veining	51.4 to 57.4	13.14	$1.9 \times 10^{-6}$
GAM 07	Pyroxenite, slightly weathered	51.0 to 57.0	10.27	$6.6 \times 10^{-7}$
GAM 11	Pyroxenite, slightly weathered	54.0 to 60.0	22.10	$2.4 \times 10^{-7}$
GAM 12	Gabbro fresh rock	50.8 to 56.8	29.59	$9.3 \times 10^{-9}$
GAM 15	Pyroxenite, slightly weathered	64.7 to 70.7	16.85	$1.4 \times 10^{-6}$

### 4.1.4 Groundwater Use

Groundwater use at the mine site and surrounds is limited.

A contemporary bore census has been undertaken in the vicinity of the mine site by ENRS (2019a), on behalf of Clean TeQ. The bore census included inspections of the Pine Park, Milverton, Victoria Park, Berrilee, Louisiana, Slapdown and Currajong Park properties and information collected included bore location, groundwater level and groundwater quality. The locations of bores inspected during the bore census are included on Figure 5. A copy of the Bore Census (ENRS, 2019a) was provided to the DPIE with this GWMP.

The closest privately-owned bore (GW057335) is located approximately 1.8 km to the west of Mining Lease 1770 (Figure 5).

### 4.1.5 Groundwater Quality

Based on the groundwater quality monitoring in June 2018, groundwater salinity across the mine site and surrounds varies from fresh (214 mg/L total dissolved solids [TDS]) to saline (10,100 mg/L TDS). Fresh groundwater has been encountered in the north-west area of the site (GAM 1), brackish in and near the palaeochannel, and saline in the south-east area of the site (GAM 11) (Coffey, 2018a). These results are similar to groundwater quality monitoring reported in Golder (2000).



In June 2018, the groundwater was generally neutral to slightly alkaline and the metal concentrations were generally below the ANZECC and ARMCANZ (2000) livestock trigger values. Where available, metals concentrations show similar values between 1999 and 2018 (Coffey, 2018a).

Detailed water quality results from June 2018 are provided in Attachment 1.

#### 4.1.6 Previous Groundwater Assessments

Golder (2000b) assessed the potential groundwater impacts associated with the mine site.

The most recent groundwater assessments prepared for the mine site are Golder (2017) and Coffey (2018b). The key potential groundwater impacts at the mine site will be associated with the excavation of the open cut and potential seepage from the tailings storage facility.

A summary of the predicted potential impacts is provided below:

- **Groundwater Inflows** – the excavation of the open cut pits has the potential to intercept groundwater in the deepest area of the open cut pits resulting in predicted groundwater inflows of up to approximately 0.071 ML/year (or 0.0023 litres per second [L/s]) (base case) reducing to be generally less than 0.002 L/s in the long-term (Golder, 2017).
- **Groundwater Drawdown** – the excavation of the open cut pits has the potential to intercept groundwater in the deepest area of the open cut pits resulting in the predicted maximum groundwater drawdown extent of 1 m not extending beyond the ML 1770 boundary (Golder, 2017).
- **Seepage** – seepage from the tailings storage facility is not anticipated to migrate significantly beyond the tailings storage facility footprint during the Project life and thereafter the open cuts would act as sink that would collect the majority of seepage from the tailings storage facility (Coffey, 2018b).
- **Groundwater Users** – given no significant groundwater drawdown or seepage impacts are predicted, and the closest privately-owned bore (GW057335) is located approximately 1.8 km to the west of Mining Lease 1770 (Figure 5), no significant impacts are predicted to groundwater users (Golder, 2017 and Coffey, 2018b).

Given the small extent of groundwater drawdown over the Project life, post-mining groundwater levels are expected to recover slowly, although the open cut pit is expected to remain a groundwater sink.

## 4.2 Borefields

### 4.2.1 Borefield Layout

The approved borefield consists of six production bores with three at each of the eastern and western borefield (Figure 4). Two of the approved production bores (ISPB01 and ISPB02) were constructed and tested in 2006. The following staging of the development of the borefield is proposed:

- Initial construction – no extraction from the two existing production bores and construction of the remaining four approved production bores.
- Construction (after the initial construction phase) – the extraction of up to 900 ML/year from the two existing production bores.
- Operations Stage – extraction of more than 900 ML/year from the six production bores.

The predicted average and maximum annual off-site water demand during the operations phase is approximately 2,800 ML/year and 4,080 ML/year, respectively (HEC, 2019). This would be sourced from the Project borefield and the Lachlan River.

### 4.2.2 Existing Groundwater Regime

The borefields site associated with the Lachlan River floodplain comprises generally the Cowra Formation which disconformably overlies the Lachlan Formation. The Cowra Formation comprises clay, silt and gravel. The Lachlan Formation consists of sand, fine to medium gravel, with a minor silt and clay unit, and is the main water supply media for the Project borefields (Coffey, 2016b).

Bedrock below the Lachlan River Floodplain consists of Silurian phyllite, schist, micaceous siltstone, sandstone, dolomite, andesite and conglomerate within the north-south trending Tullamore and Murda Synclines (Coffey, 2016b).

### 4.2.3 Groundwater Levels

Two production bores (ISPB01 and ISPB02) and seven monitoring bores (including two existing bores constructed suitable for pumping) were installed over the period 1999 to 2006 (Figure 6). Both production bores were paired with a monitoring well, ISMW01 and ISMW02, respectively (Figure 6). Details of the production bores and monitoring wells are provided in Table 5. Clean TeQ will include updated details of the bores listed in Table 5 in the next version of the GWMP.



**LEGEND**

- Property Boundary
- Borefield Location
- Water Pipeline
- Borefield Infrastructure Corridor \*
- Surface Water Infrastructure Corridor \*
- Pump Station
- Transfer Station
- Access Road
- Monitoring Bore
- Production Bore (constructed)
- Production Bore (not constructed)

\* Infrastructure Corridor includes linking pipeline, access road and electricity transmission line.

Source: Ivanplats Syerston (2005); Clean TeQ (2017); NSW Land & Property Information (2018)  
 NSW Imagery: © Department of Finance, Services & Innovation (2018)

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Existing Project Network  
 - Borefields

**Figure 6**

**Table 5 – Lachlan Formation – Borefields Production and Pumping Bores and Monitoring Wells**

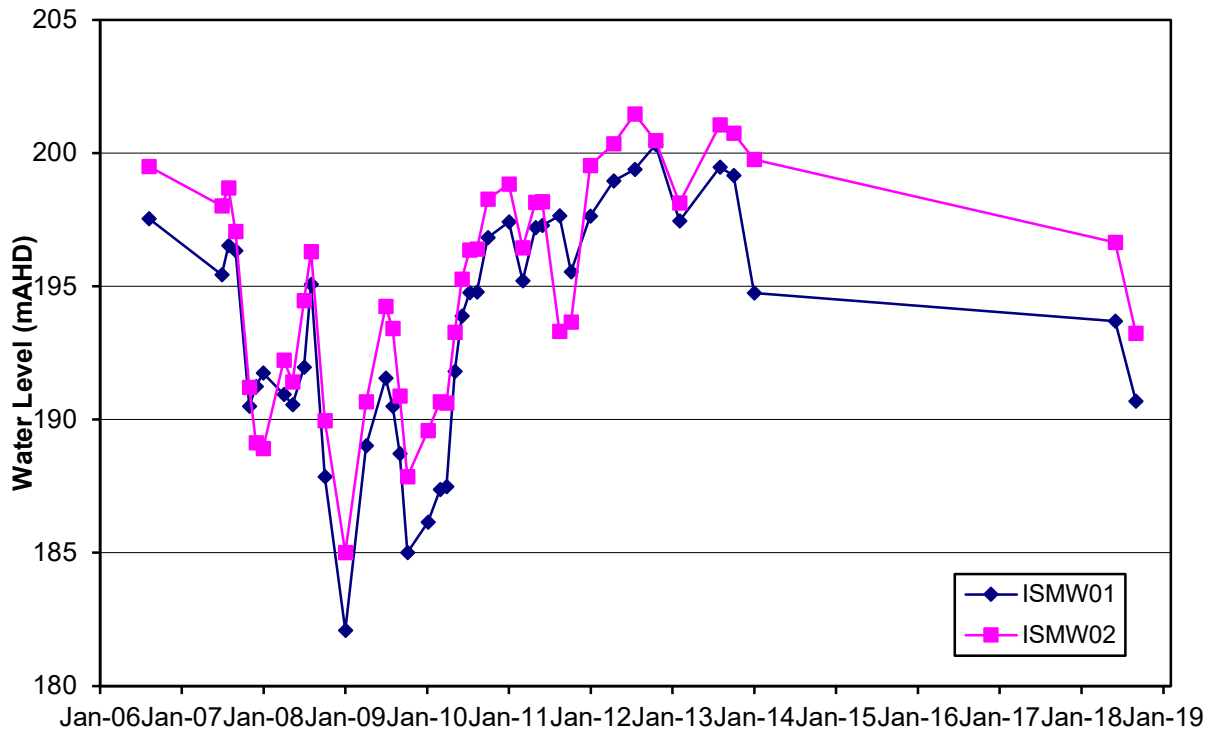
Bore ID	Type	Easting	Northing	Drilled Depth (mbgl)	TOC (mAHD)	Ground Level Survey [June 2018] (mAHD)	Pumping / Screen Depth (mbTOC)		Logger Depth [June 2018] (mbgl)
							Sump	Screen	
ISPB01	Production	547711	6319812	141.7	208.6	~208	134-136	112-134	No Logger
ISPB02	Production	551766	6316941	128.6	210.6	~211	126-128	104-126	No Logger
ISMW01	Monitoring	547695	6319812	141.1	208.93	208.38	N/A	114-135	29.5
ISMW02	Monitoring	551775	6316929	129.8	211.40	210.64	N/A	117-129	29.2*
MW-W1	Monitoring	547196	6320263	137.0	209.10	208.11	N/A	126-136	29.0
MW-E1	Monitoring	553407	6316482	127.0	212.04	211.10	N/A	108-126	29.1
PBW1	Monitoring	547240	6320179	141	TBC	~208	N/A	126-136	No Logger
PBW2	Monitoring/ Pumping	547230	6320190	137	TBC	~208	TBC	115-135	No Logger
PBE1	Monitoring/ Pumping	553413	6316485	128	TBC	~211	TBC	108-126	No Logger

Source: After Coffey (2016b) and (2018c)  
 mAHD = metres Australian Height Datum  
 mbgl – metres below ground level  
 mbTOC – metres below top of casing  
 TBC: To Be Confirmed

\* Atmospheric logger also installed.

ISMW01 and ISMW02 have been monitored for standing water levels since 2006. Chart 1 shows observed water levels at these bores.

**Chart 1 – Hydrographs for Monitoring Bores ISMW01 and ISMW02**



Automatic standing water level loggers (recording on 6 to 12 hour intervals) have since been installed (June 2018) in four existing monitoring wells, namely: ISMW01; ISMW02; MW-E1; and MW-W1 (Table 5 and Figure 6). Logger data is downloaded from each monitoring bore on a regular basis. Manual groundwater level measurements are also taken during the downloads using a down-hole interface probe to allow for comparison with logger data.

By comparison to Chart 1, the recorded water levels at ISMW01 and ISMW02 in June and September 2018 were 193.69 to 190.69 mAHD and 196.65 to 193.23 mAHD respectively (Coffey, 2018c), within the previously recorded ranges.

Subject to the results of the contemporary numerical groundwater model construction phase scenario (i.e. extraction of up to 900 ML/annum total), and in conjunction with a review of the results of the bore census (ENRS, 2019b), the baseline groundwater monitoring network will be augmented as required and construction details of monitoring bores (including any new bores) and the baseline monitoring results (including water quality and water levels) will be provided in the revised GWMP prior to operation of the borefield.

Jemalong Irrigation Limited<sup>3</sup> and DoI – L&W maintain extensive networks of standpipe monitoring piezometers in the area for various purposes. A database has been compiled (including 59 subsurface measurement points at 32 locations) for assessment of the hydraulic field head and numerical model calibration and verification and is summarised in Coffey (2016b). The location of select monitoring locations is provided on Figure 7.

For illustration purposes, the results presented for two nested piezometers (GW036083 and GW036526 – Figure 7) are shown in Chart 2 which demonstrates the significant drawdown in the Lachlan Formation from 2002 (caused by the onset of drought conditions and therefore rise in groundwater use to offset the reduced surface water allocations).

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<sup>3</sup> Jemalong Irrigation Limited is a private irrigation scheme located on the southern side of the Lachlan River opposite the borefields.



**LEGEND**

- Water Pipeline
- Borefield Infrastructure Corridor \*
- Borefield Location
- Production Bore (not constructed)
- ⊙ Production Bore (constructed)
- + Monitoring Bore
- ▲ Surface Water Flow Gauge

\* Infrastructure Corridor includes linking pipeline, access road and electricity transmission line.

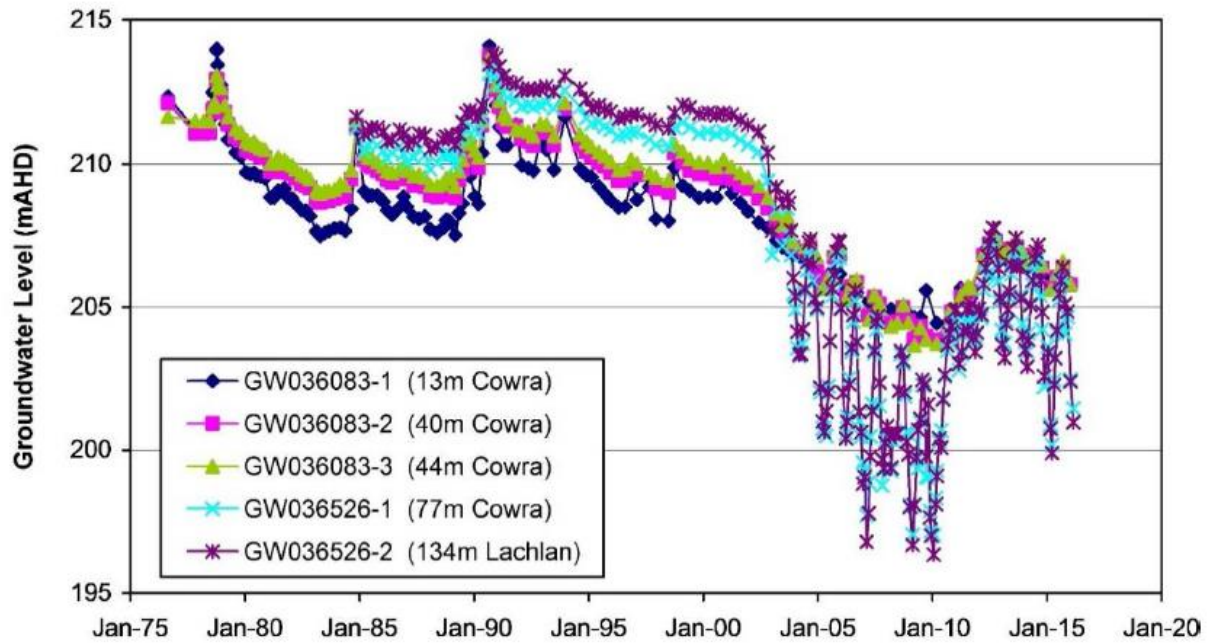
Source: Ivanplats Syerston (2005); NSW Land & Property Information (2017); NSW DPI - Water (2018)  
NSW Imagery: Esri, DigitalGlobe (2017)



**CLEAN TEQ SUNRISE PROJECT**  
Location of Existing Select Monitoring Bores  
and Surface Water Flow Gauges  
- Borefields

**Figure 7**

Chart 2 – Hydrographs for Nested Piezometers and GW036083 and GW036526



Piezometer nests GW036087, GW036088, and GW036089 are within close proximity of each other (Figure 7). Observed water levels at these piezometers have been used to calculate the observed drawdown over the period 2001 to 2010, shown in Chart 3. Results show the attenuation of drawdown moving vertically up the profile, due to pumping from the Lachlan Formation.

NSW Government monitoring piezometer nest GW036087 is the nearest nest to the borefields (Figure 7), and includes a piezometer screened in the Lachlan Formation. Chart 4 shows water level observations at this nest since 1976. These are typical of water level behaviour in the area, and in conjunction with other piezometers, provide a pre-mining baseline dataset of water levels throughout the profile in proximity to the borefields. Drawdowns between depths of 80 m and 130 m below ground are similar, however the drawdown at 40 m depth is greatly attenuated.

Chart 3 – Observed Drawdown in the Lachlan Formation (2001 to 2010)

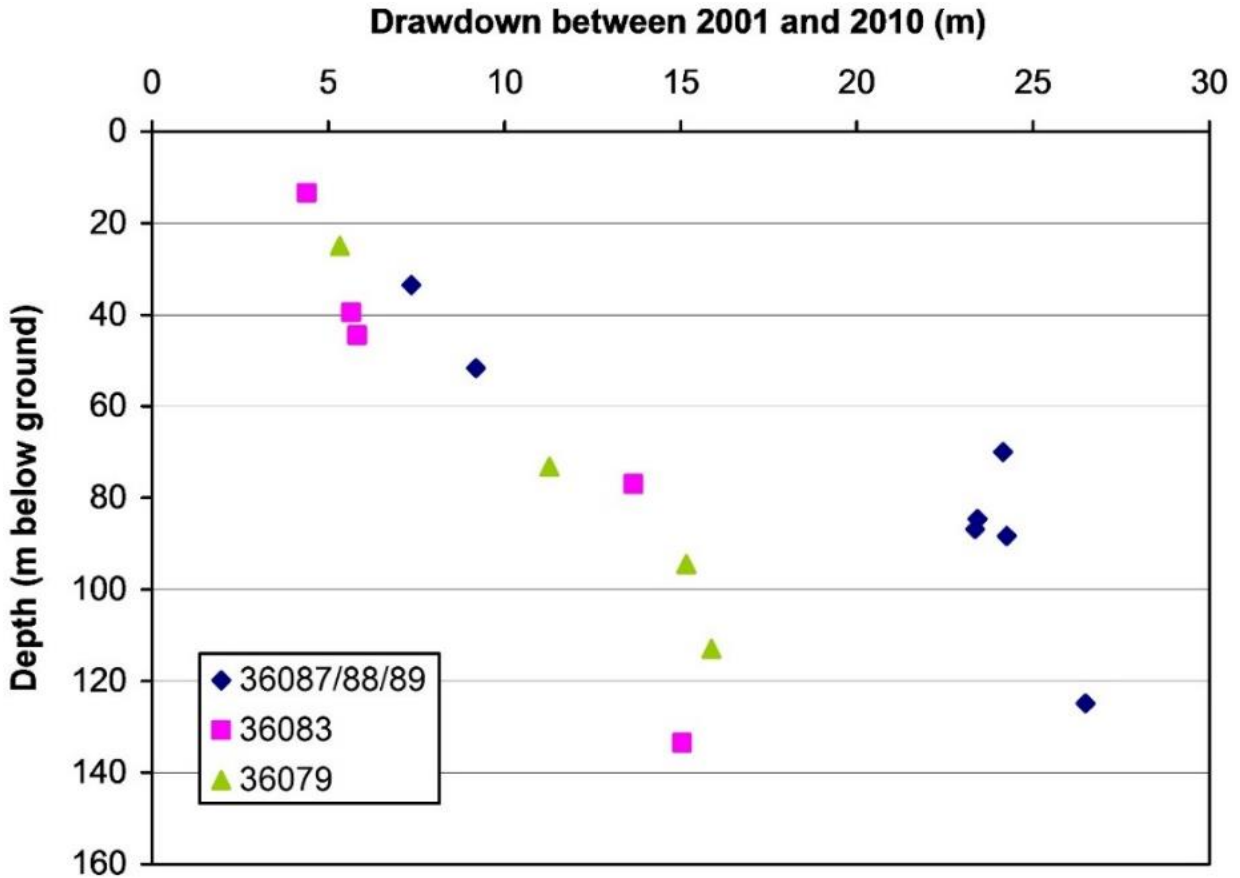
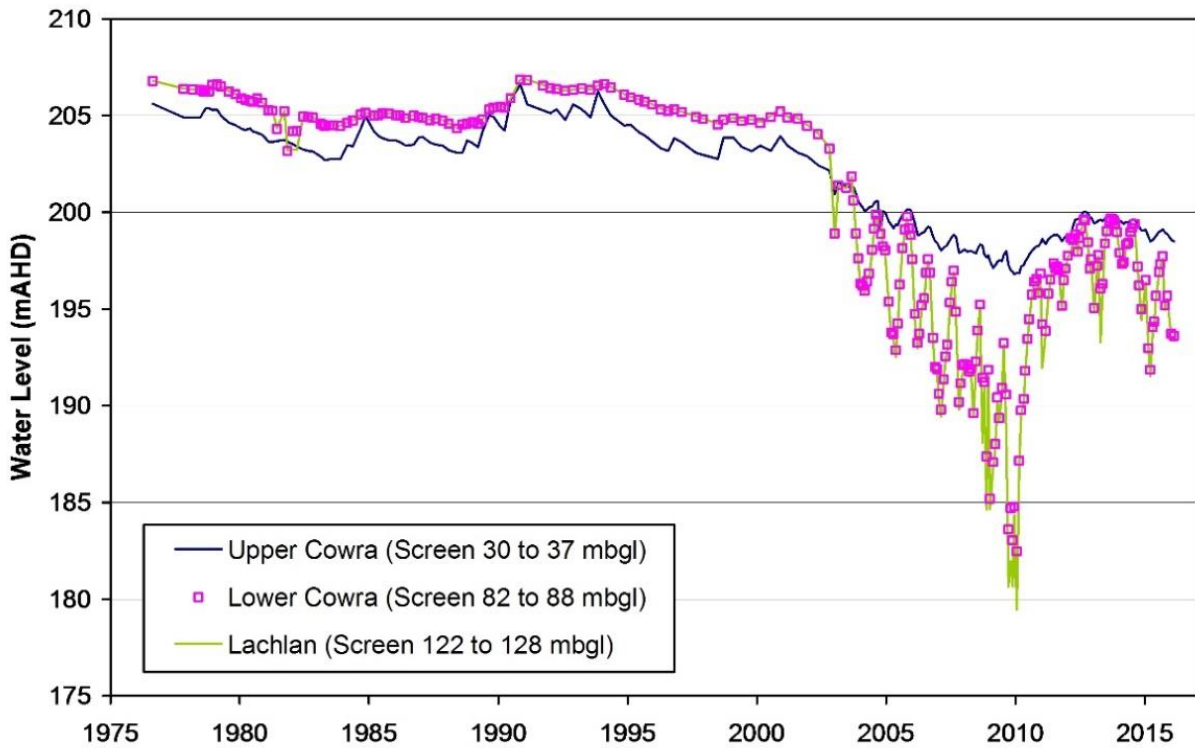


Chart 4 – Groundwater Level Observations at GW036087





#### 4.2.4 Groundwater Yield

Pumping tests (48 hour) have been carried out on the two existing production bores at the borefields. ISPB01 was pumped at a rate of 50 L/s and ISPB02 at 80 L/s for a 48 hour duration. Monitoring results for ISPB02 showed that a barrier boundary was apparent after 200 minutes of pumping. The interpreted transmissivity ranged between 1,260 square metres per day ( $m^2/day$ ) and 5,500  $m^2/day$  (Coffey, 2016a).

A 3-day single rate pumping test was also undertaken at ISPB02 at the Project borefields in 1999 with monitoring at several observation piezometers. Analysis of the pumping test results presented the following (Coffey, 2016b):

- K (optimised): 19.5 metres per day (m/day) (over a saturated media interval of 136 metres [m]);
- $K_v$  (optimised): 0.024 m/day
- $K_v/K_h$  ratio: 0.001
- Specific storage (optimised):  $2.2 \times 10^{-5}m^{-1}$

No hydraulic test data is available for determining specific yield for the Cowra Formation at the borefields. Notwithstanding, Williams (1993) estimated a value of 5% for the refillable void space at the water table in the Upper Cowra Formation in the Jemalong Plains Irrigation District.

#### 4.2.5 Groundwater Use

A survey of existing bores within 10 km of the borefields was originally completed in 2000 and included recording of relevant bore information including depths, estimated yield, groundwater levels and bore owner details for the following:

- Cowra Formation:
  - 105 stock and domestic bores;
  - 39 stock and domestic wells; and
  - 7 irrigation bores.
- Lachlan Formation:
  - 4 installed irrigation bores; and
  - 6 properties with groundwater allocation although no irrigation bores were installed at the time of the survey.

Another bore survey was undertaken in 2005 (Coffey Geosciences, 2005a). This work updated and superseded the bore survey conducted by Coffey in 2000. The 2005 survey focussed on accruing up to date information on current groundwater usage in a wider area, within a 12 km to 15 km radius of the proposed borefields. Information on property boundaries and owners within a 10 km to 15 km radius of the borefields was obtained from Forbes and Lachlan Shire Councils. The information gained in the first survey conducted in 2000 was used as a basis for the 2005 survey. The area of the survey was increased to the north-east, east and south to take in areas of past high groundwater usage. Changes of land ownership were also noted in the field and the contact database and property ownership maps were updated accordingly. The survey comprised field work with visits to the bores.

A contemporary bore census has since been undertaken by ENRS (2019b), on behalf of Clean TeQ. The 2018 bore census extended across an area of approximately 735 km<sup>2</sup> including approximately 84 properties. The 2018 bore census culminated in a database with records for one hundred and forty-six (146) bores comprising (ENRS, 2019b):

- 1 Commercial and Industrial;
- 2 Domestic water supply bores;
- 19 Irrigation;
- 2 Monitoring;
- 119 Stock and domestic; and
- 3 Town Water Supply (not equipped).

The location of the bores identified during the 2018 bore census and the results of a recent (2019) search of the PINNEENA register for groundwater works in the vicinity of the borefields is presented in Attachment 2.

The results of the bore census are currently being used in the development of the contemporary groundwater model for the development of triggers for the Project borefields.

A copy of the 2018 bore census (ENRS, 2019b) was provided to the DPIE with this GWMP.

## 4.2.7 Groundwater Quality

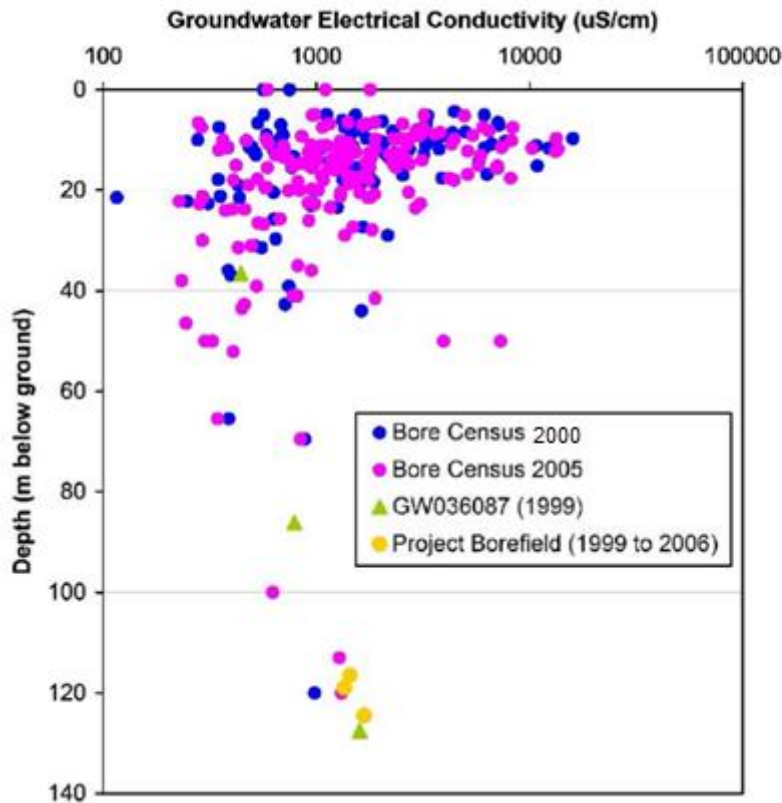
Water quality samples were collected from ISPB01 in August 2006, August 2017 and November 2019 and from ISPB02 in August 2006. The results are in Table 6.

**Table 6** – Summary of Laboratory Analysis of Groundwater Samples Collected in 2006, 2017 and 2019

Parameter	Units	ISPB01			ISPB02
		19 August 2006	15 August 2017	13 November 2019	13 August 2006
• pH	-	7.37	7.1	7.2	7.16
• Electrical Conductivity	µS/cm	1,280	1,350	1,200	1,330
<b>Alkalinity</b>					
• Total Alkalinity as CaCO <sub>3</sub>	mg/L	206	193	210	184
<b>Dissolved Major Anions</b>					
• Sulphate as SO <sub>4</sub> <sup>2-</sup>	mg/L	67	52	69	71
• Chloride	mg/L	240	235	770	277
<b>Dissolved Major Cations</b>					
• Calcium	mg/L	24	24	25	31
• Magnesium	mg/L	22	21	23	25
• Sodium	mg/L	188	188	190	215
• Potassium	mg/L	3.0	3.0	3.0	4.0
<b>Other</b>					
• Manganese	mg/L	0.042	0.051	0.048	0.034
• Iron	mg/L	<0.05	0.92	1.00	0.28
• Fluoride	mg/L	0.4	0.5	0.6	0.4
• Nitrite as N	mg/L	<0.010	<0.01	<0.02	<0.010
• Nitrate as N	mg/L	<0.010	<0.01	<0.02	0.012
• Nitrite + Nitrate as N	mg/L	<0.010	<0.01	<0.05	0.012

Chart 5 shows electrical conductivity (EC) measured at private bores during the bore census of 2000 and 2005 versus the base of the bore (Coffey, 2016b). Also shown are laboratory analytical results for samples from the Project borefields and GW036087 (screens 1 to 3), versus the midpoint of their screen intervals. There is a weak overall trend of decreasing EC with depth, to a depth of around 60 m. From measurements available, it appears that EC begins increasing with depth, below 60 m depth. However, the variation in EC in the upper 20 m is significant.

Chart 5 – Borefields Groundwater Quality – Electrical Conductivity versus Depth



Interpreted lateral variation in total dissolved solids in the local area and surrounds is also presented in Green et al (2011). Groundwater is freshest where significant stream bed leakage is thought to be occurring.

As described in Section 4.2.5, a contemporary bore census has been undertaken by ENRS (2019b), on behalf of Clean TeQ. The 2018 bore census included water quality sampling (EC and pH). Salinity ranged from 158 microsiemens per centimetre ( $\mu\text{S}/\text{cm}$ ) to 8,440  $\mu\text{S}/\text{cm}$  across the bore census area and averaged 1,613  $\mu\text{S}/\text{cm}$  (ENRS, 2019b). This is consistent with previous salinity data recorded in the vicinity of the borefield (Chart 5). Acidity was typically neutral ranging from 5.72 to 8.64 pH units and averaging 6.78 pH units (ENRS, 2019b).

#### 4.2.8 Groundwater Recharge – Surface Water Flows

Surface water flows will be a source of recharge in the vicinity of the borefields. Existing NSW Office of Water flow gauges are located in the Lachlan River at Jemalong (Station 412036) and Mulguthrie (Station 412024), as well as Island Creek (Station 412023) and Bumbergan Creek (412017) (Figure 7). Flow in Goobang Creek is not monitored.

## 5. PERFORMANCE MEASURES AND PERFORMANCE INDICATORS

During construction activities, Clean TeQ will assess the Project against the specific water management performance indicators outlined in Table 7.

**Table 7 – Water Management Performance Indicators – Construction**

Performance Measure	Performance Indicators
<b>Water Management - General</b> <ul style="list-style-type: none"> <li>Minimise the use of clean water on-site.</li> </ul>	Water use is consistent with the water use priority described in the Water Balance and in accordance with relevant <i>Water Management Act 2000</i> approvals.
<b>Mine Water Storages</b> <ul style="list-style-type: none"> <li>On-site storages (including mine infrastructure dams, groundwater storage and treatment dams) are suitably designed, installed and/or maintained to minimise permeability.</li> </ul>	Water management infrastructure is constructed and maintained generally in accordance with the design described in SWMP.
<ul style="list-style-type: none"> <li>Ensure that the floor and side walls of the <b>tailings storage facility</b>, Evaporation Basin and Surge Dam are designed with a minimum of a 900 mm clay or modified soil liner with a permeability of no more than <math>1 \times 10^{-9}</math> m/s, or a synthetic (plastic) liner of 1.5 mm minimum thickness with a permeability of no more than <math>1 \times 10^{-14}</math> m/s (or equivalent).</li> <li>Design, install and maintain a seepage interception system in the Tailings Storage Facility embankments in accordance with the DSC guidelines.</li> <li>Design, install and/or maintain the facilities to meet the requirements of the DSC.</li> <li>The design of the <b>tailings storage facility</b> should conform to: <ul style="list-style-type: none"> <li>DSC3A – Consequence Categories for Dams (DSC, 2015); and</li> <li>DSC3F – Tailings Dams (DSC, 2012).</li> </ul> </li> </ul>	<p>The tailings storage facility and evaporation pond are constructed generally in accordance with the design described in the Water Balance and SWMP.</p> <p>The tailings storage facility is designed in consultation with the DSC, and the water management infrastructure constructed and maintained generally in accordance with the design described in the Water Balance and SWMP.</p>
<b>Chemical and Hydrocarbon Storage</b> <ul style="list-style-type: none"> <li>Chemical and hydrocarbon products to be stored un banded areas in accordance with the relevant Australian Standards.</li> </ul>	Chemical and hydrocarbon storages will be constructed and maintained in accordance with the relevant Australian Standards (refer SWMP).
<b>Irrigation Area</b> <ul style="list-style-type: none"> <li>Manage the irrigation area in accordance with the EPA's <i>Environmental Guidelines: Use of Effluent by Irrigation</i>.</li> </ul>	The irrigation area is designed and maintained generally in accordance with the design described in the Water Balance and SWMP.

Note: The Water Balance and SWMP are included in Appendices A and B of the WMP.

### 5.1 Trigger Levels for Investigation

Given the negligible potential for groundwater-related impacts during the initial Project construction activities (i.e. no mining or processing activities or groundwater extraction), the proposed trigger level for investigation will be receipt of a groundwater-related complaint.

Quantitative groundwater trigger levels for potentially adverse groundwater impacts associated with the borefields will be developed using the available baseline data prior to the commencement of the extraction of groundwater from the borefield and will be included in the next version of the GWMP.

### **5.1.1 Groundwater Drawdown Trigger Levels**

#### ***Complaint-Based Trigger***

Should a groundwater related complaint be received during the initial Project construction activities, Clean TeQ will conduct an investigation and respond in accordance with the procedures described in Section 10.2.

The proposed performance indicator will be that no more than 2 m drawdown impact on water levels at groundwater production bores on privately-owned land is experienced as a result of the Project.

Should analysis of the monitoring results, and modelling if required, confirm that the Project has resulted in a greater than 2 m drawdown impact on in water levels in privately-owned bores, and the assessment is peer reviewed by a specialist, the results will then be reported to DPIE and DoI – L&W and the Contingency Plan enacted (Section 8).

#### ***Monitoring / Model Based Triggers***

As described in Section 6.2, Clean TeQ commissioned HydroSimulations in 2018 to develop a contemporary numerical groundwater model for the Project borefields in advance of borefield operation. Clean TeQ will revise this GWMP (including the initial triggers), with the results of the contemporary groundwater model in advance of operation of the production bores at the borefields.

### **5.1.2 Groundwater Quality Trigger Levels**

The ANZECC and ARMCANZ (2000) water quality guidelines apply to the quality of both surface waters and groundwaters since they have been developed to protect environmental values relating to above-ground uses such as irrigation and stock use.

ANZECC and ARMCANZ (2000) recommends that wherever possible site-specific data be used to define trigger values for physical and chemical factors which can adversely impact the environment, rather than using default values.

Table 1 of the *NSW Aquifer Interference Policy* (NSW Government, 2012) sets out the minimal impact considerations for aquifer interference activities for groundwater sources including:

*Any change in the groundwater quality should not lower the beneficial use category of the groundwater source beyond 40 m from the activity.*

The following beneficial uses were recommended by the National Water Quality Management Strategy Guidelines for Groundwater Protection in Australia for major (or significant) aquifers and have been adopted by the DoI – L&W in *The Groundwater Quality Protection Policy* (Department of Land and Water Conservation, 1998):

- ecosystem protection;
- recreation and aesthetics;
- raw water for drinking water supply; and
- agricultural water and industrial water.

The National Land and Water Resources Audit (Murray Darling Basin Commission, 2005) specified groundwater quality ranges for beneficial use categories based on salinity (Table 8). These salinity-based categories generally align with the beneficial uses within the NSW Groundwater Quality Protection Policy.

**Table 8 – Groundwater Quality Categories: Electrical Conductivity**

Beneficial Use	Quality Range	Description
<b>Potable</b>	Up to 800 $\mu\text{S/cm}$ (500 mg/L TDS)*	Suitable for all drinking water and uses.
<b>Marginal Potable</b>	800-2,350 $\mu\text{S/cm}$ (500-1,500 mg/L TDS)*	At the upper level, this water is at the limit of potable water, but is suitable for watering of livestock, irrigation and other general uses.
<b>Irrigation</b>	2,350-7,800 $\mu\text{S/cm}$ (1,500-5,000 mg/L TDS)*	At the upper level, this water requires shandyng for use as irrigation water or to be suitable for selective irrigation and watering of livestock.
<b>Saline</b>	7,800-22,000 $\mu\text{S/cm}$ (5,000-14,000 mg/L TDS)*	Generally unsuitable for most uses. It may be suitable for a diminishing range of salt-tolerant livestock up to about 6,500 mg/L [ $\sim 10,150 \mu\text{S/cm}$ ] and some industrial uses.
<b>Highly Saline</b>	> 22,000 $\mu\text{S/cm}$ (>14,000 mg/L TDS)*	Suitable for coarse industrial processes up to about 20,000 mg/L [ $\sim 31,000 \mu\text{S/cm}$ ].

$\mu\text{Scm}$  = microsiemens per centimetre; mg/L = milligrams per litre; TDS = total dissolved solids.

\*Approximate EC ranges derived from TDS ranges, with conversion Factor of 1.5625 applied. Source: *National Land and Water Resources Audit* (Murray Darling Basin Commission, 2005).

Each bore will be assigned a beneficial use category in Table 8 based on comparison of the bore census / survey results with the water quality ranges in Table 8. At any privately-owned bore where a monitored EC value is outside the applicable baseline range of its assigned beneficial use category for two successive monitoring rounds, an investigation will be initiated.

Should the investigation confirm that the Project has resulted in the change of the beneficial use category of the privately-owned bore for two successive monitoring rounds, and the investigation is peer reviewed by a specialist, the results will then be reported to DPIE and DoI – L&W and the Contingency Plan enacted (Section 8).

## 6. GROUNDWATER MANAGEMENT MEASURES

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### 6.1 Mine Site

The groundwater management measures to be implemented at the mine site are outlined in this section.

#### 6.1.1 Water Use

Consistent with the general water management performance measures for the Project (Table 7), Clean TeQ will minimise the use of clean water on-site.

Additional detail on water use at the Project is provided in the Water Balance (Appendix A of the WMP) in accordance with Condition 30(a), Schedule 3 of Development Consent DA 374-11-00.

#### 6.1.2 Mine Water Storages

The following mine water storages will be constructed during the initial construction activities (Figure 2):

- tailings storage facility;
- evaporation pond;
- water storage dam;
- mine water dams and runoff dam; and
- raw water dam.

If a mine water storage is prescribed under the *Dams Safety Act 1978*, Clean TeQ would design, install and/or maintain it to meet the requirements of the DSC.

Additional detail on mine water storages at the Project is provided in the Surface Water Management Plan (Appendix B of the WMP) in accordance with Condition 30(b), Schedule 3 of Development Consent DA 374-11-00.

#### ***Tailings Storage Facility***

Consistent with the relevant performance measures (Table 7):

- the tailings storage facility will be designed, installed and maintained to ensure no discharge of mine water off-site (except in accordance with an EPL);



- the floor and side walls of the tailings storage facility will be designed with a minimum of a 900 mm clay or modified soil liner with a permeability of no more than  $1 \times 10^{-9}$  m/s, or a synthetic (plastic) liner of 1.5 mm minimum thickness with a permeability of no more than  $1 \times 10^{-14}$  m/s (or equivalent);
- a seepage interception system will be designed, installed and maintained in the tailings storage facility embankments in accordance with DSC guidelines;
- the tailings storage facility will be designed, installed and maintained to meet the requirements of the DSC; and
- the tailings storage facility design will conform with:
  - DSC3A – Consequence Categories for Dams (DSC, 2015); and
  - DSC3F – Tailings Dams (DSC, 2012).

### ***Evaporation Pond***

Consistent with the relevant performance measures (Table 7):

- the evaporation pond will be designed, installed and maintained to ensure no discharge of mine water off-site (except in accordance with an EPL); and
- the floor and side walls of the evaporation pond will be designed with a minimum of a 900 mm clay or modified soil liner with a permeability of no more than  $1 \times 10^{-9}$  m/s, or a synthetic (plastic) liner of 1.5 mm minimum thickness with a permeability of no more than  $1 \times 10^{-14}$  m/s (or equivalent).

### ***Water Storage Dam***

Consistent with the relevant performance measures (Table 7):

- the water storage dam will be designed, installed and maintained to ensure no discharge of mine water off-site (except in accordance with an EPL);
- the water storage dam will be suitably designed, installed and/or maintained to minimise seepage; and
- the water storage dam will be designed, installed and maintained to meet the requirements of the DSC (if required under the provisions of the *Dams Safety Act 1978*).

### ***Mine Water Dams and Runoff Dam***

Consistent with the relevant performance measures (Table 7):

- the mine water dams and runoff dam will be suitably designed, installed and/or maintained to minimise seepage; and

- the runoff dam will be designed, installed and maintained to capture and convey the 100 year, 72-hour ARI rainfall event.

### **Raw Water Dam**

Consistent with the relevant performance measures (Section 5):

- the raw water dam will be suitably designed, installed and/or maintained to minimise seepage; and
- the raw water dam will be designed, installed and maintained to capture and convey the 100 year, 72-hour ARI rainfall event.

### **6.1.3 Chemical and Hydrocarbon Storages**

Consistent with the relevant performance measures (Table 7), chemical and hydrocarbon products will be stored in bunded areas in accordance with the relevant Australian Standards, including AS 1940-2017 *The Storage and Handling of Flammable and Combustible Liquids*.

### **6.1.4 Irrigation Area**

Wastewater generated at the accommodation camp will be collected and treated at an on-site wastewater treatment plant. The wastewater treatment plant will consist of anaerobic and aerobic treatment and final disinfection of treated effluent. The wastewater treatment plant will be installed and operated in accordance with Lachlan Shire Council requirements.

The treated wastewater produced from the wastewater treatment plant will be pumped to the irrigation area via the irrigation water pipeline (Figure 2).

The irrigation application area will be approximately 3.5 hectares (ha) and will be divided into irrigation zones. Up to 100,000 litres per day of treated wastewater will be pumped to the irrigation area. Sprinklers will be used to evenly distribute the treated wastewater at a maximum rate of approximately 3 millimetres per square metre per day. This application rate is conservative and will minimise risk of surface pooling and runoff (True Water Australia, 2018).

True Water Australia (2018) conducted a nutrient balance for the irrigation area and concluded that the irrigation area is of sufficient size for the expected nutrient load (i.e. nutrient loading will not be a limiting factor to irrigation).

Consistent with the relevant performance measure (Table 7), the accommodation camp irrigation area would be managed in accordance with the *Environmental Guidelines: Use of Effluent by Irrigation* (DEC, 2004) and the irrigation rate would be controlled so as not to:

- cause irrigation water runoff from the irrigation area; or
- exceed the capacity of the soil in the irrigation area to effectively absorb the applied nutrient, salt, organic material and hydraulic loads.

## 6.2 Borefield Numerical Model Review

Predictive numerical modelling was originally undertaken in 2005 (Coffey Geosciences, 2005b). The 2005 study considered information collected during drought conditions that were present at the time, including:

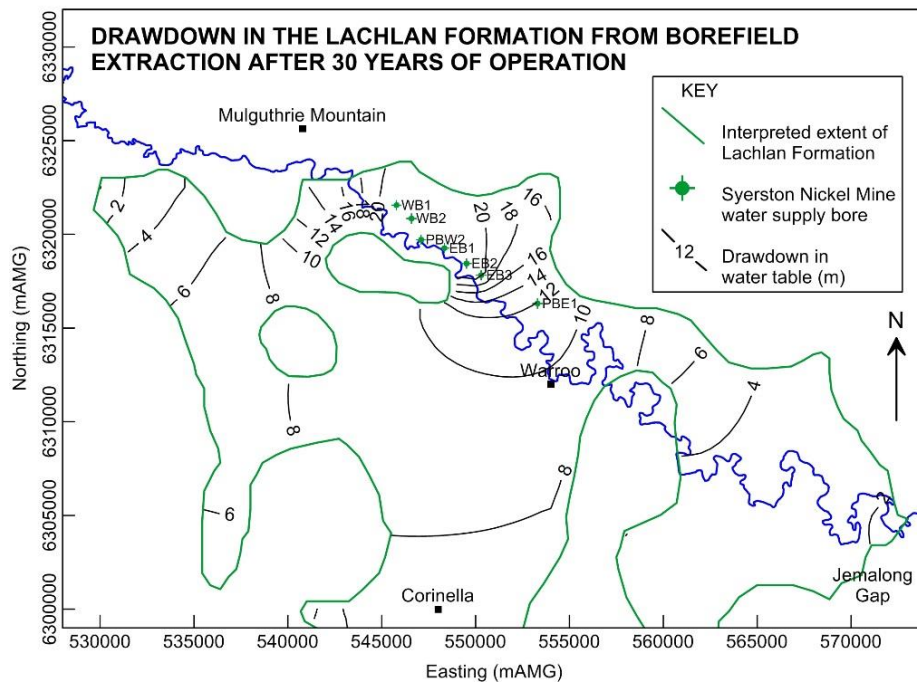
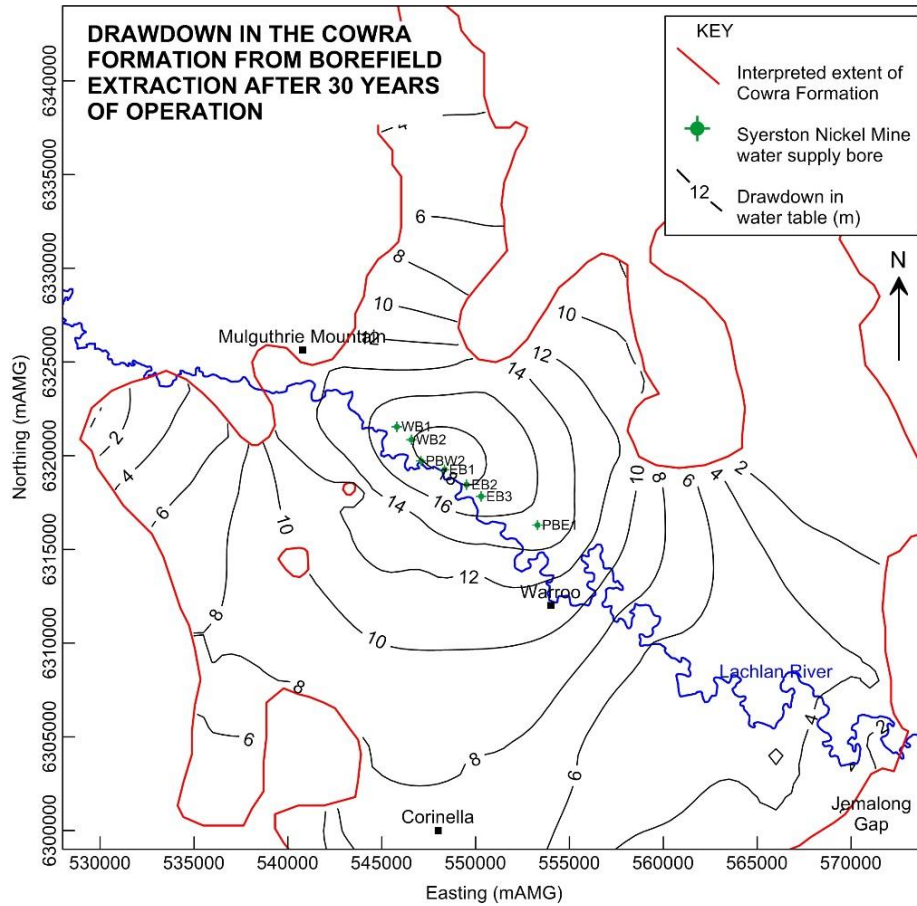
- observed large drawdowns in alluvial media from increased pumping in the Lachlan Formation (due to the onset of drought conditions) had begun to manifest (i.e. the form and character of drawdown responses had not fully developed); and
- groundwater usage data for the 2004/2005 financial year which is amongst the highest usages yet observed for the area.

The numerical model used for the 2005 studies was therefore developed using a precautionary approach, and thus conservative for the purposes of impact assessment.

At present, the character of the drawdown caused by pumping from the Lachlan Formation is well represented in monitoring hydrographs, the usage datasets for the 2004/2005 financial year are better understood, additional stream flow data has provided a strong basis for the water balance for the study area, and several independent additional data sets have allowed a reasonably reliable separation of the Cowra Formation into two layers (i.e. Upper and Lower).

Notwithstanding the above, the 2005 modelling results provide a conservative starting point for groundwater management and impact mitigation. Chart 6 shows modelled drawdowns from the 2005 study for the Cowra and Lachlan Formations after 30 years of operation of the borefields.

Chart 6 – Modelled Drawdowns in the Cowra and Lachlan Formations (Coffey Geosciences, 2005b)



Clean TeQ commissioned HydroSimulations in 2018 to develop a contemporary numerical groundwater model for the Project borefields in advance of operation of the borefields. It is noted that Chart 6 is only a conservative starting point and will be superseded by the results of the contemporary groundwater model currently being developed utilising the results of the 2018 bore census (ENRS, 2019b), available government records and other publicly available data.

Clean TeQ will revise this GWMP (including Chart 6), with the results of the contemporary groundwater model construction phase scenario (i.e. interim extraction of up to 900 ML/annum total) in advance of operation of the existing two production bores at the borefields. At this time, additional preventative actions for any landholders predicted to be affected in vicinity of the borefields will be considered and included in this GWMP.

Similarly, this GWMP will be updated in a progressive manner to subsequently include an operational (maximum extraction) phase scenario before exceeding the construction phase extraction volumes of more than 900 ML/year. This will allow for progressive validation of the numerical modelling predictions and an adaptive management approach.

The contemporary numerical groundwater model for the borefields will be reviewed annually and updated at least once every three years, with the model set-up and input parameters progressively refined to improve the prediction of current and future drawdown impacts due to pumping of the borefields and regional usage. Contemporary usage data for private bores will also be obtained where possible, as these remain an important component of validation and future calibration, and for estimating pumping rates for future predictions.

The Water Balance (Appendix A of the WMP) will be updated as required to include a site water balance for each calendar year in accordance with Condition 30(a), Schedule 3 of Development Consent DA 374-11-00.

### **6.3 Preventative Actions**

In accordance with Condition 3, Schedule 5 of Development Consent DA 374-11-00, Clean TeQ will assess and manage risks to comply with the criteria and/or performance measures outlined in Schedule 3 of Development Consent DA 374-11-00.

Preventative/adaptive management actions may include:

- construction of the mine water storages consistent with the performance measures (Table 7);
- chemical and hydrocarbon products will be stored in bunded areas in accordance with the relevant Australian Standards, including AS 1940-2017 *The Storage and Handling of Flammable and Combustible Liquids*;
- the accommodation camp irrigation area would be managed in accordance with the *Environmental Guidelines: Use of Effluent by Irrigation* (DEC, 2004);
- minimise the use of clean water on-site;
- the contemporary numerical groundwater model for the borefields (Section 6.2) will be reviewed and updated at least once every three years, with the model set-up and input parameters progressively refined to improve the prediction of current and future drawdown impacts due to pumping of the borefields and regional usage to allow for progressive validation of the numerical modelling predictions and an adaptive management approach;
- rehabilitation of the affected stock and domestic bores by lowering pump intakes and/or deepening of bores or wells to ensure continuity of water supply will be established in consultation and agreement with the affected landowner;
- optimisation of the pumping regime with regard to extraction rate and duration of pumping at the (eastern and western) borefields;
- optimisation of Project water supply requirements for the mine site (including surface water extraction from the Lachlan River); and/or
- identification of additional Project water supply sources.

## 6.4 Groundwater Users – Management of Complaints

Should a groundwater related complaint be received during the initial Project construction activities, Clean TeQ will conduct an investigation and respond in accordance with the procedures described in Section 10.2.

## 6.5 Compensatory Action

In accordance with Condition 28, Schedule 3 of Development Consent DA 374-11-00, Clean TeQ will provide a compensatory water supply to anyone whose basic landholder water rights (as defined in the *Water Management Act 2000*) are adversely and directly impacted as a result of the development. This supply will be provided in consultation with DoI – L&W, and to the satisfaction of the Secretary.

The compensatory water supply measures will provide an alternative long-term supply of water that is equivalent to the loss attributable to the development. Equivalent water supply will be provided (at least on an interim basis) as soon as possible after the loss is identified, unless otherwise agreed with the landowner. If Clean TeQ and the landowner cannot agree on the measures to be implemented, or there is a dispute about the implementation of these measures, then either party may refer the matter to the Secretary for resolution.

If Clean TeQ is unable to provide an alternative long-term supply of water, then Clean TeQ will provide alternative compensation (e.g. financial compensation) to the satisfaction of the Secretary.

Clean TeQ will revise this GWMP, including the results of the contemporary groundwater model construction phase scenario (i.e. interim extraction of up to 900 ML/annum total) in advance of operation of the existing two production bores at the borefields. At this time, compensatory actions, including a strategy for communication, negotiation, mediation and arbitration, for any landholders predicted to be affected in vicinity of the borefields will be considered and included in the GWMP.

## 6.6 Groundwater Licensing

In accordance with Condition 26, Schedule 3 of the Development Consent DA 374-11-00, Clean TeQ will ensure that it has sufficient water for all stages of the development, and if necessary, adjust the scale of Project to match its available water supply.

### ***Water Access Licences***

#### *Mine Dewatering*

In-pit dewatering is expected to be negligible over the life of the Project (Golder, 2017).

Notwithstanding, Clean TeQ currently holds WAL 28681 in the Lachlan Fold Belt MDB Groundwater Source (Lachlan Fold Belt MDB [Other] Management Zone), for 243 share components under the *Water Sharing Plan for the NSW Murray Darling Basin Fractured Rock Groundwater Sources 2011* for the mine pit should the deepest areas intercept any groundwater.

#### *Borefields Operation*

Clean TeQ currently holds WAL 32068 in the Upper Lachlan Alluvial Groundwater Source (Upper Lachlan Alluvial Zone 5 Management Zone) for 3,154 share components under the *Water Sharing Plan for the Lachlan Unregulated and Alluvial Water Sources 2012* for the borefields. The borefields will be operated in accordance with the conditions of WAL 32068.

A second WAL 39837 is also held by Clean TeQ for an additional 766 share components in the Upper Lachlan Alluvial Groundwater Source (Upper Lachlan Alluvial Zone 5 Management Zone).



## 7. MONITORING PROGRAMS

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### 7.1 Mine Site

Given that in-pit dewatering is expected to be negligible over the life of the Project (Golder, 2017), monitoring of groundwater levels and quality at the mine site is primarily aimed at adding to the baseline datasets and establishing sites for future operational monitoring associated with the potential impact of the tailings storage facility, evaporation pond and water storage dam on the groundwater table and groundwater quality.

#### ***Baseline Monitoring***

Baseline data collected from the existing groundwater monitoring network (GAM Series) at the mine site (Figure 5) will continue to be recorded prior to the commencement of construction to add to the existing baseline datasets.

Logging of groundwater levels will be continued and data downloaded periodically. The GAM Series monitoring bores will also be monitored six monthly for a suite of groundwater quality parameters including EC, pH, total dissolved solids, major cations, major anions and selected metals.

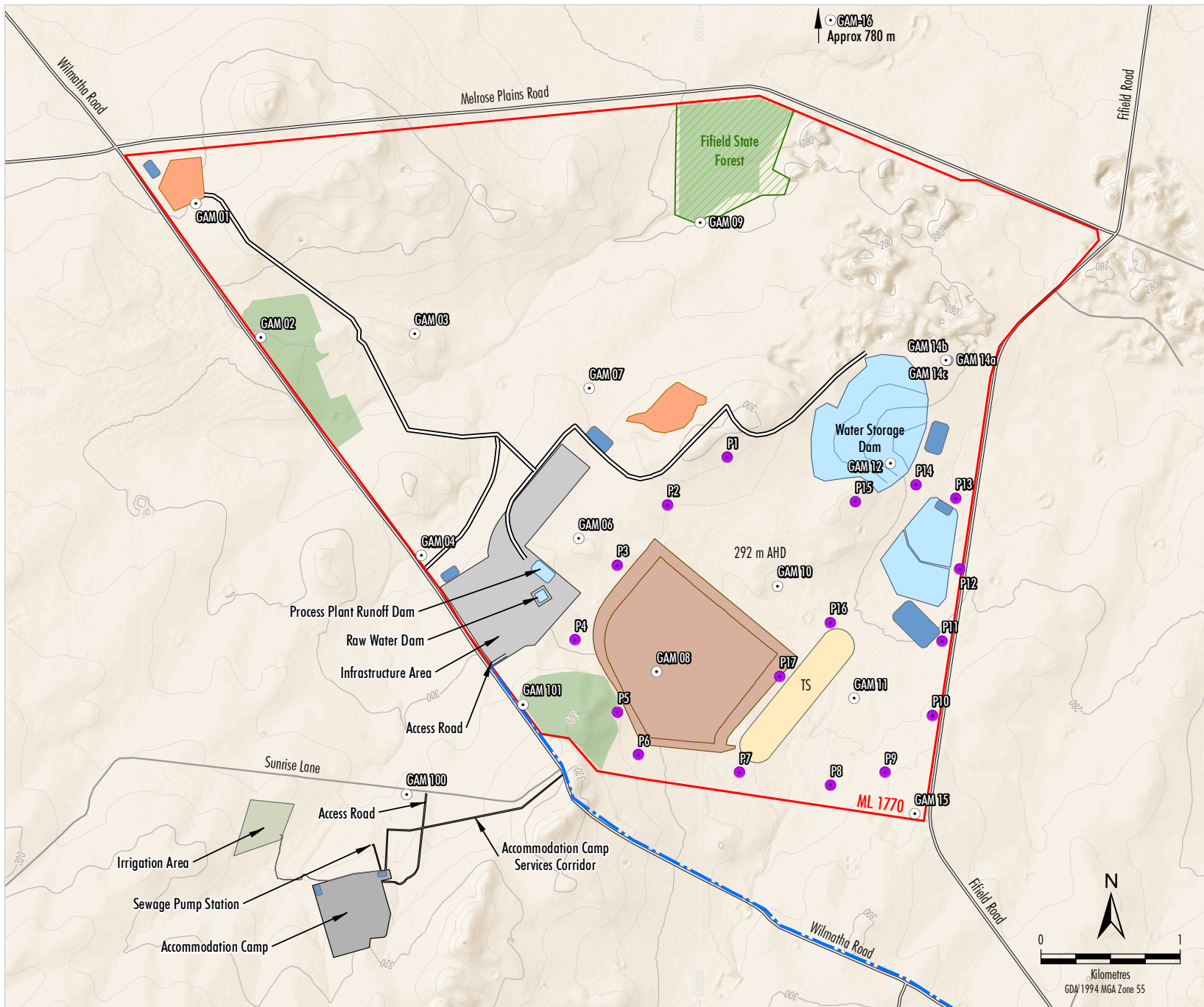
#### ***Construction Monitoring***

During construction, baseline monitoring will continue to be collected from the existing groundwater monitoring network (GAM Series) (Figure 8). Logging of groundwater levels will be continued and data downloaded periodically.

The monitoring bores will also be utilised to monitor six monthly a suite of groundwater quality parameters including EC, pH, total dissolved solids, major cations, major anions and selected metals (Table 9).

A network of site-specific monitoring piezometers (Figure 8) will also be established during the course of construction for future operational monitoring associated with the potential impact of the tailings storage facility, evaporation pond and water storage dam on the groundwater table and groundwater quality.

A summary of the construction phase mine site groundwater monitoring program is provided in Table 9.



- LEGEND**
- State Forest
  - Mining Lease Boundary (ML)
  - Tailings Storage Facility
  - Borrow Pit
  - Topsoil Stockpile
  - Infrastructure Area
  - Water Storage
  - Sediment Dam
  - Existing Open Woodland to be Maintained
  - Water Pipeline
  - Groundwater Monitoring Location
  - Proposed Piezometer Location

Source: Black Range Minerals (2000); Clean TeQ (2017, 2018); NSW Department of Industry (2018); NSW Land & Property Information (2017)

**Figure 8**

**Table 9 – Mine Site Groundwater Monitoring Program**

Monitoring Bore <sup>1</sup>	Parameter	Frequency
GAM Series (GAM-1, GAM-2, GAM-3, GAM-4, GAM-6, GAM-7, GAM-8, GAM-9a, GAM-10, GAM-11, GAM-12, GAM-14, GAM-14a, GAM-14b, GAM-15, GAM-100, GAM-101)	Water Level	Daily
	Water Quality (EC, pH, TDS, total alkalinity as CaCO <sub>3</sub> , total anions, total cations, hardness, ammonia as N, nitrate as N, nitrite as N, sulphate as SO <sub>4</sub> , carbonate alkalinity as CaCO <sub>3</sub> , Na, K, Ca, Mg, Cl and total and dissolved Al, As, Cd, Cu Co, Cr, Fe Mn, Ni, Pb, Zn)	Six Monthly
Piezometer Series (P1 to P15) (once constructed)	Water Level	Daily
	Water Quality (EC, pH, TDS, total alkalinity as CaCO <sub>3</sub> , total anions, total cations, hardness, ammonia as N, nitrate as N, nitrite as N, sulphate as SO <sub>4</sub> , carbonate alkalinity as CaCO <sub>3</sub> , Na, K, Ca, Mg, Cl and total and dissolved Al, As, Cd, Cu Co, Cr, Fe Mn, Ni, Pb, Zn)	Six Monthly

<sup>1</sup> Refer to Figure 8.

### Operations Monitoring

The groundwater monitoring program for operations will be developed in a subsequent revision of this GWMP, including review and refinement of the existing groundwater monitoring network.

Notwithstanding the above, it is expected that during the first few years of operation, the existing network of groundwater bores at the mine site will continue to be monitored (logged) and samples collected periodically for quality analysis (e.g. EC, pH, total dissolved solids, major cations, major anions and selected metals). Thereafter, sampling may be reduced as required subject to review through the Annual Review process.

### 7.2 Borefields

The objectives of the groundwater monitoring program for the borefields are:

- to assess the usage, status and maintenance requirements of the production bores;
- to assess the quality of groundwater supplied to the mine site;
- to assess groundwater usage by others in the vicinity of the borefields;
- to identify potential groundwater impacts related to the Project;
- to identify when and what remedial action may be required to maintain access to groundwater for existing groundwater users, if impacts of pumping from the borefields become significant; and
- to obtain aquifer and surface water flow data for ongoing review and refinement of the groundwater model.

## Baseline Monitoring

Baseline data collected from the existing groundwater monitoring network (MW-W1, ISMW01, ISMW02 and MW-E1) at the borefields (Figure 6) will continue to be recorded prior to the commencement of extraction at the borefields to add to the existing baseline datasets.

## Construction Monitoring

During the initial construction activities (i.e. before the extraction of groundwater), the collection of baseline data from the existing groundwater monitoring network (MW-W1, ISMW01, ISMW02 and MW-E1) at the borefields (Figure 6) will continue. A summary of the borefields groundwater monitoring program is provided in Table 10.

**Table 10** – Borefield Groundwater Monitoring Program

Monitoring Bore <sup>1</sup>	Parameter	Frequency
MW-W1, ISMW01, ISMW02 and MW-E1	Water Level	Continuous
	Water Quality (pH, EC, redox potential, temperature and dissolved oxygen)	Six Monthly

<sup>1</sup> Refer to Figure 6.

Consistent with the Secretary's approval for the progressive submission of environmental management plans, the monitoring program for the extraction phase of construction will be included in subsequent revisions of this GWMP.

Once extraction of water from the borefields has commenced during construction, based on the recommendations of HydroSimulations (in prep.), it is expected that the groundwater monitoring program will be progressively expanded to include:

- measurement of the groundwater level (with data-logging equipment) in the paired monitoring well adjacent to each the production bores;
- continuous measurement of groundwater usage at the flow meters equipped at the production bores;
- *in-situ* field measurements of groundwater quality at the production bores on a monthly basis for pH, EC, redox potential, temperature and dissolved oxygen;
- monthly measurement of groundwater levels in proposed piezometers and regional monitoring bores; and
- measurement of groundwater usage by neighbouring licensed irrigation bores and users (where access is available and metered).

Five piezometers (A to E) (Figure 9) will be progressively developed during the construction phase to add to existing borefield monitoring sites ISMW01 and ISMW02. At each production bore, a nearby monitoring piezometer screened in the Lachlan Formation will be used for monitoring (Piezometers A, B, D and E, ISMW01 and ISMW02). Piezometer C will be located approximately midway between the two groups of production bores, and will also include piezometers screened in the Upper Cowra and Lower Cowra formations.

The regional monitoring bores during the construction phase are expected to consist of 14 existing monitoring sites, including 12 NSW government monitoring sites (Figure 9).

In addition to the above, the following monitoring is proposed to obtain aquifer recharge and surface water data for ongoing review and refinement of the groundwater model, including:

- meteorological monitoring data from BoM Stations 50052 (Condobolin Agricultural Research and Advisory Station) and 50020 (Waroo); and
- surface flow from existing gauging stations on the Lachlan River (Figure 9) to monitor daily flows.

Additional detail on this component of the monitoring program will be included in subsequent revisions of this GWMP.

### ***Operations Monitoring***

The groundwater monitoring program for operations will be developed in a subsequent revision of this GWMP, including review and refinement of the existing groundwater monitoring network. Notwithstanding the above, it is expected that the construction stage monitoring program will continue and be expanded progressively during operations to include four additional regional groundwater monitoring sites (RB1 to RB4) (Figure 9 and Table 11).



**LEGEND**

- Water Pipeline
- Borefield Infrastructure Corridor \*
- Borefield Location
- Production Bore (not constructed)
- Production Bore (constructed)
- + Existing Borefield Monitoring Piezometer
- + Proposed Borefield Monitoring Piezometer
- + Regional Monitoring Bore (Existing)
- + Regional Monitoring Bore (Proposed) ^
- ▲ Surface Water Flow Gauge

\* Infrastructure Corridor includes linking pipeline, access road and electricity transmission line.

^ Indicative Location Only — Location to be confirmed in consultation with Natural Resources Access Regulator and relevant landholders.

Source: Ivanplats Syerston (2005); NSW Land & Property Information (2017); NSW DPI - Water (2018)  
NSW Imagery: Esri, DigitalGlobe (2017)

**Figure 9**

**Table 11 – Proposed Water Level Monitoring – Borefields [At Full Development]**

<b>Monitoring Bore</b>	<b>Screened Formation</b>	<b>Frequency</b>
<b>Project Borefield Monitoring</b>		
<i>Existing Sites</i>		
ISMW01	Lachlan	Continuous
ISMW02	Lachlan	Continuous
<i>Proposed Sites</i>		
Piezometers A, B, D and E	Lachlan	Continuous
Piezometer C	Upper Cowra Lower Cowra Lachlan	Continuous
<b>Regional Monitoring</b>		
<i>Existing Sites</i>		
GW025165	Lower Cowra	Monthly
GW025167	Upper Cowra	Monthly
GW036083	Upper Cowra Lower Cowra	Monthly
GW036085	Lower Cowra	Monthly
GW036087	Lower Cowra Lachlan	Monthly
GW036088	Lachlan	Monthly
GW036089	Lower Cowra Lachlan	Monthly
GW036090	Lachlan	Monthly
GW036526	Cowra Lachlan	Monthly
GW036528	Upper Cowra	Monthly
GW036550	Lower Cowra	Monthly
GW036554	Upper Cowra	Monthly
MW-E1	Lachlan	Monthly
MW-W1	Lachlan	Monthly
<i>Proposed Sites (Operations)</i>		
RB1	Upper Cowra Lower Cowra Lachlan	Monthly
RB2	Upper Cowra Lower Cowra Lachlan	Monthly
RB3	Upper Cowra Lower Cowra Lachlan	Monthly
RB4	Upper Cowra Lower Cowra Lachlan	Monthly

## 8. CONTINGENCY PLAN

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In accordance with Condition 3, Schedule 5 of Development Consent DA 374-11-00, Clean TeQ will assess and manage development-related risks to ensure that there are no exceedances of the criteria and/or performance measures.

In the event a water management performance measure for the Project (detailed in Section 5) may not have been met or a performance indicator is considered to have been exceeded, Clean TeQ will implement the following Contingency Plan:

- The Clean TeQ Environmental Superintendent will report the likely exceedance in accordance with Section 10.1.
- Clean TeQ will apply adaptive management (Section 8.1).
- Clean TeQ will identify an appropriate course of action with respect to the identified potential impacts or environmental consequences (if any), in consultation with specialists and relevant government agencies, as necessary. For example, contingency measures, such as, but not limited to, those described in Section 8.2.
- Clean TeQ will submit the proposed course of action to the DPIE for approval.
- Clean TeQ will implement the approved course of action to the satisfaction of the DPIE.

### 8.1 Adaptive Management

In accordance with Condition 3, Schedule 5 of Development Consent DA 374-11-00, where any exceedance of the criteria and/or performance measures outlined in Schedule 3 of Development Consent DA 374-11-00 occurs, at the earliest opportunity Clean TeQ will:

- take all reasonable and feasible measures to ensure that the exceedance ceases and does not recur;
- consider all reasonable and feasible options for remediation and submit a report to the DPIE describing these options and preferred remediation measures; and
- implement remediation measures as directed by the Secretary.

### 8.2 Specific Contingency Measures

Specific contingency measures for an exceedance of the water management performance measures may include:

- The conduct of additional monitoring (e.g. increase in monitoring frequency or additional sampling), which may inform further specific contingency measures.



- Provision of equivalent water supply or compensation for an impacted privately-owned bore (refer Section 6.5).
- The provision of a suitable offset (e.g. water infrastructure improvement works such as replacing open channels with pipelines) if there was an environmental consequence and/or adverse groundwater impacts were to result.
- Obtain additional entitlements for the Project under the *Water Management Act 2000* if additional water supply is required.
- Adjust the scale of Project operations to match the available Project water supply if additional water supply is required and additional entitlements under the *Water Management Act 2000* are not available.

Clean TeQ will also implement any preferred contingency measures identified to address an incident as directed by the Secretary (Sections 8.1 and 10.1).

## 9. REVIEW AND IMPROVEMENT OF ENVIRONMENTAL PERFORMANCE

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### 9.1 Annual Review

In accordance with Condition 5, Schedule 5 of Development Consent DA 374-11-00, Clean TeQ will review the environmental performance of the Project by the end of March each year (for the previous calendar year) to the satisfaction of the Secretary.

In relation to water management, the Annual Review will (where relevant):

- describe the development that was carried out in the relevant calendar year, and the development that is proposed to be carried out during the following calendar year;
- include a comprehensive review of the monitoring results and complaints records of the development over the past year, which includes a comparison of these results against the:
  - relevant statutory requirements, limits or performance measures/criteria;
  - monitoring results of previous years; and
  - relevant predictions in the Project Environmental Impact Statement (Black Range Minerals, 2000) and subsequent environmental assessments;
- identify any non-compliance over the last year, and describe what actions were (or are being) taken to ensure compliance;
- identify any trends in the monitoring data over the life of the development;
- identify any discrepancies between the predicted and actual impacts of the development, and analyse the potential cause of any significant discrepancies; and
- describe what measures will be implemented over the next year to improve the environmental performance of the development.

The Annual Review will be made publicly available on the Clean TeQ website.

### 9.2 Independent Environmental Audit

In accordance with Condition 10, Schedule 5 of Development Consent DA 374-11-00, within one year of the commencement of the development after 6 May 2017, and every 3 years thereafter (unless the Secretary directs otherwise), Clean TeQ will commission and pay the full cost of an independent environmental audit of the Project. The independent environmental audit will be conducted by a suitably qualified, experienced and independent team of experts whose appointment has been endorsed by the Secretary.

The independent environmental audit will assess the environmental performance of the Project and review the adequacy of this GWMP. If necessary, appropriate measures or actions to improve the environmental performance of the Project or this GWMP will be recommended.

The independent environmental audit, and Clean TeQ's response to the recommendations in the audit, will be made publicly available on the Clean TeQ website, in accordance with Condition 12, Schedule 5 of Development Consent DA 374-11-00.

## 10. REPORTING PROTOCOLS

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In accordance with Condition 4(g), Schedule 5 of Development Consent DA 374-11-00, Clean TeQ has developed protocols for managing and reporting the following:

- incidents;
- complaints;
- non-compliances with statutory requirements; and
- exceedances of the impact assessment criteria and/or performance criteria.

These protocols are described in detail in Clean TeQ's Environmental Management Strategy.

In accordance with Condition 9, Schedule 5 of Development Consent DA 374-11-00, Clean TeQ will provide regular reporting on the environmental performance of the Project on the Clean TeQ website. The Annual Review will be made publicly available on the Clean TeQ website to address this requirement.

### 10.1 Incident Reporting

An incident is defined as a set of circumstances that causes or threatens to cause material harm to the environment and/or breaches or exceeds the limits or performance measures/criteria in Development Consent DA 374-11-00.

In the event that review of groundwater monitoring data indicates an incident has occurred, the incident will be reported in accordance with Condition 8, Schedule 5 of Development Consent DA 374-11-00. Clean TeQ will notify the Secretary and any other relevant agencies including the relevant Council immediately after it becomes aware of the incident. Clean TeQ will also notify any affected landholders of any incident that has caused, or threatens to cause, material harm to the environment.

Within seven days of the date of the incident, Clean TeQ will provide the Secretary and any other relevant agencies with a detailed report on the incident and such further reports as may be requested. The report will:

- describe the date, time and nature of the exceedance/incident;
- identify the cause (or likely cause) of the exceedance/incident;
- describe what action has been taken to date; and
- describe reasonable and feasible options to address the incident and identify the preferred option to address the incident (Section 8.1).

## 10.2 Complaints

Clean TeQ will maintain a Community Complaints Line (tel: 1800 952 277) and email address ([community@cleanteq.com](mailto:community@cleanteq.com)) for the sole purpose of receiving community contacts and complaints. The Community Complaints Line number will be available on the website and included in Clean TeQ's advertising and community communication tools. The Community Complaints line will be staffed 24 hours a day, seven days a week during construction and operations. Clean TeQ will respond to callers on the next business day. If the issue is urgent a member of the leadership team will be contacted immediately.

Clean TeQ has developed a procedure that outlines its commitment to receiving, resolving and recording complaints received from the community. Detailed records of each complaint resolution are kept in Clean TeQ's record management systems.

Complaints will be investigated within 24 hours of receipt. The cause of the complaint will be analysed and actions to resolve the complaint taken as soon as possible. In complex cases where resolution will take more than 48 hours, Clean TeQ will commit to update the community member regularly until the complaint is resolved.

In accordance with Condition 12(a), Schedule 5 of Development Consent DA 374-11-00, a complaints register will be made available on the Clean TeQ website and updated monthly.

## 10.3 Non-Compliances with Statutory Requirements

A protocol for managing and reporting non-compliances with statutory requirements has been developed as a component of Clean TeQ's Environmental Management Strategy and is described below.

Compliance with all approvals plans and procedures is the responsibility of all personnel (staff and contractors) employed on or in association with Clean TeQ and the Project.

The Clean TeQ Environmental Superintendent will undertake regular inspections, internal audits and initiate directions identifying any remediation/rectification work required, and areas of actual or potential non-compliance.

As described in Section 10.1, Clean TeQ will report incidents in accordance with Condition 8, Schedule 5 of Development Consent DA 374-11-00 and in accordance with the protocol for industry notification of pollution incidents under Part 5.7 of the POEO Act.

Clean TeQ will notify the Secretary and any other relevant agencies including the relevant Council immediately after the authorised person becomes aware of the incident which causes or threatens to cause material harm to the environment. Within seven days of the date of the incident, Clean TeQ will provide the Secretary and any other relevant agencies with a detailed report on the incident and such further reports as may be requested.

A review of compliance with all conditions in Development Consent DA 374-11-00, Mining Lease 1770 and all other approvals and licences will be undertaken prior to (and included within) each Annual Review (Section 9.1).

Additionally, in accordance with Condition 10, Schedule 5 of Development Consent DA 374-11-00, an independent environmental audit (Section 9.2) will be conducted by a suitably qualified, experienced and independent team of experts whose appointment has been endorsed by the Secretary to assess whether Clean TeQ is complying with the requirements in Development Consent DA 374-11-00, and any other relevant approvals, EPLs, and/or mining leases.

#### **10.4 Exceedances of Impact Assessment Criteria and/or Performance**

A protocol for managing and reporting exceedances of impact assessment criteria and/or performance criteria is provided in Section 8.

## 11. REFERENCES

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# ATTACHMENT 1

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Mine Site Water Quality Results

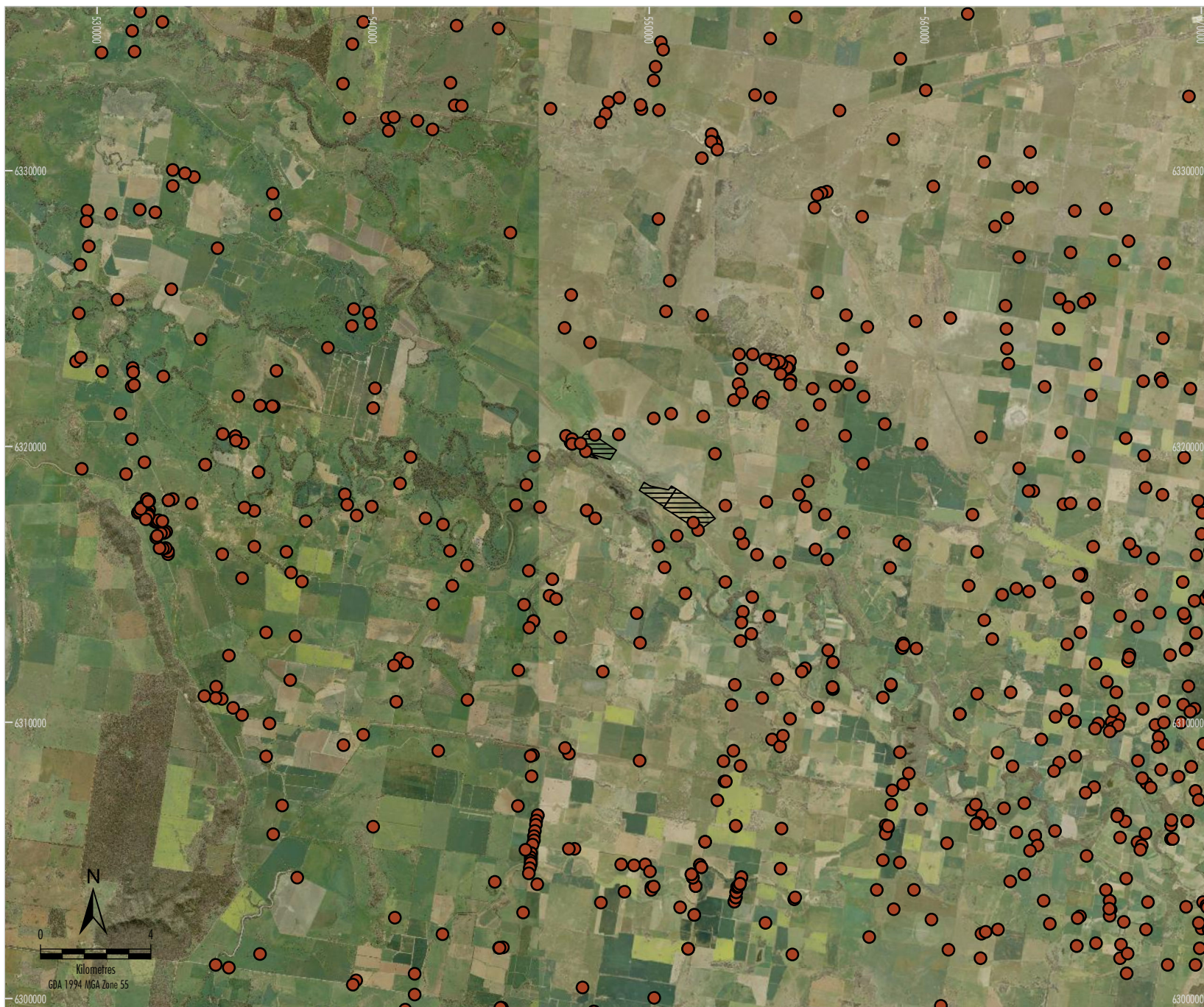
Analytical Group	Analyte	Units	LOR	ANZECC 2000 Primary Industry (Livestock)	Australian Drinking Water Guidelines 2011 Health (NHMRC)	ANZECC 2000 Freshwater 95%	Sample ID	Andersons Pit	GAM1	GAM2	GAM3	GAM4	GAM6	GAM7	GAM8	GAM10	GAM11	GAM12	GAM14C	GAM15	GAM16	GAM100	GAM101					
							Sample type	Surface water	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater	Groundwater
							Date sampled	07-Jun-18	07-Jun-18	07-Jun-18	08-Jun-18	07-Jun-18	12-Jun-18	07-Jun-18	13-Jun-18	12-Jun-18	07-Jun-18	13-Jun-18	13-Jun-18	12-Jun-18	08-Jun-18	08-Jun-18	06-Jun-18	06-Jun-18	06-Jun-18	06-Jun-18	06-Jun-18	06-Jun-18
Physical Parameters	Lab Electrical Conductivity	µS/cm	1				140	340	822	1620	1460	1490	1180	10400	5780	14800	1400	2070	4230	5430	6320	6910						
	Lab Total Dissolved Solids	mg/L	10	2000 <sup>6</sup>	600 <sup>1</sup>		81	214	452	812	851	763	588	6020	3090	10300	798	934	2420	3540	3980	4080						
	Field pH	Units	0.1		6.5 - 8.5 <sup>1</sup>	6.5 - 7.5 <sup>5</sup>	8.9	6.7	8.3	7.0	7.2	8.0	8.8	7.0	8.7	6.8	8.6	7.3	7.3	6.9	7.2	8.9						
	Field Redox	mV	1				97	198	135	257	97	151	107	230	191	141	91	96	96	165	248	144						
Nutrients	Field Temperature	°C	0.1				16.6	18.6	17.2	17.8	20.9	19.3	18	17.1	18.5	18.8	18.1	19	17.2	17.1	16.9	18.2						
	Ammonia as N	mg/L	0.01		0.5 <sup>1</sup>	0.9 <sup>4</sup>	0.16	0.02	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-						
	Kjeldahl Nitrogen Total	mg/L	0.1				0.7	0.4	-	-	-	-	-	-	-	-	<0.2	-	-	-	-	-						
	Nitrate (as N)	mg/L	0.01	400	50	0.7	<0.01	1.3	-	-	-	-	-	-	-	-	2.33	-	-	-	-	-						
	Nitrite (as N)	mg/L	0.01	30	3		<0.01	<0.01	-	-	-	-	-	-	-	-	<0.01	-	-	-	-	-						
	Nitrite + Nitrate as N	mg/L	0.01				<0.01	1.3	-	-	-	-	-	-	-	-	2.33	-	-	-	-	-						
	Nitrogen (Total)	mg/L	0.1				0.25 <sup>5</sup>	0.7	1.7	-	-	-	-	-	-	-	2.3	-	-	-	-	-						
Major Cations and Anions	Total Phosphorus as P	mg/L	0.01				<0.01	0.02	-	-	-	-	-	-	-	<0.02	-	-	-	-	-							
	Calcium (Filtered)	mg/L	1	1000			4	12	57	28	75	66	2	111	90	347	46	54	114	161	13	16						
	Magnesium (Filtered)	mg/L	1				8	<1	55	200	86	66	58	251	286	475	8	132	178	339	67	38						
	Potassium (Filtered)	mg/L	1				10	2	2	1	2	6	4	20	14	19	3	4	7	12	24	17						
	Sodium (Filtered)	mg/L	1				6	54	43	47	84	123	147	1780	725	2000	223	164	517	399	1380	1440						
	Alkalinity (Hydroxide) as CaCO3	mg/L	1				<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1						
	Alkalinity (Bicarbonate) as CaCO3	mg/L	1				65	75	412	1010	553	236	348	949	788	814	137	655	856	620	1530	704						
	Alkalinity (Carbonate) as CaCO3	mg/L	1				<1	<1	23	<1	<1	<1	56	<1	9	<1	<1	<1	<1	<1	<1	<1						
	Alkalinity (Total) as CaCO3	mg/L	1				65	75	435	1010	553	236	404	949	796	814	137	655	856	620	1530	871						
	Chloride	mg/L	1				6	30	51	57	170	332	173	2110	1350	4210	218	295	708	1420	1060	1420						
	Sulfate as SO4	mg/L	1	1000			<1	41	12	10	31	75	14	2080	437	1550	248	40	561	160	419	584						
	Cations Total	mg/L	0.01				1.37	3	9.29	19.9	14.5	14.2	11.4	104	59.9	144	12.7	20.8	43	53.6	66.8	67						
	Anions Total	mg/L	0.01				1.47	3.2	10.4	22	16.5	15.6	13.2	122	63.1	167	14	22.2	48.8	55.8	69.2	69.6						
	Ionic Balance	%	0.01				-	3.22	5.53	4.93	6.33	4.73	7.61	7.81	2.57	7.52	4.93	3.36	6.26	1.99	1.76	1.92						
	Metals (Dissolved for groundwater (field filtered) and total for surfacewater)	Aluminum	mg/L	0.01	5	0.2 <sup>1</sup>	0.055	0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
		Aluminum (Filtered)	mg/L	0.01	5	0.2 <sup>1</sup>	0.055	-	0.08	<0.01	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	0.03	<0.01	0.03	<0.01	<0.01	<0.01	<0.01					
		Arsenic	mg/L	0.001	0.5	0.01	0.013 <sup>3</sup>	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-					
Arsenic (Filtered)		mg/L	0.001	0.5	0.01	0.013 <sup>3</sup>	-	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	<0.001	<0.001	0.006	0.002	<0.001	<0.001	0.001						
Boron		mg/L	0.05	5	4	0.37	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-						
Boron (Filtered)		mg/L	0.05	5	4	0.37	-	<0.05	0.08	0.11	0.11	0.1	0.1	<0.05	0.13	0.16	0.13	0.28	0.22	0.13	0.18	0.14						
Cadmium		mg/L	0.0001	0.01	0.002	0.0002	<0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-						
Cadmium (Filtered)		mg/L	0.0001	0.01	0.002	0.0002	-	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.00037	0.0002	0.0004	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001						
Chromium		mg/L	0.001	1	0.05 <sup>2a</sup>	0.0033 <sup>2b</sup>	0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-						
Chromium (Filtered)		mg/L	0.001	1	0.05 <sup>2a</sup>	0.0033 <sup>2b</sup>	-	<0.001	0.026	0.009	0.015	0.002	0.006	<0.001	0.002	0.001	<0.001	<0.001	<0.001	0.002	<0.001	0.009						
Cobalt		mg/L	0.001	1			<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-						
Cobalt (Filtered)		mg/L	0.001	1			<0.001	<0.001	<0.001	0.001	<0.001	0.003	<0.001	0.008	<0.001	0.002	0.001	<0.001	<0.001	<0.001	0.002	<0.001						
Copper		mg/L	0.001	0.4	2	0.0014	0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-						
Copper (Filtered)		mg/L	0.001	0.4	2	0.0014	-	0.009	0.012	0.007	0.009	0.013	0.008	0.098	0.246	0.003	0.005	0.011	0.007	0.007	0.007	0.008						
Iron		mg/L	0.05				0.3 <sup>1</sup>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-						
Iron (Filtered)		mg/L	0.05				0.3 <sup>1</sup>	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.12	<0.05	<0.05	0.19	<0.05	<0.05						
Lead		mg/L	0.001	0.1	0.01	0.0034	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-						
Lead (Filtered)		mg/L	0.001	0.1	0.01	0.0034	-	0.001	0.005	<0.001	0.005	0.01	0.006	<0.001	0.011	<0.001	<0.001	0.015	0.002	<0.001	<0.001	<0.001						
Manganese		mg/L	0.001				0.28	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-						
Manganese (Filtered)		mg/L	0.001				0.5	1.9																				
Mercury		mg/L	0.0001	0.002	0.001	0.0006	<0.0001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-						
Mercury (Filtered)		mg/L	0.0001	0.002	0.001	0.0006	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001						
Nickel		mg/L	0.001	1	0.02	0.011	0.002	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-						
Nickel (Filtered)		mg/L	0.001	1	0.02	0.011	-	0.005	0.006	0.014	<0.001	0.101	0.001	0.01	0.143	0.002	<0.001	0.004	0.002	0.002	0.002	0.012						
Silver		mg/L	0.001				<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-						
Silver (Filtered)		mg/L	0.001				0.1	0.00005	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001						
Vanadium		mg/L	0.01				<0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-						
Vanadium (Filtered)		mg/L	0.01				<0.01	<0.01	0.03	<0.01	0.02	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	<0.01	0.02	<0.01	<0.01	0.02						
Zinc		mg/L	0.005	20	3 <sup>1</sup>	0.008	<0.005	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-						
Zinc (Filtered)	mg/L	0.005	20	3 <sup>1</sup>	0.008	-	0.008	0.026	0.008	0.006	0.029	<0.005	0.021	0.054	<0.005	0.01	0.022	0.013	0.007	0.009	0.006							

Notes:  
 - = not analysed  
 ANZECC = Australia and New Zealand Environment and Conservation Council  
 NHMRC = National Health and Medical Research Council  
 LOR = Limit of Reporting  
 1. Aesthetic guideline value (ADWG 2011)  
 2a. Chromium guideline value as Cr VI (ADWG 2011)  
 2b. Chromium trigger value as Cr III, low reliability indicative interim working level (IWL) (ANZECC 2000)  
 3. Arsenic trigger value as As V (ANZECC 2000)  
 4. Ammonia trigger value at pH 8. For changes in trigger values with pH refer to Section 8.3.7.2 (ANZECC 2000)  
 5. ANZECC 2000 default trigger values for physical and chemical stressors for south east Australia for slightly disturbed ecosystems. Upland river values adopted (> 150 m altitude)  
 6. TDS guideline depends on livestock. No adverse effects expected on animals as follows:  
 Poultry < 2000 mg/L  
 Dairy cattle < 2500 mg/L  
 Pigs, horses, beef cattle < 4000 mg/L  
 Sheep < 5000 mg/L

**ATTACHMENT 2**

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Bore Census (2018) and Registered Bore (2019) Records for Borefields and Surrounds



- LEGEND**
- Registered NSW PINNEENA Groundwater Bore
  - Potential Project Borefield Location

Source: NSW Department of Primary Industries, Office of Water (2014)  
 Ortho: NSW Department of Finance, Services and Innovation (2017)



CLEAN TEQ SUNRISE PROJECT

Registered Bore (PINNEENA)  
 Records for Borefield and Surrounds