ENGENY

ROLLESTON OPEN CUT
SPRING CREEK NORTH CONTINUATION PROJECT

Surface Water Assessment

QC1001_001-REP-001-3

25 JANUARY 2023

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Rev	Date	Description	Author	Reviewer	Project Mgr.	Approver
0	18/11/2022	Issue for Review	Syed Ali	Aaron Baldwin	Syed Ali	Aaron Baldwin
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Signatures:						

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1. INTRODUCTION

Rolleston Open Cut (ROC) commissioned Engeny to undertake a surface water assessment to support approvals processes for the progression of the northern extent of mining activities in the Spring Creek Pit. This report summarises the key outcomes of the assessment including impacts to streamflow and catchments, water quality, flooding, in addition to the high level operational and closure water management strategy.

The southern boundary of the Spring Creek North Pit (SCNP) is located in the northern extent of ML 70307 and progresses uphill to the north-west into ML 70415. Mining in SCNP is scheduled over seven years. The pit progression intercepts several minor drainage gullies requiring diverting away from mining areas, as well as reconfiguration of spoil placement areas requiring operational sediment and drainage control structures. The SCNP progression also provides sufficient spoil to backfill the existing Spring Creek Pit. The SCNP final void will be located at the far northern extent of ML70415 with negligible external catchment.

1.1 Project Description

The Rolleston Open Cut (ROC) thermal coal mine has been in operation since 2005 and has approval to mine up to 19 million tonnes (Mt) run-of-mine (ROM) per annum. ROC is situated approximately 275 km west of Gladstone and approximately 16 km west of the town of Rolleston in the Central Highlands Regional Council area. The Spring Creek North Continuation Project (the Project) would extend the mining area of the existing ROC Spring Creek Pit, on mining lease 70415, Figure 1.1. Though situated on an existing Mining Lease, the Project area has not previously been approved for mining. The Project will not increase the mine's production rate or extend the life of the Project. No change in the method of mining is proposed. No additional supporting infrastructure such as rail or road will be required.

The pit area will be mined by open cut methods, with the recovery of all coal meeting customer quality specifications. The mining strips will generally be 50 to 70 m wide, depending on depth and other constraints. Coal will be loaded on to trains within ML70418 and transported to coal domestic/ export facilities in Gladstone via the rail network referred to as the Blackwater System.

The Project has been designed to utilise the existing approved ROC infrastructure wherever practical. This approach reduces the disturbance footprint by utilising approved ancillary infrastructure such as electricity lines, water supply pipelines, coal handling facility (CHF), train load out facility (TLO), haul roads and rail infrastructure. Although the Project would be able to largely utilise existing infrastructure, additional mine infrastructure, as well as upgrades to existing mine infrastructure, would be required and are summarised in Table 1.1.

The Project will be required to meet the requirements of the ROC Progressive Rehabilitation and Closure Plan (PRCP). ROC is required to submit the PRCP to the Department of Environment and Science by April 2024. Ramp 1, in the existing Spring Creek Pit mining area, has been mined out leaving a highwall that cannot be battered down to an acceptable grade without extending the slope outside of the current approval limit and into the Project footprint. If the Project was approved for mining, the pit would be extended north and the existing, previously approved Ramp 1 void filled. A buffer has been included in the Project area to provide the ability to reshape the proposed final highwall batter to an acceptable grade that would support the final land use (i.e., grazing) and not be a Non-Use Management Area (NUMA).

TABLE 1.1: SPRING CREEK NORTH CONTINUATION PROJECT SUMMARY

Feature	Description
Production	Approximately 35.7 Mt ROM coal over the life of the Project.
Annual Production Limit	No change – current approval of 19 Mt ROM per annum.
Project Area	593 hectares
Pit Area	510 hectares
Mine Life[1]	Production: approximately 2039 Rehabilitation: up to approximately 2046
Operating hours	No change – 24 hours per day, 7 days a week.
Workforce	Continued employment of up to 1030 mine workers, decreasing towards the end of the mine life.

Feature	Description
Mining Method	Open cut mining
Mining Lease	ML70415 (existing)
Mine Infrastructure	The Project would largely utilise existing infrastructure as part of the current ROC operations. The existing Mine Infrastructure Area (MIA) would not require any upgrades.
Water Infrastructure	A new clean water drain at the western end of the Project area will be required to separate clean and mine affected water. The Project will not require any additional levees, diversions or dams. The current Spring Creek Pit dewatering pipeline will be relocated north of the Project area. There are two (2) stream order 1 drainage line and no floodplains in the Project area.
Electrical Infrastructure	New 66 kV line north of the Project pit
Public Roads	No change
Mine Access	The Project will utilise the existing ROC access road which connects directly to the Dawson Highway.
Communications	No change
Rehabilitation	Progressive rehabilitation of disturbed areas following decommissioning of the mined and infrastructure areas. Progressive rehabilitation scheduling will be included in the whole of site PRCP (Progressive Rehabilitation and Closure Plan) due for submission in April 2024. The Project does not have any out of the pit dumps.
Final Void	The existing final void (at Ramp 1) will migrate further to the north into the Project area, to the top of the local catchment.

[1]*Includes the existing mine and the Project*

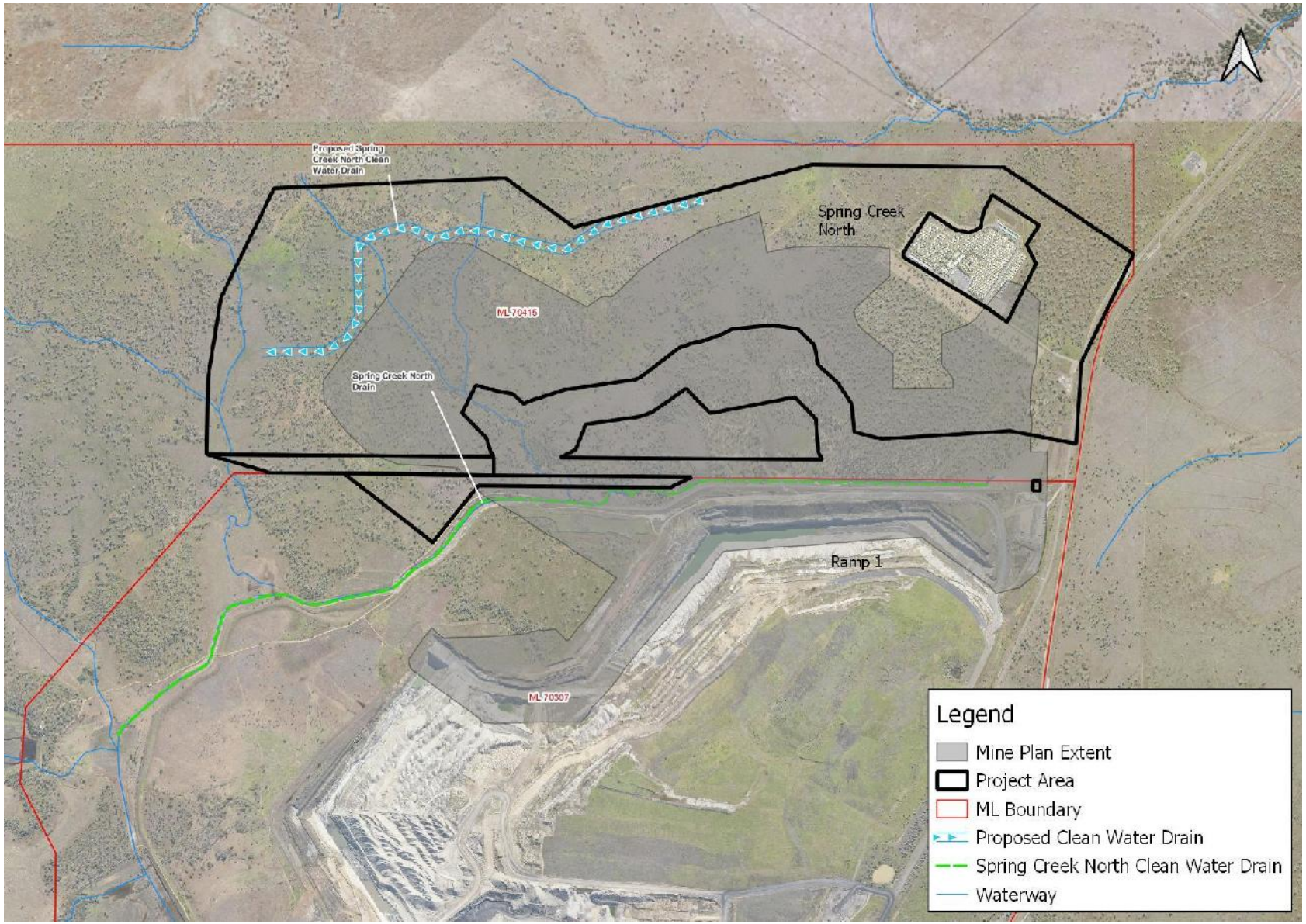


Figure 1.1: Spring Creek North Continuation Project Area

1.2 Legislative Requirements

The over-arching legislation that applies to the management of water at ROC include:

- Environmental Protection Act 1994 (Qld).
- Environmental Protection Regulation 2008 (Qld).
- Environmental Protection (Water and Wetland Biodiversity) Policy 2019 (Qld).
- Water Act 2000 (Qld).
- Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act).

The relevance of the above legislation to the Project are described in Section 3.2.

1.3 Existing Approved Mining

Current approved areas for mining and/or associated activities as per the Environmental Authority (EPML00370013) include the following:

- Rolleston (ML 70307).
- Rolleston Rail Loop (ML 70418).
- Rolleston South (ML 70416).
- Rolleston West (ML 70415).
- Springwood (ML 70458).

1.4 Independent Expert Scientific Committee Requirements

The Independent Expert Scientific Committee on Coal Seam Gas and Large Coal Mining Development (the IESC) is a statutory body under the EPBC Act. Proposals for expansion or modification of existing mining operations must address key requirements including:

- Impacts to water resources from existing operations and from proposed expansion or modification.
- Use of current and historical monitoring data to support statements on impacts.
- Use of existing project data to verify any modelling predictions.
- Outlining how existing data is used to assess the potential impacts of the proposed project.

Table 1.2 lists the IESC requirements and how the requirements have been addressed in this report or other technical studies for the Project. The following considerations were made to address the IESCP requirements:

- Assessing the Project using a conceptual model was not considered to be required, as the Project area drains internally and will be entirely managed by the existing mine water management system and therefore cannot affect the downstream water quality.
- The catchment areas of Bootes Creek and Meteor Creek will be reduced by 4.5% and 0.9% respectively. With respect to the impacts of the Great Barrier Reef, the catchment area of the Fitzroy River will be reduced by less than 0.005% resulting in limited impact.
- The existing Rolleston Open Cut Water Management Plan (WMP) (ROC, 2021) documents the site water balance model development, calibration, assumptions and limitations. The Water Management Plan is updated annually including calibration and assesses short- and long-term water management risks and water management system containment performance.
- The existing Rolleston Open Cut Receiving Environment Monitoring Program (REMP) (ROC, 2022) details water monitoring requirements for ongoing operations and assesses potential impacts to surface water resources. Section 3.5 provides further details of the current REMP.
- The WMP and REMP are considered suitable controls for ensuring ongoing calibration of existing models for assessing ongoing impacts associated with the Project and sites operation.

TABLE 1.2: IESC SURFACE WATER REQUIREMENTS

Information Requirement	Comment /Relevant Section
Surface Water	
Context and Conceptualisation	
Describe the hydrological regime of all watercourses, standing waters and springs across the site including: Geomorphology, including drainage patterns, sediment regime and floodplain features. Spatial, temporal and seasonal trends in streamflow and/or standing water levels. Spatial, temporal and seasonal trends in water quality data (such as turbidity, acidity, salinity, relevant organic chemicals, metals, metalloids and radionuclides), and, Current stressors on watercourses, including impacts from any currently approved projects.	**Section 2 –** provides details of the nearby waterways and drainage features to the Project.
Describe the existing flood regime, including flood volume, depth, duration, extent and velocity for a range of annual exceedance probabilities. Provide flood hydrographs and maps identifying peak flood extent, depth and velocity. This assessment should be informed by topographic data that has been acquired using lidar or other reliable survey methods with accuracy stated.	**Section 2.2 –** provides details of the existing flood behaviour and shows the Project is not impacted by waterway flooding in events up to the 0.1% AEP flood event. **Section 6.3** – Provides hydraulic assessment of the proposed clean water drain to confirm drain capacity and stability.
Provide an assessment of the frequency, volume, seasonal variability and direction of interactions between water resources, including surface water/ groundwater connectivity and connectivity with sea water.	**Section 6.1** – Provides details of the impacts to surface water resources.
Analytical and Numerical Modelling	
Provide conceptual models at an appropriate scale, including water quality, stores, flows and use of water by ecosystems.	Existing daily water and salt balance model of the ROC water management system which is annually updated and used to assess system performance for short and long-term mine plans is presented in the ROC Water Management Plan (ROC, 2021).
Use methods in accordance with the most recent publication of *Australian Rainfall and Runoff* (Ball et al. 2016).	
Develop and describe a program for review and update of the models as more data and information becomes available.	The ROC Water Management Plan (ROC, 2021) and Receiving Environment Monitoring Program (ROC, 2022) are updated annually are considered suitable controls for ensuring ongoing calibration and assessing potential impacts associated with the Project and ongoing ROC site operations.
Describe and justify model assumptions and limitations and calibrate with appropriate surface water monitoring data.	The water balance model calibration and assumptions and limitations are presented in the ROC Water Management Plan (ROC, 2021) and updated annually.
Provide an assessment of the risks and uncertainty inherent in the data used in the modelling, particularly with respect to predicted scenarios.	
Provide a detailed description of any methods and evidence (e.g., expert opinion, analogue sites) employed in addition to modelling.	**Section 6 –** provides expert review of the potential impacts of the Project.
Impacts to Water Resources and Water-Dependant Assets	
Describe all potential impacts of the proposed project on surface waters. Include a clear description of the impact to the resource, the resultant impact to any assets dependent on the resource (including water-dependent ecosystems such as riparian zones and floodplains), and the consequence or significance of the impact. Consider: Impacts on streamflow under the full range of flow conditions. Impacts associated with surface water diversions. Impacts to water quality, including consideration of mixing zones.	**Section 6 –** provides expert review of the potential impacts of the Project. SCNP drains internally and will be entirely managed by the existing mine water management system and therefore cannot affect the downstream water quality.

Information Requirement	Comment /Relevant Section
The quality, quantity and ecotoxicological effects of operational discharges of water (including saline water), including potential emergency discharges, and the likely impacts on water resources and water-dependent assets. Landscape modifications such as subsidence, voids, post rehabilitation landform collapses, on-site earthworks (including disturbance of acid-forming or sodic soils, roadway and pipeline networks) and how these could affect surface water flow, surface water quality, erosion, sedimentation and habitat fragmentation of water-dependent species and communities.	The Project is expected to reduce the catchment areas of Bootes Creek and Meteor Creek by 4.5% and 0.9% respectively. With respect to the impacts of the Great Barrier Reef, the catchment area of the Fitzroy River will be reduced by less than 0.005% resulting in limited impact.
Discuss existing water quality guidelines, environmental flow objectives and requirements for the surface water catchment(s) within which the development proposal is based.	
Identify processes to determine surface water quality guidelines and quantity thresholds which incorporate seasonal variation but provide early indication of potential impacts to assets.	
Propose mitigation actions for each identified significant impact.	
Describe the adequacy of proposed measures to prevent or minimise impacts on water resources and water-dependent assets.	
Describe the cumulative impact of the proposal on surface water resources and water-dependent assets when all developments (past, present and reasonably foreseeable) are considered in combination.	
Provide an assessment of the risks of flooding (including channel form and stability, water level, depth, extent, velocity, shear stress and stream power), and impacts to ecosystems, project infrastructure and the final project landform.	
Data and Monitoring	
Identify monitoring sites representative of the diversity of potentially affected water-dependent assets and the nature and scale of potential impacts, and match with suitable replicated control and reference sites (BACI design) to enable detection and monitoring of potential impacts.	The existing Rolleston Open Cut Environmental Authority EPML00370013, Receiving Environment Monitoring Plan (ROC, 2022) and Water Management Plan (ROC, 2021) are suitable for monitoring of water quality and surface water impacts and will continue to be implemented. **Section 3.5 -** provides further details of the current ROC REMP.
Ensure water quality monitoring complies with relevant National Water Quality Management Strategy (NWQMS) guidelines (ANZG 2018) and relevant legislated state protocols (e.g., QLD Government 2013).	
Identify data sources, including streamflow data, proximity to rainfall stations, data record duration and describe data methods, including whether missing data has been patched.	
Develop and describe a surface water monitoring program that will collect sufficient data to detect and identify the cause of any changes from established baseline conditions and assess the effectiveness of mitigation and management measures. The program will: Include baseline monitoring data for physico-chemical parameters, as well as contaminants (e.g., metals). Comparison of physico-chemical data to national/regional guidelines or to site-specific guidelines derived from reference condition monitoring if available, and, Identify baseline contaminant concentrations and compare these to national guidelines, allowing for local background correction if required.	
Describe the rationale for selected monitoring parameters, duration, frequency and methods, including the use of satellite or aerial imagery to identify and monitor large-scale impacts.	
Develop and describe a plan for ongoing ecotoxicological monitoring, including direct toxicity assessment of discharges to surface waters where appropriate	

Information Requirement	Comment /Relevant Section
Identify dedicated sites to monitor hydrology, water quality, and channel and floodplain geomorphology throughout the life of the proposed project and beyond.	
Water and Salt Balance, and Water Quality	
Provide a quantitative site water balance model describing the total water supply and demand under a range of rainfall conditions and allocation of water for mining activities (e.g., dust suppression, coal washing etc.), including all sources and uses.	Existing daily water and salt balance model of the ROC water management system which is used to assess performance for short and long term mine plans is presented in the ROC Water Management Plan (ROC, 2021). Further modelling of the project was not considered required for the following reasons: • The Project is a minor continuation on existing mining activities and does not require development of new mining pits or mine water storages. • The Project area drains internally and will be entirely managed by the existing mine water management system and therefore cannot affect the downstream water quality. • The small increase in catchment area reporting to the mine water system will be offset by progressive rehabilitation of existing disturbance.
Describe the water requirements and on-site water management infrastructure, including modelling to demonstrate adequacy under a range of potential climatic conditions.	
Provide estimates of the quality and quantity of operational discharges under dry, median and wet conditions, potential emergency discharges due to unusual events and the likely impacts on water-dependent assets.	
Provide salt balance modelling that includes stores and the movement of salt between stores and considers seasonal and long-term variation.	
Final Landform and Voids – Coal Mines	
Identify and consider landscape modifications (e.g., voids, on-site earthworks, and roadway and pipeline networks) and their potential effects on surface water flow, erosion, sedimentation and habitat fragmentation of water-dependent species and communities.	To be completed in the sites Progressive Rehabilitation and Closure Plan (PRCP).
Assess the adequacy of modelling, including surface water and groundwater quantity and quality, lake behaviour, timeframes, and calibration.	
Provide an evaluation of stability of void slopes where failure during extreme events or over the long term (for example due to aquifer recovery causing geological heave and landform failure) may have implications for water quality.	
Evaluate mitigating inflows of saline groundwater by planning for partial backfilling of final voids.	
Provide an assessment of the long-term impacts to water resources and water-dependent assets posed by various options for the final landform design, including complete or partial backfilling of mining voids. Assessment of the final landform for which approval is being sought should consider: Groundwater behaviour - sink or lateral flow from void. Water level recovery - rate, depth, and stabilisation point (e.g., timeframe and level in relation to existing groundwater level, surface elevation). Seepage - geochemistry and potential impacts. Long-term water quality, including salinity, pH, metals and toxicity. Measures to prevent migration of void water off-site. For other final landform options considered sufficient detail of potential impacts should be provided to clearly justify the proposed option.	
Assess the probability of overtopping of final voids with variable climate extremes, and management mitigations.	

2. RECEIVING WATERWAYS

2.1 Overview

As described in the Rolleston Coal Expansion Project (RCEP) Environmental Impact Statement (EIS) (Xstrata, 2013) approved in 2016, the site is located on the Fitzroy Basin, within the Comet River Sub-basin which covers an area of 17,292 square kilometres. Three watercourses as defined under the Water Act 2000 - Meteor Creek, Sandy Creek and Bootes Creek – as well as two main drainage features – Gibbs Gully and Spring Creek flow generally in a north-east direction through the ROC operation. These streams are ephemeral with little or no flow between April and November and high flows in the summer months. Recovery from streamflow to groundwater systems occurs during infrequent, sustained flood events.

Bootes Creek arises approximately 8.2 km to the west of the mining leases and flows east through the mining leases. Two smaller tributaries (Spring Creek and Gibbs Gully) join Bootes Creek within the mining leases. A water supply dam has been constructed in Gibbs Gully, upstream of the confluence with Bootes Creek. Bootes Creek eventually flows into Meteor Creek downstream of the ML.

Meteor Creek rises on the Great Dividing Range (Carnarvon National Park), along the northern edge of the Consuelo Tableland, at an altitude of approximately 1200m. It runs in a general north-easterly direction (through mining leases 70458 and 70416 as well as Albinia National Park) for approximately 125km to enter the Comet River as a fifth-order stream at approximately 200m altitude. The headwater tributaries have a steep gradient while the downstream half of the Meteor Creek is relatively flat, dropping only 100m in the last 60km of its flow to the Comet River. About 21 km downstream of the confluence of Meteor Creek and Bootes Creek, Meteor Creek joins the Comet River.

The existing waterways and drainage features are shown in Figure 2.2. A summary of the catchment area for the existing waterways is provided in Table 2.1.

TABLE 2.1: EXISTING WATERWAY CATCHMENT AREAS

Waterway	Catchment Area (km²)	Total Catchment Area (including upstream catchments) (km²)
Spring Creek North Drain	6.9	6.9
Spring Creek	57.3	64.2
Bootes Creek	95.0	159.2
Meteor Creek[1]	761.5	920.7

[1]*Inclusive of the Sandy Creek catchment.*

Spring Creek North Drain
6.9 km2

Spring Creek
57.3 km2

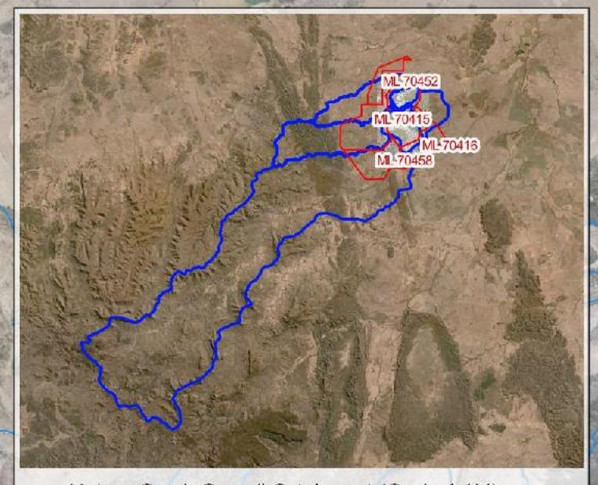
Bootes Creek
95.0 km2

Meteor Creek at confluence with Bootes Creek
761.5 km2

Spring Creek North Drain
Spring Creek Diversion Drain
Bootes Creek Stage 1 Diversion
Bootes Creek Stage 2 Diversion
Gibbs Gully Diversion Drain
Sandy Creek Diversion

ML 70452
ML 70418
ML 70307
ML 70415
ML 70416
ML 70458

SPRING CREEK
BOOTES CREEK
SANDY CREEK
METEOR CREEK



Meteor Creek Overall Catchment (Scale 1:1M)

SCALE: 1:100,000
HORIZONTAL DATUM: GDA94 / MGA zone 55
VERTICAL DATUM: AUSTRALIAN HEIGHT DATUM

0 1,000 2,000 3,000 4,000 m

LEGEND

- ML Boundary
- Waterway
- Waterway Catchment
- Watercourse Diversion
- Clean Catchment Diversion Drain

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ENGENY

Ph: 07 3221 7174
Level 1
580 Queen St
Brisbane QLD
www.engeny.com.au

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SPRING CREEK NORTH CONTINUATION PROJECT

FIGURE 2.1: EXISTING WATERWAYS

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2.1.1 Bootes Creek

Bootes Creek is the second largest watercourse traversing the ROC Mine lease boundary and catchment area of roughly 100 km^2 at the existing confluence location with Gibbs Gully, which is west of the mine lease areas of ML70458, ML70415 and ML70307. Bootes Creek has a deep incised active channel which is highly sinuous with a tight channel meander radius. Bootes Creek has two permanent diversions, one licensed under the Water Act 2000 (Stage 1) and one Authorised under the site Environmental Authority (Stage 2).

The Bootes Creek Stage 1 Diversion starts immediately downstream of the confluence with the Spring Creek Diversion drain and is located south of the Spring Creek mining area. It was constructed in several stages from 2010 to 2016 through a rehabilitated mining area. The area was backfilled with mine overburden in several stages to allow for settlement, with the top 2-3m layer comprising of tertiary clay fill.

The Bootes Creek Stage 2 Diversion is currently under construction and will divert a 4km reach of the existing channel located upstream of the Spring Creek drain confluence. The Stage 2 is an excavated channel with upstream and downstream plug embankments to direct flows through the new channel and provide pit flood protection. No impacts to the Bootes Creek Stage 2 Diversion will be observed as a result of mining in Spring Creek North Pit.

2.1.2 Spring Creek

Spring Creek is not a defined watercourse under the Water Act 2000. It is a stream order 3 drainage feature (before confluence with Bootes Creek) with its catchment originating to the west and north of ROC. Spring Creek drains in an easterly direction towards Spring Creek Pit and is then diverted south via an excavated channel into Bootes Creek. An upper catchment tributary gully of Spring Creek is impounded by an existing clean water storage (Naroo Dam) with overflows to the diversion channel towards Bootes Creek. A number of small northern catchments of Spring Creek drain in a southerly direction towards the existing Ramp 1 in Spring Creek Pit. These catchments are currently redirected around the western side of the pit into the main Spring Creek channel by an excavated drain (Northern Diversion). The Northern Diversion was constructed in 2012 and includes an excavated through rock and is in a stable condition showing minimal signs of erosion or degradation.

The northern tributaries of Spring Creek draining towards Ramp 1 in Spring Creek Pit are small in nature (stream order 1) and have poorly defined channel features. The total area currently diverted around the northern side of Spring Creek Pit is 6.9 km^2 and the total Spring Creek catchment before the confluence with Bootes Creek is 64.2 km^2.

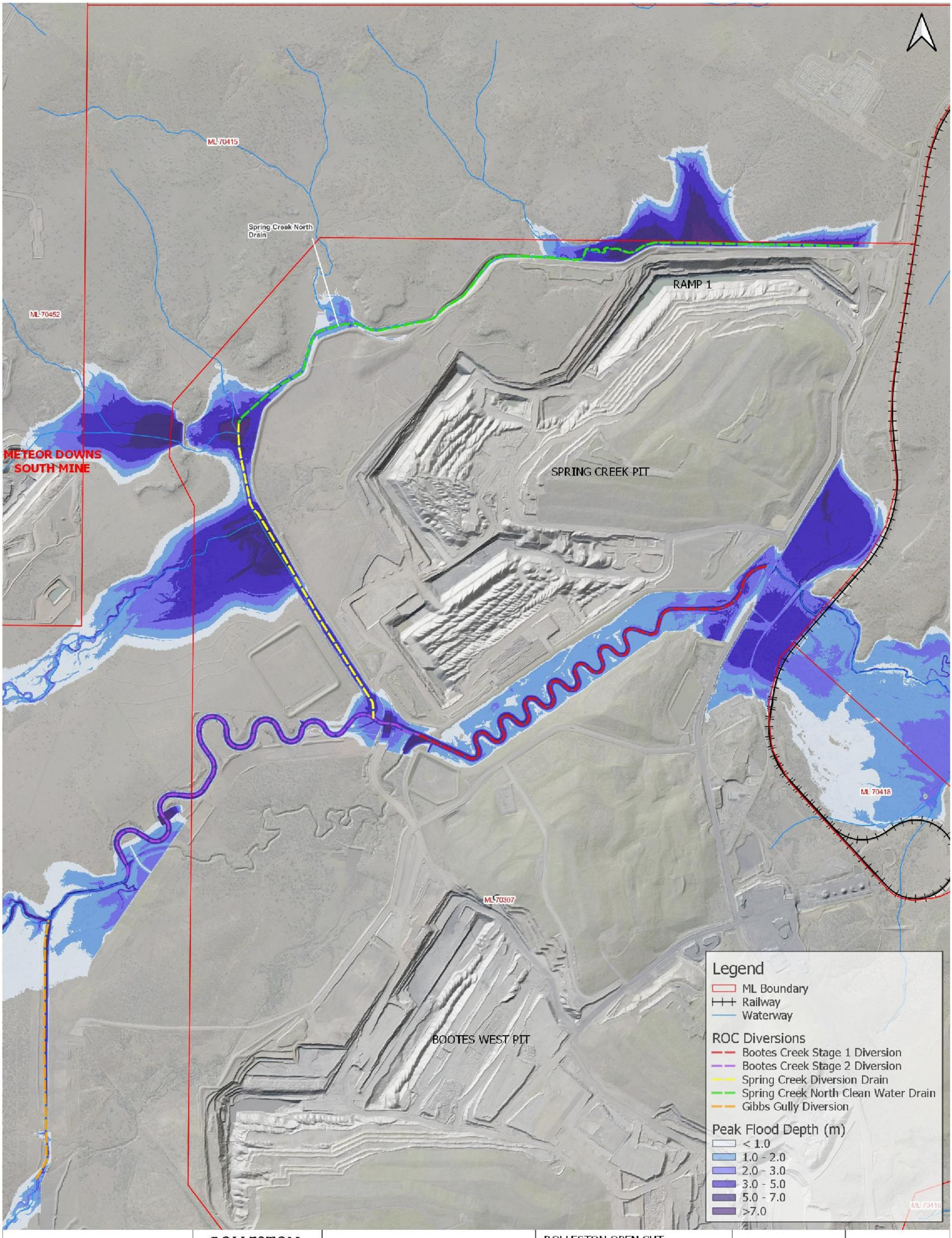
2.2 Flooding

Bootes Creek and Spring Creek flooding within the ROC MLA occurs in the lower floodplain areas and is managed by existing licenced diversions and levees (only required for Bootes Creek). The drainage system around the northern side of Spring Creek Pit conveys local stormwater runoff and is not influenced by larger waterway flooding of the main Spring Creek or Bootes Creek systems.

Existing flooding results for Bootes Creek and Spring Creek for a very rare flood event (0.1% Annual Exceedance Probability) are shown in Figure 2.2 (depth) and Figure 2.3 (velocity). The existing flood results indicate:

- The SCNP clean water drain is situated at a higher elevation relative to Bootes Creek system and therefore lower velocities are observed in the area.
- The existing Spring Creek Diversion has sufficient capacity and does not require further modification or upgrade.
- Mining in Spring Creek North Pit will reduce the catchment area reporting to Bootes Creek and ultimately Meteor Creek, and therefore flood impacts are also expected to be reduced.

Further discussion on flood impacts from mining in Spring Creek North Pit is provided in Section 6.3. No additional flood modelling work was completed to support this surface water assessment.



Level 2, 500 Queen Street, Brisbane
PO Box 10183 Brisbane QLD 4000

www.engeny.com.au

P: 07 3221 7174
E: admin@engeny.com.au

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0 500 1,000 m

Scale in metres (1:25,000 @ A3)

HORIZONTAL DATUM: GDA94 / MGA zone 55
VERTICAL DATUM: AHD

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FIGURE 2.2: BOOTES CREEK AND SPRING CREEK 0.1% AEP PEAK FLOOD DEPTHS

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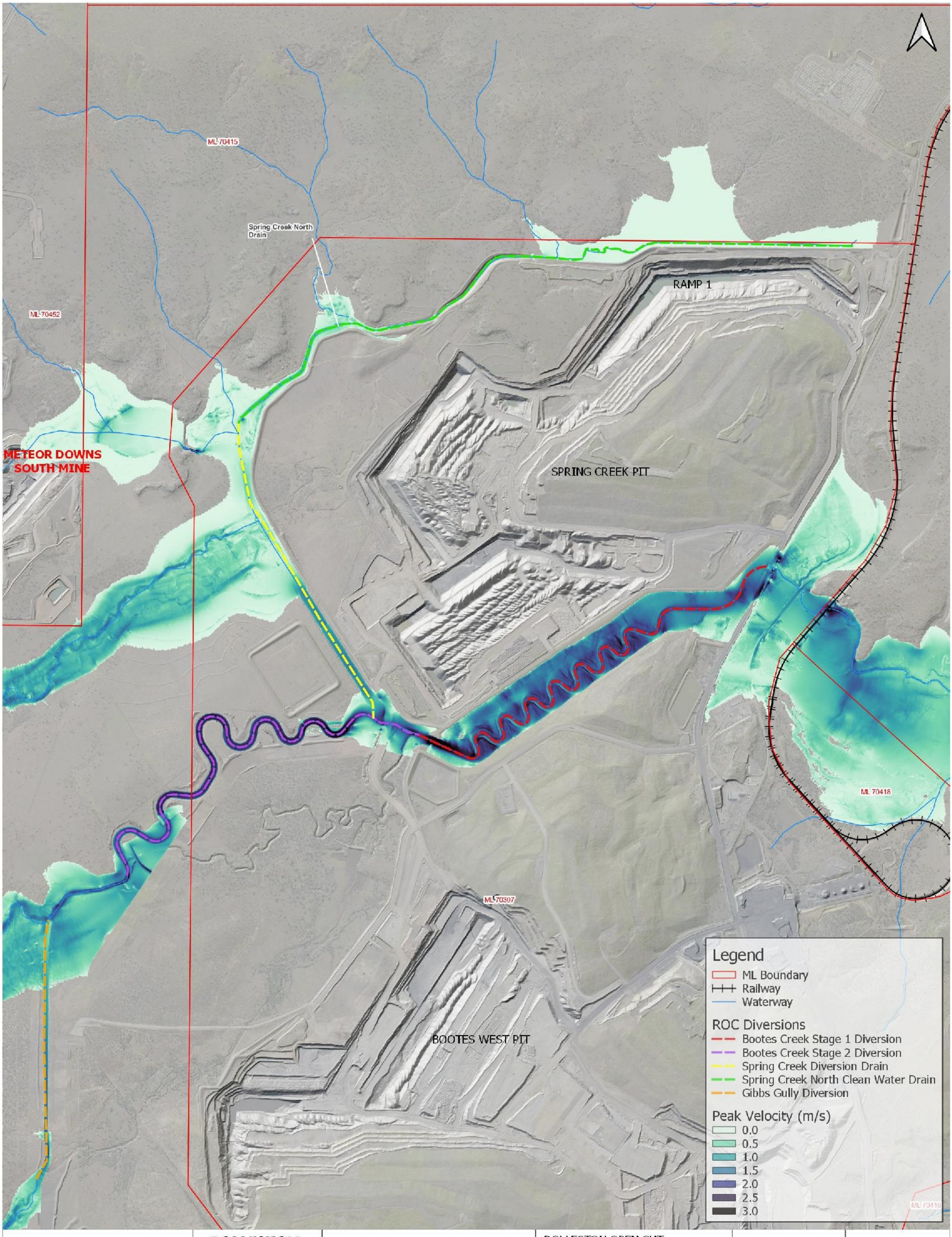
Date: 20/1/2023



Level 2, 500 Queen Street, Brisbane
PO Box 10183 Brisbane QLD 4000

www.engeny.com.au

P: 07 3221 7174
E: admin@engeny.com.au

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Scale in metres (1:25,000 @ A3)

HORIZONTAL DATUM: GDA94 / MGA zone 55
VERTICAL DATUM: AHD

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FIGURE 2.3: BOOTES CREEK AND SPRING CREEK 0.1% AEP PEAK FLOOD VELOCITY

Job Number: QC1001_001
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Drawn: AB

Date: 20/1/2023

3. ENVIRONMENTAL VALUES AND WATER QUALITY OBJECTIVES

3.1 Overview

The following sections outline the relevant legislation, Environmental Values (EV), and Water Quality Objectives (WQO) relevant to Rolleston Open Cut mine and The Project. The environmental values and Water quality objectives are reported as per the Rolleston Open Cut Receiving Environment Monitoring Program Procedure (ROC, 2022).

3.2 Relevant Legislation

3.2.1 Environmental Protection Act 1994 (EP Act)

The EP Act defines environmental value as:

- A quality or physical characteristic of the environment that is conducive to ecological health or public amenity or safety; or
- Another quality of the environment identified and declared to be an environmental value under an environmental protection policy or regulation.

3.2.2 Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)

The Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) defines the legal framework to protect and manage nationally and internationally important flora, fauna ecological places defined as Matters of National Environmental Significance (MNES). MNES relating to flora and fauna do exist within the Project area, however, are assessed in other studies and are not considered relevant as part of this surface water assessment.

3.2.3 Environmental Protection Regulation (EP Regulation) 2019

The Environmental Protection Regulation (EP Regulation) 2019 further defines specified environmental objectives and performance outcomes for key environmental aspects. The Water and Wetlands environmental objectives are summarised in Section 3.4.

3.1.4 Environmental Protection (Water and Wetland Biodiversity) 2019

The purpose of the EPP (Water and Wetland Biodiversity) is to identify environmental values and associated water quality objectives for Queensland waters. The Project is located within the Comet River Sub-basin of the greater Fitzroy Basin. Environmental Values and Water Quality Objective for the Comet River Sub-basin are scheduled under the EPP (Water and Wetland Biodiversity) and are outlined in Sections 3.3 and 3.4.

3.2.4 Water Act 2000 (Queensland)

The Water Act 2000 is the key regulatory document in Queensland for the allocation and use of water resources. The Water Act provides a range of plans, licence and permits for surface and groundwater resources throughout the state. These include:

- Water resources plans.
- Water use plans.
- Resource operations plans.

3.2.4.1 Water Plan (Fitzroy Basin) 2011

Water resources within the Fitzroy are managed under the Water Plan (Fitzroy Basin) 2011. The purposes of the plan are defined as:

- To define availability of water in the plan area.
- To provide a framework for sustainably managing water and the taking of water.
- To identify priorities and mechanisms for dealing with future water requirements.
- To provide a framework for establishing water allocations.
- To provide a framework for reversing, where practicable, degradation of natural ecosystems.
- To regulate the taking of overland flow water.
- To regulate the taking of groundwater.

The plan defines the following surface water performance indicators and objectives:

- Environmental flow objectives (EFOs):
  - Which define the flow conditions which must be maintained at defined management nodes in the Fitzroy basin. EFO's are defined for a range of conditions including flow volume, flow duration, seasonal base flow, medium to high flow and first post-winter flow events.
- Water allocation security objectives (WASOs):
  - Which define the minimum-security requirements for both supplemented and un-supplemented water allocations for each of the water supply schemes within the basin.

Spring Creek North Continuation Project will not impact the objectives of the Water Plan (Fitzroy Basin) 2011 because:

- Surface water licences are not required and,
- The SCNP footprint is minor and expected to have negligible streamflow impacts in the receiving waterways (discussed in Section 6).

3.2.4.2 Fitzroy Basin Resource Operations Plan 2014

The Fitzroy Resource Operations Plan (ROP) 2014 is a document prepared to outline strategies for the implementation of the Water Resource (Fitzroy Basin) Plan 2011. The Fitzroy ROP regulates water allocations and licensing within the Fitzroy basin. The ROP sub-divides the Fitzroy Basin into water management zones. The Project is located upstream of the Comet River unsupplemented water management area.

3.3 Environmental Values

Under the Environmental Protection Policy (EPP Water), waters are defined as including the bed and banks of waters. Surface waters are defined as water other than groundwater. The term watercourse is used generically and includes watercourses defined under the Water Act 2000 (Water Act) as well as streams/gullies that do not meet watercourse criteria under the Water Act (i.e., they do not necessarily have defined bed and banks or a change of vegetation across the drainage line).

Part 3 of the EPP (Water) states that environmental values (EV) are to be protected or enhanced. The ROC site is part of the 'western tributaries' of the Comet River (Basin 130). The EV and Water Quality Objective (WQO) are described in Sections 2 and 3 of the Comet River Sub-basin Environmental Values and Water Quality Objectives. The Comet River sub-basin environmental values are presented in Table 3.1. The management intent for ROC is 'aquatic ecosystem – moderately disturbed'.

TABLE 3.1: ROC ENVIRONMENTAL VALUES (ROC, 2022)

Value	Description
Aquatic Ecosystem	ROC mine site has ecological values considered to be moderately disturbed under the EPP (Water). Under Schedule 2 of the EPP (Water), moderately disturbed is water in which the biological integrity of the water is adversely affected by human activity to a relatively small but measurable degree. High ecological value areas are present immediately upstream (HEVa2122 and HEVa2123) and downstream (HEVa2124) of the Project.
Recreation	Suitable for use as primary, secondary or visual recreation, this includes activities such as swimming.
Stock	Suitable as a drinking water supply for livestock.
Irrigation	Suitable for irrigation water supply, for example for irrigation of crops, pasture, parks, gardens and recreational areas.
Industrial	Suitable as an industrial water supply. Open cut coal mining, manufacturing and other industrial activities occur within the area and account for approximately 0.3% of land use.
Farm Use	Suitable for domestic farm water supply, other than drinking water, e.g., laundry and produce preparation.
Human Consumption of Aquatic Species	Suitable for human consumption of aquatic foods e.g., fish, crustaceans and shellfish.
Drinking Water	Suitable drinking water supply. Rolleston town water supply is drawn from the Comet River, upstream of the confluence of Meteor Creek and the Comet River. The water supply of the town of Comet is approximately 100 km downstream and is considered too far away to be affected by the Project.
Cultural and Spiritual Values	Custodial use of water resources by local traditional owners, upstream and downstream. Cultural and spiritual values of water are defined in the EPP (Water) as being cultural and spiritual values, including its aesthetic, historical, scientific, social or other significance, to the present generation or past or future generations.

3.4 Water Quality Objectives

Under the EPP (Water), the objectives are specific water quality parameters for the protection of specific EVs identified at the site. The WQOs have been established on the principle that water quality downstream of the site should be similar to that of an unmodified reference site. The default approach as specified in the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC and ARMCANZ, 2000) uses the 20th and 80th percentiles to achieve protection of moderately disturbed waters. Consequently, WQOs for the catchment waters are primarily based on the guidelines developed for aquatic ecosystem EV protection. The current trigger investigation levels and contaminant trigger levels as per the Rolleston Open Cut EA are also shown in Table 3.2.

TABLE 3.2: WATER QUALITY OBJECTIVE LIMITS FOR THE COMET RIVER REGIONAL WQOS AND EVS WQ1307 (ROC, 2022)

Parameter	Units	Aquatic Ecosystem	Drinking Water	Human Consumption	Farm Use	Irrigation	Stock Water	Recreation (primary contact)	Most Conservative WQO	Current ROC EA Trigger Investigation Levels and Contaminant Trigger Levels
Electrical Conductivity (EC)	µS/cm	375 (high flow)/ 210 (base flow)					2984[1]		375 (high flow)/ 210 (base flow)	1,000 (Bootes Creek) 700 (Meteor Creek)
Turbidity	NTU	50	500		500				50	
pH	pH	6.5 - 8.5	6.5 - 8.5		6.5 - 8.5	6 - 9.0		6.5 - 8.5	6.5 - 8.5	6.5 - 9.5
Total Suspended Solids (TSS)	mg/L	30							30	1,300
Major Ions										
Chloride (Cl)	mg/L	0.003	250		250	175		400	0.003	
Nitrate (NO3)	mg/L		50		50		400		50	1.1
Nitrite (NO2)	mg/L		3		3		30		3	
NOx	mg/L	0.5				5			0.5	
Ammonia (NH3)	mg/L	0.02	0.5		0.5			0.01	0.01	0.9
Total Nitrogen (TN)	mg/L	0.5							0.5	
Sulphate (SO4)	mg/L	5	200		200		1000	400	5	250
Alkalinity (CaCO3)	mg/L		150		150			500	150	
Potassium (K)	mg/L									
Magnesium (Soluble)	mg/L									
Calcium (Soluble)	mg/L						1000		1000	
Sodium (Na)	mg/L		30		30	115		300	30	115

Parameter	Units	Aquatic Ecosystem	Drinking Water	Human Consumption	Farm Use	Irrigation	Stock Water	Recreation (primary contact)	Most Conservative WQO	Current ROC EA Trigger Investigation Levels and Contaminant Trigger Levels
Fluoride (Fl)	mg/L		1.5		1.5	2	2		1.5	2
Metals										
Aluminium	mg/L	0.055	0.1	0.055	0.1	5	5	0.2	0.055	0.27
Arsenic	mg/L	0.013	0.01	0.013	0.01	0.1	0.5	0.05	0.01	0.013
Boron	mg/L	0.37	4	0.37	4	0.5	5	1	0.37	
Cadmium	mg/L	0.0002	0.002	0.0002	0.002	0.01	0.01	0.005	0.0002	0.0002
Chromium (Cr III+Cr IV)	mg/L	0.001	0.05	0.001	0.05	0.1	1	0.05	0.001	0.002
Cobalt	mg/L					0.05	1		0.05	
Copper	mg/L	0.0014	1	0.0014	2	0.2	0.4	1	0.0014	0.005
Iron	mg/L		0.3		0.3	0.2		0.3	0.2	0.3
Lead	mg/L	0.0034	0.01	0.0034	0.01	2	0.1	0.05	0.0034	
Manganese	mg/L	1.9	0.1	1.9	0.1	0.2		0.1	0.1	
Mercury	mg/L	0.00006	0.001	0.00006	0.001	0.002	0.002	0.001	0.00006	
Molybdenum	mg/L		0.05		0.05	0.01	0.15		0.01	0.034
Nickel	mg/L	0.011	0.02	0.011	0.02	0.2	1	0.1	0.011	
Selenium	mg/L	0.005	0.01	0.005	0.01	0.02	0.02	0.01	0.005	0.01
Silver	mg/L	0.0005	0.1	0.0005	0.1			0.05	0.0005	0.001
Uranium	mg/L		0.017		0.017	0.01			0.01	0.001
Vanadium	mg/L					0.1			0.1	0.01

Parameter	Units	Aquatic Ecosystem	Drinking Water	Human Consumption	Farm Use	Irrigation	Stock Water	Recreation (primary contact)	Most Conservative WQO	Current ROC EA Trigger Investigation Levels and Contaminant Trigger Levels
Zinc	mg/L	0.008	3	0.008	3	2	20	5	0.008	0.058

[1] *Derived from converting the TDS value for dairy cattle of 2,000mg/L using a conversion factor of 1.492*

3.5 Surface Water Monitoring

ROC has developed and continues to implement a Receiving Environment Monitoring Program (REMP) to monitor, identify and describe any adverse impacts to surface water environmental values, quality and flows due to the authorised mining activity (ROC, 2022). This includes monitoring the effects of the mine on the receiving environment periodically (under natural flow conditions) and while mine affected water is being discharged from the site.

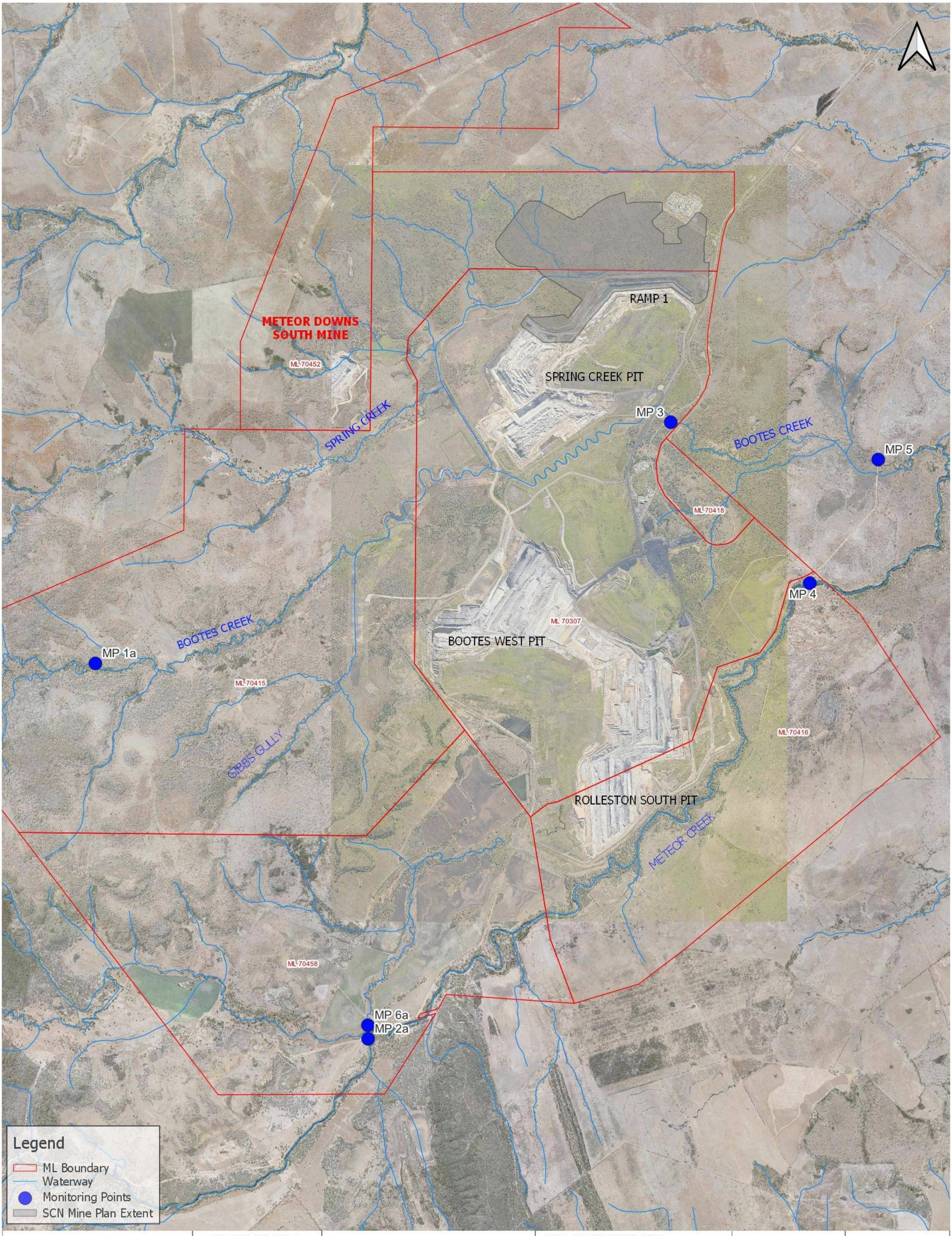
The ROC REMP provides surface water monitoring procedures for the following:

- Surface water quality during releases.
- Creek bed sediments.
- Biological condition (Aquatic macroinvertebrates).
- Stream flow hydrology; and
- Stream bank stability.

Monitoring locations for the above items are given in Table 3.3 below with locations shown in Figure 3.1. The REMP also outlines the frequency, analytes, and data capture requirements for each of the required monitoring efforts.

TABLE 3.3: RECEIVING WATER UPSTREAM BACKGROUND SITES AND DOWNSTREAM MONITORING POINTS

Monitoring Point (MP)	Receiving Waters Location	Easting (GDA2020)	Northing (GDA2020)
Upstream Monitoring (background)			
MP 1a	Bootes Creek Upstream	633648	7293044
MP 2a	Meteor Creek Upstream	638622	7286202
MP 6a	Sandy Creek Upstream	638619	7286450
Downstream Monitoring			
MP 3	Bootes Creek Downstream	644142	7297439
MP 4	Meteor Creek Downstream	646678	7294507
MP 5	Bootes Creek Downstream	647926	7296759



Level 2, 500 Queen Street, Brisbane
PO Box 10183 Brisbane QLD 4000

www.engeny.com.au

P: 07 3221 7174
E: admin@engeny.com.au

ROLLESTON OPEN CUT
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ENGENY

0 1,000 2,000 3,000 m

Scale in metres (1:60,000 @ A3)

HORIZONTAL DATUM: GDA94 / MGA zone 55
VERTICAL DATUM: AHD

ROLLESTON OPEN CUT
SPRING CREEK NORTH
CONTINUATION PROJECT

FIGURE 3.1: MONITORING POINT LOCATIONS

Job Number: QC1001_001
Revision: 0
Drawn: AB

Date: 23/12/2022

4. EXISTING WATER MANAGEMENT SYSTEM

4.1 Overview

The following sections provide a description of the existing water management system for Ramp 1 in the Spring Creek Pit and the overall water management system for ROC.

4.2 Existing Spring Creek North Pit Water Management

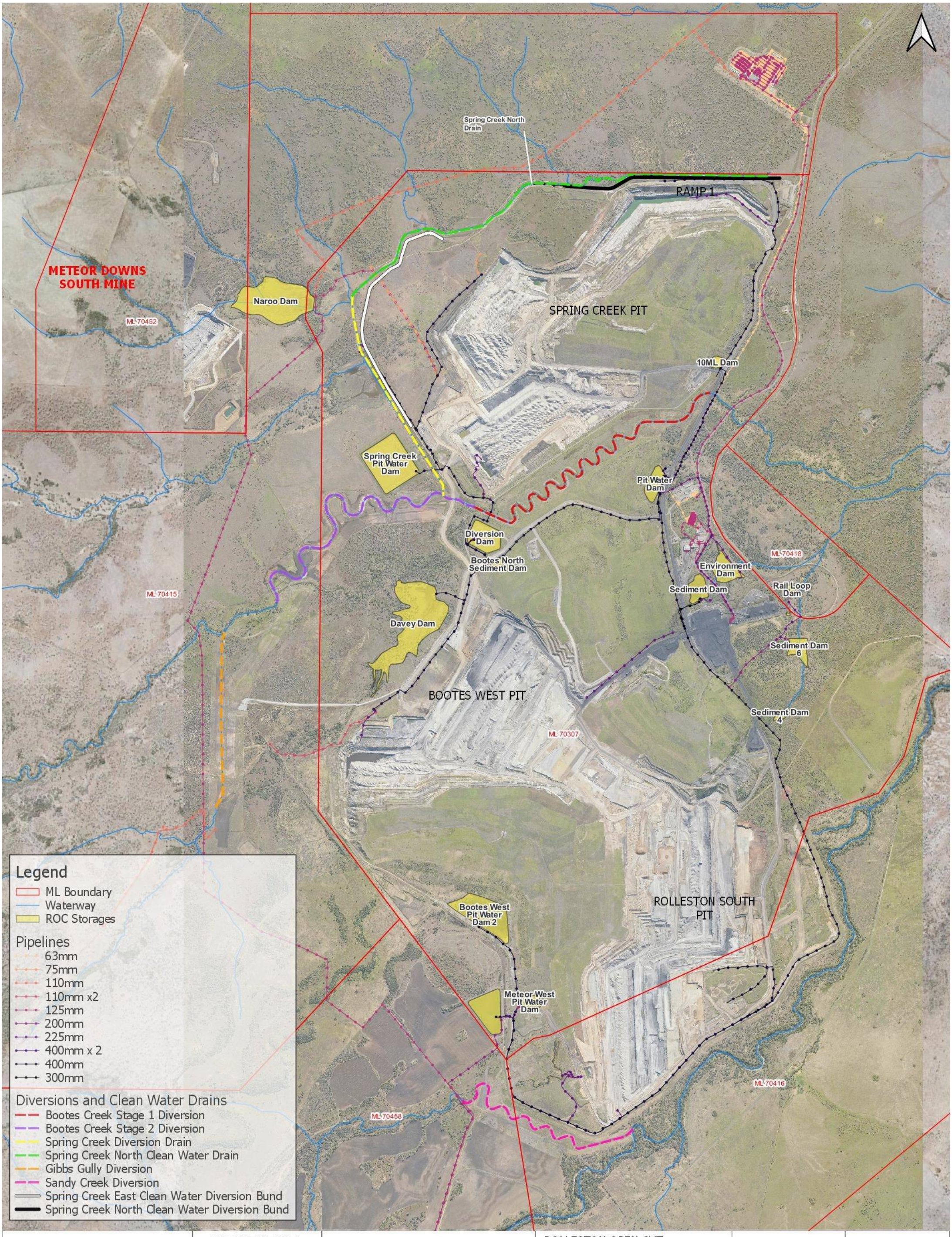
The existing Spring Creek mining area is the most northern mining pit at ROC. The pit receives inflows from rainfall runoff in addition to groundwater inflows. Existing water management infrastructure associated with Spring Creek mining area include:

- Pit dewatering – Pumps and pipelines to allow dewatering to the existing mine water system to supply site water demands, storage or release. The existing pit dewatering pump and pipeline are located along the pit highwall and can pump water into the mine water pipeline near Pit Water Dam (PWD) which can transfer at high capacity to all the key water storages.
- Clean catchment diversion drains and bunds – A series of excavated drains and bunds that redirect runoff upslope of the highwall towards the west into Spring Creek before flowing into Bootes Creek.

The existing Spring Creek Pit layout and water management infrastructure is shown in Figure 4.1.

4.3 Overall Water Management System

The overall ROC water management system is described in the following sections. A layout plan showing existing storages, pumps and drainage features is shown in Figure 4.1 and Figure 4.2 and the water management system schematic is shown in Figure 4.2.



Level 2, 500 Queen Street, Brisbane
PO Box 10183 Brisbane QLD 4000

www.engeny.com.au

P: 07 3221 7174
E: admin@engeny.com.au

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0 1 2 km

Scale in metres (1:37,000 @ A3)

HORIZONTAL DATUM: GDA94 / MGA zone 55
VERTICAL DATUM: AHD

ROLLESTON OPEN CUT

FIGURE 4.1: ROLLESTON OPEN CUT EXISTING LAYOUT

Job Number: QC1001_001
Revision: 0
Drawn: AB

Date: 22/12/2022

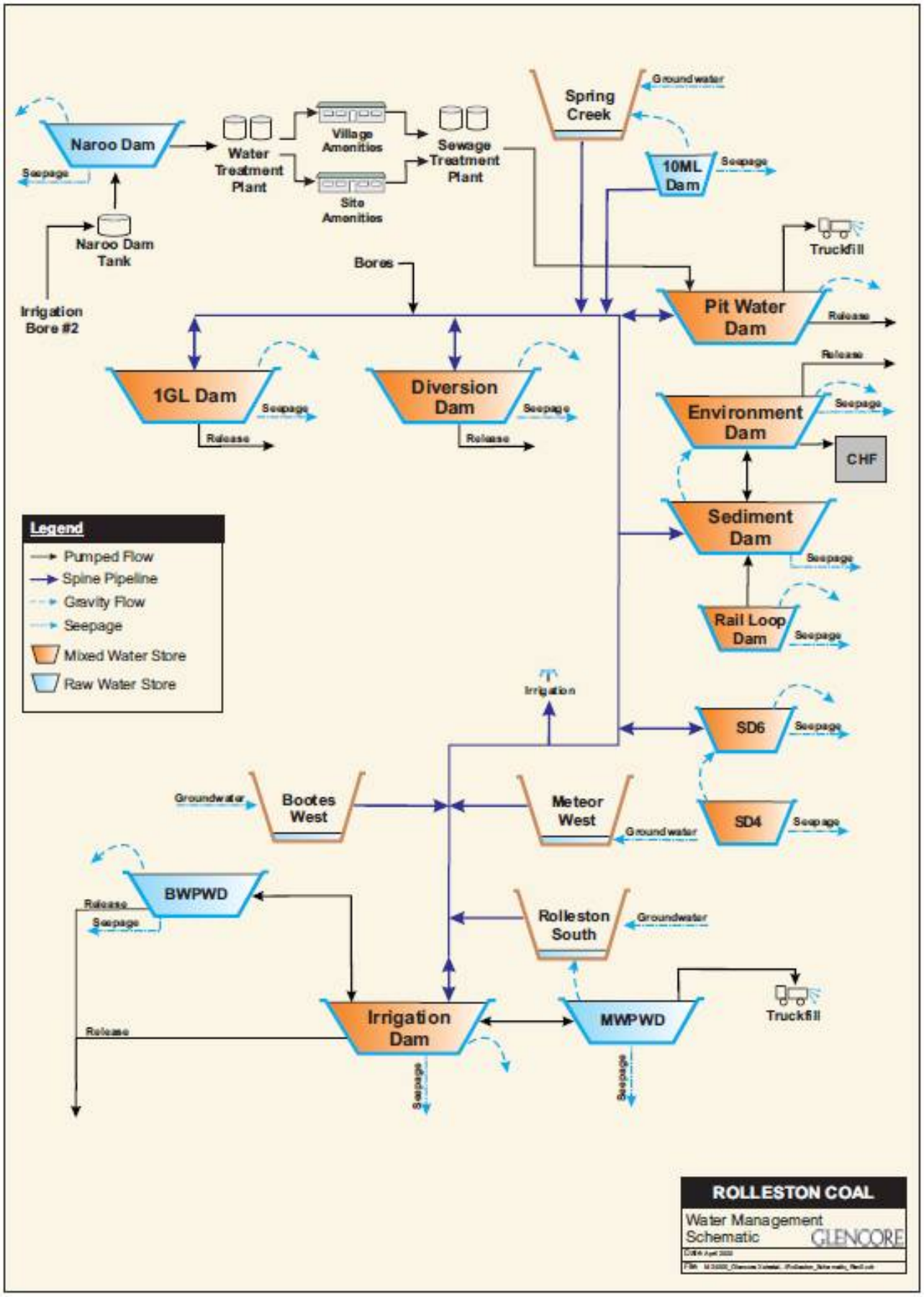

Figure 4.2: Existing Water Management System Schematic

4.3.1 Clean Water System

The existing Rolleston Open Cut clean water management system includes clean water storages, groundwater dewatering bores, diversion and flood protection levees/bunds. The overall purpose of the clean water management system is to:

- Divert clean catchment from the mine water and sediment water systems.
- Supply raw water for potable demands.
- Supplement mine water demands.
- Advanced dewatering of underground aquifer/s to reduce groundwater ingress into mining pits.
- Provide operating mine pits with 0.1% AEP flood protection.

The clean water management system is described in the following sections.

4.3.1.1 Clean Water Storages

The existing ROC clean water storages are described in Table 4.1.

TABLE 4.1: EXSITING CLEAN WATER STORAGES

Name	Storage Capacity (ML)	Description/Purpose
Naroo Dam	968	Naroo Dam is a catchment dam and is the preferred raw water supply on site. Subject to sufficient stored water, it is used for direct raw water supply to the water treatment plant (WTP) for potable water demands at the site and mine accommodation village. A bore water source (Irrigation Bore #2) is also connected to a header tank to supplement Naroo Dam supply. Water is pumped from Naroo Dam or the header tank to the WTP.
Davey Dam	322	Davey Dam is a catchment dam on Gibbs Gully that is currently utilised for supply to minor site water demands such as construction water or nearby dust suppression use. Davey Dam is proposed to be decommissioned during 2023 as the Bootes West pit highwall will progress through the dam embankment.

4.3.1.2 Bore Licences

The existing groundwater extraction bores and licencing is described in Table 4.2.

TABLE 4.2: EXISTING GROUNDWATER EXTRACTION BORES AND LICENCING

License	Bore I.D.	Maximum Capacity	Purpose
80 ML Basalt WL181775	Site 1	2.7ML/Month	Advanced pit dewatering and supplement the mine water system during extended drought conditions
	Site 22	10ML/Month	
350 ML WL89247F	Irrigation bore #1	5ML/Month	Supplement the mine water system during extended drought conditions. Backup raw water supply to the RO plant.
	Irrigation bore #2	8.2ML/Month	Supply raw water to the Reverse Osmosis (RO) water treatment plant which supplies potable demands for the village and MIA
50 ML Basalt WL604037	McQueen's Bore	3ML/Month	Advanced pit dewatering and supplement the mine water system during extended drought conditions
50 ML Sandstone WL177603	Aldebaran Bore	6.5ML/Month	
AWL618770 (no limit on extraction	Site 35 {due to low yields no other bores are operating under this WL}	6ML/Month	

4.3.1.3 Diversions and Flood Protection Levees

The existing creek diversions and flood protection levees are described in Table 4.3.

TABLE 4.3: EXISTING CREEK DIVERSIONS AND FLOOD PROTECTION LEVEES

Name	Description/Purpose
Spring Creek Diversion Drain	The Spring Creek Diversion drain was constructed to allow the advancement of Spring Creek Pit. The Spring Creek Diversion Drain includes an excavated drain heading south into Bootes Creek and a bund embankment to redirect flow into the drain and provide pit flood protection. The drain is approximately 60m wide.
Bootes Creek Diversion	The Bootes Creek Diversions (Stage 1 and 2) direct runoff from the Bootes catchment through the mine between the Spring Creek and Bootes West/North Pits. The Bootes Creek Diversions and associated levee protect Spring Creek and Bootes West Pits from a 1:1000 AEP flood. The Stage 2 Diversion is currently under construction with a planned completion in early 2023.
Sandy Creek Diversion	The Sandy Creek Diversion is authorised under the site Environmental Authority (EPML00370013). It directs runoff from Sandy Creek towards Meteor Creek to enable mining of Rolleston South Pit. The Sandy Creek Diversion has a meandering low flow channel and a 150 m wide high flow channel bound by the Meteor Creek Levee to the east.
Gibbs Gully Diversion	Gibbs Gully Diversion redirects the Gibbs Gully drainage line north towards Bootes Creek (upstream of the Stage 2 Diversion) to allow the advancement of Bootes West pit. The diversion includes an excavated diversion channel with a 10m base width and a maximum depth of 10m and an upstream levee plug embankment to direct flow into the diversion drain.
Meteor Creek Levee	The Meteor Creek Levee provides Rolleston South Pit 0.1% AEP flood protection from Meteor Creek and Sandy Creek for the life of mine. The Meteor Creek Levee is approximately 7 km long and ties into the Meteor West Dump (near MWPWD) following the Sandy Creek Diversion and Meteor Creek channel. The Meteor Creek Levee will be integrated into the final landform extent for most of the Rolleston South Pit.

4.3.2 Mine Water System

A water management system schematic for the existing Rolleston Open Cut is presented as Figure 4.2. The site water management infrastructure maps, including MAW storages, sediment dams, pipelines, drains, and levees, are presented in Figure 4.1. The mine water system contains numerous in-pit sumps, staging dams and larger storage dams for mine affected water. The mine water storages are summarised in Table 4.4.

TABLE 4.4: EXISTING MINE WATER STORAGES

Name	Dam Classification / Purpose	Base Water Level (RL m)	Maximum Operating Level (RL m)	Maximum Operating Volume (ML)
Pit Water Dam	Pit Water Dam / Release Dam	230.4	234.8	181
Environment Dam	Pit Water Dam / Release Dam	229.0	231.9	72.7
Sediment Dam (MIA Dam)	Pit Water Dam	231.2	235.4	164.9
Sediment Dam 6	Pit Water Dam / Release Dam	233.4	237.9	88.9
Sediment Dam 4	Pit Water Dam	250.3	254.1	26
Rail Loop Dam	Pit Water Dam	228.1	229.9	10.1
Meteor West Pit Water Dam	Pit Water Dam	236.2	243.8	160.1

Name	Dam Classification / Purpose	Base Water Level (RL m)	Maximum Operating Level (RL m)	Maximum Operating Volume (ML)
Bootes West Pit Water Dam 2	Pit Water Dam / Release Dam	236.9	245.6	1,335
Irrigation Dam[1]	Pit Water Dam / Release Dam	238.0	245.5 (MOL[1]: 243.1)	647.6 (MOV[2]: 367ML)
Diversion Dam[3]	Pit Water Dam / Release Dam	233.8	243.5	586
Spring Creek Pit Water Dam	Pit Water Dam / Release Dam	242.3	249.5	1,272
Total System Capacity (ML)	-	-	-	**4,263**

[1] *Maximum operating level*

[2] *Maximum operating volume*

[3] *Diversion Dam will be unavailable from 2023 to the end of 2024 due to mine progression in Bootes West Pit.*

4.3.2.1 Mine Water Release Conditions and Infrastructure

Mine water releases can be made to Bootes Creek and Sandy Creek (tributary of Meteor Creek) in accordance with the flow triggers and water quality limits prescribed in Environmental Authority (EA) EPML00370013 Rolleston Open Cut. Gravity releases are possible at Bootes West Pit Water Dam 2, Environment Dam, Sediment Dam 6, Diversion Dam, Irrigation Dam and Spring Creek Pit Water Dam. Pumped releases are possible from all dams shown in Table 4.4, except for Rail Loop Dam.

Releases into Bootes Creek can be undertaken from the following dams (in order of priority), at maximum combined rate of 5.0 m^3/s in receiving water high flow conditions.

- Environment Dam.
- Diversion Dam (unavailable from the beginning of 2023 till the end of 2024).
- Pit Water Dam (pumped release).
- Sediment Dam 6.
- Spring Creek Dam.

Releases to Meteor Creek under gravity can currently be undertaken from Irrigation Dam and Bootes West Pit Water Dam 2 to the maximum rate of 6.5 m^3/s.

TABLE 4.5: MINE WATER RELEASE CONDITIONS

Waterway	Release Mode	Receiving Water Flow Criteria (m^3/s)	Maximum Release Rate (m^3/s)	EC Release Limit (µS/cm)
Bootes Creek (RP1,3,4,6)	Low Flow Release[1]	<1.0	0.5	280
	Medium 1 Release	1.0	1.0	1,600
	Medium 2 Release	2.5	2.5	1,600
	High Flow Release	5.0	5.0	1,800
Meteor Creek (RP5)	Low Flow Release[1]	<2.5	0.5	324
	Medium 1 Release	2.5	1.4	1,600
	Medium 2 Release	7.5	4.0	1,600
	High Flow Release	15.0	6.5	1,800

[1]*Lowflow release conditions continue for 28 days after natural flow event which has exceeded the low flow criteria (i.e. 1 m^3/s for Meteor Creek)*

4.3.2.2 Water Transfer Infrastructure

The water management system also includes an interconnecting pipe network with associated pumps to allow pit dewatering and mine affected water transfers between water storage structures across the site. The existing pipeline network is shown on Figure 4.1.

4.3.3 Erosion and Sediment Control

Erosion and sediment are controlled onsite by all mine affected catchments draining internally to the mine water system with the use of sediment control structures. Internally draining catchments are managed through typical controls such as:

- Vegetation establishment.
- Rock protection.
- Sediment dams and
- Pit sumps.

ROC minimises disturbed area catchments where possible to reduce the volume of water and sediment handled onsite. To date ROC has received certification for progressive rehabilitation of 581ha of rehabilitated land. Runoff from the certified rehabilitation currently drains to existing storages and sediment dams, however, if ROC enters a wetter period there is opportunity to freely drain these areas from site. The certified rehabilitation at ROC is summarised in Table 4.6.

TABLE 4.6: ROC CERTIFIED REHABILITAITON

Rehabilitation Area	Certification Year	Total Area (ha)	Drainage Location
Bootes Creek Pit	2018	141	30ha to Stage 1 Bootes Creek Diversion, 78ha to Pit Water Dam Sump, 20ha to Bootes Creek North Sediment Dam and 13ha to Sediment Dam
Bootes West Pit	2018	79	79ha to Bootes West Pit Water Dam2
Bootes Creek Pit	2019	60	45ha to Sediment Dam, 8ha to Pit Water Dam Sump, 2ha to Bootes North Sediment Dam and 5ha to Stage 1 Bootes Creek Diversion
Meteor Creek Pit	2019	47	6ha to Sediment Dam 4 and 41ha to Sediment Dam
Spring Creek Pit	2019	60	53ha to 10 ML Dam and 7ha into Spring Creek Pit
Bootes West/ Meteor West	2022	60	48ha to Bootes West Pit Water Dam2, 8ha to Bootes West Pit and 4ha to Meteor West Pit Water Dam,
Diversion Pit	2022	88	88ha to Stage 1 Bootes Creek Diversion
Spring Creek Out of Pit Dump	2022	16	2ha to Spring Creek Diversion and 14ha to the Spring Creek Clean Water bund
Spring Creek Pit	2022	30	10ha to 10 ML Dam and 20ha to Spring Creek Pit
TOTAL	-	**581**	-

4.3.4 Acid Mine Drainage

Existing water quality data shows that the site does not experience significant saline runoff from disturbed areas of pit and spoil. Previous work in the mine EIS and contaminant source studies have indicated that the Non-Acid Forming (NAF) to Potential Acid Forming (PAF) ratio is >20:1, with a net neutralising effect of any potential acid leachate (DEHP, 2015). No acidic drainage has been observed on site throughout the mine life.

5. PROPOSED INFRASTRUCTURE

5.1 Overview

The proposed water management strategy for the continuation of mining in Spring Creek North Pit includes:

- Clean Water Management – Construction of a new drain to direct clean runoff to the west, around the planned SCNP mining extent.
- Pit Dewatering – Relocation and extension of the existing pit dewatering pipeline north of the SCNP planned mining extent.

5.2 Clean Water Management

The proposed progression of SCNP will intercept the existing clean water drain, requiring a new drain to be constructed to redirect overland flow from the northern natural catchment away from proposed operation areas. A single drain to capture residual natural surface runoff which would otherwise report to SCNP is proposed. The drain will redirect flow west around the SCN mine plan and through Bootes Creek Diversion before flowing off site to the east. The flow path is represented in Figure 6.1, the proposed drain location in Figure 5.3 a long section in Figure 5.1. The drain will be sized to convey the 0.1% AEP peak flow which is estimated to be 9.1m^3/s. Excavation of the drain is likely through rock, similar to the existing drain (refer Figure 2.1) and further armouring or protection is not expected to be required. The drain will aim to:

- Maximise reinstatement of natural catchment reporting to Spring Creek.
- Eliminate the risk of mixing of natural surface runoff with mine affected water; and
- Prevent potential ponding of water against highwall areas on the northern edge of the mine footprint.

Based on the proposed drain allignment prelminary sizing of the drains for the expected 0.1% AEP peak flows is shown in Table 5.1.

TABLE 5.1: CLEAN WATER DRAIN CONCEPT DESIGN DETAILS

Item	SCNP Clean Water Drain
Drain Length	2,329m
Longitudinal grade	0.2% (Steepest section)
0.1% AEP Peak Flow	9.1 m3/s
Base Width	10 m
Maximum flow depth	1.4 m
Maximum flow velocity	0.65 m/s (Steepest Section)
Maximum bund Height	3.5 m

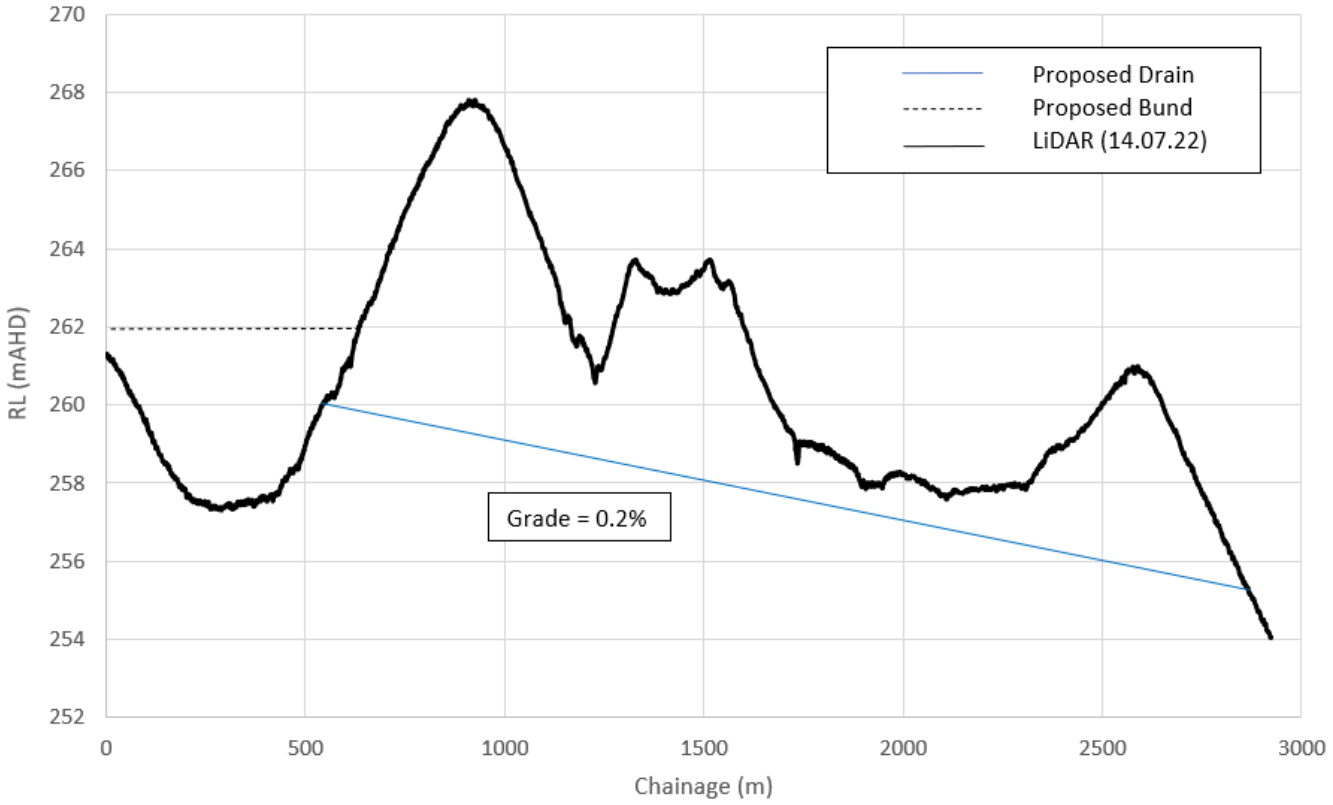

Figure 5.1: Drain Long Section

5.3 Pit Dewatering

The existing Ramp 1 catchment area is 311 ha. Following completion of mining in Spring Creek North, the catchment is expected to increase to approximately 674 ha by the end of the final landform development (Figure 5.2), representing an increase of 363 ha. Realignment of the dewatering pipeline to facilitate mining in Spring Creek North Pit is required and the proposed alignment is shown in Figure 5.3. No changes to pipe infrastructure are expected with Spring Creek North Pit continuing to dewater via the spine pipeline.

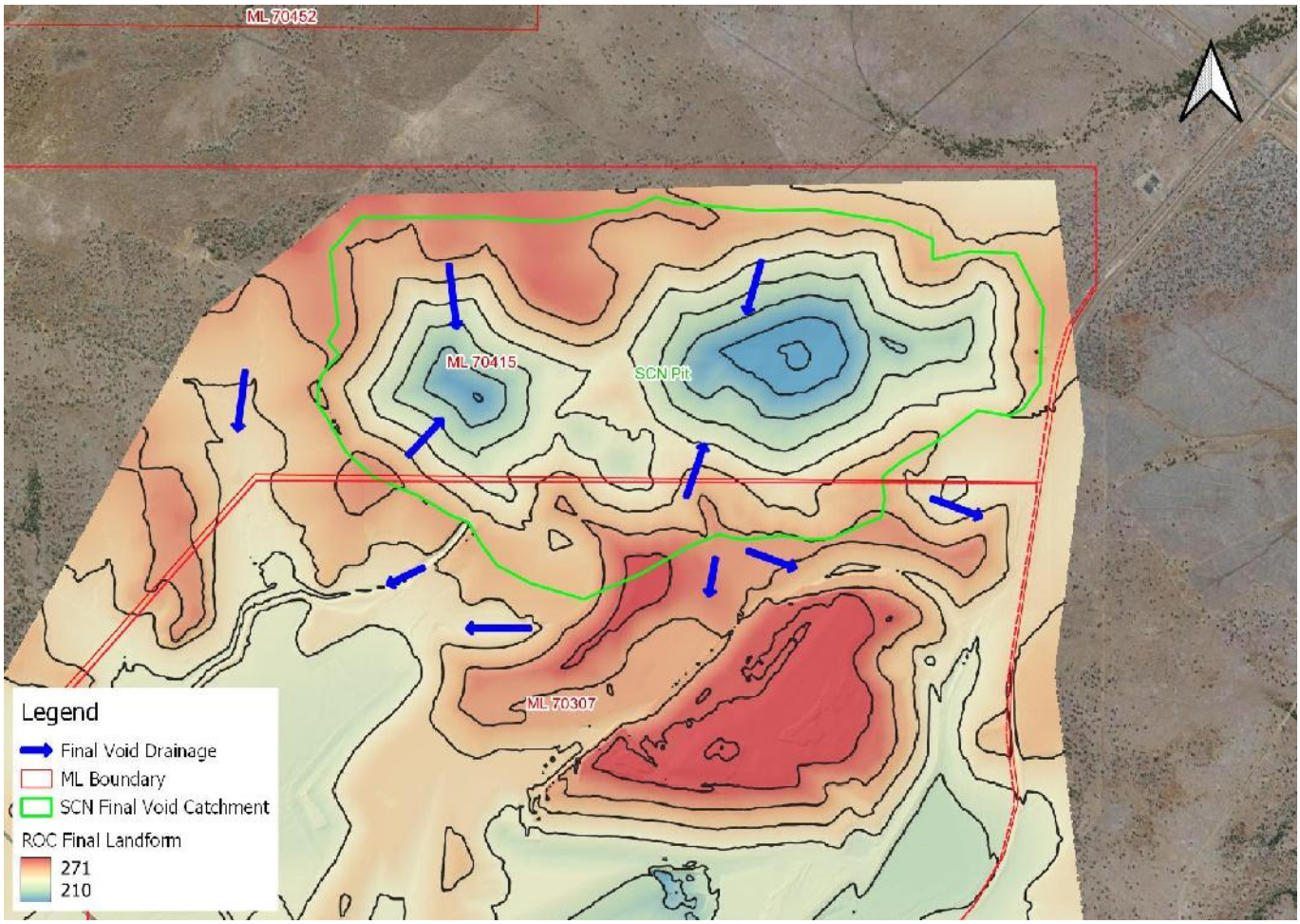

Figure 5.2: SCN Final Void Catchment

SPRING CREEK NORTH PIT

ML 70415

ML 70307

ML 70418

Spring Creek North Drain

10ML Dam

Pit Water Dam

Diversion Dam

Bootes North Sediment Dam

Davey Dam

Environment Dam

Sediment Dam

Rail Loop Dam

Legend

- ML Boundary
- Railway
- Waterway
- ROC Storages

Diversions and Clean Water Drains

- Bootes Creek Stage 1 Diversion
- Bootes Creek Stage 2 Diversion
- Spring Creek Diversion Drain
- Spring Creek North Clean Water Drain
- Spring Creek East Clean Water Diversion Bund
- Spring Creek North Clean Water Diversion Bund

Pipelines

- 63mm
- 75mm
- 110mm
- 125mm
- 225mm
- 400mm x 2
- 400mm
- 300mm

SCN Mine Plan

- Year 1
- Year 2
- Year 3
- Year 4
- Year 5
- Year 6
- Year 7
- Year 8
- Year 13

Proposed Infrastructure

- Proposed Spring Creek North Clean Water Drain Footprint
- SCN Pipeline Realignment
- SCN Pipeline Realignment (Year13)

Level 2, 500 Queen Street, Brisbane
PO Box 10183 Brisbane QLD 4000

www.engeny.com.au

P: 07 3221 7174
E: admin@engeny.com.au

ROLLESTON OPEN CUT
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0 250 500 750 1,000 m

Scale in metres (1:20,000 @ A3)

HORIZONTAL DATUM: GDA94 / MGA zone 55
VERTICAL DATUM: AHD

ROLLESTON OPEN CUT
SPRING CREEK NORTH
CONTINUATION PROJECT

FIGURE 5.3: MINE PLAN AND PROPOSED INFRASTRUCTURE

Job Number: QC1001_001
Revision: 0
Drawn: AB

Date: 24/1/2023

6. SURFACE WATER ASSESSMENT

6.1 Streamflow and Catchments

Capture of rainfall runoff within the disturbance area has the potential to reduce overland flow in the immediate vicinity of the proposed SCNP. However, impacts to the natural streamflow of waterways are expected to negligible beyond the immediate project area for the following reasons:

- The maximum potential catchment reduction over the Project life, as per Figure 6.1, is 510 ha. This represents approximately 5% of the Bootes Creek catchment (95 km^2), and less than 1% of the total Meteor Creek catchment at the confluence with Bootes Creek.
- There are no water users in the immediate vicinity of SCNP that will be impacted by the change in local catchments.

Although impacts are expected to be negligible, implementation of the proposed clean water drain will minimise the extent of overland flow impact.

6.2 Water Quality

SCNP will be internally draining and managed through the existing water management system via pit dewatering sumps. Therefore, no external surface water quality impacts on the immediate or downstream waterways are expected.

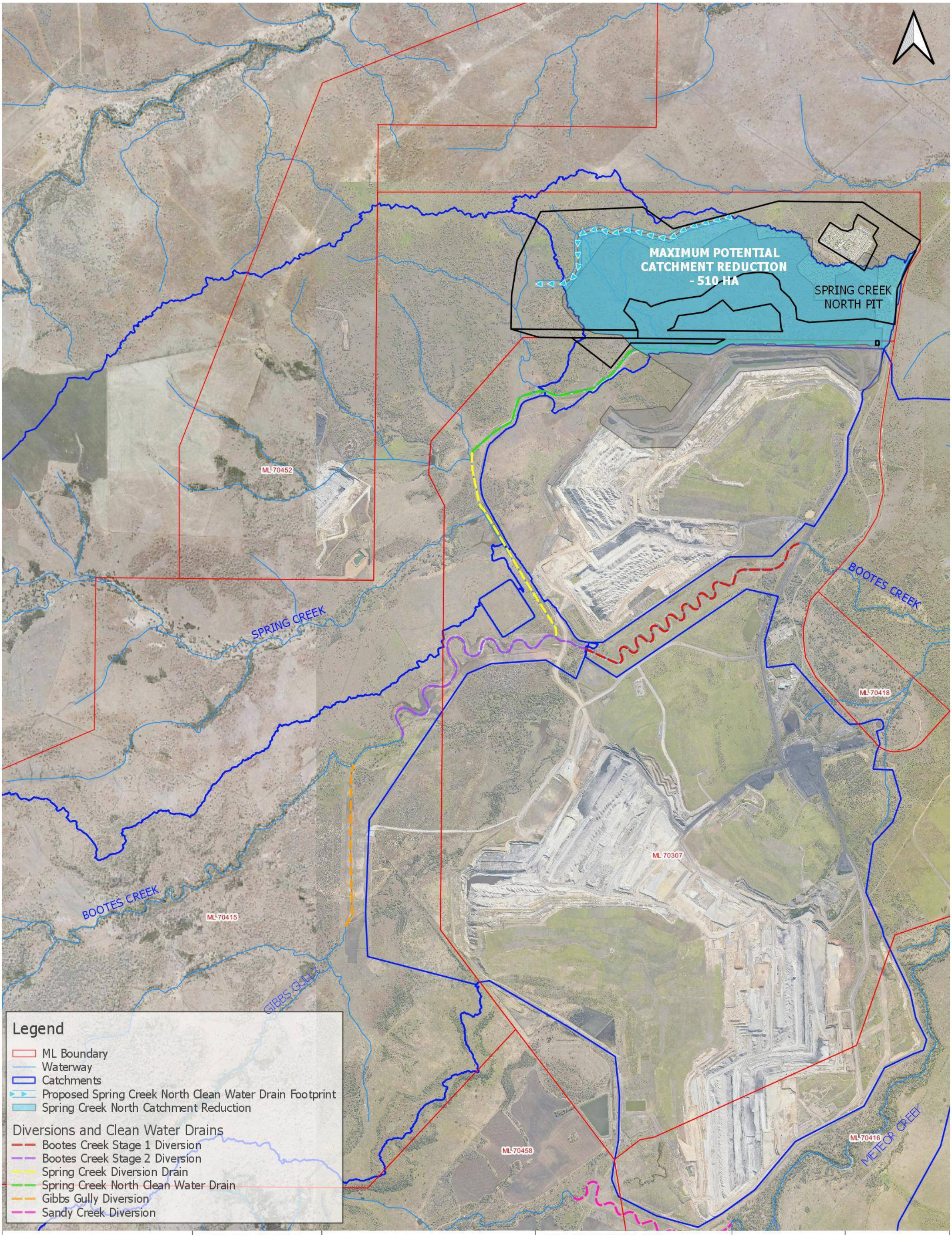
6.3 Flooding

Flood impacts resulting in mine progression in SCNP are expected to be negligible given:

- Mining commences high in the landscape and progresses further uphill to the north-west, resulting in negligible external catchment.
- SCNP is situated 30m in elevation above the Bootes Creek floodplain, towards the top of the local catchment and is approximately 4km from Bootes Creek itself.

6.4 Cumulative Impacts

Cumulative impacts associated with The Project are considered negligible as the individual impacts associated with SCNP development are similar to the existing Ramp 1 in Spring Creek Pit. Improved outcomes for surface water post closure are expected as The Project enables effective rehabilitation of the SCNP final void. The existing Ramp 1 void highwall is located immediately south of the existing mine lease boundary and cannot, without the inclusion of mining activities in the Project area, be battered back to a flatter grade to improve landform and drainage outcomes. The proposed final landform will see backfilling of the existing Ramp 1 void.



Level 2, 500 Queen Street, Brisbane
PO Box 10183 Brisbane QLD 4000

www.engeny.com.au

P: 07 3221 7174
E: admin@engeny.com.au

ROLLESTON
OPEN CUT
GLENCORE

ENGENY

0 500 1,000 1,500 2,000 m

Scale in metres (1:40,000 @ A3)

Map Projection: Tranverse Mercator
Horizontal Datum: GDA 94

ROLLESTON OPEN CUT
SPRING CREEK NORTH
CONTINUATION PROJECT

SPRING CREEK NORTH
CATCHMENT REDUCTION

Job Number:
QC1001_001
Revision: 0
Drawn: AB
Checked: -
Date:
23/12/2022

7. REFERENCES

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Rolleston Open Cut (2021) Water Management Plan, Effective 18 November 2021, Document number ROLOC-2064063594-506.

Rolleston Open Cut (2022) Receiving Environment Monitoring Program Procedure, Effective 28 July 2022, Document number ROLOC-2064063594-5.

8. QUALIFICATIONS

(a) In preparing this document, including all relevant calculation and modelling, Engeny Water Management (Engeny) has exercised the degree of skill, care and diligence normally exercised by members of the engineering profession and has acted in accordance with accepted practices of engineering principles.

(b) Engeny has used reasonable endeavours to inform itself of the parameters and requirements of the project and has taken reasonable steps to ensure that the works and document is as accurate and comprehensive as possible given the information upon which it has been based including information that may have been provided or obtained by any third party or external sources which has not been independently verified.

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