PROGRESSIVE REHABILITATION AND CLOSURE PLAN

VECCO CRITICAL MINERALS PROJECT

PREPARED FOR
VECCO INDUSTRIAL PTY LTD

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Table of Abbreviations

AARC	AARC Environmental Solutions Pty Ltd
ACH	Alumina chloride hexahydrate
AEP	Annual exceedance probability
AMV	Ammonium metavanadate
BoM	Bureau of Meteorology
CoA	Commonwealth of Australia
DAF	Department of Agriculture and Fisheries
DAFF	Department of Agriculture, Fisheries and Forestry
DES	Department of Environment and Science
DNRM	Department of Natural Resources and Mines
DoE	Department of Environment
DRDMW	Department of Regional Development, Manufacturing and Water
DSITI	Department of Science, Information Technology and Innovation
EA	Environmental Authority
EC	Electrical conductivity
EP Act	*Environmental Protection Act 1994*
EP Regulation	*Environmental Protection Regulation 2019*
ERA	Environmentally relevant activity
FoS	Factor of safety
FVC	Fractional vegetation cover
GAB	Great Artesian Basin
ha	Hectare
HPA	High purity alumina
H_2SO_4	Sulfuric acid
Kg	Kilogram
km	kilometre
m	Metre
mbgl	Metres below ground level
mm	Millimetre
MDL	Mineral development licence

MLA / MLAs	Mining Lease Application / Mining Lease Applications
Mtpa	Million tonnes per annum
NUMA	Non-use management area
PFC	Projected foliage cover
PMF	Probable maximum flood
PMLU	Post-mining land use
PRCP	Progressive Rehabilitation and Closure Plan
PRCP Guideline	Progressive Rehabilitation and Closure Plan Guideline
RE	Regional ecosystem
ROM	Run of mine
SMU	Soil mapping unit
t	tonnes
TDS	Total dissolved solids
The Project	Vecco Critical Minerals Project
VC	Vegetation community
Vecco	Vecco Industrial Pty Ltd
V_2O_5	Vanadium pentoxide
Yr	year

1 Introduction

AARC Environmental Solutions Pty Ltd (AARC) has been commissioned by Vecco Industrial Pty Ltd (Vecco) to develop a Progressive Rehabilitation and Closure Plan (PRCP) for the Vecco Critical Minerals Project (the Project) in accordance with the requirements of the *Environmental Protection Act 1994* (EP Act).

The proposed Project is located approximately 70 km north of the township of Julia Creek and 515 km west of Townsville in Northwest Queensland in the Northwest Minerals Province. An overview of the Project's regional location has been provided in Figure 1. The Project seeks to develop a greenfield, open-cut mine to extract and process vanadium pentoxide (V_2O_5) and High Purity Alumina (HPA), along with minor quantities of other Rare Earth Elements (REE) over an operational life of 26 years with a maximum disturbance footprint of 1387.4 ha.

This PRCP outlines the proposed post-mining land use (PMLU) for the Project as well as the rehabilitation methods that will occur progressively over the life of mine to achieve an environmentally sound land use outcome. This document represents Vecco's objective to provide a rehabilitation strategy that benefits both environmental and public interest.

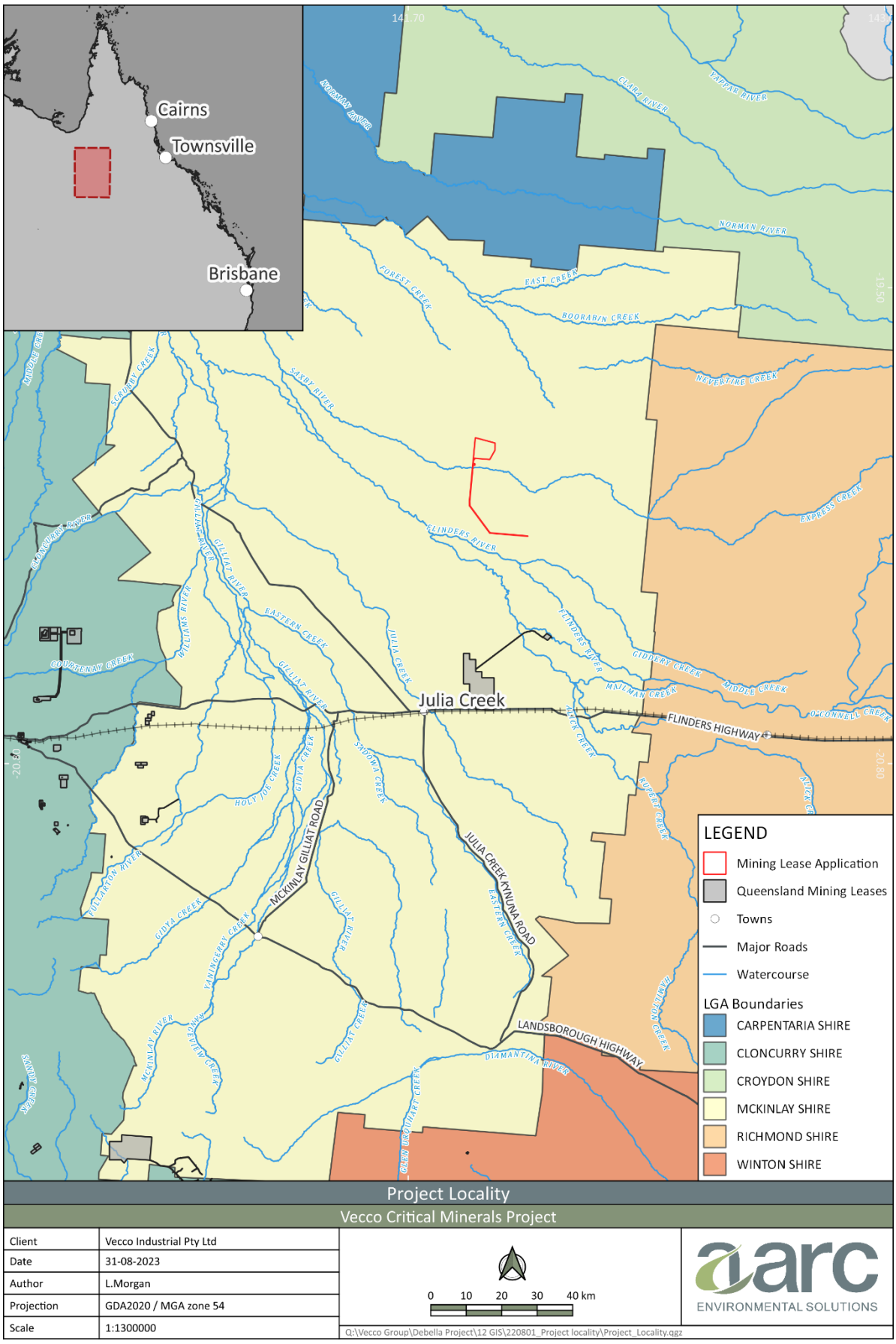

Figure 1: Project location

2 Scope and objectives

The purpose of this PRCP is to describe how progressive rehabilitation will be carried out during and after the Project's operational life. The PRCP has been developed in accordance with the requirements of the *Progressive Rehabilitation and Closure Plan Guideline* (DES 2023, PRCP Guideline). The PRCP Guideline states that the PRCP must include a rehabilitation planning part and a rehabilitation schedule which are described as follows:

Rehabilitation Planning part:

The purpose of the rehabilitation planning part of the PRCP is to support and justify the development of the proposed PRCP schedule. This part must detail how progressive rehabilitation and closure will be carried out over the entire Project site and on both a rehabilitation area basis and improvement area basis. The key components of the rehabilitation planning part for the Project are:

- community consultation information (refer section 3.2);
- post-mining land use (PMLU) (refer section 3.3);
- rehabilitation and management methodology (refer section 3.5);
- risk assessment (refer section 3.6); and
- a monitoring and maintenance program (refer section 3.7).

Rehabilitation Schedule part:

The rehabilitation schedule is a required element of a PRCP. Once approved, the schedule becomes a legally binding and enforceable instrument with which the Project must comply. The schedule must include:

- nomination of either a PMLU or non-use management area (NUMA) for all land within the relevant resource tenures, including land uses for undisturbed land;
- identification of when land becomes available for rehabilitation or improvement;
- rehabilitation or management milestones to achieve the PMLU or NUMA outcomes;
- milestone criteria that demonstrate when each milestone has been completed;
- completion dates for each milestone to be achieved;
- any conditions considered necessary or desirable; and
- a final site design.

The administering authority may impose a condition on a PRCP schedule if it considers the condition is necessary or desirable (Section 4.2 of the PRCP Guideline). Two deemed conditions are to be included in all PRCP schedules in accordance with Section 206A of the EP Act. The first condition states that when carrying out a relevant activity under the PRCP schedule, the holder must comply with a requirement stated in the environmental authority (EA) relevant to carrying out the activity. The second condition states that the holder must comply with the following matters stated in the schedule:

- each rehabilitation milestone and management milestone, and
- the date by which each rehabilitation milestone and management milestone is to be achieved.

3 Project planning part

3.1 Project planning

3.1.1 Project description

The Vecco Critical Minerals Project (the Project) will mine and process the world class vanadium deposit held, under Exploration Permit for Minerals (EPM) 25254. The Project will target vanadium pentoxide (V_2O_5) and High Purity Alumina (HPA), along with minor quantities of rare earth elements (REE). The proposed life-of-mine (LOM) is approximately 36 years, including construction, operation, and rehabilitation.

The Project is located 515 km west of Townsville and 70 km north of Julia Creek in the North-West Minerals Province. The region is well established for the extraction of resources such as copper, lead and zinc, and offers opportunity for vanadium extraction projects due to its rich, accessible, deposits.

The Project will tap into Queensland's rich natural resources to extract key minerals to support the global shift in decarbonising energy production. Demand for high purity alumina and vanadium is rapidly growing as renewable energy demand increases. Vanadium is used in the manufacture of vanadium flow batteries, associated with renewable energy generation and the global shift to decarbonisation. Vanadium does not degrade over the 25-year battery life and can be recycled thereafter making it a truly green energy storage solution. The Project can produce vanadium with a low carbon footprint, offering an in-demand product in the decarbonising movement.

The Project will also target the production of HPA, and REE, recognised by the Queensland Government and the Commonwealth Government as critical minerals that can be used in battery and other renewable energy applications. The Project will significantly contribute to the critical resource objectives on both state and federal levels.

The Project will be supported by Vecco's Australia first electrolyte manufacturing facility which will produce the electrolyte crucial for vanadium flow batteries. The phase one scale facility is currently using imported vanadium until the mining Project is ready for integration.

A conceptual Project layout is provided in Figure 3. The Project is a greenfield operation that will consist of a shallow, open-cut mine processing up to 1.9 Mtpa run of mine (ROM) ore to produce up to 5,500 t V_2O5 and 4,000 t HPA. Minor quantities of other REEs may present opportunity for saleable biproducts of the process. Ore will be mined to an approximate depth of up to 35 m. Processing will occur following on site crushing and screening of the ore. Mineral products will be packed in containers and transported by truck to Townsville, for secondary processing into battery electrolyte or export from the Port of Townsville to international markets.

3.1.1.1 Project activities

Associated mining activities for the Project that would otherwise form environmentally relevant activities (ERAs) or notifiable activities under the EP Act are provided in Table 1 and Table 2 below.

Table 1: Prescribed ERAs for the Project

Environmentally Relevant Activity	Description	Activity Summary
Schedule 2 of the EP Regulation		
7(3)(6)(c) Chemical manufacturing	Manufacturing, in a year, the following quantities of inorganic chemicals, other than inorganic chemicals to which items 1 to 4	The Project will include a sulphuric acid processing plant to produce up to 43,110 tpa sulphuric acid

Environmentally Relevant Activity	Description	Activity Summary
	apply — more than 10,000t but not more than 100,000t	from bulk sulphur feed brought to site.
8(3)(1)(c) Chemical storage	Chemical storage (the relevant activity) consists of storing more than 500 m^3 of class C1 or C2 combustible liquids under AS1940 or dangerous goods class 3.	Chemicals will be located within the MIA area in appropriately bunded designated areas. Chemicals include: • Flotation reagent • Sulphuric acid • Flocculant • Organic solvent • Organic diluent • Ammonia • Hydrochloric acid • Ammonium sulphate • Sodium chlorate
31 (2)(a) Mineral processing	Processing, in a year, the following quantities of mineral products, other than coke (a) 1,000 t to 100,000 t.	Mineral processing to produce up to 5,500 tpa vanadium pentoxide, 4,000 tpa HPA and minor quantities of REEs.
33(1) Crushing, milling, grinding or screening	Crushing, milling, grinding or screening (the relevant activity) consists of crushing, grinding, milling or screening more than 5,000 t of material in a year.	The vanadium benefaction process involves the physical separation of target minerals from gangue material, using up to 9,290 t feed material in a year.
63(3)(1)(b)(i) Sewage Treatment	Operating a sewage treatment works at a site that has a total daily peak design capacity of more than 100 but not more than 1500 equivalent persons.	Sewage Treatment Plant will accommodate an approximate peak of 146 EPs during the construction phase.
Schedule 3 of the EP Regulation		
19 Mining Metal Ore	Mining metal ore, other than a metal ore mentioned in items 11, 12, 14, 15, 16, 17 or 18	The Vecco Project will mine vanadium pentoxide and high purity alumina, as well as minor quantities of rare earth elements.

Table 2: Notifiable activities for the Project

Notifiable activity	Notifiable activity description
Schedule 3 of the EP Act	
7 Chemical storage	Storing more than 10 t of chemicals (other than compressed or liquefied gases) that are dangerous goods under the dangerous goods code.
24 Mine wastes	a) Storing hazardous mine or exploration wastes, including, for example, tailing dams, overburden or waste rock dumps containing hazardous contaminants; or b) Exploring for, or mining or processing, minerals in a way that exposes faces, or releases groundwater, containing hazardous contaminants.

Notifiable activity	Notifiable activity description
29 Petroleum product or oil storage	Storing petroleum products or oil: c) In above ground tanks: a. for petroleum products or oil in class 3 in packaging groups 1 and 2 of the dangerous goods code – more than 2,500 L capacity; or b. for petroleum products or oil in class 3 in packaging groups 3 of the dangerous goods code – more than 5,000 L capacity; or c. for petroleum products that are combustible liquids in class C1 or C2 in Australian Standard AS 1940, 'The storage and handling of flammable and combustible liquids' published by Standards Australia – more than 25,000 L capacity.
37 Waste storage, treatment of disposal	Storing, treating, reprocessing or disposing regulated waste including operating a sewage treatment facility with onsite disposal facilities.

3.1.1.2 Mining tenements

The PRCP relates to activities within three Mining Lease Applications (MLAs) overlying Exploration Permit for Minerals (EPM) 25254, 25440, 26846, 26928, 28556 and 28388 held by Vecco (Figure 2). The Project partially overlies EPM 27954, which is held by Red Ox Copper Pty Ltd.

It is noted that given the overall extent of the Project, for descriptive purposes the three MLAs have been subcategorised and described hereon as follows:

- Production MLA (MLA 100367) which contains the disturbance associated with the mine pit, MIA, water storages and drains, a section of the water extraction pipeline, internal roads, airstrip, solar farm, mining areas and stockpiles, mineral processing plant, sewage treatment plant and the workers accommodation village;
- Transport MLA (MLA 100368) which contains the disturbance associated with road access from Punchbowl Road, Saxby low level crossing, and gates, fencing and grids allowing access through the Stock route; and
- Infrastructure MLA (MLA100369)which contains the disturbance associated with a section of water extraction pipeline and water pumping infrastructure.

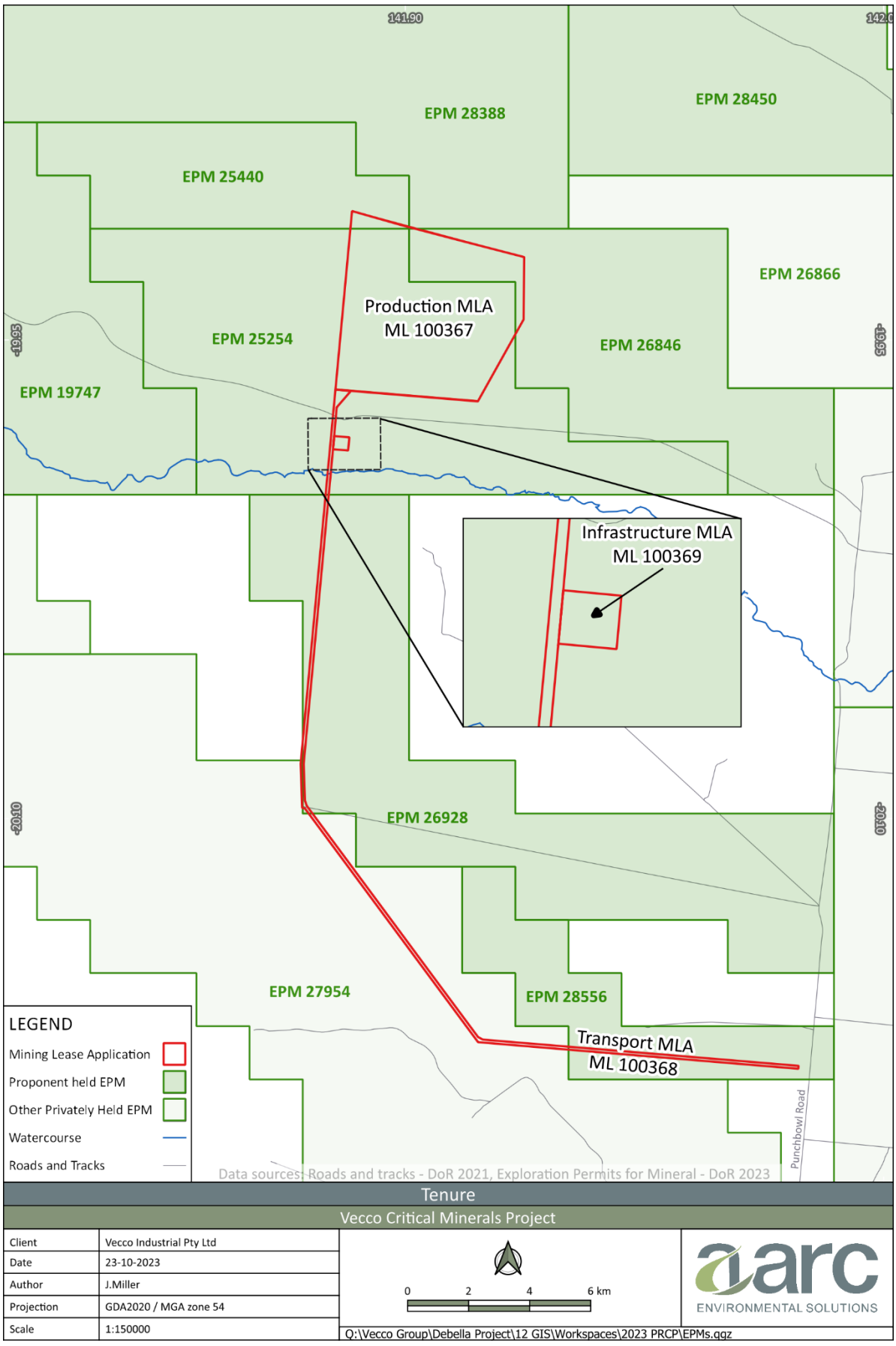

Figure 2: Project tenements

3.1.1.3 Mining operations and site layout

Mine operations will be conducted using conventional surface mining equipment, including hydraulic excavators, front end loaders, rear dump trucks, and dozers in free-dig mode. The Project proposes mining to a depth of 35 m below the natural surface. Excavators will load the ROM ore into haul trucks for transport to the ROM stockpile area located in the MIA, ready for mineral processing.

A summary of the mining sequence is planned as follows:

- clearing of vegetation ahead of mining, followed by the removal and storage of topsoil and subsoil for later use in the rehabilitation process;
- removal of overburden for placement in an initial out-of-pit dump, and then backfilled in the void behind the active mining strip;
- excavation of ore using hydraulic excavators and off-roads trucks for mining and haulage via road networks to the ROM stockpile areas for processing; and
- progressive placement of neutralised process residue to the floor of the void prior to backfill.

The total ROM shale to be excavated is approximately 48 Mt at a rate of up to 1.9 Mtpa/yr. The life of mine waste rock material handled is estimated to be approximately 26.3 Mbcm for the Project.

General layout arrangements for various stages of the Project are shown in Figure 3 to Figure 8. The stage plans show the mine's progression over time.

A small waste rock dump will be established to the west of the pit. Waste material will be re-handled to backfill the final void at the completion of mining activities.

Mineral processing will occur on site. The final mineral products will be packed in containers onsite and transported by truck to Townsville for secondary processing into battery electrolyte or to export from the Port of Townsville to overseas markets.

Process residue will be produced as a waste stream on site and will be returned to the exposed floor of the open pit after neutralisation. The ratio of overburden to process residue is expected to be approximately 5:1 (volume) (Boyd 2022). The residue will be a combined waste stream from the different ore processes. The combined residue stream is planned to be co-disposed into the mined pit and covered with waste rock material including, Toolebuc Limestone, Allaru Mudstone, Quaternary Alluvium and original subsoil and topsoil profile. The management of process residue waste is described in further detail in section 3.5.9.1.

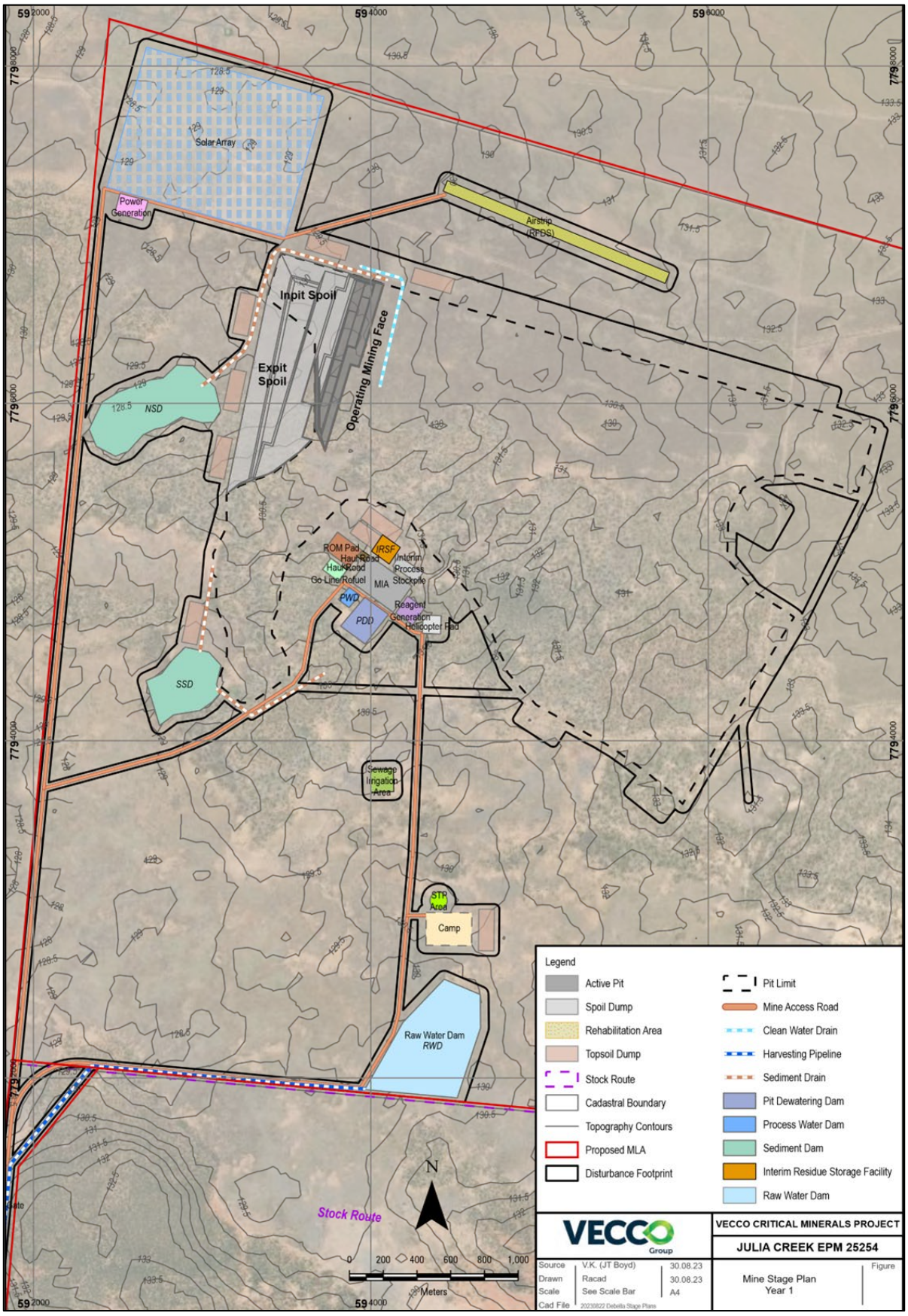

Figure 3: Mine plan - year 1

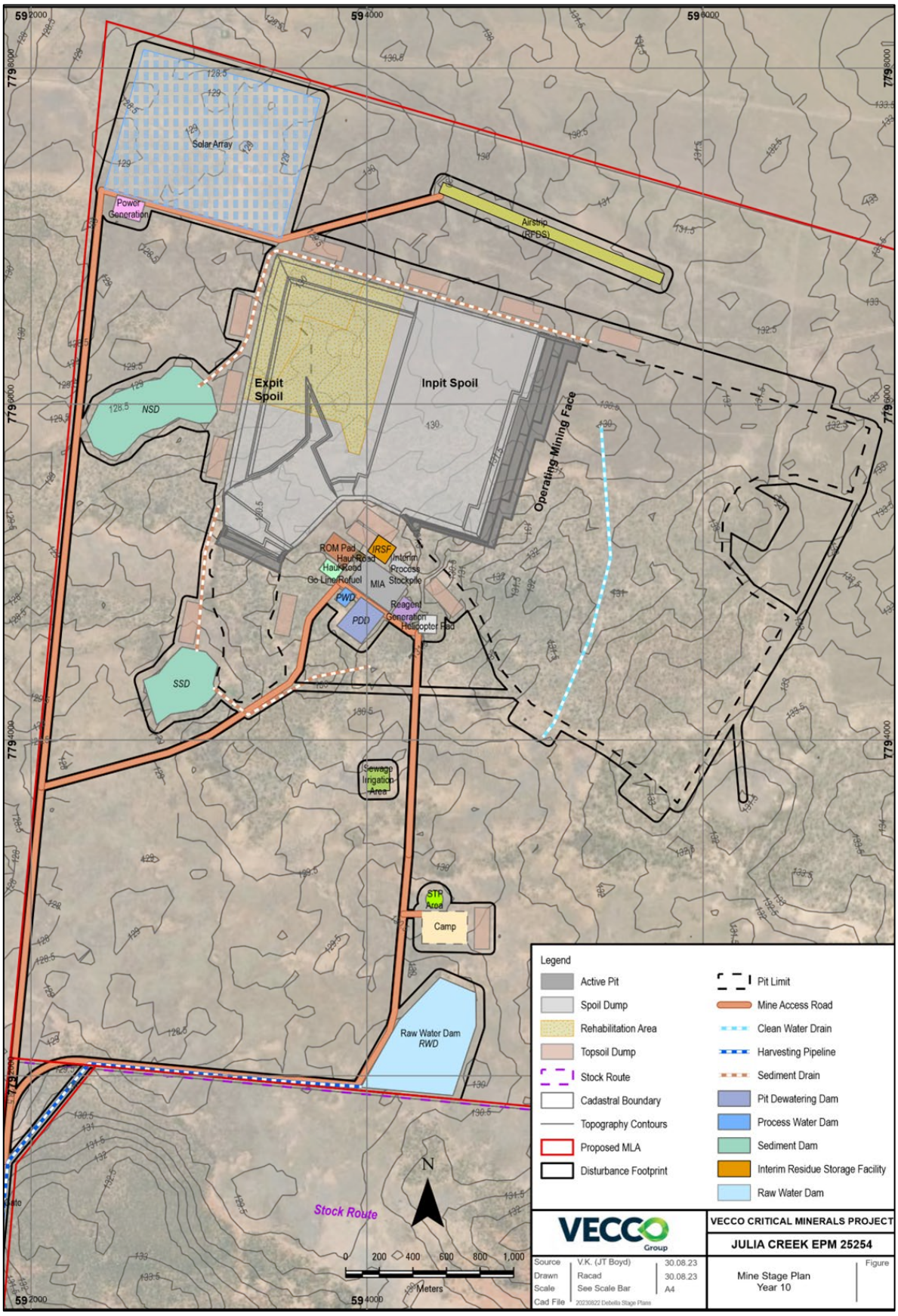

Figure 4: Mine plan - year 10

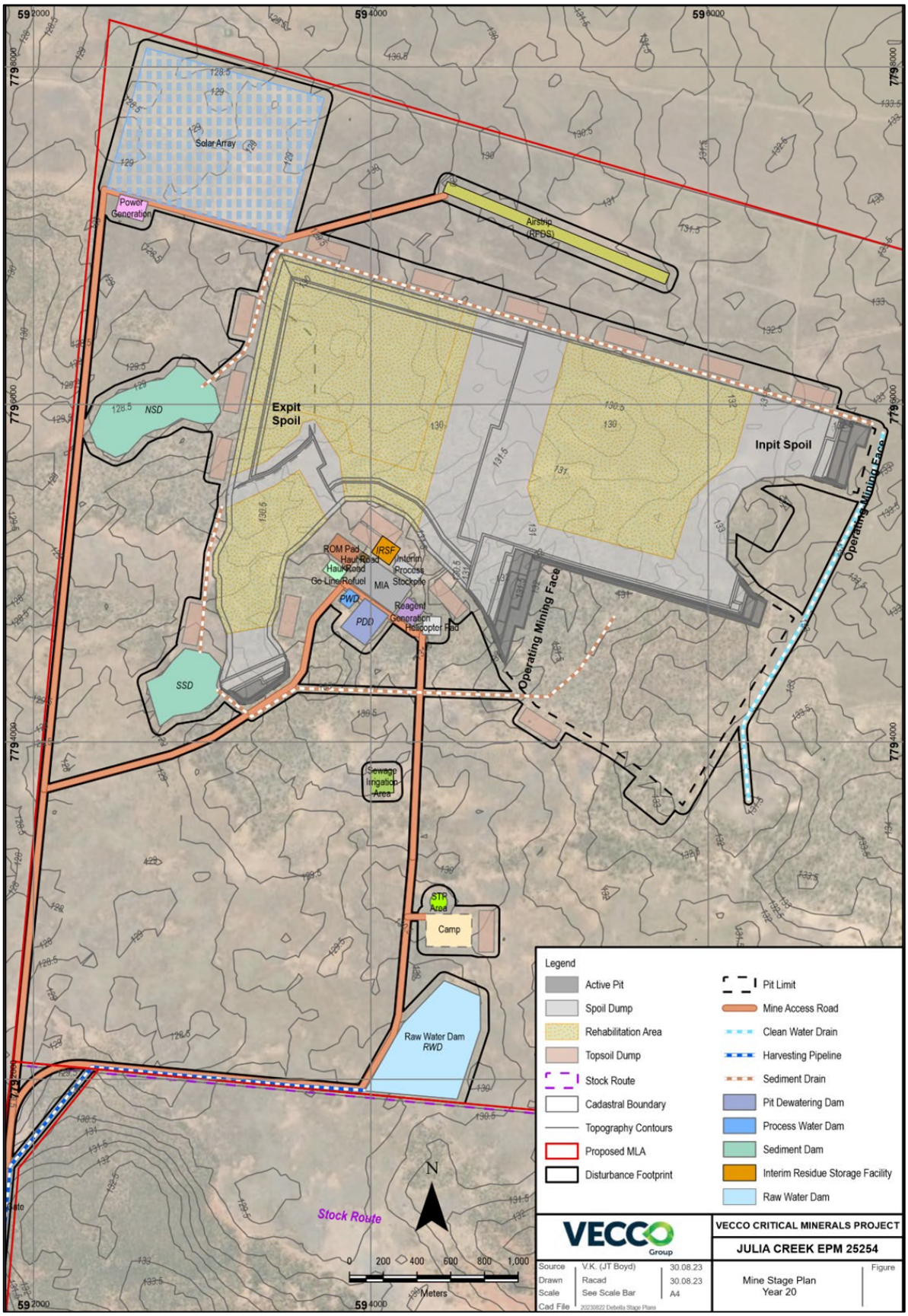

Figure 5: Mine plan - year 20

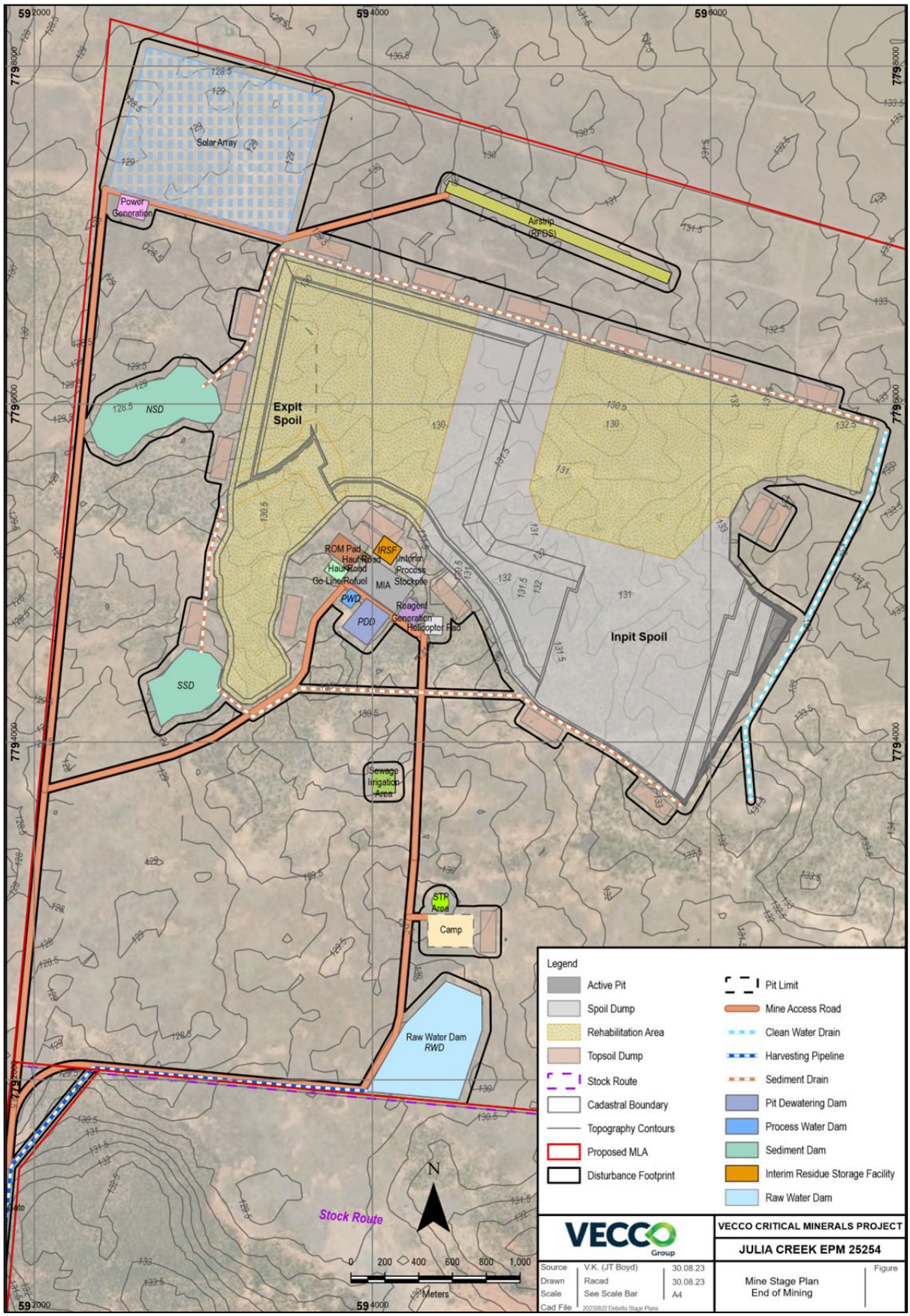

Figure 6: Mine plan - end of mine

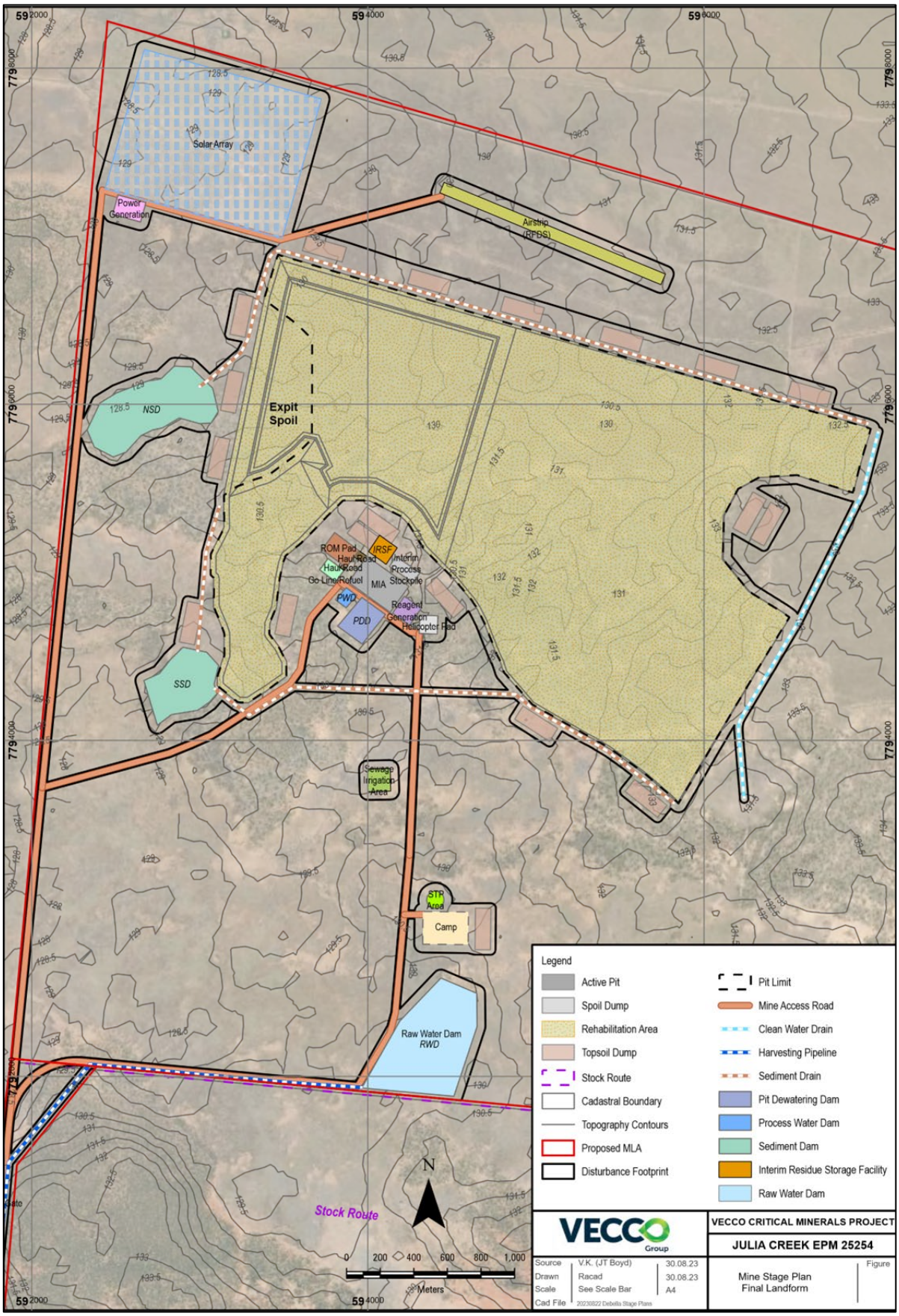

Figure 7: Final landform following void backfill and waste rock rehabilitation

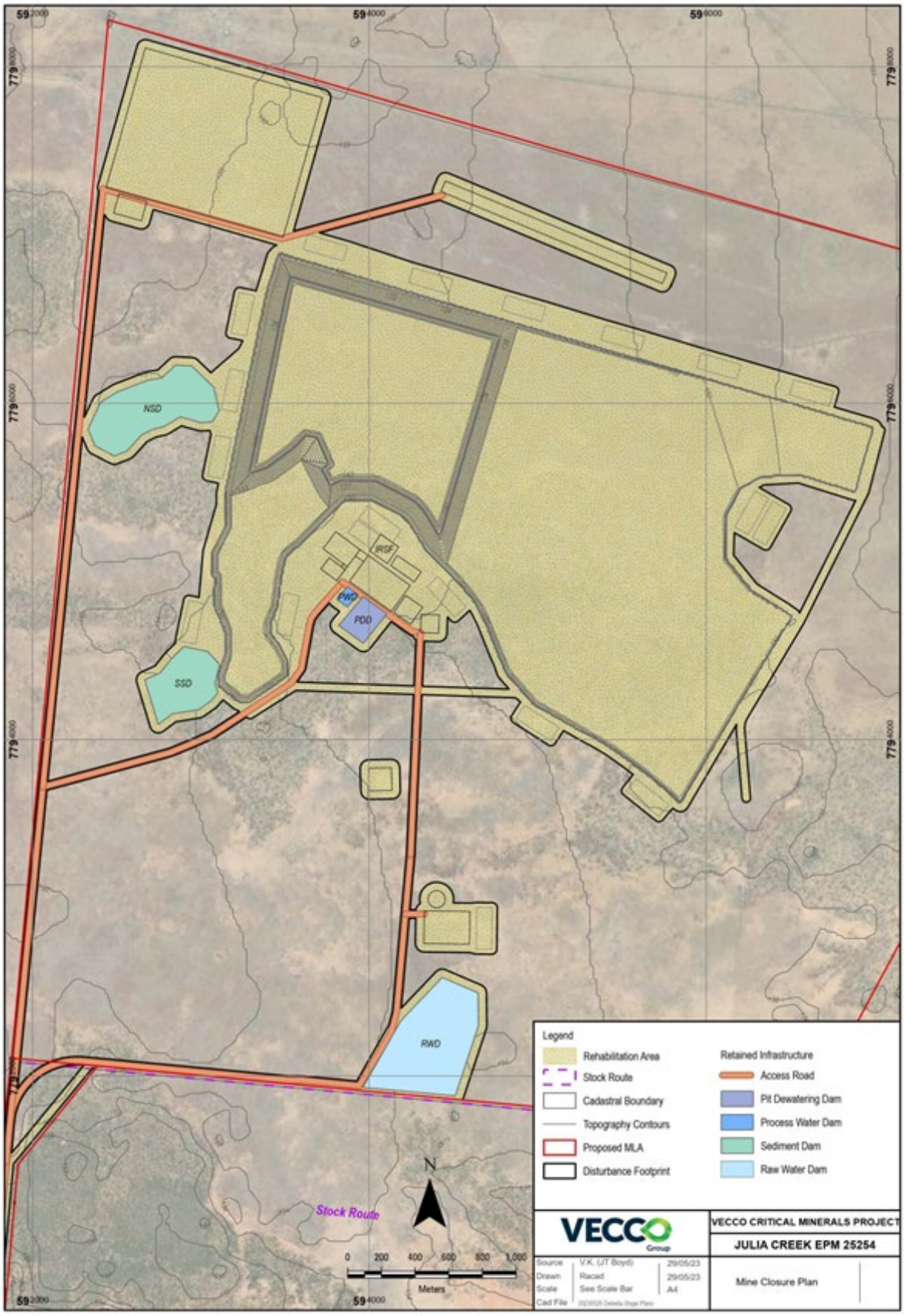

Figure 8: Final landform following bulk earthworks

3.1.2 Climate

The regional climate of the Project can be described as sub-tropical with wet season dominated rainfall and mild, dry winter months. Rainfall is highly seasonal and is typically associated with monsoonal, thunderstorm and cyclone weather patterns.

A long-term representative historical rainfall data set was developed from nearby recorded data from Bureau of Meteorology (the Bureau) rainfall gauging stations and infilled with SILO Data Drill when gauged data was unavailable (Engeny 2023). Rainfall records ranging from 1887 - 2022 from the following rainfall gauging stations was used to determine historical rainfall data:

- Zonia Downs (029051), located approximately 7 km from the Project;
- Crowfels Station (029011), located approximately 25 km from the Project;
- Bunda Bunda (029005) located approximately 34 km from the Project;
- Millungera Station (029036) located approximately 37 km from the Project; and
- Manfred Downs (029132) located approximately 53 km from the Project.

Rainfall records indicate that annual average rainfall is approximately 517 mm/year, with the wettest months occurring December to February (Figure 9).

Monthly pan evaporation data was adopted from the SILO data drill at the location of the Project (DES 2022). The SILO data drill is a derived data set from a combination of interpolated recorded data between weather stations and derived long-term average values. Average annual evaporation at the Project is estimated to be 2079 mm/year (Figure 10), approximately four times higher than average annual rainfall.

The mean monthly maximum temperature is highest in December (39.3°C), dropping to 28.3°C in June before rising in subsequent months. The mean monthly minimum temperature ranges between 11.4°C to 25.0°C throughout the year, with an annual mean minimum temperature of 19.1°C. Summer maximum temperatures are potentially detrimental to crop growth.

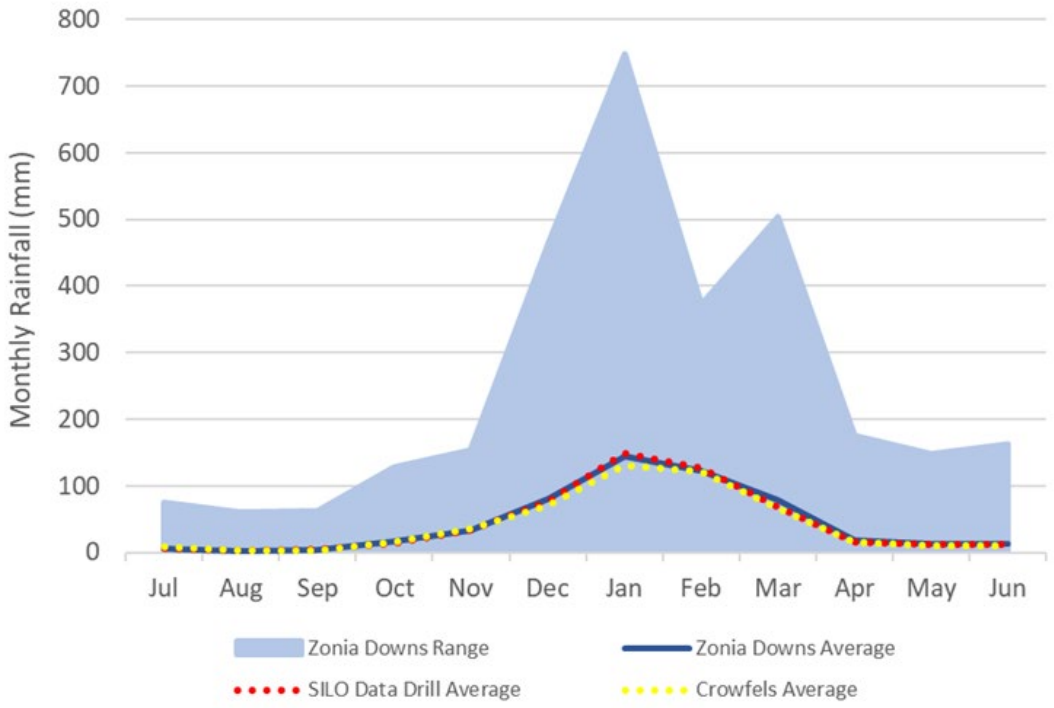

Figure 9: Mean monthly rainfall in the Project region (Engeny 2023)

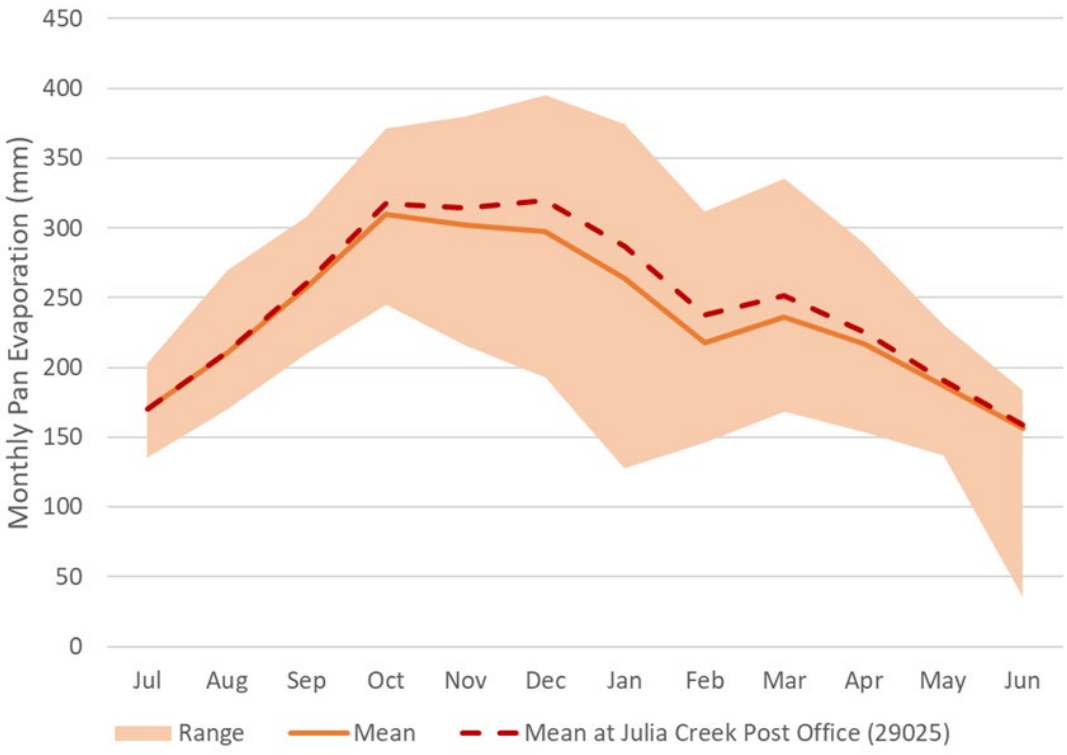

Figure 10: Monthly evaporation summary in the Project region (Engeny 2023)

3.1.3 Surface hydrology

The Project is located within the Flinders Drainage Basin, which encompasses an area of 109,298 km^2 and contains the Cloncurry River, Flinders River and Saxby River sub-catchment areas (DES 2022a). The Project is located adjacent the Saxby River floodplain, within the Saxby River sub-catchment which covers a total area of 10,147 km^2 (Engeny 2023). The Saxby River is situated approximately 2 km south of the production MLA and is intersected by the planned access road within the transport MLA. The main channel of the Saxby River is defined as a 6^{th} order stream, with braided channels originating from the main channel (Figure 11). The Saxby River is approximately 1,030 km in length and begins at the Norman River and flows south-west for 108 km before turning north-west converging with the Flinders River eventually discharging into the Gulf of Carpentaria.

Periods of flow in the Saxby River are restricted to the wet season events between the months of November to late March (Figure 9). No tributaries or other watercourses are mapped to traverse the Project production MLA (Figure 11).

A group of seasonal wetlands are mapped to occur approximately 22 km south of the production MLA along a section of the transport MLA access road (Figure 12). Seasonal wetlands are also mapped in within the riparian zone of the Saxby River.

The Saxby River floodplain is restricted on the northern side of the river at the production MLA boundary, with the topography rising by around 5 m over 800 m to where the project site is located. The southern bank floodplain extends out around 10 km from the Saxby River channel to the border of the Flinders River sub-catchment with water during significant floods flowing from the Saxby River into the Flinders River (Figure 13).

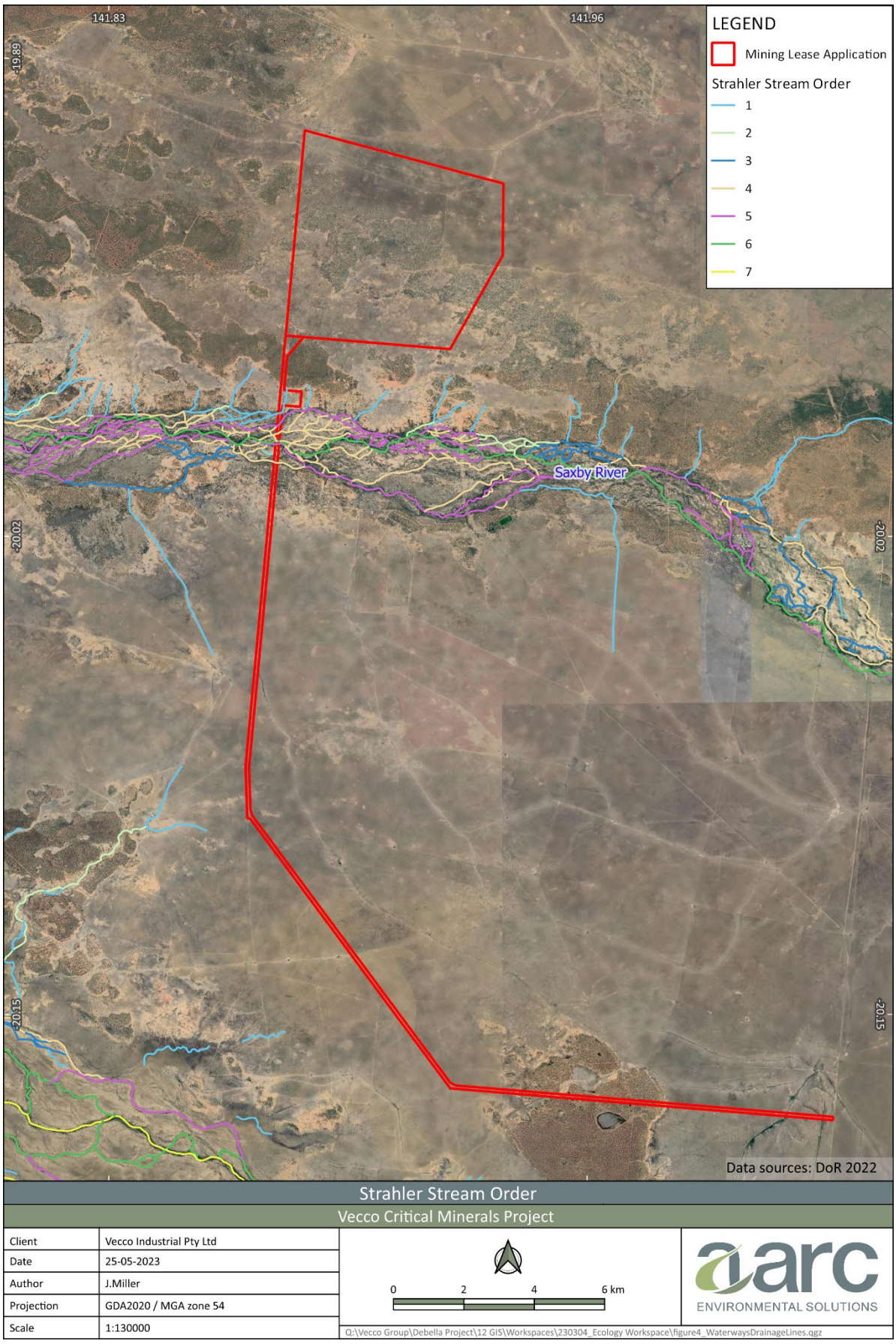

Figure 11: Waterways of the Project, by Strahler stream order

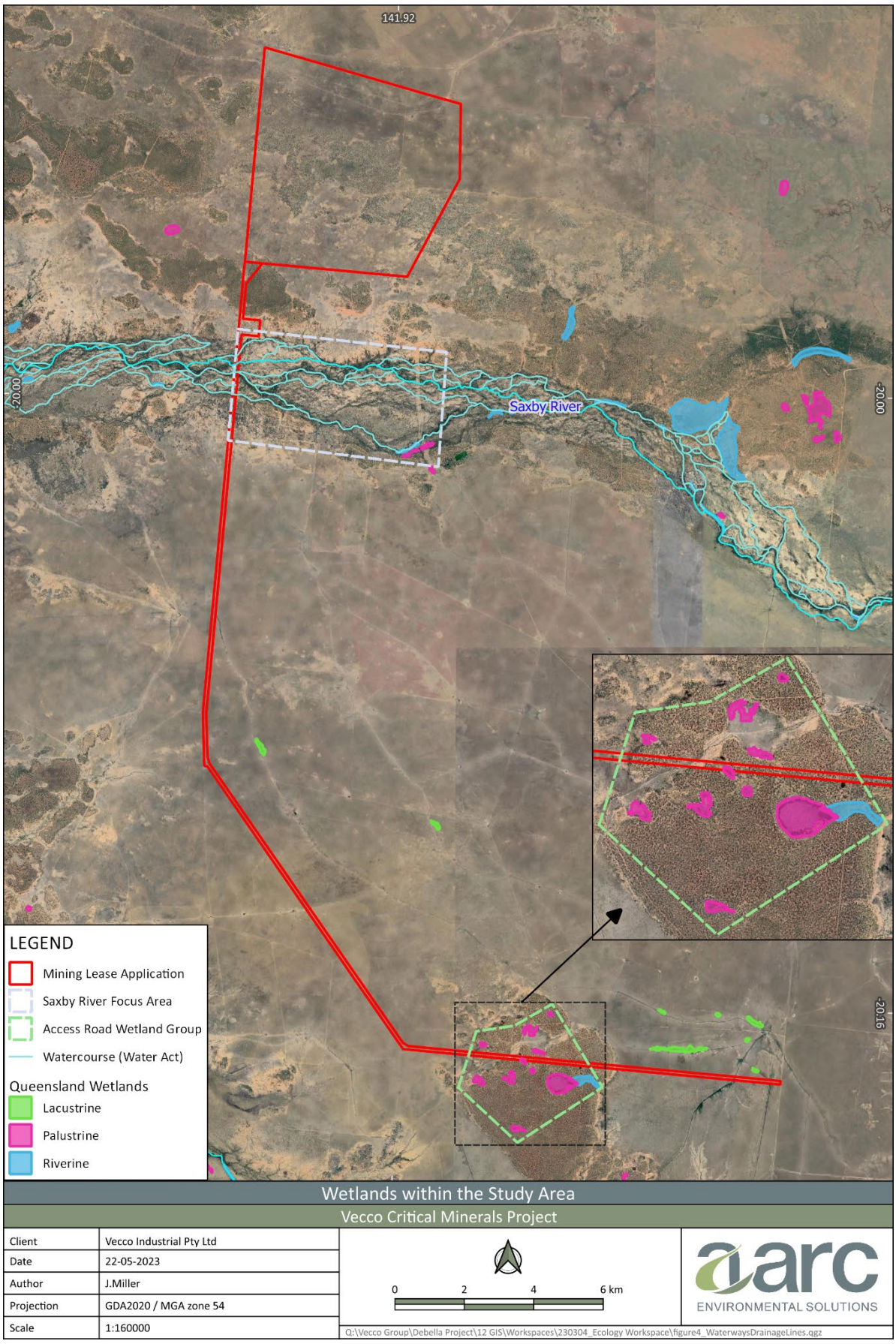

Figure 12: Wetlands of the Project

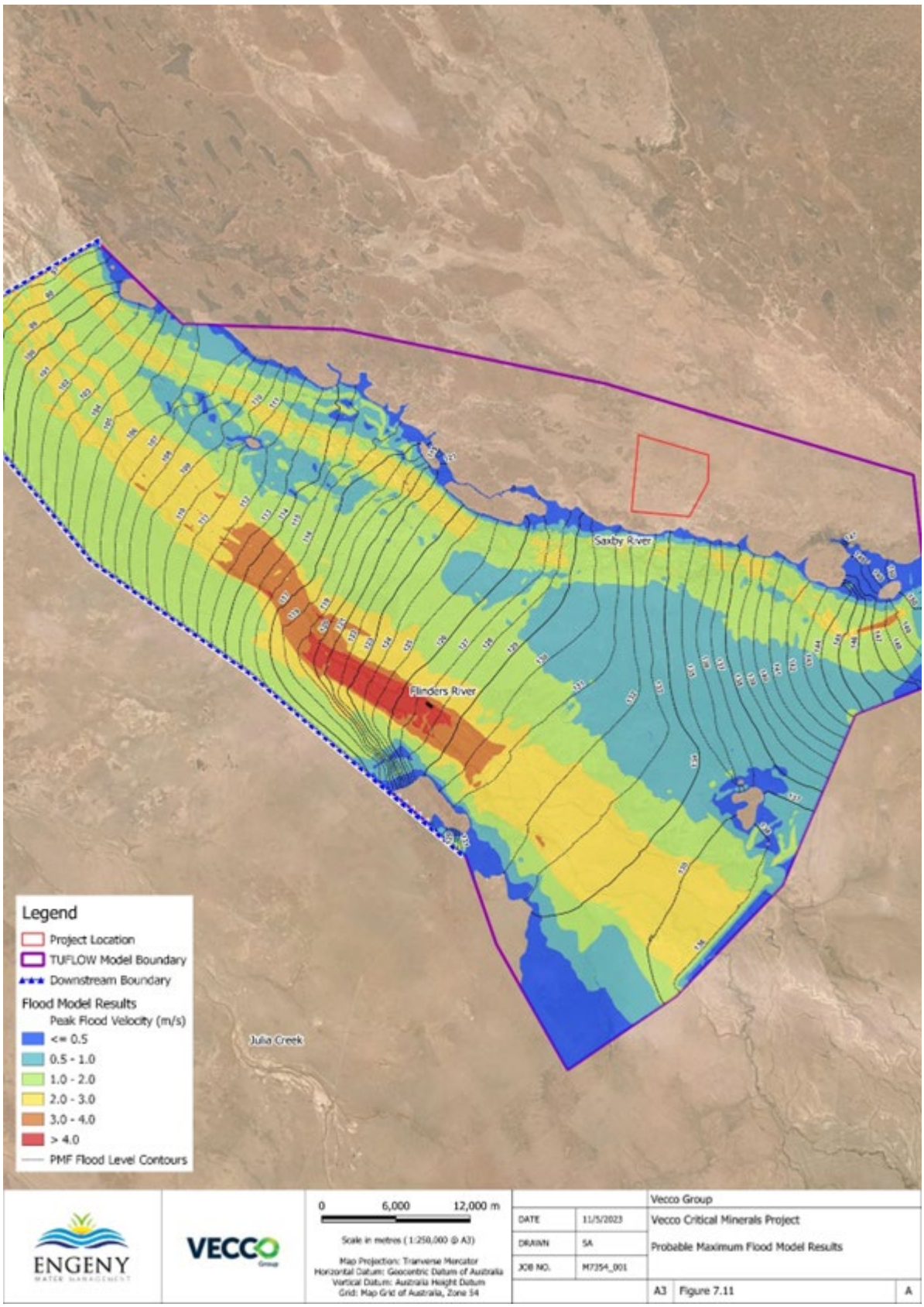

Figure 13: Probable maximum flood extent and levels

3.1.3.1 Surface water quality

The availability of surface water quality data for the Saxby River is limited due to the ephemeral nature of the watercourse and the limited available access during flow events. Water quality monitoring for the Project was undertaken in February 2022, May 2022 and March 2023 along the Saxby River and associated canals (Figure 14) following rainfall / flow events.

Water quality in the Saxyby River is considered typical of a slightly to moderately disturbed aquatic ecosystem in this region. Water quality in the Saxby River showed consistent elevation for some parameters including aluminium, chromium, copper, manganese, and hydrocarbons when compared to the aquatic ecosystem objectives for slightly to moderately disturbed waters. These elevated parameters are assumed to be linked to natural mineralisation in the sub-soils of the area. There are other potential contributing sources to water including grazing and agricultural land practices - and inflows from uncapped groundwater bores, accessing underlying artesian waters and overtopping to land and waters via constructed bores drains.

A comparative analysis of water quality monitoring results against relevant guidelines are provided in Table 3, Table 4 and Table 5.

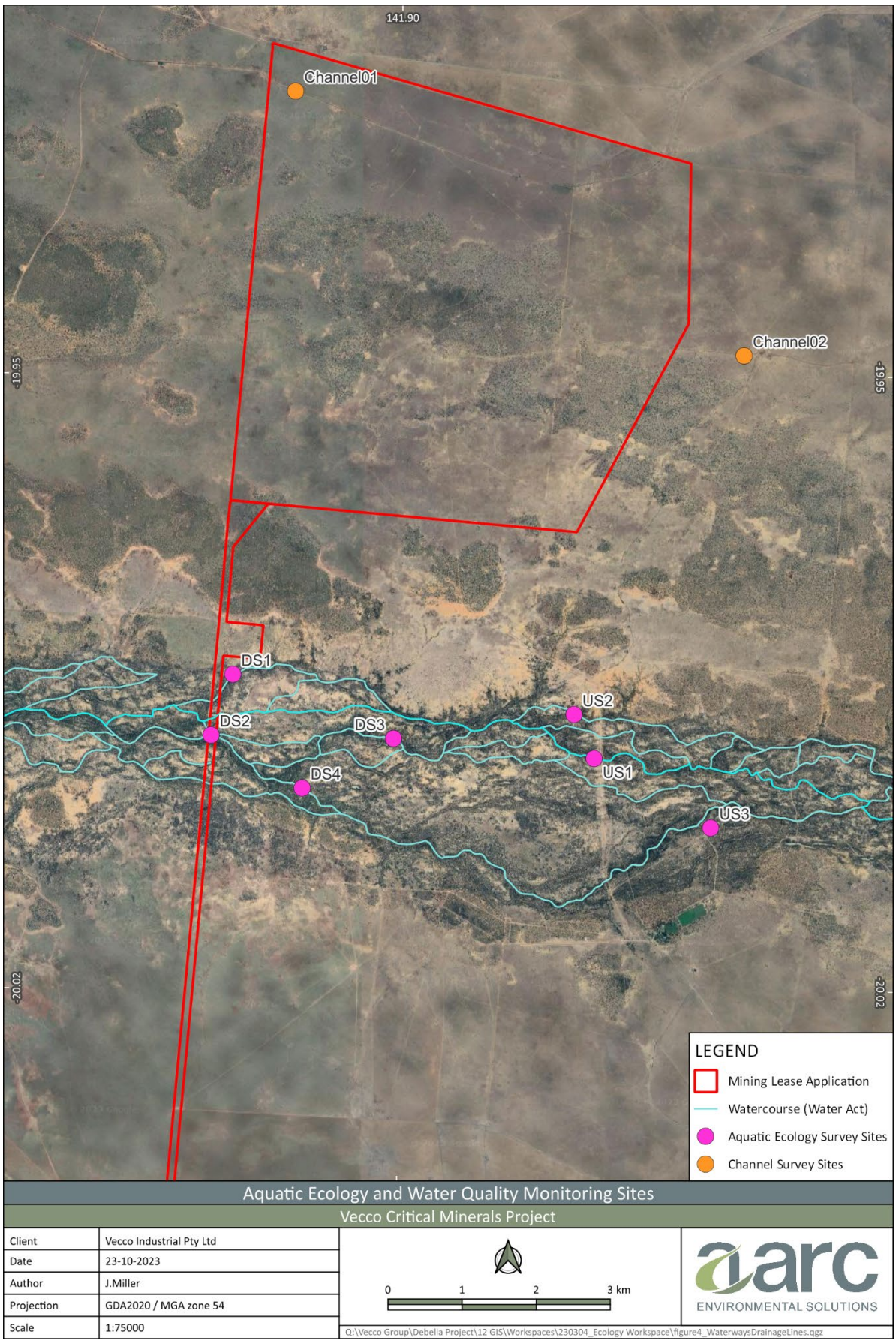

Figure 14: Water quality and aquatic ecology monitoring sites

Table 3: Dissolved metals results and comparison to aquatic ecosystem protection guideline values

Parameter	Water quality objective	Units	DS1	DS2	US1	US2	US1	US2	US3	DS4	DS2	DS3	Canal01	Canal02	DS1	DS2	DS3	DS4	US1	US2	US3
			14/02/22	14/02/22	14/02/22	12/04/22	16/05/22	16/05/22	16/05/22	16/05/22	16/05/22	16/05/22	02/03/23	02/03/23	02/03/23	02/03/23	02/03/23	02/03/23	02/03/23	02/03/23	02/03/23
Aluminium	0.055	mg/L	0.011	0.089	0.263	<5	0.966	0.334	1.01	0.743	1.25	1.44	<0.01	<0.01	0.11	0.26	0.15	0.04	0.07	0.06	0.10
Arsenic	0.013	mg/L	0.001	0.001	0.002	0.004	0.001	0.001	<0.001	0.001	<0.001	<0.001	0.003	0.004	<0.001	0.001	0.001	<0.001	0.002	0.002	0.001
Boron	0.370	mg/L	<0.05	<0.05	<0.05	0.16	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.05
Cadmium	0.0002	mg/L	<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	<0.0001	<0.0001	<0.0001
Chromium	0.001	mg/L	<0.001	<0.001	<0.001	0.002	<0.001	0.002	<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
Copper	0.0014	mg/L	0.002	0.001	0.002	0.001	0.002	<0.001	0.002	0.002	0.002	0.002	<0.001	<0.001	0.001	0.002	0.001	0.001	0.002	<0.001	0.002
Lead	0.0034	mg/L	<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	0.002	0.001	0.001	0.002	<0.001	0.002
Manganese	1.9	mg/L	0.007	0.02	0.066	0.263	0.003	0.022	0.009	0.006	0.002	0.002	ND	ND	ND	ND	ND	ND	ND	ND	ND
Nickel	0.011	mg/L	0.002	0.001	0.002	0.010	0.002	<0.001	0.002	0.002	0.002	0.002	0.001	0.001	<0.001	0.002	0.002	0.001	0.002	0.002	0.002
Zinc	0.008	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

Notes: Cells shaded orange indicate guideline value exceedance.

Table 4: Total metals results and comparison to stock watering protection guideline values

Parameter	WQO	Units	DS1	DS2	US1	US2	US1	US2	US3	DS4	DS2	DS3	Canal01	Canal02	DS1	DS2	DS3	DS4	US1	US2	US3
			14/02/22	14/02/22	14/02/22	12/04/22	16/05/22	16/05/22	16/05/22	16/05/22	16/05/22	16/05/22	02/03/23	02/03/23	02/03/23	02/03/23	02/03/23	02/03/23	02/03/23	02/03/23	02/03/23
Aluminium	5	mg/L	25.4	4.44	5.62	33.6	6.4	1.02	7.83	4.34	9.82	9.67	0.08	0.22	4.47	6.10	3.12	5.34	1.29	2.19	3.57
Arsenic	0.5	mg/L	0.004	0.002	0.003	0.009	0.002	0.001	0.002	0.002	0.002	0.002	0.004	0.006	0.002	0.002	0.002	0.002	0.002	0.002	0.002
Boron	5	mg/L	0.05	<0.05	<0.05	0.18	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.001	0.005	0.004	0.005	0.003	0.005	0.001	0.002	0.003
Cadmium	0.01	mg/L	0.0002	<0.0001	<0.0001	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	0.0001	<0.0001	0.002	0.005	0.001	0.002	0.002	0.002	0.001	0.001	0.002
Chromium	1	mg/L	0.025	0.004	0.006	0.034	0.007	0.001	0.009	0.003	0.012	0.012	0.002	0.001	0.004	0.004	0.003	0.004	0.002	0.003	0.003
Cobalt	1	mg/L	0.008	0.002	0.003	0.025	0.003	0.001	0.004	0.002	0.007	0.005	<0.001	<0.001	0.001	0.002	<0.001	0.002	<0.001	<0.001	0.002
Copper	1 (cattle)	mg/L	0.017	0.003	0.004	0.02	0.006	0.002	0.006	0.003	0.009	0.008	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Lead	0.1	mg/L	0.01	0.002	0.003	0.019	0.002	<0.001	0.003	0.002	0.006	0.005	0.001	0.002	0.003	0.004	0.003	0.004	0.003	0.002	0.003
Mercury	0.002	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.004	0.006	0.002	0.002	0.002	0.002	0.002	0.002	0.002
Molybdenum	0.15	mg/L	0.003	0.001	0.002	0.004	<0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Nickel	1	mg/L	0.013	<0.001	0.002	0.024	0.007	0.002	0.008	0.004	0.01	0.009	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Selenium	0.02	mg/L	0.00007	<0.2	0.0003	0.0017	0.0003	<0.0002	0.0004	<0.0002	0.0006	0.0005	<0.001	0.005	0.004	0.005	0.003	0.005	0.001	0.002	0.003
Uranium	0.2	mg/L	<0.001	<0.001	<0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	0.005	0.001	0.002	0.002	0.002	0.001	0.001	0.002
Zinc	20	mg/L	0.05	0.01	0.014	0.058	0.015	0.008	0.018	0.008	0.026	0.021	<0.001	<0.001	0.001	0.002	<0.001	0.002	<0.001	<0.001	0.002
Fluoride	2	mg/L	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

Notes: Cells shaded orange indicate guideline value exceedance.

Table 5: Physico-chemical results and comparison to aquatic ecosystem protection guideline values

Parameter	WQO	Units	DS1	DS2	US1	US2	US1	US2	US3	DS4	DS2	DS3	Canal01	Canal02	DS1	DS2	DS3	DS4	US1	US2	US3
			14/02/22	14/02/22	14/02/22	12/04/22	16/05/22	16/05/22	16/05/22	16/05/22	16/05/22	16/05/22	02/03/23	02/03/23	02/03/23	02/03/23	02/03/23	02/03/23	02/03/23	02/03/23	02/03/23
pH	6 to 8	-	7.37	7.8	7.93	8.13	7.28	7.3	7.27	7.32	7.41	7.5	7.50	7.60	7.53	7.42	7.78	7.93	7.86	7.68	7.93
EC	550	µS/cm	216	153	153	1170	104	46	101	69	99	99	150	136	73	56	141	145	164	103	147
Total Hardness	n/a	CaCO3 mg/L	-	-	-	67	33	12	33	23	31	31	45	57	22	18	54	47	61	33	54
Sulphate as SO4	n/a	mg/L	40	5	6	11	7	2	7	5	8	8	<1	<1	3	2	2	3	3	2	2
Ammonia as N	n/a	mg/L	-	-	-	0.1	<0.01	0.08	0.04	0.28	0.06	0.09	0.09	0.05	0.04	0.03	0.10	0.39	0.10	0.04	4.01
Nitrite as N	n/a	mg/L	-	-	-	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Nitrate as N	n/a	mg/L	-	-	-	<0.01	0.01	<0.01	<0.01	<0.01	0.06	0.06	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	0.02	<0.01	<0.01
Chloride	n/a	mg/L	<1	3	<1	2	2	4	4	3	<1	2	7	4	3	2	7	9	7	5	9
TSS	n/a	mg/L	-	-	-	141	46	9	92	31	263	149	28	22	49	32	41	78	34	16	54
Turbidity	15	ntu	1040	152	181	1400	220	19.9	287	133	424	371	13.6	11.7	96.1	121	65.5	113	44.4	37.2	88.5

Notes: Cells shaded orange indicate guideline value exceedance.

Table 6: Petroleum hydrocarbon data for all survey sites 2022

Parameter	ANZECC (2000) Trigger value	Units	US2	US1	US3	DS4	DS2	DS3	Canal01	Canal02	DS1	DS2	DS3	DS4	US1	US2	US3
			12/04/22	16/05/22	16/05/22	16/05/22	16/05/22	16/05/22	02/03/23	02/03/23	02/03/23	02/03/23	02/03/23	02/03/23	02/03/23	02/03/23	02/03/23
C6- C9 Fraction	20	mg/L	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
C10 - C14 Fraction	100	mg/L	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
C15-C28 Fraction	100	mg/L	<100	<100	<100	<100	<100	<100	<100	140	<100	<100	<100	130	380	<100	<100
C29-C36 Fraction	100	mg/L	<50	<50	<50	<50	<50	<50	<50	60	<50	<50	<50	<50	80	<50	<50
C10-C36 Fraction (sum)	100	mg/L	<50	<50	<50	<50	<50	<50	<50	200	<50	<50	<50	130	460	<50	<50
C6-C10 Fraction	20	mg/L	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
C6-C10 Fraction minus BTEX (F1)	100	mg/L	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
>C10-C16 Fraction	100	mg/L	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
>C16-C34 Fraction	100	mg/L	<100	<100	<100	<100	<100	<100	<100	170	<100	<100	<100	<100	430	<100	<100
>C34-C40 Fraction	100	mg/L	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100
>C10-C40 Fraction (sum)	100	mg/L	<100	<100	<100	<100	<100	<100	<100	170	<100	<100	<100	<100	430	<100	<100
>C10-C16 Fraction minus Naphthalene (F2)	100	mg/L	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100	<100

3.1.3.2 Stream sediment quality

An analysis of stream sediments collected along the Saxby River upstream and downstream the Project for total metals in 2022 indicates stream sediments are below the low sediment quality objectives (AARC 2023b).

No exceedance of high or low objectives were identified during the sediment quality assessment, with the results at all sites below the low trigger level from the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG 2018) (AARC 2023c).

Saxby River stream sediment is characterised by high percentages of sand (up to 88%) at most sample sites with variable levels of clay and silt. Two sites US3 and DS3 had higher concentrations of clay and silt 62% and 43% respectively. Minor gravel presence was recorded at all sites with site DS3 recording the highest percentage at 21%. Only minor large cobble was present recorded at less than 1% for all sites.

3.1.4 Land

3.1.4.1 Underlying landholders

The Project's production MLA is located entirely within Lot 1 on Plan SX7, with adjacent properties Lot 2 on Plan SX7 and Lot 15 on Plan TD29. The transport lease is located on the western edge of Lot 2 on Plan SX7 and the southern edge of Lot 4 on Plan SX7. This lease is adjacent to Lot 15 on Plan TD29, Lot 1 on Plan SX5, Lot 6 on Plan SX5, and Lot 5 on Plan SX13, and will adjoin Punchbowl Road - owned by McKinlay Shire Council - with a newly developed intersection. The infrastructure lease is located on Lot 2 on Plan SX7.

Additional tenures intersected by the Project MLAs include:

- Stock route 010MLAY, mapped as 'minor and unused' in Queensland Globe, owned by McKinlay Shire Council; and
- A publicly gazetted unnamed road.

No State Forests, National Parks or conservation tenure are located within, or on land adjacent to, the Project. The Bow Park station, upon which the proposed MLAs are located, is designated partly as a Forest Consent Area.

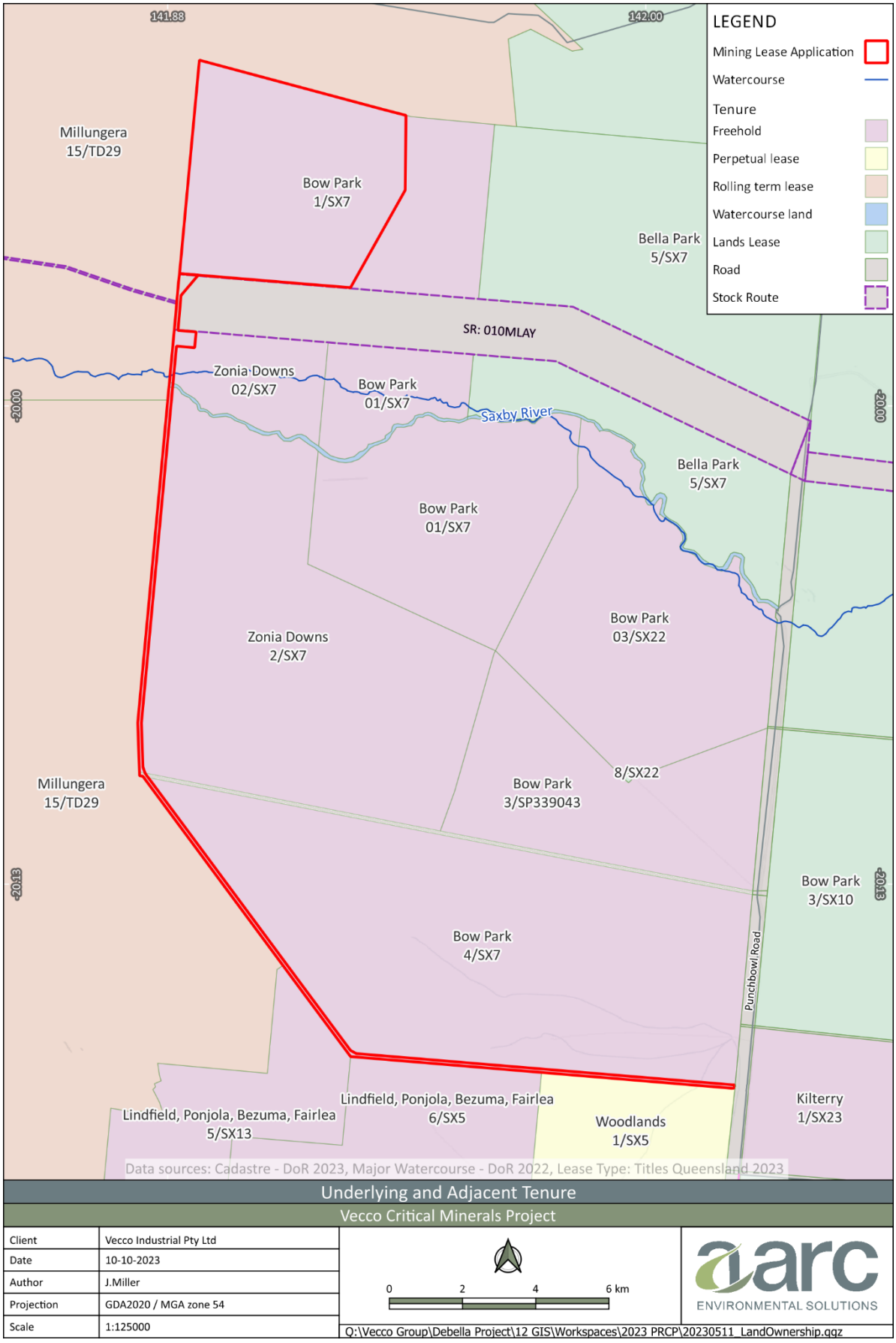

Figure 15: Project land ownership tenure

3.1.4.2 Current land use

The land in and surrounding the Project area is within the *McKinlay Shire Planning Scheme* (2019) and is zoned as 'Rural'. The Project is not located in a Priority Agricultural Area, Strategic Cropping Area, Strategic Environmental Area or Priority Living Area, as defined by the *Regional Planning Interests Act* 2014.

The predominant land use of North-West Queensland is low intensity cattle grazing, dryland cropping and resource operations. The current land use of the Project site is low intensity cattle grazing on native pastures.

Queensland Land Use Mapping classifies the project area as 'Grazing Native Vegetation', which is defined as (ABARES 2016):

> *Land uses based on grazing domestic stock on native vegetation where there has been limited or no deliberate attempt at pasture modification.*

Consultation with landowners within and adjacent the Project area indicates that the stock route 010MLAY located south of the mine is occasionally used or is planned for future use by landowners for cattle movements.

3.1.4.3 Topography

The topography of the Project region is generally flat to gently undulating, with elevations ranging between 130 m and 150 m Australian Height Datum (AHD). The topography of the Project is representative of the surrounding region, being generally flat alluvial clay plains with sandy alluvial deposits as slight near-level rises.

The surface topography of the Project Area is relatively subdued, reducing from east to west by approximately 10 m over 11 km, a gradient of less than 0.001 (Figure 16). The subdued topography is reflected in the nature of the rivers in the area, such as the Saxby River to the south of the Project site, which meander within multiple channels over a wide area.

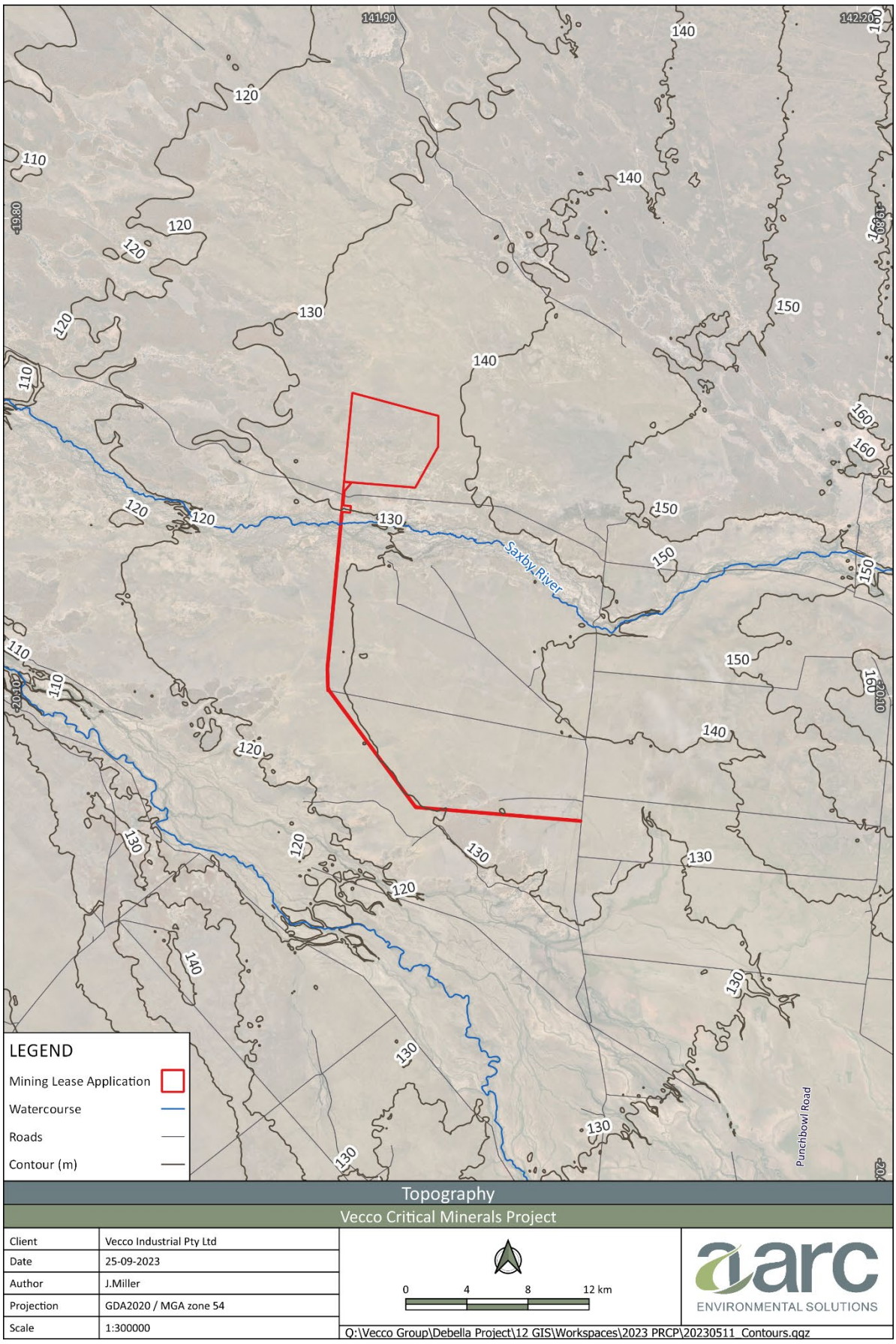

Figure 16: Topography of the Project area

3.1.4.4 Land types

The area within the production MLA boundaries can also been classified into two land systems, where a land system is an area with recurring characteristics of topography, soils and vegetation (Perry et al. 1964). These are:

- The Balbirini Land System - characterised by gently undulating treeless plains with heavy soils carrying Mitchell grass pastures. Flat plains are sloping gently towards the coast. Surrounding soils are calcareous cracking clay with gilgai, occupied largely by blue grass-browntop downs, as well as small areas of Mitchell grass downs and sparse woodland.
- The Bylong Land System - described as sandy outwash plains, with local elevations of approximately 3 m. The landscape comprises of deep sandy soils (brown soils of light texture), and moderately dense low woodland vegetation (up to 6 m). The associated grass layer is three-awn-ribbon grass, which has a sparse ground cover and low forage production. A feature of the community is that most of the trees and shrubs are grazed by stock.

3.1.4.5 Land zone

Three land zones (and associated soil types) occur within the Project:

- Land Zone 3 – Recent Quaternary alluvial systems, including closed depressions, paleo-estuarine deposits currently under freshwater influence, inland lakes, and associated wave-built lunettes (Wilson and Taylor 2012). Land Zone 3 excludes colluvial deposits such as talus slopes and pediments. This Land Zone includes a diverse range of soils predominantly Vertosols and Sodosols (Wilson and Taylor 2012). Land Zone 3 also occurs with Dermosols, Kurosols, Chromosols, Kandosols, Tenosols, Rudosols and Hydrosols; and Organosols in high rainfall areas (Wilson and Taylor 2012).
- Land Zone 4 – Tertiary-early Quaternary clay deposits, usually forming level to gently undulating plains not related to recent Quaternary alluvial systems (Wilson and Taylor 2012). This Land Zone mainly occurs with Vertosols with gilgai microrelief. Land Zone 4 also includes thin sandy or loamy surfaced Sodosols and Chromosols with the same paleo-clay subsoil deposits (Wilson and Taylor 2012).
- Land Zone 5 – Tertiary-early Quaternary loamy and sandy plains and plateaus (Wilson and Taylor 2012). Land Zone 5 consists of extensive, uniform near level or gently undulating plains with sandy or loamy soils and includes dissected remnants of these surfaces. Soils are usually Tenosols and Kandosols, also minor deep sandy surfaced Sodosols and Chromosols (Wilson and Taylor 2012).

3.1.5 Soils

Soils of the Project are predominately from the Mitchell Soil Mapping Unit (SMU) (approximately 73% of the production MLA) (Figure 17). Mitchell SMUs are predominately deep, Grey Dermosols with Grey Vertosols occurring on gently inclined or near-level plains within an old alluvial landscape. The SMU occurs along regions of paleo-drainage and flood channels. The soil consists either of a sandy surface, or self-mulching sandy clay surface, with clay content increasing with depth. Mitchell soils up to 0.6 m depth are suitable for re-use in rehabilitation, with two stage stripping recommended (refer section 3.5.13.1).

The Soapberry SMU is characterised by reddish brown, deep, sandy soil occupying the southern region of the Project (Figure 17), on gently inclined or near-level plains. The profile generally exhibits little or no A horizon material and therefore often comprises a B horizon with a sandy texture throughout. Soapberry soils up to a depth of 0.5 m are suitable for re-use in rehabilitation activities with two stage stripping and soil amelioration recommended (refer section 3.5.13.1).

The Gum SMU is located in the central region of the production MLA (Figure 17) on gently inclined or near-level rises and is characterised by reddish brown, clay loam sandy soil. The profile consists of only a B horizon with sandy clay loam to medium clay texture throughout. Gum soils up to a depth of 0.5 m are suitable for re-use in rehabilitation activities with two stage stripping and soil amelioration recommended (refer section 3.5.13.1).

The transport MLA is characterised by uniform fine grey and brown cracking clays, interspersed with alluvial sands associated with the Saxby River and wetlands. These soils are similar to the Mitchell SMU, given the dominance of tussock grassland vegetation community (VC 3a) verified during the terrestrial ecology field surveys (AARC 2023b). Small sections are classified as deep sandy soils, equivalent to the Soapberry SMU, coinciding with riparian vegetation (VC 1a) found along the Saxby River and/or wetlands.

A Soils and Land Suitability Assessment for dryland grazing and sorghum cropping was undertaken for each SMU of the Project (AARC 2023a). Mitchell soils were classified as Class 4 soils for, both cropping and grazing, defined as unsuitable land, due to moderate to severe limitations. Mitchell soils are limited primarily due to soil water availability (high evaporation rates and dry season soil drought) and precipitation. Soapberry and Gum soils were classified as Class 5 soils for both grazing and cropping restricted by soil moisture availability, with light textured soil properties limiting water storage capacity due to high permeability and drainage properties. However, despite the soil land suitability classifications it is noted that the current land use for the Project area is low intensity cattle grazing on native pastures.

Topsoil and subsoil use in rehabilitation activities for the Project is further described in section 3.5.13.1.

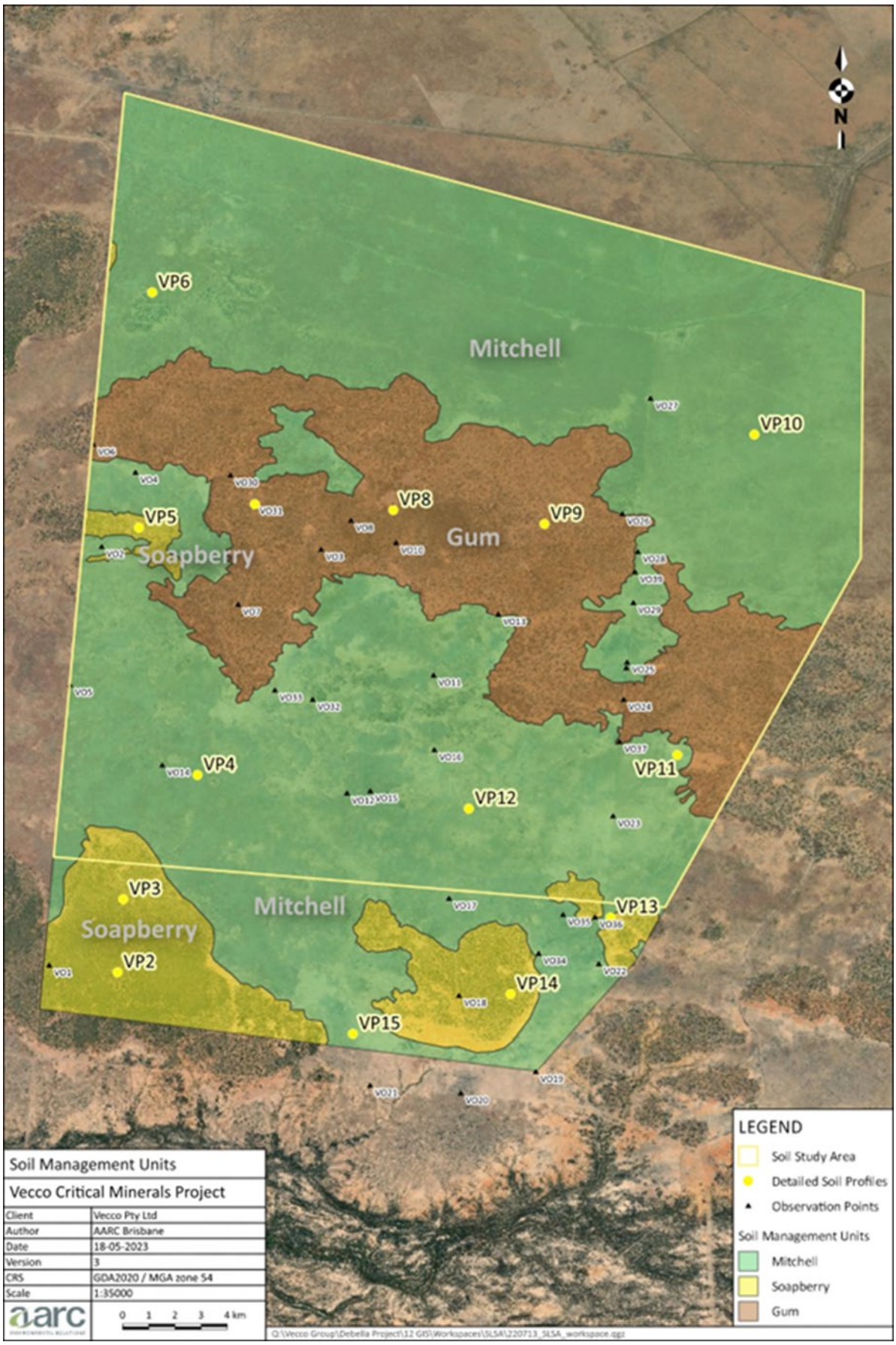

Figure 17: Soil mapping units of the production MLA (1:35,000)

3.1.6 Geological setting

The Project is situated on the Euroka Ridge, a regional scale feature that separates the Carpentaria and Eromanga Basins. The regional geological features are shown in Figure 18, along with the main geological formations relevant to the Project (JTB 2018).

The Euroka Ridge is a major Proterozoic basement high feature trending northeast between tectonic blocks of the Mt Isa Inlier Eastern Fold belt to the Georgetown Inlier. Basement rock comprises coarse metamorphic sediments and granites. Several perpendicular smaller scale ridges of the Mt Fort Bowen and Mt Brown-St Elmo ridges occur towards the centre of the Euroka Ridge.

The Carpentaria Basin is comprised of Early Cretaceous to Middle Jurassic age, fluvial to shallow marine dominated sediments. The Carpentaria Basin is the northern lateral equivalent of the Eromanga Basin (and Surat Basin, further to the south). The Cretaceous formations drape over the basement ridges. The Cretaceous Toolebuc Formation which hosts the vanadium deposit is an upper marker formation of the stratigraphic sequence (JBT 2018).

The Toolebuc Formation is a thin but laterally persistent geological unit of Upper Albian age from the Early Cretaceous period. It occurs within a thick section of fine-grained clastics in the Eromanga Basin, Queensland. The top of the Toolebuc Formation occurs at a depth below surface of ~25 to 30 m in the Project area and combined thickness typically 5-6 m.

The Toolebuc Formation strata is known to contain a limestone unit that is rich in Mesozoic vertebrate fossils around the towns of Richmond, Julia Creek, Hughenden and Boulia. The Toolebuc Formation shows little evidence of diagenesis other than physical compaction, hence the high preservation rate of fossils. However, the formation is heterogeneous, and the limestone is subordinate to calcareous and bituminous siltstone, black labile sandstone, and shale which are of greater significance in this mine material characterisation assessment. Limestone within the Toolebuc Formation contains low vanadium grades and up to 44.6% calcium oxide. Limestone will be used in mine processing and for neutralising acidic materials. The majority of limestone will be handled as mine waste material.

The Toolebuc Formation is overlain by the Allaru Mudstone from the Carpentaria-Karumba and Northern Eromanga Basin. Allaru Mudstone consists of blue-grey mudstone composed of clay-sized particles with some siltstone beds with an average thickness of 8.5 m. Allaru mudstone mined as waste material.

A thin cover of Karumba Basin unconsolidated Quaternary sediments (Quaternary Alluvium and Wondoola Beds) consisting of soil, clay, sand and gravel with an average thickness of 9.5 m. Quaternary Alluvium and Wondoola Beds are backfilled into the mined void as waste.

The transition material between the Toolebuc Formation and Wallumbilla Formation will form the pit floor and will be mined for rare earth elements, due to the low-quality vanadium encountered at this depth. The mudstone floor is also a blue-grey mudstone unit.

The stratigraphic sequence across the Project Area is summarised below in

Table 7 and shown on Figure 19.

A number of faults are present local to the pit extent (Figure 20). The faults have the potential to locally affect the ore zone in terms of displacement and/or grading, but no major displacement along the faults is evident in the geological data (JBT 2023).

Table 7: Stratigraphy and groundwater observations at Project site (JBT 2018; AARC 2023a)

Age	Formation	Unit	Code	Lithological description	Typical thickness (m)	
Quaternary	Alluvium		buqa	Soils, sands, and clays	0 – 2	
	Wondoola Beds			Unconsolidated sands, clays and gravels	5 – 10	
Cretaceous	Allura Mudstone		ALM	Mudstone with minor interbedded siltstone and infrequent sandstone	10 – 100	
	Toolebuc Formation	St Elmo Coquina	TLBA	Banded shelly limestone, minor bituminous shale	3 – 7	8 - 15
		Willats Crossing Shale	TLBB	Laminated bituminous shale. Minor to common limestone bands. Manfred Coquina at base	1 – 4	
		Arolla Shale	TLBD	Finely laminated bituminous shale	2 – 5	
		Arolla Shale Lower Transition	TLBE	Oilshale transition to Wallumbilla Formation	0 - 2	
	Wallumbilla Formation		WLA	Blue to Grey Mudstone with minor siltstone and fine-grained carbonaceous mudstone	150 - 180	
Late Jurassic to Early Cretaceous	Gilbert River Formation			Coarse sandstone, interbedded with grey shale	50 – 70	
Proterozoic				Proterozoic Basement		

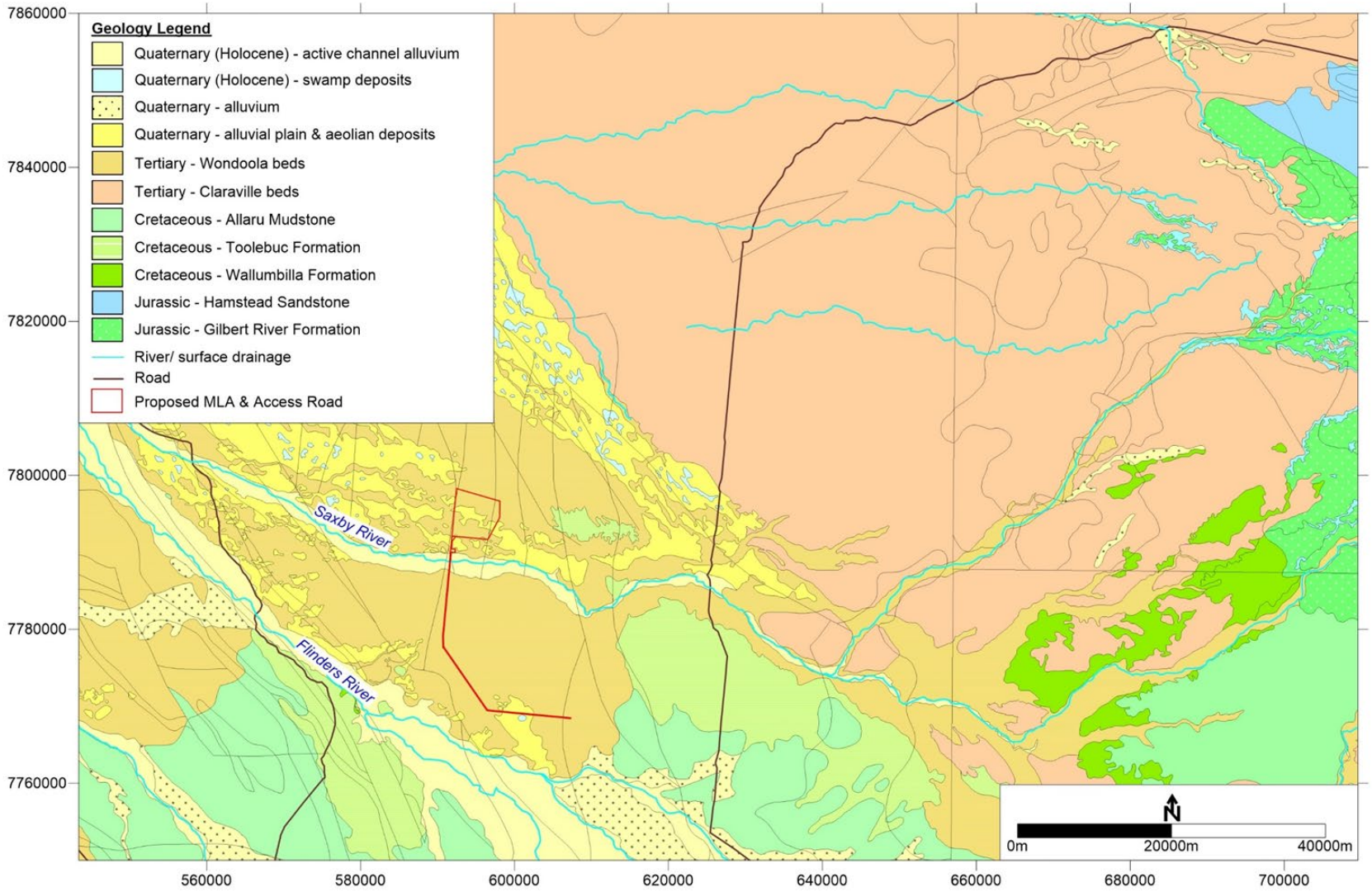

Figure 18: Surface and regional geology (JBT 2023)

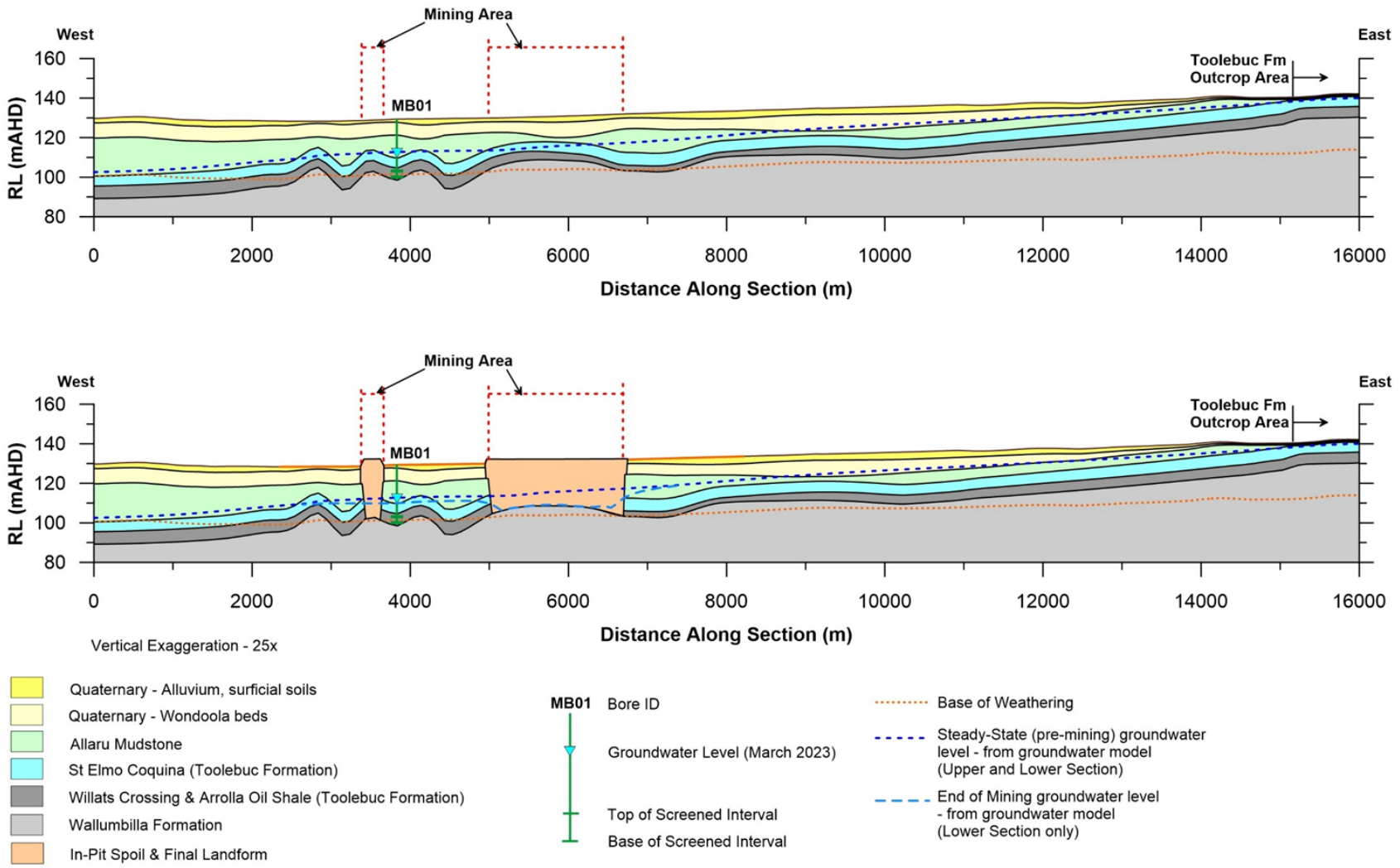

Figure 19: Geological cross section (JBT 2023)

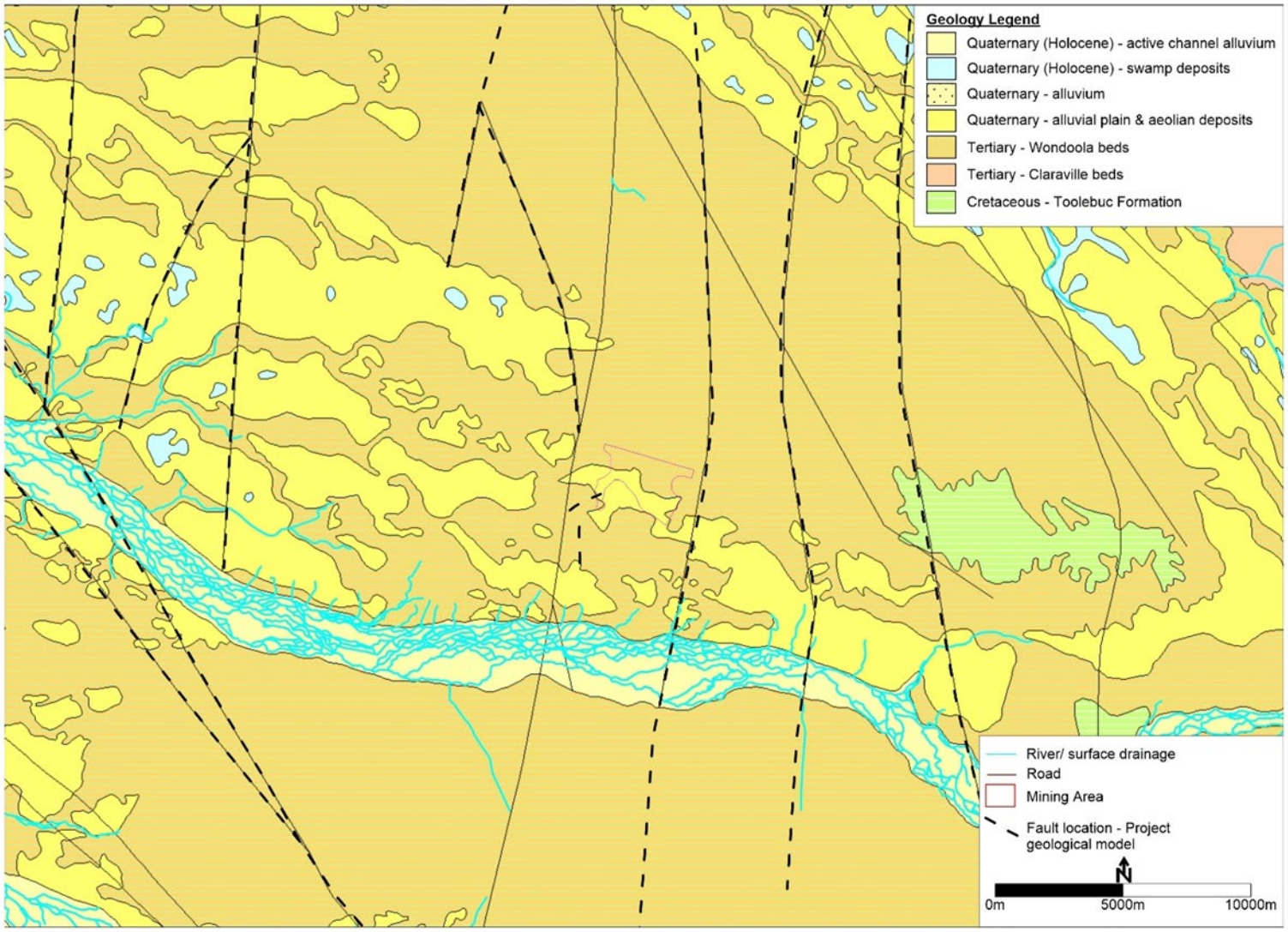

Figure 20: Faults present at the Project (JBT 2023)

3.1.7 Groundwater

A conceptual model of groundwater within the Project has been developed and is shown on Figure 21. Essential elements of the model are described below:

- Groundwater at site is developed within the Toolebuc Formation, with groundwater present in both the shale at the base of the unit (Willats Crossing/ Arolla Shale) as well as the overlying St Elmo Coquina. The groundwater level tends to be close to or just above the top of the St Elmo Coquina.
- The groundwater flow direction in the shallow groundwater units generally honours topography and flows in the direction of surface drainage, generally from east to west.
- The groundwater level is generally in the range of 18-22 m below ground level (mbgl), which corresponds to an elevation that is approximately at or just above the top of the St Elmo Coquina.
- The hydraulic conductivity (K) of the Toolebuc Formation (both the Willats Crossing/ Arolla Shales as well as the overlying St Elmo Coquina) is relatively low, ranging from 0.001 to 0.031 m/day in bores MB02, MB03 and MB04 (Willats Crossing/ Arolla Shale) and 0.006 m/day in MB05 (St Elmo Coquina). The calculated K is higher in two bores that are screened within the shale, being bore MB01 (0.93 m/day) and MB06_DR (1.55 m/day). The higher K at these sites may be related to local bore conditions (e.g. the presence of localised fractures). If the higher K is related to fractures, these tend to have a narrow range of influence and it is judged as more likely that the unit should be considered as being a low-permeability unit with the calculated K for bores MB02, MB03 and MB04 being more indicative of the overall K of the unit.
- The Allaru Mudstone forms a confining unit above the Toolebuc Formation and limits direct rainfall recharge to the Toolebuc Formation in the Project area.
- The St Elmo Coquina of the Toolebuc Formation is conceptualised to be recharged within two zones close to the Project area:
    - One zone occurs approximately 10 km east of the Project area, where the Toolebuc Formation crops out at surface; and,
    - The second zone occurs at the northern extent of mining, where the Allaru Mudstone is absent and the underlying St Elmo Coquina is in contact with the unconsolidated Tertiary sediments. This is supported by observations of water level response to rainfall in monitoring data.
- The Toolebuc Formation is separated by the underlying GAB aquifers (Gilbert River Formation) by low-permeability sediments of the Wallumbilla Formation. The Gilbert River Formation is artesian in the Project area, indicating that the Wallumbilla Formation is acting as an effective confining layer for this unit and also that the flow potential for the GAB aquifers is upwards (i.e. any shallow groundwater contamination resulting from the Project will not flow downwards to the GAB aquifers as the GAB aquifer pressure is higher than the groundwater level in the Toolebuc Formation). Based on data from private bores the Wallumbilla Formation has an average thickness of ~ 166 m in the Project area and the water-bearing units of the Gilbert River Sandstone occur at an average depth of 202 mbgl.
- The Saxby River, which occurs to the south of the Project, is an ephemeral water course and available data suggests that the regional groundwater level (i.e. the groundwater level that is developed within the Toolebuc Formation) occurs below the base of the river at a depth of ~20 mbgl. The Saxby River alluvium is therefore disconnected from the regional groundwater table by approximately 20 m of Allaru Mudstone and monitoring data to date indicates that the Toolebuc Formation bore adjacent to the Saxby River (GW06_DR) had no water level response to the above average 2022/2023 wet season, where significant flow was observed in the Saxby River.

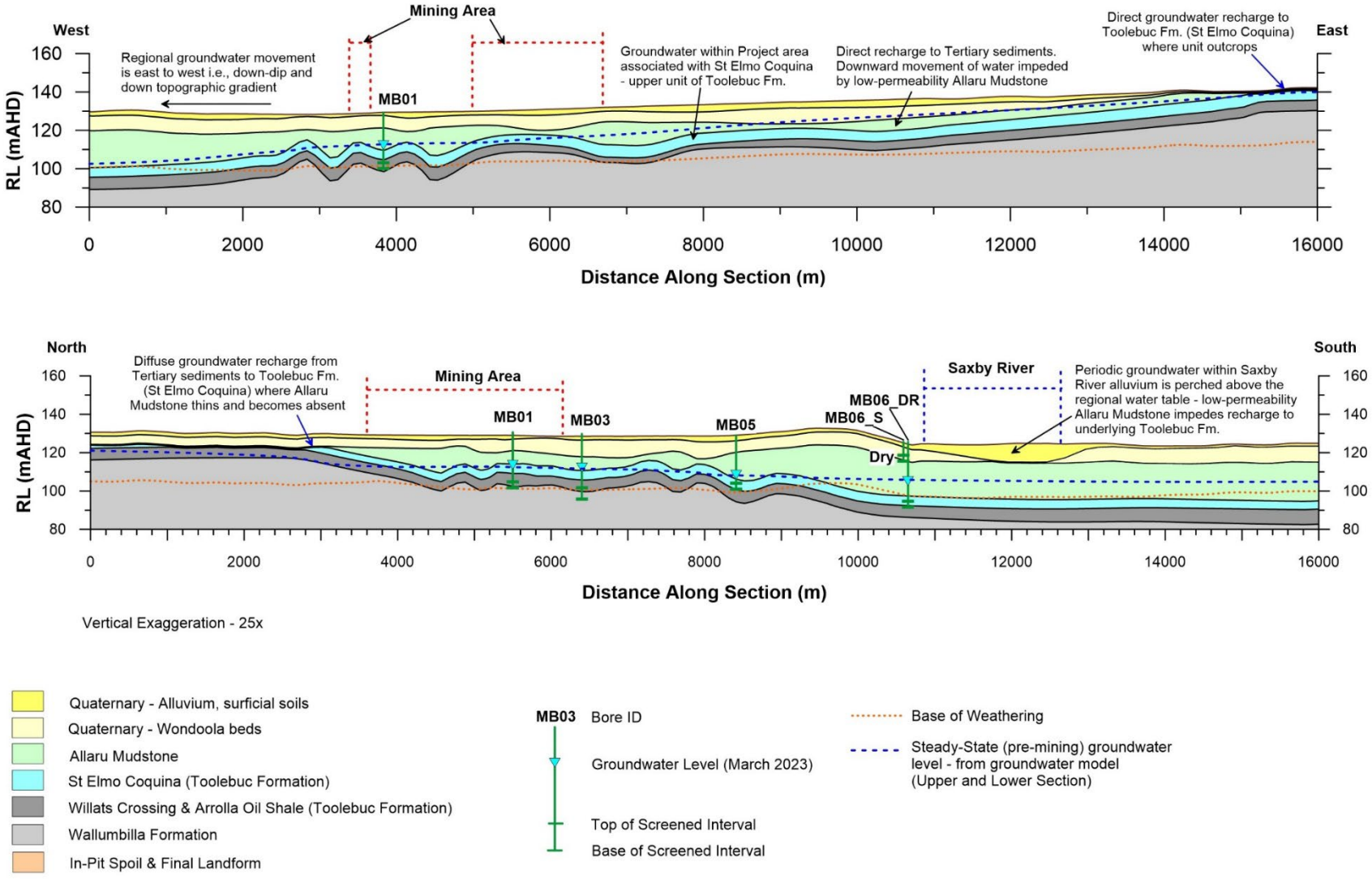

Figure 21: Pre-mining conceptual groundwater model (JBT 2023)

3.1.7.1 Groundwater use

Data from registered groundwater bores within approximately 20 km of the Project (Figure 23) was obtained from the Department of Resources Groundwater Database (JBT 2023). There are 14 registered bores located within 20 km of the Project with all bores constructed in the Gilbert River Formation. The Gilbert River Formation is a GAB aquifer that underlies the Project and recharges approximately 100 km east of the Project.

The Wallumbilla Formation of the Project, a low permeability unit, acts as an effective confining layer over the Gilbert River Formation. As such the flow potential for the GAB aquifers is upwards. Any shallow groundwater contamination resulting from the Project will not flow downwards to GAB aquifers as the GAB aquifer pressure is higher than the groundwater level in the Toolebuc Formation. Therefore, groundwater within the shallow groundwater units of the Project area (i.e. the units above the Wallumbilla Formation) are assessed as having no potential for interaction with the underlying Gilbert River Formation GAB aquifer (JBT 2023).

3.1.7.2 Groundwater dependant ecosystems

Mapping data indicates the possible presence of 'derived terrestrial GDEs' around the edges of vegetation communities within and surrounding the Project area. Databases identify these as permeable sandy plain aquifers with fresh, seasonal groundwater connectivity regime. The location of these potential GDEs broadly aligns with the outter edges of Quaternary – alluvial plain and aeolian deposits, mapped in the surface geology.

Mapping data also identifies potential presence of 'derived terrestrial GDEs' within the Saxby River riparian zone. Databases identify these as Quaternary alluvial aquifers with fresh, seasonal groundwater connectivity regime.

The locations of these are shown in Figure 22, which also shows the underlying 1:100,000 scale surface geology, predicted end of mining (EOM) groundwater level drawdown contours, and Project groundwater monitoring bore locations.

The Project to impact is assessed to be minor, due to:

- geological drilling at site indicates that the Quarternary/Tertiary (Cainozoic) sediments are dry within the Production MLA;
- the groundwater system at the Project location is developed within the Toolebuc Formation, which is hydraulically disconnected from the Cainozoic sediments by the low-permeability Allaru Mudstone;
- groundwater level drawdown due to mining is predicted to be isolated to the Toolebuc Formation and to be of limited extent;
- there is low risk of the Project impacting any perched water in shallow Cainozoic sediments, which could be expected to be seasonal and located within lenses that appear to be isolated from those in the MLA area;
- the 0.5 m end of mining drawdown contour is approximately 3.7 km north of the closest location of Saxby River alluvium (Figure 22); and
- the Toolebuc Formation between the Saxby River is hydraulically isolated from the alluvium.

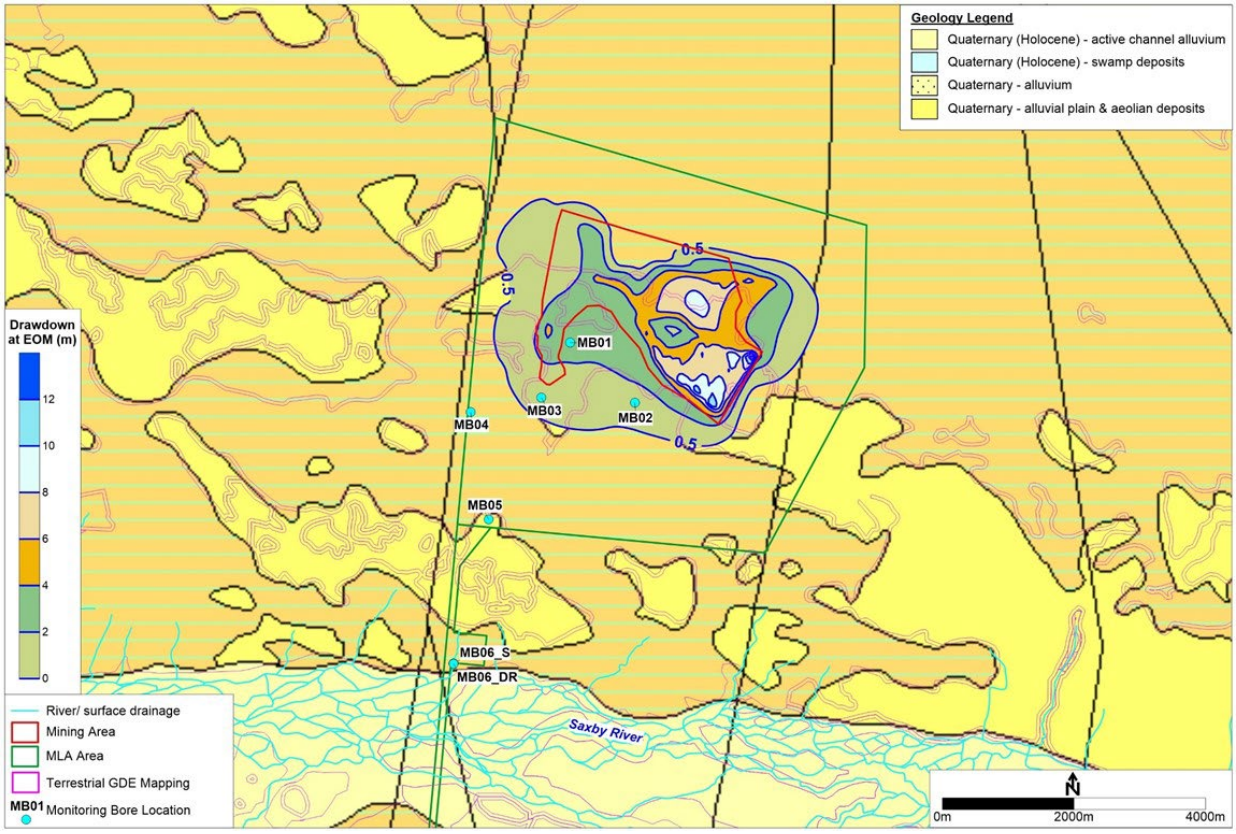

Figure 22: Derived GDEs relative to the Project and predicted drawdown

3.1.7.3 Groundwater level and quality

Seven groundwater monitoring bores were installed during 2021 and 2022 for the Project (Figure 24). Monitoring indicates that groundwater level within the Project is generally in the range of 18-22 m below ground level (mbgl), which corresponds to an elevation that is approximately at or just above the top of the St Elmo Coquina.

Groundwater quality data has been recorded during a sampling event in 2022, and 2023 following the wet season. Further sampling will be required to establish long-term water quality trends for the monitoring sites. Field electrical conductivity (EC) ranging between 1,937 µS/cm to 12,979 µS/cm was recorded and is highest in bore drilled in the Toolebuc Formation bore adjacent to the Saxby River. The higher EC at this site may indicate degradation in water quality along the flow line. EC of 7,264 µS/cm was recorded at the bore location closest to the recharge zone in the north of the Project area where the Allaru Mudstone is absent. It is noted that there has been no groundwater quality data has been recorded post wet season.

Sulphate in groundwater is relatively elevated in the groundwater bores at site, with concentrations ranging from 513 to 3,250 mg. Data indicates that the groundwater for bores within or close to the ore zone (Bores MB01, MB02, MB03, MB04) are of sodium-sulphate ($Na\text{-}SO_4$) water type (i.e. sodium is >50% meq of the cations and sulphate is >50 meq% of the anions), with the two bores to the south of the ore zone (MB05, MB06_DR) recording a lower meq% of sulphate and being of sodium-chloride-sulphate ($Na\text{-}Cl\text{-}SO_4$) water type, as chloride and sulphate are both elevated, but neither records a meq% concentration >50%.

Major ion concentrations in groundwater samples are likely due to long term leaching through the regolith, coupled with low transmissivity of groundwater through the ore (RGS 2023).

The Project is located within a mineralised province, and therefore it is expected that the groundwater from bores within the mineralised zones are elevated with respect to a number of metal/metalloid parameters. Based on data collected during multiple data collection events, including post-wet season, groundwater at

the Project site is elevated in metal/metalloid concentration for a number of parameters, relative to the ANZG (2018) 95% freshwater protection limit. For comparison purposes, the data has also been compared to the hardness modified trigger values (HMTVs) for cadmium, lead, nickel and zinc, with the values calculated from the minimum, maximum and mean calcium and magnesium concentrations. The ANZG (2018) guidelines note that, if the water sample exceeds the standard hardness value of 30 mg/L $CaCO_3$, then it is appropriate to modify the default guideline value (DGV) for all hardness sensitive metals except copper. Site groundwater records a minim/maximum/mean hardness of 221 mg/L, 1625 mg/L and 697 mg/L respectively. Site groundwater records elevated concentrations of:

- Arsenic (three samples out of twelve when compared to the ANZG (2018) DGV);
- Boron (ten samples out of twelve when compared to the ANZG (2018) DGV);
- Cadmium:
    - two samples out of twelve when compared to the ANZG (2018) DGV; and
    - no bores when compared to the HMTV calculated from the minimum hardness value for site groundwater);
- Cobalt (two samples out of twelve when compared to the ANZG (2018) DGV);
- Copper (four samples out of twelve when compared to the ANZG (2018) DGV);
- Molybdenum (eleven samples out of twelve when compared to the ANZG (2018) DGV);
- Nickel
    - Four samples out of twelve when compared to the ANZG (2018) DGV;
    - Two samples out of twelve when compared to the HMTV calculated from the minimum hardness value for site groundwater; and
    - no samples when compared to the HMTV calculated from the mean hardness value for site groundwater);
- Zinc:
    - Ten samples out of twelve when compared to the ANZG (2018) DGV;
    - Six samples out of twelve when compared to the HMTV calculated from the minimum hardness value for site groundwater;
    - Three samples out of twelve when compared to the HMTV calculated from the mean hardness value for site groundwater); and
    - One sample out of twelve when compared to the HMTV calculated from the maximum hardness value for site groundwater).

Groundwater quality is recorded in October 2022 is provided in the Groundwater Assessment (JBT 2023).

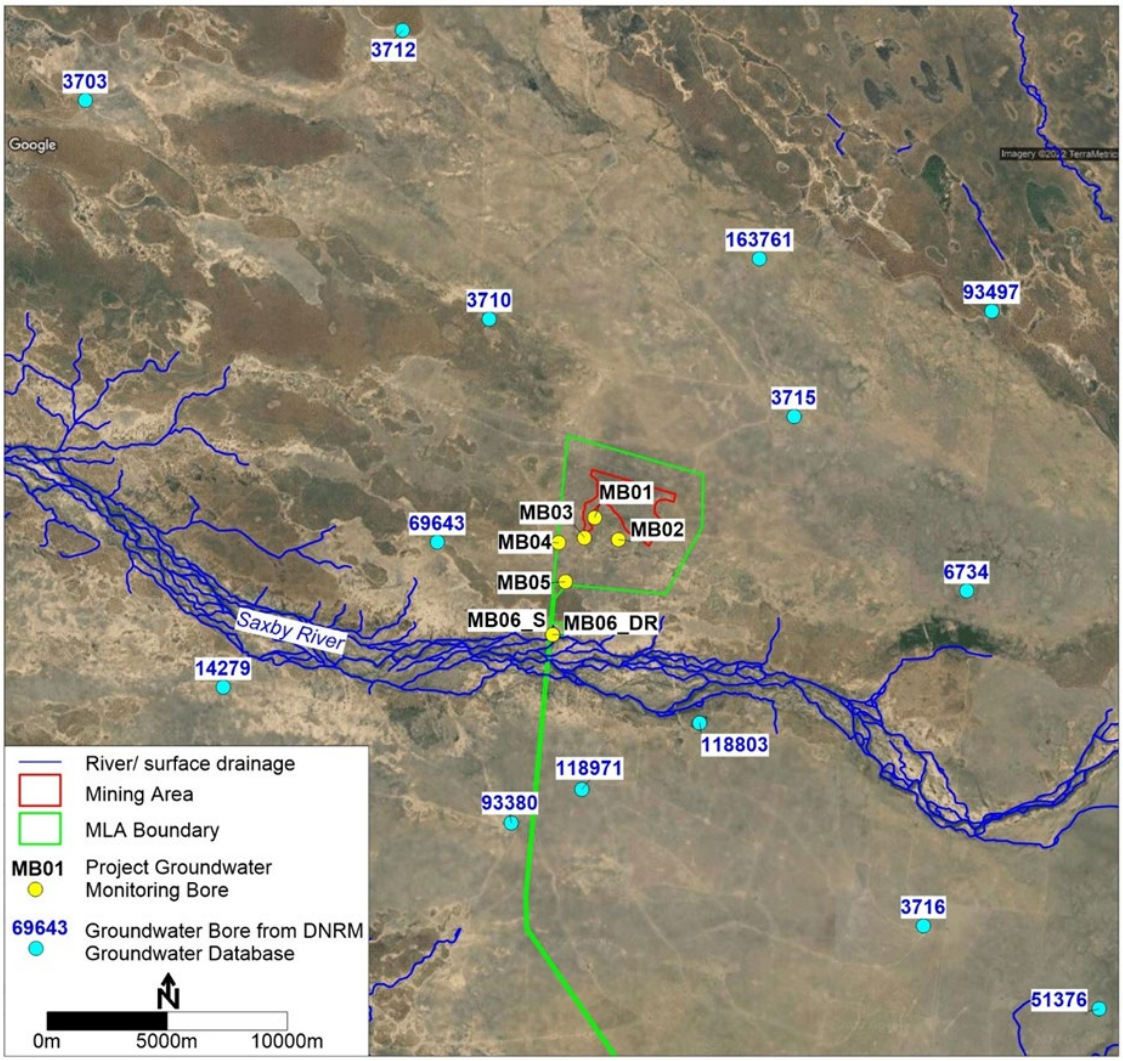

Figure 23: Registered groundwater monitoring bores local to the Project (JBT 2023)

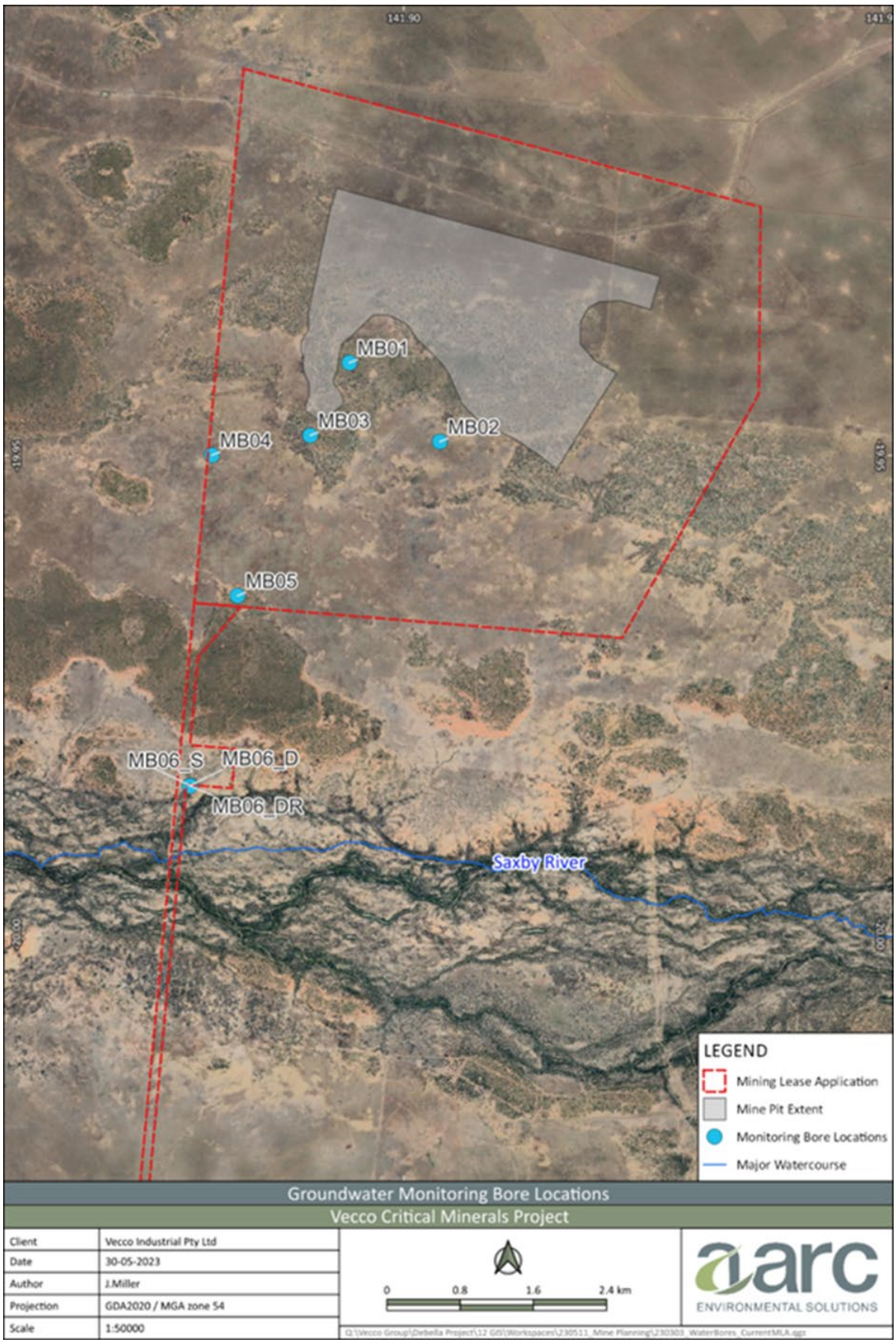

Figure 24: Project groundwater monitoring network

3.1.8 Flora and fauna

Desktop assessments for flora and fauna were undertaken between 2021 - 2023 to collate information on the terrestrial ecological values within the project area and surrounds. The review informed the terrestrial ecology assessment methods and field survey techniques design, ensuring a robust assessment of conservation significant flora and fauna known from the region potentially inhabiting the Project. Terrestrial flora and fauna surveys were conducted for the Project in early wet season 2021 (13-17 September), and early dry season 2022 (7-13 April) to validate desktop assessments.

3.1.8.1 Vegetation communities

Ten vegetation communities / Regional Ecosystems (REs) were mapped during field surveys of the Project site. Table 8 outlines the REs characteristic of each field verified vegetation community. The conservation listing of each RE is provided under the *Vegetation Management Act 1999* (VM Act) and the Queensland Biodiversity Status (BD Status), used in a range of planning and biodiversity management tools. The distribution of these field verified regional ecosystems is provided in Figure 25 and Figure 26.

Table 8: Summary of field verified Vegetation Communities

Map Unit	Vegetation Community	Associated RE	VM Act Status[1]	BD Status[2]
1: Low dry woodlands				
VC 1a	Wild Plum/Beefwood/Bloodwood woodland on gently undulating sand plains	2.5.1a	Least Concern	Least Concern
VC 1b	Western bloodwood low woodland on sandy soil	2.5.12a	Least Concern	Least Concern
VC 1c	*Melaleuca spp*. low open woodland on alluvial plains	2.5.33b	Least Concern	Least Concern
2: Woodlands on alluvial soils				
VC 2a	Coolibah woodland on alluvial plains	2.3.17a	Least Concern	Of Concern
VC 2b	Gidgee low woodland on alluvial plains	2.3.7a	Least Concern	Least Concern
3: Tussock grasslands				
VC 3a	Tussock grassland on Tertiary clay deposits.	2.4.2b	Least Concern	Least Concern
VC 3b	*Aristida spp./Sporobolus spp.* grassland on alluvial deposits	2.3.69a	Least Concern	Of Concern
VC 3c	Common Native Couch and *Sporobolus spp.* dominant grassland on silty clays	2.3.69b	Least Concern	Of Concern
VC 3d	*Feathertop Wiregrass and* Common Native Couch grassland on sandy loam	2.5.35	Least Concern	Least Concern

Map Unit	Vegetation Community	Associated RE	VM Act Status[1]	BD Status[2]
VC 3e	Seasonal swamp dominated by Common Native Couch in circular depressions in sand plains	2.3.33b	Least Concern	Of Concern

[1] Endangered; Of Concern; Least Concern
[2] Endangered; Of Concern; No Concern at Present

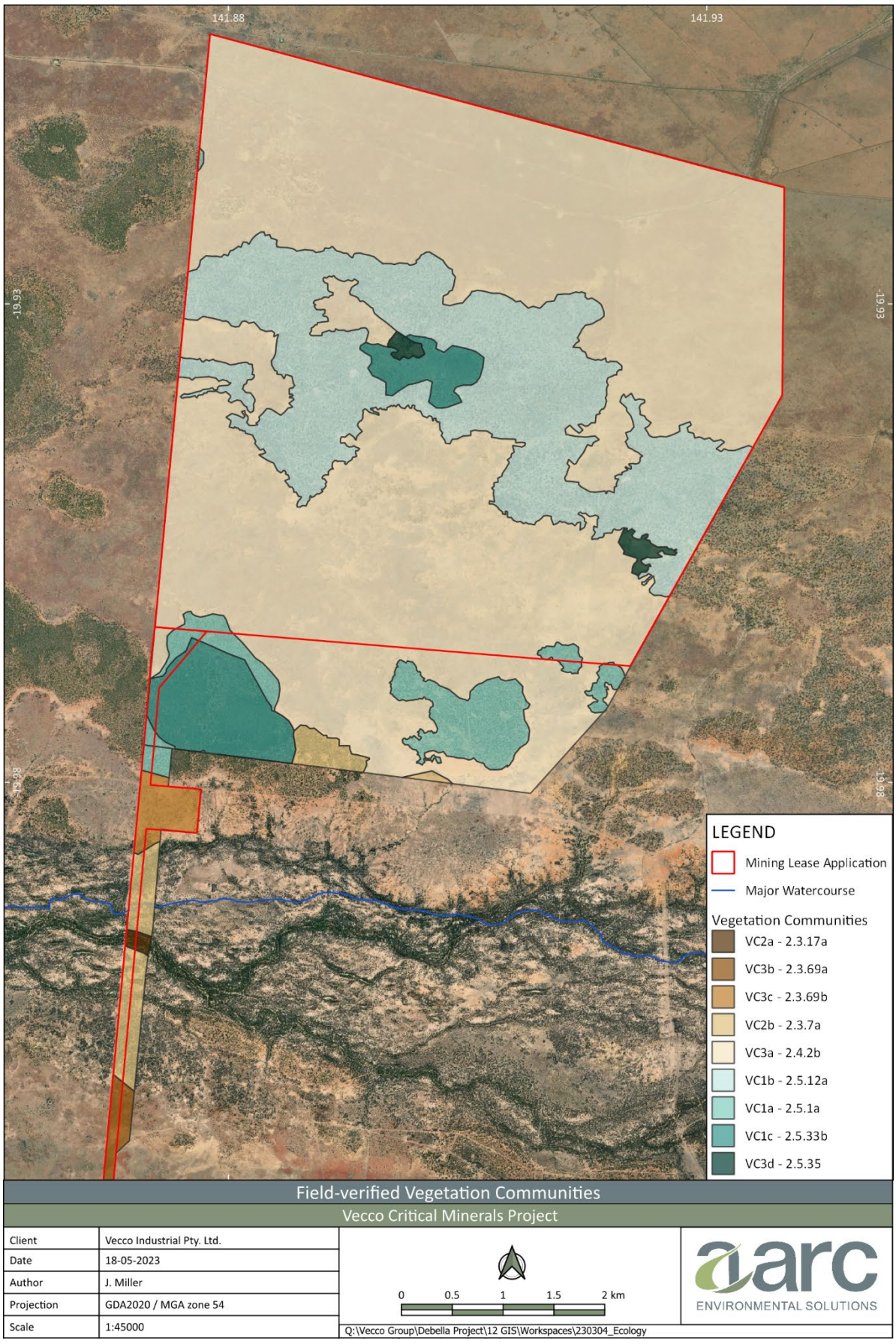

Figure 25: Field verified vegetation communities of the Project – north

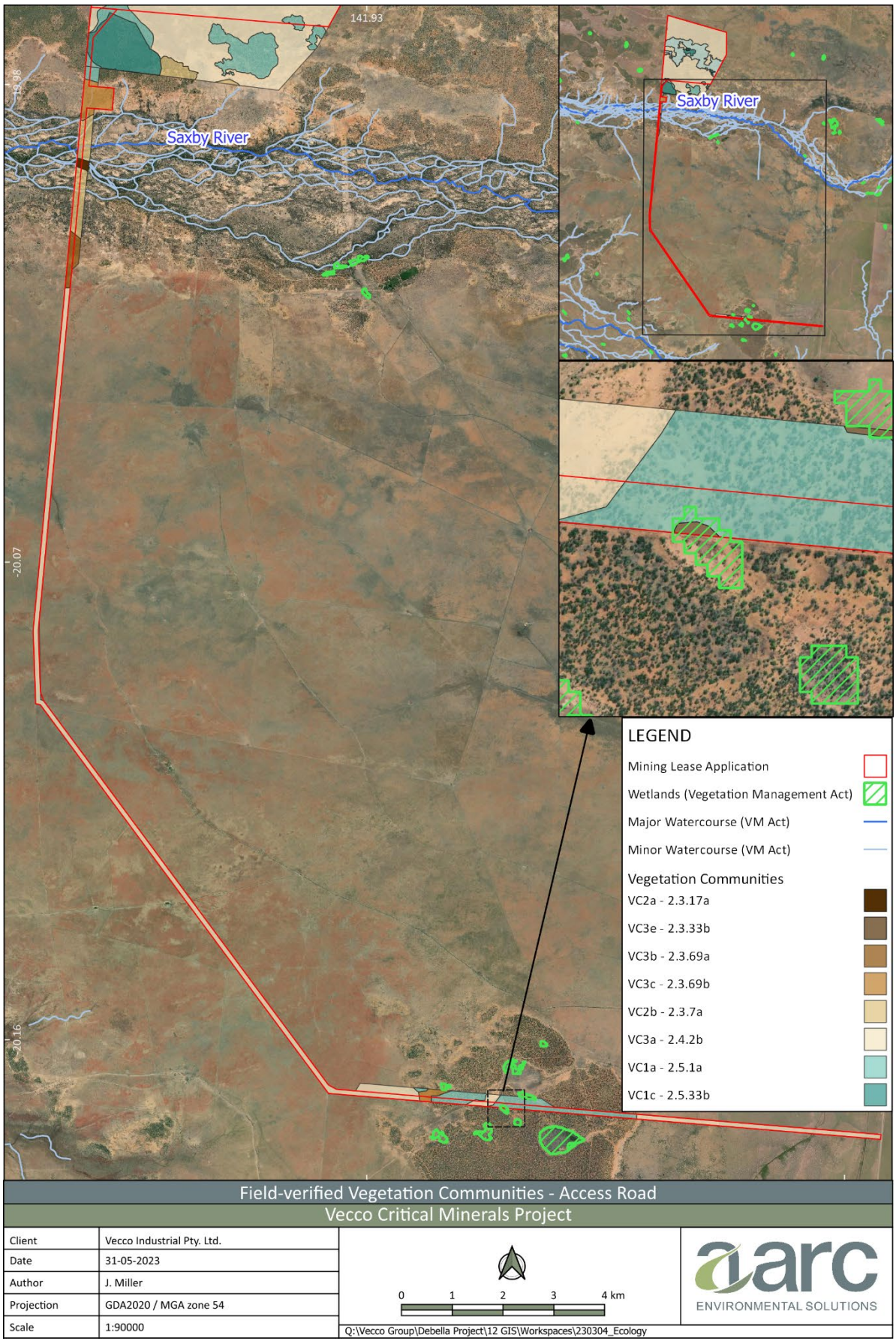

Figure 26: Field verified vegetation communities of the Project - south

Vegetation condition

The condition of vegetation and the nature of disturbance present within the vegetation communities was recorded during the field surveys. Evidence of cattle grazing was noted at all vegetation communities, occurring in the form of tracks, pats, and direct observation. The condition of all vegetation communities was notably reduced by existing land management practices.

Disturbances observed included:

- previous vegetation clearing for agricultural activities;
- cattle grazing activities;
- roads/tracks;
- man-made canals for irrigation; and
- the occurrence of weeds.

The environmental weed Mimosa Bush was present at half of all survey sites, while other introduced species such as Spike Mallow (*Malvastrum americanum*), and Sticky Stylo (*Stylosanthes viscosa*) were observed within VC2a. Noogoora Burr was identified within VC1c in the survey site BC18. Bare ground and litter cover however only accounted for 1% of vegetation coverage within the affected communities, with the exception of the occurrence of Buffel Grass within VC 2.5.33a, 8% of the ground layer within survey site BC13. There was also evidence of debris resulting from storm damage within VC 2a recorded in the post-wet season survey.

3.1.8.2 Terrestrial flora species

A total of 89 native flora species were recorded during the field surveys representing 26 families and 63 genera. The dominant family group was Poaceae (22 species) with Leguminosae (16 species) and Myrtaceae (9 species) also prominent. The dominant family groups demonstrate the overall composition and condition of the vegetation communities surveyed, with the ground layer being the most diverse.

No Critically Endangered, Endangered, Vulnerable, or Near Threatened Flora species under the NC Act or the EPBC Act were identified within the Project area.

Nine introduced flora species were recorded within the Project area in low to moderate abundance.

1) Black Pigweed (*Trianthema portulacastrum*);
2) Caribbean stylo (*Stylosanthes hamata*);
3) Sticky Stylo (*Stylosanthes viscosa*);
4) Townsville Stylo (*Stylosanthes humilis*);
5) Noogoora Burr (*Xanthium occidentale*);
6) Mimosa Bush (*Vachellia farnesiana*);
7) Spike Mallow (*Malvastrum americanum*);
8) Buffel Grass (*Cenchrus ciliaris*); and
9) Pigweed (*Portulaca oleracea*).

None of these species are listed as prohibited matters, or restricted matters under the Biosecurity Act (Qld). None of the species identified within the Project site are classed as Weeds of National Significance.

3.1.8.1 Wetlands

No high ecological significance wetlands or associated trigger areas are mapped within the Project site or within 100 km of the site.

Several VM wetlands have been identified adjacent or intersecting the transport MLA. These form a cluster of small palustrine wetlands, located along a stretch of the transport corridor MLA. One of these small palustrine wetlands intersects this MLA to a minor extent (0.45 ha).

The cluster of wetlands was surveyed by ecologists through a combination of field observations from a helicopter following rainfall and ground observations (including flora species composition). The wetlands are characterised as:

- topographical depressions forming ephemeral wetlands and waterbodies that fill irregularly following local rainfall and overland flow;
- trees are typically absent or sparse, with occasional Gutta-percha (*Excoecaria parvifolia*);
- shrubs are also sparse and represented by scattered Currant Bush (*Carissa spinarum*) only; and
- the ground layer is dominated by Native Couch (*Brachyachne convergens*).

Cattle grazing was evident within the wetland areas, where the availability of standing water, when present, is thought to provide a source of drinking water, attracting cattle to the location.

Historic satellite image analysis shows the wetlands are rarely inundated in the dry season and only occasionally inundated in the wet season, following local rainfall. For example, the wetland that is partially located within the transport MLA was found to contain water in 1 in 25 dry seasons and 2 out of 9 wet seasons (AARC 2023c). The ephemeral wetland features are not fed by any groundwater source or open bore drain.

3.1.8.2 Terrestrial fauna

A total of 123 native vertebrate species were identified within the Project site during the field surveys, comprising 1 amphibian, 22 reptiles, 85 birds and 15 mammals (9 of them confirmed micro-bat species). The Project site provides a variety of habitat characteristics for fauna including:

- Variety of habitat types to promote reptile diversity, such as vegetated drainage features, woodlands and grasslands. This range of habitat provided microhabitats such as fallen timber, bark crevices, shedding bark, ponds and soil cracks, providing shelter from extreme climate, protection from aerial predators and foraging habitat.
- Variety of habitat types suitable for small ground-dwelling mammals, the mixed dry woodland, the riparian low woodland and mixed tussock grassland.
- Potential micro-bat roosting sites including tree hollows and shedding bark, which were limited to the woodland vegetation communities.

Five fauna species listed as endangered or special least concern under the NC Act and vulnerable or migratory under the EPBC Act were identified as potentially occurring during desktop assessment. These conservation significant fauna species were targeted during the fauna surveys.

No conservation significant fauna species were recorded during the field surveys.

The Project is unlikely to result in a significant impact on migratory birds and no offsets in accordance with the '*Environment Protection and Biodiversity Conservation Act 1999* Environmental Offsets Policy' (DSEWPaC 2012) are not required (AARC 2023b).

No Julia Creek Dunnart were reported during targeted field surveys undertaken between September 2021 and April 2022 (Ecosmart Ecology 2023). It is assessed as unlikely that the Julia Creek Dunnart would inhabit the Project due to the lack of suitable habitat, intensive grazing pressures and absence of other black-soil

specialist vertebrate species which are often sympatric with Julia Creek Dunnart and therefore potential indicators of presence (Ecosmart Ecology 2023).

Five introduced fauna species have been recorded within the Projects site through the detection of scats, tracks, sensor camera detection and/or direct observation:

1) Cane Toad (*Rhinella marina*)

2) European Cattle (*Bos taurus*)

3) Wild Dog (*Canis famuiliaris*)

4) Feral Cat (*Felis catus*)

5) Feral Pig (*Sus scrofa*)

Three of the introduced species, the Feral Cat, the Feral Pig and the Wild Dog are listed as a restricted matter, and none are a prohibited matter under the Biosecurity Act (Qld).

3.1.8.3 Stygofauna

Stygofauna generally prefer aquifers where the water table is shallow, electrical conductivity is less than 5000 µS/cm (Hancock and Boulton 2008), and dissolved oxygen concentration is above 1 mg/L (Hahn 2006). Most of the bores at the Project had water quality and water levels that were suitable for stygofauna. However, due to low hydraulic conductivity of the aquifers, isolation from direct surface infiltration by the Allaru Mudstone, and the lack of connectivity to any potential colonising aquifer, make it very unlikely that stygofauna would occur in the aquifers affected by the Vecco Critical Mineral Project. No stygofauna were found during the field survey undertaken in 2023 at the Project (Eco Logical Australia 2023).

3.1.8.4 Waterways providing fish passage

The Saxby River is mapped as being at major risk of adverse impact from waterway barrier works on fish movement. The Project will require the crossing of the Saxby River across several channels (mapped as major risk). This river is an ephemeral waterway that does not flow for long stretches of the year, limiting the connectivity of waterways and wetlands near the Project. It is considered the Saxby River is likely to provide some localised fish passage for periods during which it sustains flow.

When assessed against the Matters of State Environmental Significance residual impact guidelines, the Project is considered unlikely to result in a significant residual impact on the waterways providing for fish passage. Based on the assessment, no offsets under the *Environmental Offset Regulation 2014* for waterways providing for fish passage are required for the Project.

3.1.8.5 Aquatic habitat

The habitat bioassessment scores from the aquatic sites within the sampling environment fell into the fair and good categories, with no results in the excellent category. The results indicate a moderate to good abundance of aquatic biota present.

The habitat condition assessment considered the impact/influence of ten different upstream activities on the waterways, with ‘50’ representing the maximum score (no impact) and ‘10’ representing the minimum score (full impact). Condition assessment scores ranged from 44 to 47. Of the sites surveyed, all three sites had condition scores above 40 indicating that the influence of activities upstream has had relatively low impact.

The most significant alteration to aquatic habitat condition was identified as influence of agriculture. The current land use of the Project site is low intensity cattle grazing and, in the absence of regular watering stations stock are reliant on natural waterways for drinking water and shelter.

3.1.8.6 Macroinvertebrates and aquatic fauna

A summary of 2022 macroinvertebrate survey results is provided as follows:

- Total abundance of macroinvertebrates across the sites in the Saxby River ranges between 23 and 116 individuals;
- A total of 45 macroinvertebrate taxa were identified. Richness varies between sites, from 8 to 16 total taxa;
- The PET taxa are three orders of macroinvertebrate (*Ephemeroptera, Trichoptera, Plecoptera*) that are particularly sensitive to disturbance. A total of four PET taxa were identified across all sites during both surveys, *Trichoptera Hydropsychidae*, *Ephemeroptera Leptophlebiidae*, *Ephemeroptera Caenidae*, and *Trichoptera Leptoceridae*.
- The SIGNAL2 analysis shows all sites falling within Quadrant 4 of the bi-plot, indicating levels of pollutants that reflect urban, industrial, or agricultural pollution in the Saxby River; and
- The percentage of pollutant tolerant taxa (taxa with a signal score between 1 and 3) in the Saxby River ranges from 50 % to 90.9 %. A lower percentage of tolerant taxa indicates an improved habitat condition / water quality.

Macroinvertebrate communities present were considered representative of an ephemeral system with influences from agricultural land practices evident.

The presence of freshwater fish, crustaceans and amphibians were also recorded, confirming suitable habitat in the Saxby River ecosystem. No species of conservation significance were recorded. One species of freshwater crab (*Austrothelphusa spp*.) and one fish species, Spangled Perch (*Leiopotherapon unicolor*), were observed at sites DS1 and DS2 in the Saxby River.

No conservation significant or EPBC Act or NC Act listed Endangered, Vulnerable or Near Threatened species were observed at any of the survey sites during the survey. All aquatic species recorded are native and are considered common or widespread species in the Flinders Drainage Basin. No pest fish species were observed during field surveys.

Riparian fauna was not targeted during this survey; however, observations were taken while completing the survey. Two native NC Act Least Concern status amphibian species were observed during the survey at site DS1, these included the Eastern Snapping Frog (*Litoria novaehollandiae*) and the Ornate Burrowing Frog (*Opisthodon ornatus*). No aquatic fauna species of conservation significance were observed during surveys.

3.2 Community consultation

3.2.1 Stakeholder and community engagement activities

The surrounding community and affected stakeholders have been engaged during 2022 and early to mid-2023 in preparation of the Environmental Authority application for the Project to ensure that all relevant community members are aware of the Project, its aspects, and potential impacts. Consultation has provided the opportunity to comment on issues of relevance to them. Objectives of Project consultation have included the following principles:

- Ensure community members have understood the Project details, timing and workforce arrangements so that discussions about impacts and benefits are meaningful.
- Provide community members with the opportunity to identify and assess potential social impacts and applicable
- Ensure transparent and inclusive community engagement to facilitate the ongoing management and monitoring of potential social impacts.
- Ensure Project planning and delivery are informed by community views.
- Ensure rehabilitation objectives and post-mining land uses are developed in consideration of community expectations.

Vecco has developed a Community Consultation Register that meets the requirements of Section 126C(1)(c)(iii) of the EP Act, and the PRCP Guidelines. This register has been used to record consultation date(s), engaged community member(s), consultation type, information provided, key issues raised, response actions and/or outcomes and any commitments made by Vecco. A summary of key consultation activities undertaken with parties that may have an interest in rehabilitation and closure planning is provided in Table 9.

3.2.2 Community consultation plan

A Community Consultation Plan for the Project has been developed to address the requirements of 126C(1)(c)(iii) and Section 126C(1)(c)(iv) of the EP Act, and the PRCP Guideline. It is intended to act as a framework to guide consultation and ensure stakeholders are provided the opportunity to engage on, among other things, rehabilitation and closure matters relating to the Project. The Project Community Consultation Plan is provided in Appendix D.

Ongoing consultation will occur at key stages of the Project life where any significant progress is made or Project when activities change significantly. The following methods will be used to maintain contact with the local community throughout the life of the Project:

- Provide company contact phone number and website for enquiries and complaints.
- Communicating with the community throughout the life of the project via site visits, consultation meetings and printed materials.
- Consulting with the community closer to the closure and decommissioning of the mine concerning requirements for mine closure, potential land uses and post mining monitoring.
- Feedback from the consultation process will continue to be entered into the consultation register.

Ongoing monitoring of the local environment will be a requirement in the EA conditions for the Project. A community consultation register is included in the Community Consultation Plan and is used to record ongoing consultation date(s), engaged community member(s), consultation type, information provided, key issues raised, response actions and/or outcomes and any commitments made by the Project. All complaints received will also be included in the community consultation register.

Table 9: Consultation register

Name	Contact Details	Stakeholder Type	Discussion Focus	Method	Interview Timing	Interviewer	Interview Notes	Follow-up
Guy and Deborah Keats	"Bow Park" and "Zonia Downs"	Landholder	Project overview	Face-to-face	Regular Contacts	JG	Discussed Project background and timeline for commencement. Discussion focused on traffic movements, water and power solutions, as well as ongoing monitoring requirements. The landholder indicated that post-mining, they would like to see the Project footprint returned to its original land use (grazing). The landholder and Vecco will work together to develop appropriate grass mixes for rehabilitation.	Engage regularly, including providing regular Project updates
			Project impacts on and opportunities for landholder and local community	Telephone	30/08/2023	FM	Second generation property owner with successful grazing business. Started with one property; now has three. There used to be lots of families along the road to Julia Creek - now hardly any. Biggest existing challenge of living in the region is attracting and retaining staff. Lack of fuel-price parity and the Fringe Benefits Tax make it difficult, as it is not cost-effective to accommodate employees (e.g. food and board). Consequently, it is cheaper for companies to FIFO their people - which means that they do not participate in local community life, thereby impacting remote town viability (e.g. Mary Kathleen example). While the landholder fundamentally does not want the Project 'invading' their land, they have been working closely with Vecco to achieve mutually beneficial outcomes. This includes realigning the initial Project access road to minimise impact to grazing operations. The landholder and Vecco are also working closely on achieving a water-sourcing solution that benefits both (and the region).	
Alex Power	"Debella"	Landholder	Project overview	Telephone	11/08/2023	JG	Discussed Project background and timelines. The landholder requested that the Project name be changed from Debella to avoid confusion with their property. Vecco agreed to this. The landholder also mentioned water concerns.	Keep engaged and provide regular Project updates

			Name change	Telephone	29/08/2023	JG	Advised that the Project name had changed from Debella to Vecco Critical Minerals Project. The landholder was grateful for the quick response. Discussed the Project water approach - including flood harvesting - and advised that we would keep the landholder updated as the strategy progressed. Also advised Project strategies around traffic, noise, dust and power.	Forward future updates by email and address any future queries the landholder has as they arise
Alan Hick	"Lindfield"	Landholder	Project overview	Telephone	15/08/2023	JG	Discussed Project background and timelines. Discussions focused on water, traffic and cattle safety on the roads. The landholder was very knowledgeable on the vanadium industry and has been following its progress.	Keep engaged and provide regular Project updates
Evan Acton	"Millungra"	Landholder	Project overview	Face-to-face	4/09/2023	JG	Discussed Project overview and timeframes. The main points of discussion were the Project's water requirements. The landholder did not have a problem with either flood harvesting or saved GAB water. The landholder did not have concerns about the access road running up their boundary and was, overall, positive about the Project.	Keep engaged and provide regular Project updates
Tony	"Woodlands"	Landholder	Project overview	Face-to-face	15/08/2023	JG	Discussed Project background and timelines. Discussions focused on road traffic and water.	Keep engaged and provide regular Project updates
Hon Bob Katter	Katter's Australian Party 42-44 Simpson Street Mount Isa 07 4743 3534	Government (Fed)	Project overview	Face-to-face	5/05/2023	TN	Presented on Project background and status. Discussions focused on road conditions and potential required upgrades.	Follow-up meeting being planned
Scott Stevens	Dept Regional Development, Manufacturing and Water	Government (State)	Project overview	Face-to-face	18/01/2023	JG/TN/GB	Presented on Project background and status, including Project approval requirements and anticipated timeline.	
Scott Stevens			Project overview	Face-to-face	23/08/2023	SR/JG/TN	Presented on Project background and status. Focused on water demands and supply options.	Determine water licence application options

Mario Tinning (Paramedic)	Julia Creek Ambulance Station 1 Hospital Lane Julia Creek	Government (State)/ Emergency Services/ Community	Project impacts and opportunities	Face-to-face	5/09/2023	FM/SR/GB	(Met at Mt Isa QAS) Part of Julia Creek community for 10 years (partner runs the Julia Creek dance school). Julia Creek has not changed much in that time. Ambulance is always on call in Julia Creek (roster is Thursday to Thursday). It covers a large area (between Richmond, Cloncurry and Winton) and often relies on the Fire Captain for directions. Most callouts are related to stations (i.e. horse falls, machinery accidents). The community is very resilient, only calling QAS as a last resort. The rescue helicopter flies to Julia Creek from Mt Isa (thanks to strategically placed fuel bowsers). Heavily involved in the community - including first aid sessions at school and attendance at major events. The paramedic advised that there were not enough activities for young children - particularly a lack of instrumental music opportunities. Potential for PCYC was raised. Foresees main Project challenge as traffic on Punchbowl Road (also raised concerns about antisocial behaviour). Hopes that the Project will provide support during emergencies. Excited for potential growth. Mentioned community fatigue around 10-year wait (so far) for vanadium industry to progress. Keen to be involved in Project familiarisation and joint safety training exercises with the mine and other emergency services. Also interested in visiting the site prior to construction.	Provide regular Project updates
Steve Malone (Fire Captain)	Julia Creek Fire Station 66 Burke Street Julia Creek	Government (State)/ Emergency Services/ Community	Project impacts and opportunities	Face-to-face	23/08/2023	SR	Discussed staff numbers, MOU on Project emergency training/familiarisation, access to site in emergencies and antisocial behaviour in Julia Creek.	Provide regular Project updates
					5/09/2023	FM/SR/GB	During community targeted discussion, advised that the Project's mines rescue team could be a big value-add to the community. Also discussed positives of improving the Julia Creek airport and constructing an airstrip at the Project to support residents north of the Saxby River (who are cut off during floods).	
Sgt Kirinda Kildey (Officer in Charge)	Julia Creek Police Station Lot 6 Mathews Street Julia Creek	Government (State)/ Emergency Services/ Community	Project impacts and opportunities	Face-to-face	23/08/2023	SR	Discussed staff numbers, MOU on Project emergency training/familiarisation, access to site in emergencies and antisocial behaviour in Julia Creek.	Provide regular Project updates

Kelly Leong (Director of Nursing)	Julia Creek Multipurpose Health Service 1 Burke Street Julia Creek	Government (State)/ Community	Project impacts and opportunities	Face-to-face	6/09/2023	FM/SR/GB	New to Julia Creek but 10 years' experience in remote healthcare. The Julia Creek Multipurpose Health Service (MPHS) was recently upgraded and after a long search, now has a doctor. A Level 2 hospital, patients with more complex cases are sent to Mt Isa or Townsville (Townsville is Queensland's only tertiary hospital outside of Brisbane). Julia Creek does not cover surgery, birthing, mental health or child health. However, the community nurse (funded by the State Government and McKinlay Shire Council) attends home visits and supports patients to make medical appointments. The hospital has four aged-care beds and two inpatient beds. Staffing is challenging due to lack of nurses and accommodation. There should be nine permanent staff but there are currently only seven agency staff. The hospital has accommodation for eight. Hospital growth depends on community numbers, so it is hoped that the Project will attract new families to town. For RFDS, Retrieval Services Queensland is contacted first - it then calls RFDS. RFDS is only used in emergencies and rescue helicopters rarely land in Julia Creek. The Project will need to be prepared to manage major health issues on site, in case RFDS or transport to Julia Creek MPHS is not possible. The hospital is keen to be involved in Project emergency training.	Provide regular Project updates
Johanna (Director) and Sam (Deputy Director)	Julia Creek Early Learning Centre 1 Shaw Street Julia Creek	Government (State)/ Community	Project impacts and opportunities	Face-to-face	6/09/2023	FM/SR/GB	Julia Creek's existing 21-place childcare centre has been State/local government run since 2016 (previously C&K). It recently recruited a new director (Johanna). The centre faces the same challenges as other Julia Creek businesses and services - lack of accommodation options and staff shortages. However, JCELC staff have access to Council housing. A new 40-place centre is planned to be located near the school.	Provide regular Project updates

Tanya Ballantyne (Principal) and Anna Imeson (Business Manager)	Julia Creek State School Burke Street Julia Creek	Government (State)/ Community	Project impacts and opportunities	Face-to-face	6/09/2023	FM/SR/GB	Current enrolment is 46 (52 is the next level for an additional teacher), though the school has infrastructure capacity for another 75 children or three spare classrooms (it was the old high school). Classes are multi-age (P/1/2/3 and 4/5/6). While a P-6, it also has a learning hub to accommodate distance education for high schoolers. Losing local teenagers to boarding school (i.e. they rarely return after completion) drains the town of social drive and connection. In addition to the hub, the school provides excursions to mines, etc. to promote career opportunities. The school would like to see more team sports and an instrumental music program. It recognised the value of a partnership with the local Cultural Society (craft days). Housing is the biggest capacity challenge. The school has access to some housing but is looking to build more (but facing similar challenges in securing builders/electricians/carpenters in reasonable timeframes and at reasonable pricing). General community feedback included subpar electricity supply (regular blackouts and brownouts) and poor communications (no NBN; most use wi-sky or Starlink). There is general positivity about the new vanadium projects. However, the school has had considerable consultation with other proponents and expressed a level of fatigue with respect to 'when will it happen?'	Provide regular Project updates
Cr Janene Fegan (Deputy Mayor) - part Cr Shauna Royes Trevor Williams (CEO)	McKinlay Shire Council 29 Burke Street Julia Creek	Government (Local)/ Community	Project overview	Face-to-face	23/08/2023	SR	Discussed Project background and timelines. Discussions focused on Punchbowl Road and Project water supply.	Keep engaged and provide regular Project updates

Cr Philip Curr (Mayor) Cr Janene Fegan (Deputy Mayor) - part Cr Shauna Royes Cr John Lynch Trevor Williams (CEO)			Project impacts and opportunities	Face-to-face	6/09/2023	FM/SR/GB	Julia Creek is safe, friendly and welcoming. The town has good retail offerings and lots of volunteers. Emergency services work very well together. Julia Creek has changed over time - it used to be a sheep-farming area - it is now cattle, cotton and soon-to-be mining. Council is keen to develop the airport (longer runway to accommodate Dash-8 type aircraft) and is currently looking for a grant to achieve this. The main challenges facing Julia Creek are accommodation and electricity. Council has six vacant positions due to lack of housing. While it owns substantial land already zoned for residential, there is limited return in developing them (as well as difficulties finding available construction companies and supporting trades - there is currently an 18-month wait for a local builder to construct a house). Council has submitted a grant for five one-bed units. While Copperstring construction will directly impact Julia Creek, there is no planned connection for the town to the grid. Currently electricity is delivered via an old power line from Charters Towers. NBN will be installed in Julia Creek by February 2024. Regarding the Project, Council expressed interest in a communal acid plant in Julia Creek (rather than each mine having its own). Council is also keen to connect with Townsville-based Critical Minerals Queensland (CMQ) to discuss industry challenges and opportunities for McKinlay Shire. Aligned with CMQ, the State Government is spending $75 million to build a demonstration facility to support the critical minerals industry. Council indicated a clear preference for returning the Vecco Project to post-mining land use of grazing. Council was supportive of Vecco's commitment to backfill voids.	
Adam White (Proprietor)	Adam White Earthmoving	Local Business/ Community	Project overview	Face-to-face	16/05/2023	JG	Discussed Project background and status. Discussions focused on local content requirement policy and timing of works local contractors may undertake.	Keep updated on work packages
Corinna Sollitt (Proprietor)	Corrinna's Café and Bakery 33 Burke Street Julia	Local Business/ Community	Project overview	Face-to-face	17/05/2023	JG	Discussed Project background and timeline for commencement. Discussion revolved around staffing and workforce location and services required locally.	Keep updated on when activities will be underway

	Creek	Local Business/ Community	Project overview	Face-to-face	23/08/2023	SR	Discussed Project background and timeline for commencement. Discussion revolved around staffing and workforce location and services required locally. Arrange time for formal SIA discussion.	that increase catering requirements
		Local Business/ Community	Project impacts and opportunities	Face-to-face	5/09/2023	FM/SR/GB	Long-term local who appreciates their friendly, low-crime community. Lack of medical support has been an ongoing issue for Julia Creek; however, a new doctor started a few months ago. Allied services such as dentistry and breast cancer support visit the town annually (they bring their own accommodation). The town has a gym but there needs be more sporting teams to keep residents (particularly children) active. Accommodation is currently a challenge. Companies are buying up motels. Café staff (generally backpackers) stay in the proprietor's two houses. There are plenty of jobs but not enough people or houses to accommodate them. With respect to Project impacts, the proprietor supported Vecco's commitment to buying local wherever possible.	
Dane Crocker	Crocker Rural	Local Business/ Community	Project opportunities	Face-to-face	14/10/2022	JG	Discussed Project background and status. Discussions focused on local content requirement policy and timing of works local contractors may undertake.	Keep updated on work packages
Steve and Leah Laidlow (Proprietors)	Foodmart 54 Burke Street Julia Creek	Local Business/ Community	Project impacts and opportunities	Face-to-face	5/09/2023	FM/SR/GB	The proprietors also own the Richmond Foodworks and recently relocated to Julia Creek. Julia Creek Foodmart is aligned with but separate to Foodworks. Fruit and vegetables come from Rocklea in Brisbane; while meat comes from the local butcher and various other items from Metcash. The Foodmart has capacity to service the Project. Julia Creek's population is getting older as when teenagers leave for boarding school, they rarely return. Lack of accommodation in Julia Creek makes it hard to attract staff. Supportive of the Project as the town needs more people.	Keep updated on when activities will be underway that increase catering requirements

Steve and Linda Malone (Proprietors)	Godiers Café and Marketplace 43 Burke street Julia Creek	Local Business/ Community	Project impacts and opportunities	Face-to-face	5/09/2023	FM/SR/GB	Proprietor is also the local Fire Captain. Both proprietors are born-and-bred locals, who have been running the store for 13 years. Julia Creek is a caring community that is safe, tightknit and supportive of community parenting. Store trade tends to align with cattle prices. The accommodation shortage has led to a staff shortage. Backpackers are taking on roles as ringers and general residents are attracted to mining. To save money, a nearby mine offered its Julia Creek employees a move to the coast and subsequent FIFO. Supportive of Vecco's commitment to buying local. Interested in programs proposed for protecting the endangered Julia Creek Dunnart - suggested a program of trapping be implemented ahead of Vecco mining progression. Also interested in mine rehabilitation methods to return the Project footprint to existing grazing land use.	Keep updated on when activities will be underway that increase catering requirements
	Julia Creek Caravan Park Old Normanton Road Julia Creek	Local Business/ Community	Project overview	Face-to-face	17/05/2022	JG	Discussed Project background and timeline for commencement. Discussion revolved around staffing and workforce location and services required locally.	
Steve (Manager)	Julia Creek Villas 2 Burke Street Julia Creek	Local Business/ Community	Project overview	Face-to-face	23/08/2023	SR	Discussed Project background and timeline for commencement. Discussion revolved around staffing and workforce location and services required locally.	Keep updated on when activities will be underway that increase accommodation requirements
			Project impacts and opportunities	Face-to-face	5/09/2023	FM/SR/GB	Villas used to be the old convent school with a few new buildings added on. Long-term Julia Creek resident. The town has not changed much in the last 40 years. However, house prices have risen since news of potential mining. While accommodation is scarce, the business was less busy than this time last year. Most people who stay in the Villas are workers, as tourists tend to have caravans. The exceptions are major events such as Dirt n Dust. Supportive of the new mining industry as it will help Julia Creek to grow.	
Ricky Slater		Local Business/ Community	Project overview	Telephone	16/02/2023	JG	Discussed Project building requirements and early works, including workforce accommodation.	Provide update when carpentry work required

Rebecca Bell (Manager)	Top Pub 33 Goldring Street Julia Creek	Local Business/ Community	Project impacts and opportunities	Face-to-face	5/09/2023	FM/SR/GB	The pub has 11 rooms and two dongers but is impacted by the town's accommodation shortage (for staff). Notably, Top Pub has no poker machines. The pub can supply major events (such as Dirt n Dust and the races) and can support the Project if it has a wet mess. Top Pub has been successful in attracting staff via Facebook. Julia Creek infrastructure - particularly housing - will struggle to accommodate the new critical minerals industry unless it grows with it. The town has changed over the past 12 months - more road workers and the like are diluting the locals and the latter are not coming together as a community as much as they used to.	Keep updated on when activities will be underway that increase catering and accommodation requirements
Jackie Gregory and Garry Davidson	Aurizon	Other - Industry	Project overview	Face-to-face	16/05/2023	JG	Discussions focused on transport requirements - particularly from Julia Creek to Townsville, Stuart Terminal development and Maxwelton/Richmond Terminal.	Aurizon working on proposal for land use at Stuart and logistics
			Project overview	Face-to-face	11/08/2023	SR	Discussed option for sulphur supply into Townsville Port and Julia Creek. Discussed facilities in Julia Creek and opportunities to upgrade same. Discussed potential to share logistics with Incitec Pivot (IPL).	Aurizon provided contact details for IPL
David Sollitt	Ergon Energy	Other - Utility	Project overview	Face-to-face	17/04/2023	JG	Discussed Project background and status. Discussions focused on power demands and likely solutions.	Ergon wants to understand excess Project power demands (if any) and how it can assist with grid connection
		Other - Utility	Project overview	Face-to-face	5/09/2023	SR	Discussed challenges around power supply for JC and the lack of capacity. 5MW capacity remaining.	Ergon wants to understand excess Project power demands (if any) and how it can assist with grid connection
Tanya Kum Sing	tanyakumsing@yahoo.com.au	Mitakoodi - TO	Email regarding introduction	Email	21/09/2023	SR	Introduction to Vecco and offer to meet in Cloncurry on Thursday 28/09/23	Meeting on the 28/09/23 if confirmed.

Tanya Kum Sing	tanyakumsing@yahoo.com.au	Mitakoodi - TO	Email regarding introduction	Email	28/09/2023	SR	Follow up email re possible meeting.	Meeting not confirmed.
Tanya Kum Sing	tanyakumsing@yahoo.com.au	Mitakoodi - TO	Phone Message	Phone	28/09/2023	SR	Message Left	Message Left
Tanya Kum Sing	tanyakumsing@yahoo.com.au	Mitakoodi - TO	Phone Conversation	Phone	29/09/2023	SR	Tanya returned previous call. Discussion had re meeting. Tanya was out of town and unable to meet. SR introduced Vecco Group and detailed exploration work and pending ML and EA applications. Tanya stated that they had no claim over the area and that their legal group would track any notification regarding ML's and EA's in the area. Tanya stated she would send through the legal contact for future discussions	Nothing at this stage. Notification to be made during notification period.

3.3 Post-Mining Land Use

This section of the PRCP describes and discusses the PMLUs proposed for the Project in accordance with Section 126C(1)(d) of the EP Act.

In accordance with the Queensland Government's objectives defined in *the Mined land rehabilitation policy* (Queensland Government 2018), the general post-mining rehabilitation goals for the Project are to leave an area that is safe, stable, does not cause environmental harm and is able to sustain the PMLU.

3.3.1 Existing land use

The Project is not located in a Priority Agricultural Area, Strategic Cropping Area, Strategic Environmental Area or Priority Living Area, as defined by the *Regional Planning Interests Act* 2014. The current land use of the Project site is low intensity cattle grazing on native pastures. Land within the within the MLA boundaries support beef cattle production.

The Project is partially located over a Forest Consent Area, as defined by the *Land Act 1994.*

3.3.2 Planning scheme conformance

The land in and surrounding the Project area is within the *McKinlay Shire Planning Scheme* (2019) and is zoned as 'Rural'. The purpose of the rural zone is to:

1) *provide for rural uses and activities; and*

2) *provide for other uses and activities that are compatible with—*

    a. *existing and future rural uses and activities; and*

    b. *the character and environmental features of the zone; and*

3) *maintain the capacity of land for rural uses and activities by protecting and managing significant natural resources and processes.*

Relevant to the Project, the purpose of the rural zone in the planning scheme aims to provide:

- *grazing and value-adding rural uses where they do not conflict with petroleum or mining leases or facilities or stock routes;*
- *are associated with and do not threaten the viability of existing rural uses and to assist with maintaining the viability of existing rural production enterprises;*
- *protect established rural uses from the adverse amenity and safety impacts of proposed extractive industry;*
- *new extractive industry activities are established where they have minimum impact on the viability of existing agricultural, residential and tourist uses;*
- *biodiversity values and ecological connectivity are protected and maintained;*
- *the character and landscape of all rural land is maintained;*

The Project activities and proposed PMLU will support two of the three core industry sections, agriculture and mining, identified in the McKinlay Shire Economic Development Plan 2018-2022 (AEC 2018).

3.3.3 Rehabilitated landforms

The Project activities will result in land disturbance from clearing for open-cut mining operations and supporting infrastructure. Disturbed areas are to be progressively rehabilitated as soon as practicable from when areas become available for rehabilitation (refer to section 3.5.5 for rehabilitation timeframe justification, and Appendix A for the milestone schedule). The key disturbance areas and associated final landforms are described below.

3.3.3.1 Out-of-pit waste rock dump

At the start of mining operations, waste rock will be initially placed out of pit. The dump will represent the highest part of the final landform, up to 12 m above natural surface. All recreated landforms have been designed to a maximum slope of <1:10 vertical to horizontal ratio (V:H) (10%). This conservative landform design is intended to ensure landform stability and achievement of sustainable grazing land use without the need for contour banks and artificial drop structures.

The surface of rehabilitated waste rock will comprise a 2 m growth medium cover with 1.5 m of suitable sub-soils and 0.5m of topsoil (A and upper B horizons).

3.3.3.2 Backfilled mining void

The backfilling of the pit will result in no final void at the end of mining, this will ensure a safe and stable landform, capable of sustaining the final PMLU of grazing. All mining areas will be backfilled to at least natural surface. Most areas of the backfilled void will end up 2 to 3 m above the original surface, accounting for lower density of excavated materials and increased moisture in residue stream. All recreated landforms have been designed to a maximum slope of <1:10 vertical to horizontal ratio (V:H) (10%). This conservative landform design is intended to ensure landform stability and achievement of sustainable grazing land use without the need for contour banks and artificial drop structures.

Waste rock materials are predominantly non-acid forming and include limestone with high acid neutralising capacity. Process residue material will also be disposed of in the void. The neutralised residue will be truck dumped to cover the pit floor prior to backfilling of the void with waste to surface. The geochemical assessment of the waste rock and process residue material (RGS 2023) found that predicted water quality parameters are typical of groundwater within the Project areas. A Mine Waste Management Plan (RGS 2023b) was developed to ensure effective and best practice waste disposal.

Final landforms will be covered to a depth of 2 m, with 1.5 m of suitable sub-soils and 0.5m of topsoil (A and upper B horizons). Surface preparation of the final landform will include addition of ameliorants (where required), ripping and seeding to minimise surface water interactions with waste rock material and hay mulching to promote seed germination and minimise erosion.

3.3.3.3 Water management infrastructure

Proposed water management infrastructure will include sediment dams and associated drains, mine affected water storages, and a raw water dam to store water extracted from Saxby River. Water management infrastructure will be decommissioned as soon as practicable once the service life of the infrastructure has passed. Sediment dams, the Raw Water Dam, Process Water Dam and Pit Dewatering Dam will be retained post-mining for use as water storages for farm use.

3.3.3.4 Other disturbance areas

Mine operations will require the clearance of vegetation for development of the mine infrastructure area, supporting infrastructure including roads and tracks. Project infrastructure has been designed to minimise the extent of disturbance and to located infrastructure outside of the Saxby River floodplain.

The development of the access road will require a low-level crossing to be constructed at the watercourse crossing of Saxby River. Much of the river crossing will occur at existing ground level for approximately 3 km,

gently grading towards the main low flow channel where a sequence of culverts at this deepest section of the river channel will maintain fish passage and permit the navigation of fish during low flow events.

Mine infrastructure to be decommissioned will be demobilised, removed, have topsoil replaced, and the land rehabilitated to the final PMLU as soon as practicable once the service life of the infrastructure has passed.

3.3.4 Post mining land use options

3.3.4.1 Grazing

The current land use of the Project is low intensity cattle grazing on predominantly native pastures. The Soil and Land Suitability Assessment for the Project site (AARC 2023a) found that the land suitability of the project area for cattle grazing is limited by low precipitation and moisture availability, significant heat stress, and moderate wind erosion. The examination of the land suitability limitations for cattle grazing indicated that the Project area consists of marginal land (Class 4) presently considered unsuitable due to severe limitations, and unsuitable land (Class 5) with extreme limitations – however given the current land use is low intensity grazing, it is evident that the Project area can sustain grazing activities.

Native grasses are mostly perennial and persist well in the Australian environment. Their adaptation to the harsh and varying climate – including severe droughts, low rainfall, and highly-weathered soils – make achieving the PMLU of grazing on native pastures most likely to succeed when seeding with native grasses. The Australian Land Use Management Classification (ABARES 2016) defines the nominated land use for the area as 'grazing native vegetation' where native species are present in greater than 50% of dominant species (ABARES 2016). Flora and fauna studies undertaken for the Project support the classification of a 'grazing native vegetation' land use, with native species dominating grassland communities (AARC 2023b).

Landholders and local council have expressed a clear preference to return as much of the land as possible back as to a grazing land use.

3.3.4.2 Cropping

The pre-mining land use assessment (AARC 2023a) determined that the cropping suitability classes ranged between Class 4 (marginal land considered unsuitable due to severe limitations) and Class 5 (unsuitable land with severe limitations). No suitable cropping land was identified in the pre-mining assessment. Therefore, cropping is not considered a feasible alternative PMLU.

3.3.4.3 Water storages

Water storages provide the opportunity for on-site farm use post mining, in an environment subject to limited rainfall at times. The landholder has identified the preference to retain water storages post mining and will be subject to a landholder agreement. Due to the nature of the material stored in the Interim Residue Storage Facility, this water storage will be rehabilitated to pasture.

3.3.5 Post mining land use outcomes

The proposed PMLUs have been developed with consideration for the existing local and regional land use, consultation with local community, the *McKinlay Shire Planning Scheme* (McKinlay Shire 2019), local ecological values, and site characteristics. The proposed PMLUs aim to reinstate the existing land use of low intensity grazing on native vegetation by returning the land to similar vegetation type and land class suitability to that existing prior to mine disturbance.

In summary, areas previously cleared for pasture will be returned to 'Grazing Native Vegetation', all water dams will be retained in the final landform as 'Water Storages' for the purposes for on-site farm use, with the exception of the Interim Residue Storage Facility which will be rehabilitated to 'Grazing Native Vegetation'.

The proposed PMLUs are shown on Figure 27 - Figure 28, detailed in Table 10 and:

- are considered viable, having regard to the use of land in the surrounding region;
- are consistent with how the land was used before a mining activity was carried out;
- are consistent with the uses of land permitted under local planning instruments; and
- will deliver, or aim to deliver, a beneficial environmental outcome that is acceptable to the local community.

Table 10: Proposed PMLU by mine activity

Mine domain / area	Description	PMLU	PMLU description	Disturbance area (ha)
Infrastructure	• Mineral processing plant, ore handling facilities and associated infrastructure; • workers village accommodation; • sewage treatment plant and effluent irrigation infrastructure; • solar array and associated infrastructure; • water extraction infrastructure; • airstrip and associated fencing; and • minor disturbance from other approved disturbance activities resulting in compacted land requiring rehabilitation including topsoil stockpiles on natural surfaces.	Grazing Native Vegetation	Low intensity grazing on native species dominant pasture.	375.7
	• mine access roads and tracks; • Saxby River crossing; and	Retained Infrastructure	Retained road.	247.7
Water Management infrastructure	• Clean water diversion drain; • sediment drains; and • Interim Residue Storage Facility.	Grazing Native Vegetation	Low intensity grazing on native species dominant pasture.	53.9
	• Raw water dam; • Sediment dam; • Pit dewatering dam; and • Process Water Dam.	Water Storage	Water storage for on-site farm use (stock watering).	69.8
Open-cut pit	• Process residue material placed in-pit; and • In-pit waste rock dump.	Grazing Native Vegetation	Low intensity grazing on native species dominant pasture.	599.0
Out-of-pit waste rock dump	• Out-of-pit waste rock dump.	Grazing Native Vegetation	Low intensity grazing on native species dominant pasture.	39.2
			Total disturbance	1385.6

3.4 Non-use management areas

There are no non-use management areas proposed for the Project.

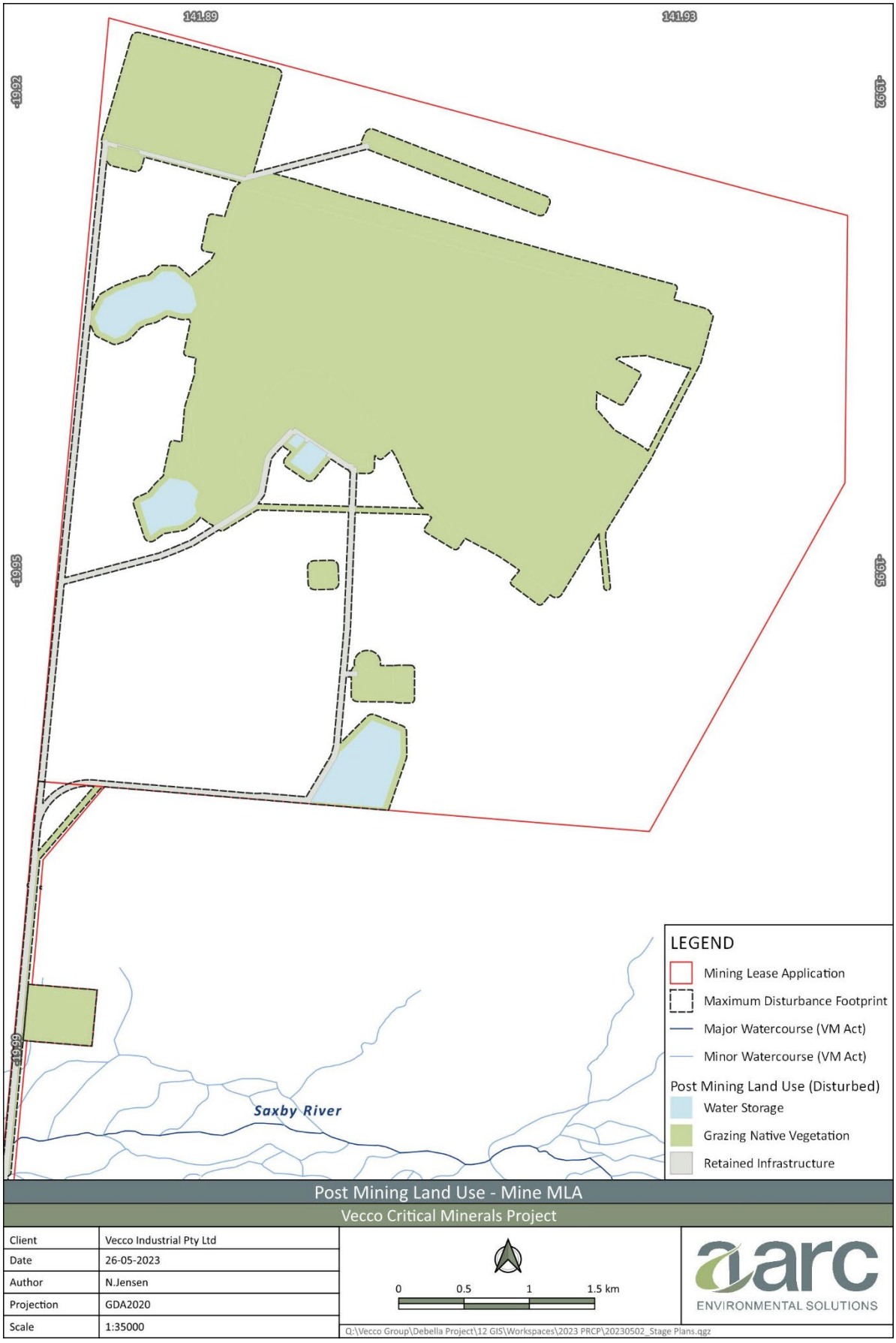

Figure 27: Proposed PMLU – production MLA

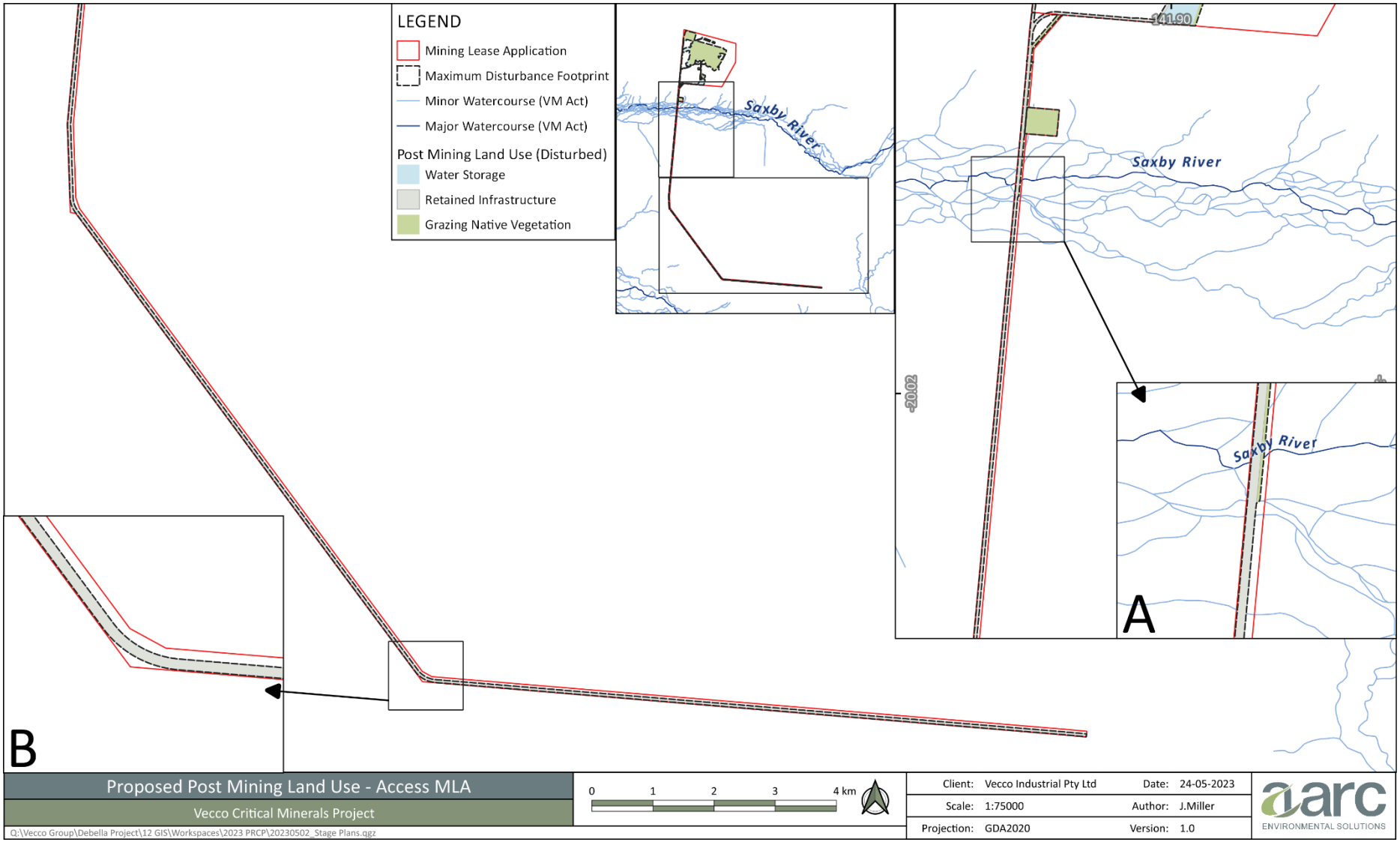

Figure 28: Proposed PMLU – Southern MLA

3.5 Rehabilitation management methodology

3.5.1 Rehabilitation objectives

In Queensland, mine rehabilitation is required under the EP Act. Amendments to the EP Act in late 2018 implemented key elements of the State Government's *Mined Land Rehabilitation Policy* (Queensland Government 2018) which intends to ensure that, for land disturbed by mining activities:

- the land is safe and structurally stable;
- there is no environmental harm being caused by anything on or in the land; and
- the land can sustain a post-mining land use (Section 111A of the EP Act).

These three objectives comprise the general rehabilitation goals for the Project.

3.5.2 Rehabilitation areas

To allow the development of a PRCP schedule that satisfies the requirements of the PRCP Guideline, discrete rehabilitation areas (RAs) have been defined for the Project. An RA is defined by the EP Regulation as an area of land in the PMLU to which a rehabilitation milestone for the post-mining use relates. RAs are nominated for areas of disturbance within the Project with consideration for the disturbance type and the proposed PMLU. The rehabilitation areas proposed for the Project are described in Table 11 and shown on Figure 29.

Table 11: Nominated rehabilitation areas

Reference	Rehabilitation area	Description	Area (ha)
RA1	Mine infrastructure area	• Mineral processing plant, ore handling facilities and associated infrastructure; • workers village accommodation; • sewage treatment plant and effluent irrigation infrastructure; • solar array and associated infrastructure; • water extraction infrastructure; and • airstrip and associated fencing.	154.5
RA2	Retained infrastructure	• Mine access roads and tracks. • Saxby River crossing.	247.7
RA3a	Water Management infrastructure (rehabilitated to low intensity grazing)	• Final landform drains rehabilitated to support vegetation for low intensity grazing.	52.4
RA3b	Water management infrastructure (retained for stock watering)	• Raw water dam; • Sediment dam; • Pit dewatering dam; and • Process Water Dam.	69.8
RA4	Residue storage facility	• Interim Residue Storage Facility.	1.5
RA5	In-pit residue disposal and backfilled pit area	• Residue material placed across pit floor. • Waste rock placed in the backfilled pit to surface level or above.	599.0
RA6	Out-of-pit waste rock dump	• Out-of-pit waste rock dump.	39.2

Reference	Rehabilitation area	Description	Area (ha)
RA7	Other minor disturbance	• Minor disturbance from other approved activities resulting in compacted land requiring rehabilitation including topsoil stockpiles and laydown areas on natural surfaces.	221.2
		Total Disturbance	1385.6

3.5.3 Rehabilitation milestones

There are nine rehabilitation milestones nominated for the Project which have been outlined in Table 12. It is noted that not all rehabilitation milestones will be applicable to all RAs. The applicability of rehabilitation milestones to the various RAs is also shown in Figure 29 and Figure 30.

Table 12: Rehabilitation milestones and applicability to rehabilitation areas

Milestone reference	Milestone description	RA1	RA2	RA3a	RA3b	RA4	RA5	RA6	RA7
RM1	Infrastructure decommissioning and removal	√							
RM2	Management of contaminated land status	√							
RM3	Removal of waste material					√			
RM4	Landform development (re-profiling / re shaping)			√			√	√	
RM5	Surface preparation (topdressing, contour ripping, soil amelioration)	√		√		√	√	√	√
RM6	Seeding	√		√		√	√	√	√
RM7	Achievement of revegetation	√		√		√	√	√	√
RM8	Achievement of PMLU to stable condition	√		√		√	√	√	√
RM9	Achievement of stock water storage to stable condition				√				
RM10	Achievement of retained infrastructure to stable condition		√						

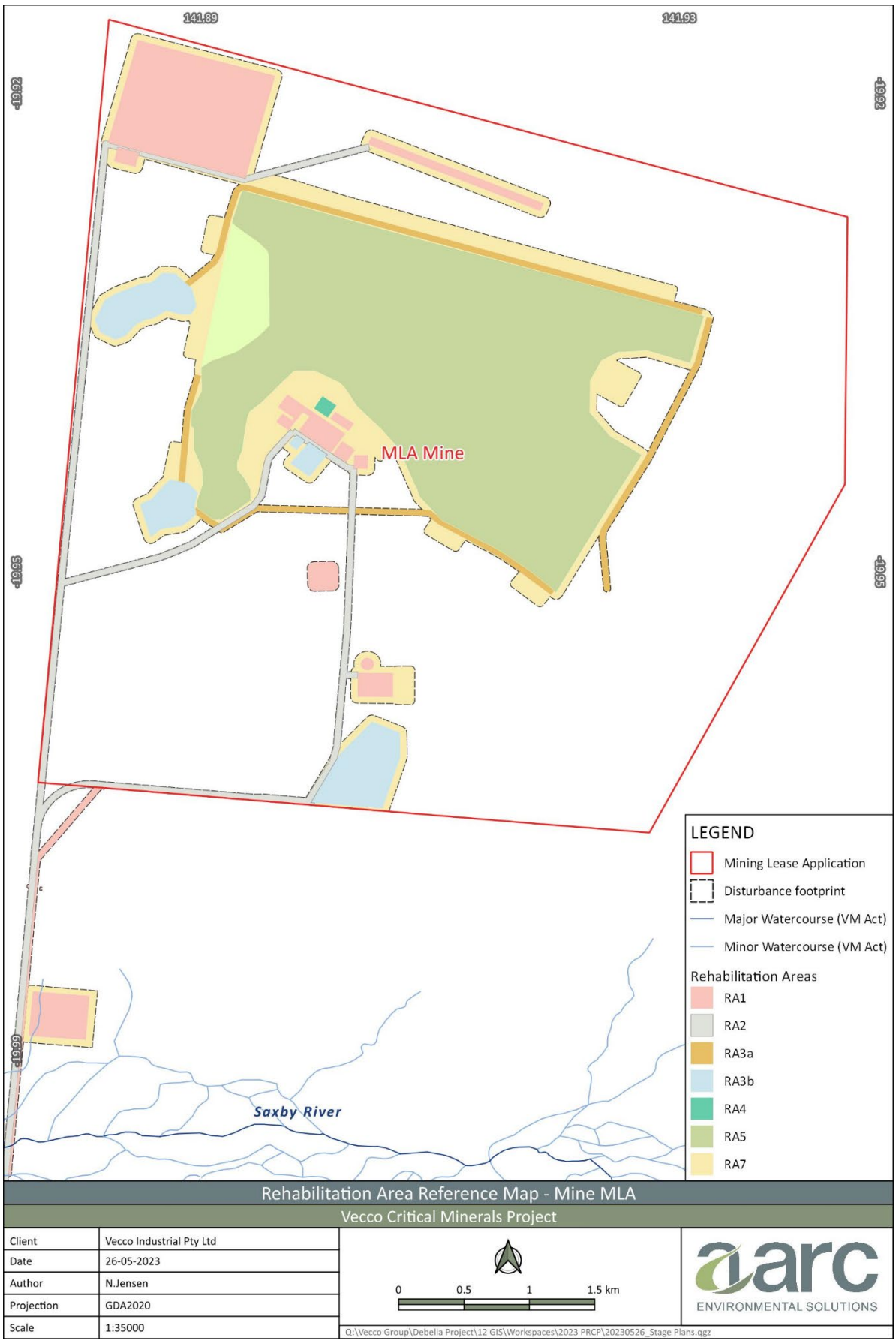

Figure 29: Rehabilitation areas reference map – production MLA and transport MLA

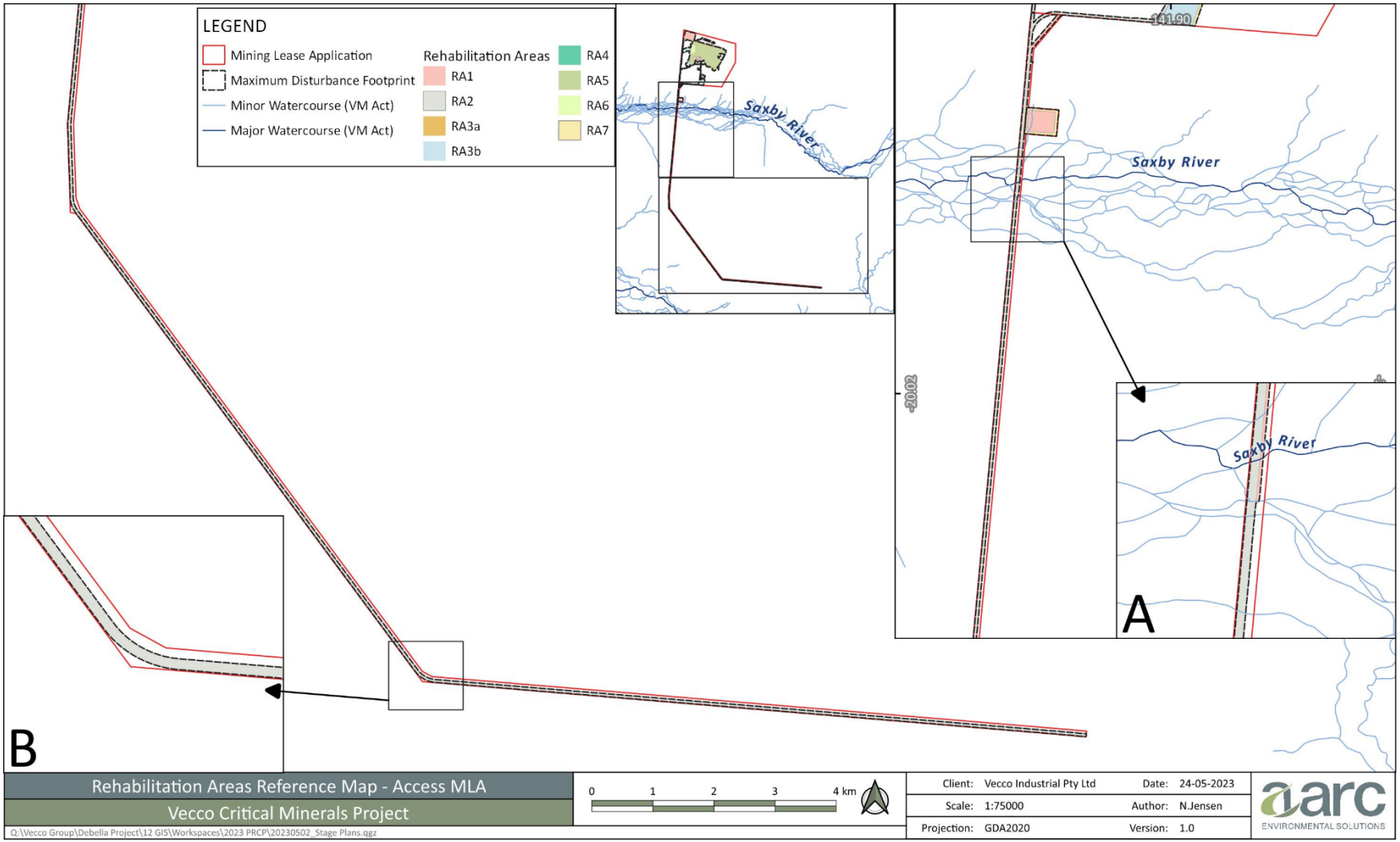

Figure 30: Rehabilitation areas reference map - transport MLA

3.5.4 Milestone criteria and completion criteria

Key to assessing the success of rehabilitation is the definition of milestone criteria. Milestone criteria are preferably specific, measurable, achievable, realistic, and timely. They should:

- be outcome-based (linked to the end land use);
- be flexible to adapt to changing circumstances;
- be able to evolve as the mine life progresses;
- include metrics suitable to demonstrate that rehabilitation is trending positively;
- undergo periodic review; and
- include a measurement approach that details how the criterion will have been met (CoA 2016a; ANZMEC and MCA 2000).

A set of milestone criteria has been identified for the Project to provide a clear definition of milestone completion and successful rehabilitation for each RA. The milestone criteria demonstrate the completion of progressive rehabilitation or improvement steps and events. The completion criteria for each PMLU will be used as the milestone criteria for the final milestone in the proposed schedule, which shows achievement of a stable condition for the PMLU at surrender.

Milestone and indicators for each RA for the Project are provided in Table 13.

Table 13: Completion criteria

Milestone reference	Rehabilitation milestone	Applicable RA	Milestone criteria	Justification for milestone criteria
RM1	Infrastructure decommissioning and removal	RA1	a) With the exception of any infrastructure to remain as part of the PMLU or where infrastructure is agreed to be retained by the landholder as evidenced by a signed landholder agreement, the following are complete: i. all services disconnected and removed; ii. all concrete, bitumen and gravel roads removed; iii. all operational pipelines drained and removed; iv. all fencing that is not part of PMLU requirements removed; v. all buildings demolished and/or removed off-site; vi. all machinery and equipment removed; vii. all surface water drainage infrastructure removed; and viii. all rubbish removed.	• Demonstrate that no infrastructure remains in the final landform.
RM2	Management of contaminated land status	RA1	a) Preliminary site investigation completed by AQP[1]. b) Detailed site investigation report, as required under the Environmental Protection Act 1994, completed. c) Contaminated materials (e.g. PCBs, Dioxins, Mercury, hydrocarbon contaminated soils) removed and appropriately disposed or remediated. d) Validation testing confirms that contaminated soils have been removed or remediated. e) A site suitability statement from a AQP[1] confirms the uses or activities for which the land is suitable, align to the approved PMLUs for the site.	• A contaminated land investigation completed by an AQP[1] is necessary to ensure that risks to human health and the environment have been appropriately managed. • As required, it will be necessary to remove / remediated and dispose of contaminated materials to ensure a safe and non-polluting site. • Once any contaminated soils have been removed and/or remediated validation testing. will ensure a safe, non-polluting PMLU remains.
RM3	Removal of waste material	RA4	a) Waste within interim residue storage area removed and placed in pit.	• No residue material or potential contaminants to remain in the final landform.

Milestone reference	Rehabilitation milestone	Applicable RA	Milestone criteria	Justification for milestone criteria
			b) Removal of additional 0.25 m in-situ surface and transferred to pit. c) Soils sampling demonstrates that soils have a: i. soil pH is between pH 5.5 – 9; ii. Low exchangeable sodium potential; and iii. EC suitable for plant growth.	
RM4	Landform development (re-profiling / re shaping)	RA3a RA5 RA6	**Landform development works:** a) All bulk earthworks and landform reshaping/reprofiling works completed to design specifications. b) Certification provided by an AQP[1] confirms that drainage features are constructed to design specifications. c) Geotechnical assessment undertaken by an AQP[1] prior to construction confirms that the landform design will achieve long-term stability for each relevant landform. d) Slopes ≤10%. e) Final landforms ≤ 12m above ground level	• To establish a stable condition for land, the final site design specifications must be met to demonstrate final landform stability • Certification must be provided by a suitably qualified geotechnical engineer that the final landform is geotechnically stable post reshaping / re-profiling of landform.
RM5	Surface preparation (topdressing, contour ripping, soil amelioration)	RA1 RA3a RA4 RA5 RA6 RA7	a) Prior to each rehabilitation event, soil health and suitability assessed and documented by an AQP[1], and a recommendation made for ameliorants to ensure sodicity, salinity, pH and fertility levels are suitable to achieve the relevant PMLU. b) Records of topsoil placement and origin, and evidence indicating achievement of a target depth of 0.2 m (+/- 0.05 m) for all RAs, except for RA5 and RA6 which has a cover of 0.5 m (+/- 0.05 m). c) Records of subsoil placement and origin and evidence indicating achievement of a target depth of 1.5 m. d) Records of any ripping undertaken of minimum depth of 0.3 m.	• A soil testing should be completed by a suitably qualified person to ensure soil is suitable for target vegetation establishment and specify any requirements for potential amelioration prior to seeding. • To encourage water infiltration and grass root development to a depth that is sufficient for adequately stabilising surface soils. • Subsoil will be applied over RA5 and RA6 with a minimum thickness of 1.5 m to support plant growth in accordance with outcomes of the Project soils assessment (AARC 2023a). • Topsoil will be placed with a minimum thickness of 0.5 m for RA5 and RA6, and 0.2 m for all other RAs to provide sufficient depth for vegetation growth.

Milestone reference	Rehabilitation milestone	Applicable RA	Milestone criteria	Justification for milestone criteria
			e) Records of ameliorants applied and incorporated into surface, as recommended by an AQP[1]	• Ameliorants may be required to improve cohesion with the subsoil / topsoil and to sustain nitrogen levels. • Gypsum application would improve the structural stability of Soapberry and Gum SMU. Required rates will be dependant on ongoing soil testing programs.
RM6	Seeding	RA1 RA3a RA4 RA5 RA6 RA7	a) Seeding of target species in accordance with Table 17: Indicative pasture species seed mix. i) A minimum of four species listed have been seeded.	• Standard rates used for rehabilitating heavily degraded landscapes include 10-15 kg target species and cover crop as per recommendations in the soil assessment (AARC 2023s). Considering the scale of the area required for revegetation, this approach will ensure target seed is not unnecessarily wasted whilst not compromising on final revegetation milestones.
RM7	Achievement of revegetation	RA1 RA3a RA4 RA5 RA6 RA7	a) Greater than 60% vegetation cover. b) Native grass species are dominant (>50% cover) in the ground canopy c) No 'Severe' erosion[4], and drainage follows appropriate paths. d) Weed species presence is ≤15%	• WEPP erosion modelling indicates acceptable erosion rates can be achieved in the final landform at 45% vegetative cover. • Erosion monitoring to demonstrate stability of the landform. • Excessive weed cover has the potential to outcompete native species cover, demonstrating weed cover is similar to reference locations will demonstrate rehabilitation areas represent the natural landscape.
RM8	Achievement PMLU to stable condition	RA1 RA3a RA4 RA5 RA6	a) Land suitability assessment by an AQP[1] certifies that land has achieved a minimum post-mine land suitability[3] of Class 4 or 5. b) Soil health assessment confirms soil is suitable for vegetation establishment, and that: i) soil organic matter >0.9 g/100 g); ii) soil pH is between pH 5.5 – 9; and	• Soil health assessment to demonstrate that soils in the rehabilitated landform contain the baseline characteristics / characteristics similar to reference location to sustain vegetation communities. • Land suitability assessment to demonstrate that land suitability is similar to the pre-mining landscape.

Milestone reference	Rehabilitation milestone	Applicable RA	Milestone criteria	Justification for milestone criteria
		RA7	ii) EC is suitable for plant growth. c) Weed cover is ≤10% (excluding exotic pasture grasses). d) Analysis of monitoring data for groundwater, surface water and stream sediments demonstrate that the surrounding environment is statistically equivalent to reference sites (P<0.05). Monitoring is to include dissolved Molybdenum, Strontium and Vanadium. e) Provide a final rehabilitation report including monitoring records.	• Existing land managers modify the predominant impact to native pasture (grazing by cattle) by monitoring pasture conditions and maximizing yield. This trend would continue once rehabilitation has achieved a pre-mined state.
RM9	Achievement of stock water storage PMLU to stable condition	RA3b	a) Landholder agreement, transferring ownership and liability of the site agreed and signed by all relevant parties. b) Retained water storage water quality parameters to be below the trigger values for livestock drinking water defined in Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG 2018). c) Concentrations of Molybdenum, Strontium and Vanadium to be statistically equivalent to reference sites / baseline monitoring data (P<0.05). d) All retained water storages assessed as safe and stable by an AQP[1]. e) Hazard and Safety Assessment completed by an AQP[1] demonstrates hazards in RAs are consistent with the type and severity of hazards typical of neighbouring equivalent land use. Remaining hazards are considered to be low risk with no significant increase in risk expected over time.	• Monitoring records to demonstrate water contained within retained water storages is suitable for stock use on consecutive monitoring occasion. • Assessment of retained infrastructure by an AQP[1] to demonstrate that the PMLU is safe, stable, sustainable and non-polluting.
RM10	Achievement of retained infrastructure to a stable condition	RA2	a) Hazard and Safety Assessment completed by an AQP[1] demonstrates hazards in RAs are consistent with the type and severity of hazards typical of neighbouring equivalent land use. Remaining hazards are considered to be low risk with no significant increase in risk expected over time.	• Assessment of retained infrastructure by an AQP[1] to demonstrate that the PMLU is safe, stable, sustainable and non-polluting.

Milestone reference	Rehabilitation milestone	Applicable RA	Milestone criteria	Justification for milestone criteria
			b) Landholder agreement, transferring ownership and liability of the site agreed and signed by all relevant parties.	

1. AQP means a person who has professional qualifications, training, skills or experience relevant to the nominated subject matter and can give authoritative assessment, advice and analysis on performance relating to the subject matter using the relevant protocols, standards, methods, or literature.

2. Department of Science, Information Technology and Innovation and Department of Natural Resources and Mines (2015) Guidelines for Agricultural Land Evaluation in Queensland (Second edition), State of Queensland or later version. https://www.publications.qld.gov.au/dataset/qld-agricultural-land-evaluation-guidelines/resource/d6591386-08e2-453f-a6fa-dff2a756215f.

3. The method for satellite-derived fractional vegetation cover is outlined in Section 3.7.2.4.

4. Erosion classification:

Erosion classification	Minor	Moderate	Severe	Extreme
No. of rill/gully*	<15	15–30	31–50	>50
Maximum observed depth (cm)	<10	10–30	30–60	>60

**Gully: highly visible form of soil erosion, with steep-sided, incised drainage lines greater than 30 cm deep.*

3.5.5 Rehabilitation milestone timeframes

Rehabilitation milestones must be achieved as soon as practicable after land becomes available for rehabilitation. Land is considered to become available for rehabilitation at the completion of mining, except where land is being used for operating infrastructure, placement of topsoil stockpiles or is identified as being retained infrastructure post-closure.

Rehabilitation milestone timeframes have been developed with consideration for the size of the rehabilitation area, the applicable milestone activities and interim rehabilitation activities that are scheduled to occur or anticipated to be required before the area becomes available for rehabilitation. Milestones that involve revegetation activities, including monitoring of revegetation, make provision for unfavourable growing seasons and unforeseen extreme events such as droughts or storms that could negatively impact vegetation establishment. As a result, milestone timeframes are extended to ensure achievement.

A risk assessment for rehabilitation activities was undertaken for the Project and the risks identified have informed the timeframe assigned to each milestone. The Project risk assessment is detailed further in section 3.6 and has been provided in full in Appendix F.

The nominated rehabilitation timeframes considered for scheduling of rehabilitation areas are discussed in Table 14.

Table 14: Rehabilitation timeframes

Milestone	Summary of rehabilitation methodology	Associated risks	Risk level assigned	Typical timeframe (years)	Justification for assigned timeframe
RM1 - Infrastructure decommissioning and removal	• All non-required services, equipment, machinery, infrastructure disconnected and removed.	No risks were associated with infrastructure decommissioning.	Class I	1	Some mine infrastructure (e.g. haul road) will be required to facilitate rehabilitation activities and will therefore not become available for rehabilitation for several years post-closure. Decommissioning activities are considered low risk, however there is a significant amount of equipment in the CHPP requiring decommissioning; therefore decommissioning is expected to take less than 2 years.
RM2 - Management of contaminated land status	• Contaminated material remediated and a contaminated land assessment undertaken by an AQP[1].	Hydrocarbon or heavy metal contamination from buildings/workshop and laydown areas.	Class II	1	A preliminary site investigation will be undertaken by an AQP[1] to identify potential areas of contamination. A detailed site investigation report will be completed by an AQP[1]. If contaminated land is identified, contaminated materials will be removed and appropriately disposed or remediation. Following this, validation testing will be undertaken to confirm mitigation activities have been adequate. A site suitability statement from a AQP[1] confirms the uses or activities for which the land is suitable, align to the approved PMLUs for the site. Given the risk classification associated with this activity and the activities required to achieve the milestone criteria the timeframe assigned is 1 year.

Milestone	Summary of rehabilitation methodology	Associated risks	Risk level assigned	Typical timeframe (years)	Justification for assigned timeframe
RM3 - Removal of residue material	• Removal of all residue material. • Removal of the 0.5 m of surface material. • Soils testing.	Residue material remains in the post mining landform	Class II	1	Achievement of the milestone criteria is dependent on earthworks and the placement of surface material into the pit after cessation of mining activities. Given the risk classification associated with this activity and the activities required to achieve the milestone criteria the timeframe assigned is 1 year.
RM4 - Landform development (re-profiling / re shaping)	• All bulk earthworks and landform reshaping/reprofiling works completed to design specifications. • Drainage assessment and installation of drainage features (where required). • Geotechnical assessment of stability prior to construction. • Design certification by an AQP[1].	Surface roughness rockiness, depressions) in excess of that expected for the PMLU.	Class I	2	As land becomes available, all bulk earthworks and installation of drainage features will be completed to design specifications and assessed as geotechnically stable by an AQP[1]. Given the size of areas becoming available at any point in time is highly variable and the need to coordinate works with climatic seasons, the timeframe assigned is 2 years.
		Slope steepness in excess of that expected for the PMLU	Class II		
		Significant slope failure.	Class II		
		Overflow of drainage structures.	Class II		
		Insufficient fill volumes to achieve final landform topography	Class II		
RM5 - Surface preparation (topdressing, contour ripping, soil amelioration)	• Surface preparation (e.g. topsoiling, contour ripping, soil amelioration activities as required).	Insufficient quality of topsoil resources onsite available to undertake rehabilitation activities.	Class I	1	Subsoil and topsoil amelioration and prompt vegetation establishment are key processes to minimise the identified risks. The timeframe assigned is 1 year.
RM6 - Seeding	• Revegetation with seed and / or tube stock consistent with the PMLU.	Natural hazards (fire, drought, heavy rainfall) following planting resulting in poor seed establishment and loss of topsoil.	Class II	1	The seeding and / or planting of suitable target species is classified as low risk, however, there is an inherent risk associated with the impact of natural weather events. The assigned timeframe of 1 year allows time for vegetation establishment and planting to consider climatic conditions to optimise planting success.

Milestone	Summary of rehabilitation methodology	Associated risks	Risk level assigned	Typical timeframe (years)	Justification for assigned timeframe
RM7 - Achievement of revegetation	• Vegetation and erosion monitoring and maintenance as required.	Insufficient vegetative cover required to achieve landform stability.	Class II	5	Achievement of target revegetation criteria is dependent on good climatic conditions and soil preparation. Allowance is made for poor growing seasons and extreme events such as droughts or storms that will negatively impact vegetation establishment, erosion, landform stability and consequent maintenance actions that may be required. Given these factors and the risk classification, the timeframe assigned is 5 years.
		Presence of pests and weeds above what is expected for the PMLU.	Class I		
		Initial/ongoing erosion resulting in dispersive soils, long-term stability and downstream water quality impacts.	Class II		
RM8 - Achievement of PMLU to stable condition	• Vegetation and erosion monitoring and maintenance. • Land suitability, soil health and hazard and safety assessment. • Water quality monitoring of water storages, groundwater, surface water and stream sediments.	Insufficient pasture density to sustain PMLU.	Class II	5	Achievement of a sustainable and non-polluting target PMLU is dependent on establishment of mature, self-sustaining vegetation demonstrated through multiple seasons of growth and evidence of successful recruitment. The timeframe of 5 years considers the time necessary for establishment of mature, self-sustaining vegetation and the various risks identified. The nominated timeframe provides allowance for reparation activities following any pasture dieback events.
		Pests and weeds in excess of completion criteria.	Class I		
		Downstream water quality impacts and sedimentation resulting from insufficient vegetation cover.	Class II		
		Remaining hazards are assessed above 'low risk'.	Class II		
RM9 - Achievement of stock water storage to stable condition	• Landholder agreement. • Water quality monitoring of retained water storages. • Hazard and Safety Assessment.	Poor water quality in retained water storages.	Class I	4	Allowance is made for reparation activities, the likelihood of natural hazard events, consecutive water quality monitoring events and challenges associated with pest/weed control. The timeframe assigned is 4 years.
		Dam failure or dam break causing downstream hazards to the public.	Class II		
RM10 - Achievement of retained infrastructure to stable condition	• Hazard and Safety Assessment. • Landholder agreement.	Hazards in excess of those expected for the PMLU.	Class II	1	Given the minimal active rehabilitation work required to achieve a stable condition for retained infrastructure, the timeframe assigned is 1 year.

1. AQP means a person who has professional qualifications, training, skills or experience relevant to the nominated subject matter and can give authoritative assessment, advice and analysis on performance relating to the subject matter using the relevant protocols, standards, methods, or literature.

3.5.6 Final landform development

The final landform design and the sequencing of landform development are influenced by the nature of the mining practices proposed. The final landform has been designed with consideration to the pre-mining landscape, PMLU, stakeholder consultation, flood modelling, in-pit and out-of-pit waste rock dump planning, landform shaping, and rehabilitation practices post mining.

Landform design principles and rehabilitation methods of each of the key mine RAs are discussed in the subsections below and in section 3.5.13.

3.5.6.1 Out-of-pit waste rock dump

At the start of mining operations, waste rock will be initially placed out of pit. All backfilled landform slopes including the out-of-pit waste rock dump have been designed to ≤ 1:10 slopes, reducing the potential for erosion due to surface runoff and increasing the chances or revegetation success.

The surface of rehabilitated waste rock will comprise a 2 m growth medium cover with 1.5 m of suitable sub-soils and 0.5m of topsoil (A and upper B horizons).

The out-of-pit waste rock dump landform, will be a maximum height of 12 m above ground level.

3.5.6.2 Backfilling of the mining void

The backfilling of the pit will result in no final void at the end of mining, this will ensure a safe and stable landform, capable of sustaining the final PMLU of grazing. All mining areas will be backfilled to at least natural surface. Most areas of the backfilled void will end up 2 to 3 m above the original surface, accounting for lower density of excavated materials and increased moisture in the residue stream. All recreated landforms have been designed to a maximum slope of <1:10 vertical to horizontal ratio (V:H) (10%). This conservative landform design is intended to ensure landform stability and achievement of sustainable grazing land use without the need for contour banks and artificial drop structures. The surface of rehabilitated waste rock will comprise a 2 m growth medium cover with 1.5 m of suitable waste and 0.5m of sub-soil (0.3m) and topsoil (0.2m).

The backfill design aims to cover the potentially reactive pit floor to prevent oxidation. The proposed operational procedure includes a ramp down from the ring road to a low-level dump pass, which will cover the floor as quickly as possible with either treated residue waste material, or acid consuming waste. Cover materials will be hauled around the western end of the pit, or alternatively across the bridge located in the middle of the pit to tip out at a low level and cover the floor with minimum exposure time. The progressive covering will occur throughout the mine life to prevent the mudstone floor from oxidising. Residue material will be placed at a ratio of limestone waste rock to residue material of 5:1. The life of mine schedule has been planned to cover the floor as quickly as possible with co-disposed residue. In the current schedule, the median length of time that the floor is exposed is three days, and the average is 9 days.

Maintaining mildly alkaline pH in the backfilled mine voids will result in low concentrations (or concentrations below detection) of elements such as aluminium, cadmium, copper, cobalt, iron, manganese, nickel and zinc. Elements such as molybdenum, strontium and vanadium present at low mg/L concentration will maintain environmental mobility as they are less prone to precipitation, but other attenuation mechanisms with organic components, and clay minerals under anoxic or reducing conditions or co-precipitation with other metalloids, is likely to reduce soluble concentrations of these elements over time.

A Mine Waste Management Plan has been developed (RGS 2023b) and will be implemented to ensure water within the backfilled void does not become a contaminant source.

3.5.6.3 Water storages

Water storages will be cleaned of accumulated sediments and embankments revegetated providing permanent access for stock. Retained dams will have a PMLU of water storage, while the embankments will be revegetated to a low intensity grazing PMLU.

3.5.6.4 Built infrastructure

All process plants and associated buildings and equipment will be dismantled and removed upon cessation of mining operations and rehabilitated to pasture. Roads, carparks, hardstands will be removed, reprofiled, topsoiled and seeded.

The mine access road is an unsealed road that will be retained by the landowner post mining. The Saxby River crossing will also be retained and will provides improved access for the landholder throughout his property. The Saxby River crossing culvert has been designed to minimise disturbance and obstruction int the Saxby River channel and floodplain. The culvert design is only 100 mm above natural topography and will extend the width of the access road. Edge protection will be utilised in areas where flood velocities may scour the channel. The Saxby River crossing concept design is shown on Figure 31, and a typical culvert cross-section is provided in Figure 32.

For any roads or additional infrastructure to be retained, a written agreement will be entered into with the underlying landowner that transfers liability for the structure and its use to the landowner.

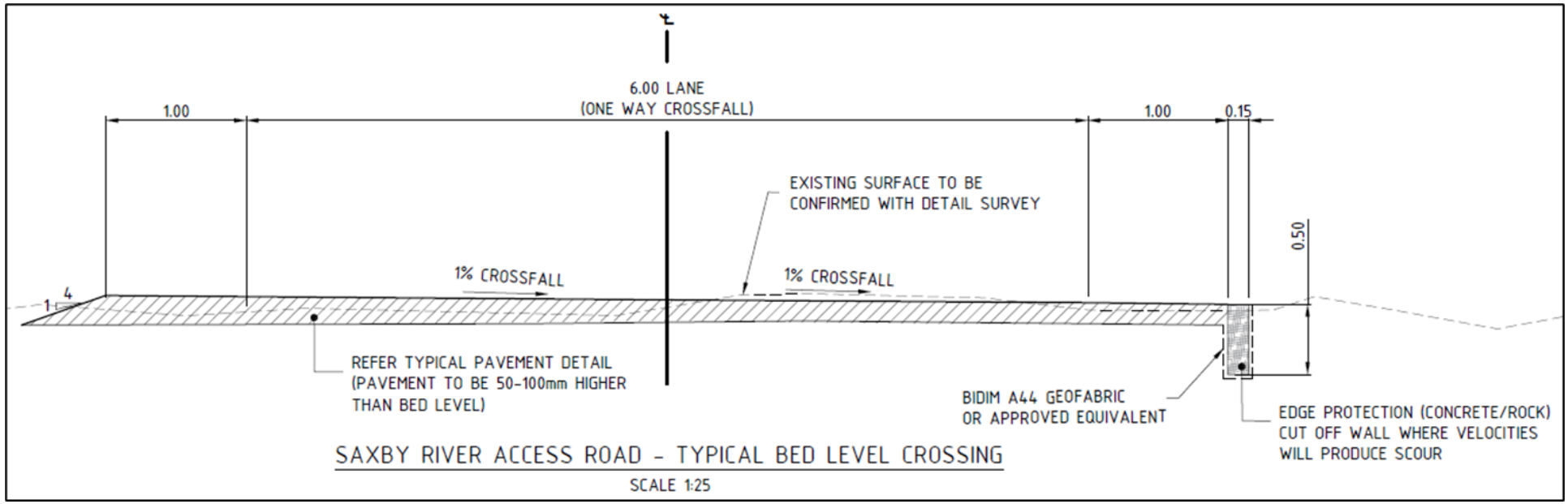

Figure 31: Saxby River crossing concept design

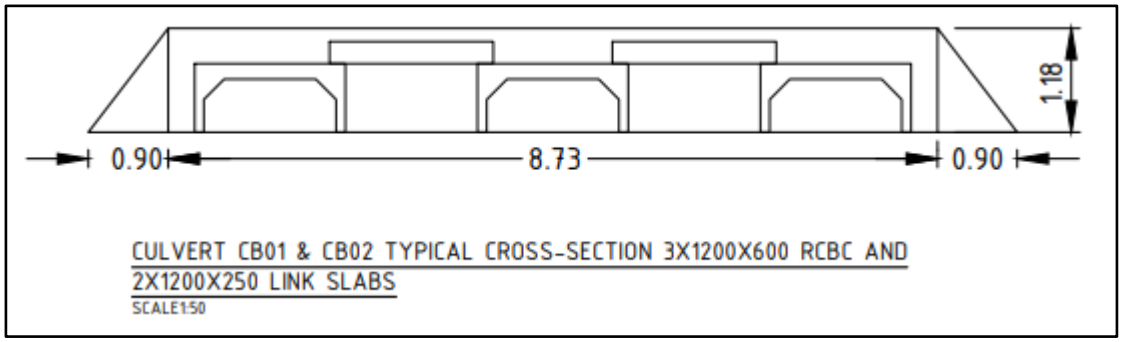

Figure 32: Typical culvert cross-section (TMM 2023)

3.5.6.5 Final landform stability

Erosion modelling through Water Erosion Prediction Project (WEPP) was conducted to ensure slope stability and land suitability of the proposed final landform. WEPP modelling considers four key data points: climate information, soil profile, land use management and slope design. Climate parameters were modelled from the area using CLIGEN 5.3, with input data sourced from SILO (daily rainfall, maximum and minimum temperature, solar radiation and maximum relative humidity) and BOM (pluviograph data). Six soil samples were included for modelling, two from each SMU unit. The samples included are as follows:

- Mitchell SMU:
  - VP10; and
  - VP12.
- Soapberry SMU:
  - VP14; and
  - VP2.
- Gum SMU:
  - VP7; and
  - VP9.

In determining the land use management parameters for WEPP modelling, cover classes were established at 5% intervals ranging from 0% to 100%. Vegetation cover was fixed at these percentages throughout the WEPP simulations, such that consistent cover was maintained across the 100-year simulation period without growth or decay. Slope design specifications were sourced from the proposed final landform design, with the selected slope being representative of the highest risk erosion conditions. The western slope was selected as it represents the maximum allowed slope height and grade. The top of the slope is approximately 142 m above RL (AHD), with the bottom of the slope approximately 130 m above RL, giving a slope height of 12 m. The slope design is separated into two sections, with an initial 25 m decline gradually increasing to 1:10, followed by a short plateau approximately 25 m along the slope, then a second 1:10 slope approximately 103 m long.

126 100-year WEPP iterations were run, covering the range of soil samples and land use management profiles identified above. To determine the maximum potential erosivity of the slope, the average annual soil loss, expressed in tonnes per hectare per year (t/ha/yr.), for each iteration was calculated and assessed against a target and maximum erosion rate. A target erosion rate of 5 t/ha was adopted for assessing land suitability and erosivity risk (Landloch 2013; Howard and Loch 2019). Additionally, a maximum tolerable erosion rate of 10 t/ha was adopted, as the rate was considered acceptable for mining rehabilitation purposes (Lu 2001). The results of this analysis can be found in Figure 33.

The average base erosion with no vegetation cover on the slope is 48.98 t/h/yr., with a maximum base erosion rate of 64.03 t/ha/yr. (VP12). At 35% vegetation cover, erosion on the slope is modelled to be within the maximum erosion threshold for all soil samples, with VP7, VP9 and VP14 meeting the maximum erosion threshold at 25% vegetation cover. 60% vegetation cover is required for all soil samples to meet the target erosion rate of 5 t/ha, with VP7, VP9 and VP14 meeting the target erosion threshold at 45% vegetation cover. Given these results, the slopes of the proposed final landform should remain stable and non-erosive irrespective of topsoil properties, where 60% vegetation cover is maintained based on the target erosion rate.

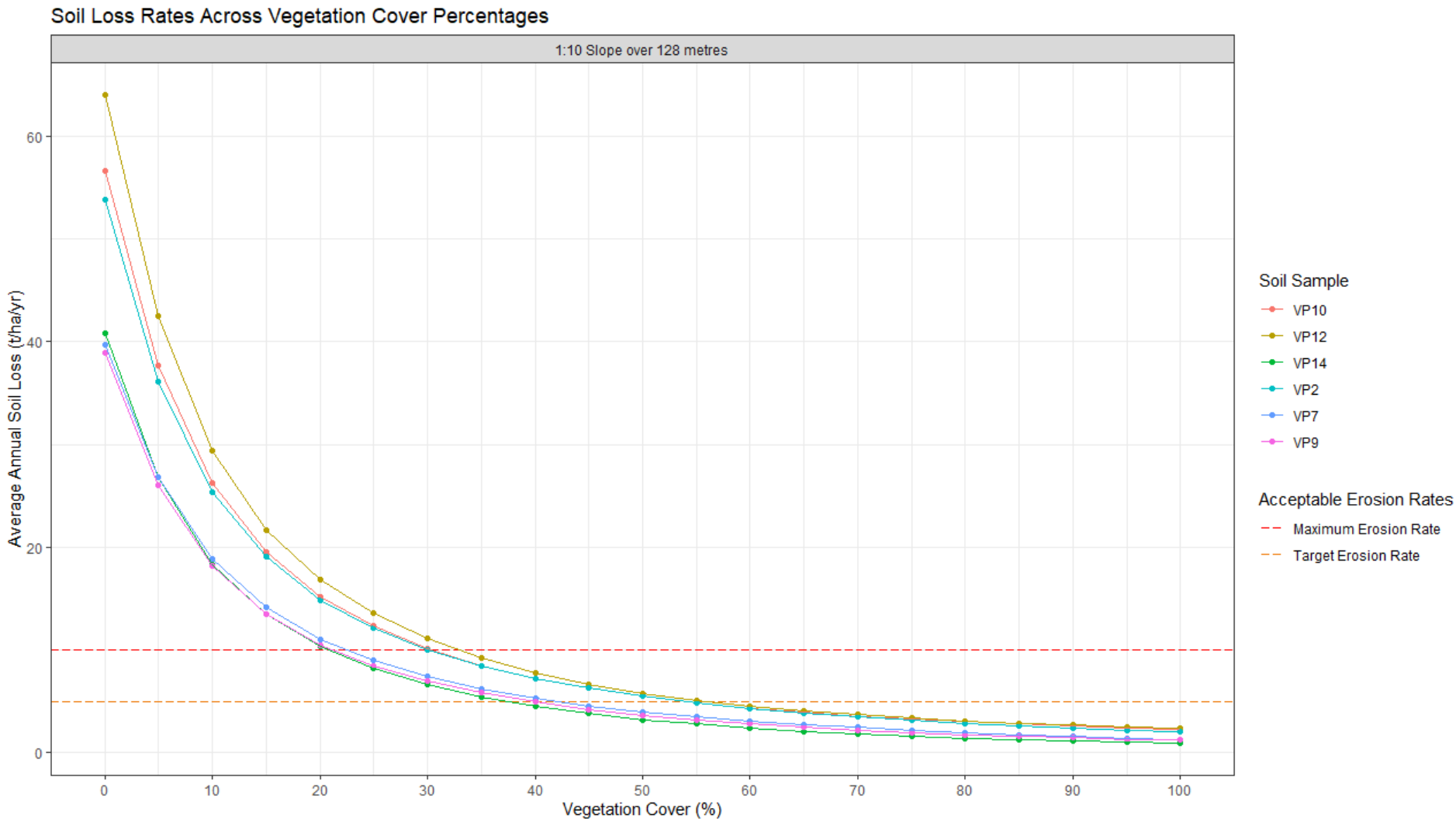

Figure 33: Average annual soil loss rates (t/ha/year) as vegetation cover increases.

3.5.6.6 Quality assurance / Quality control

Rehabilitation activities will be carried out in accordance with the applicable methods described in this document and records will be maintained to demonstrate achievement of rehabilitation milestones. The monitoring and maintenance program (section 3.7) has been developed to ensure that rehabilitation progresses towards achievement of milestone criteria and ultimately relinquishment. Rehabilitation monitoring will allow for timely identification of the need for corrective action or maintenance work, and changes to the rehabilitation strategy based on past rehabilitation successes and failures; and as new information becomes available.

The site has been subject to various assessments with a view to increasing knowledge of the site to inform the final landform design and rehabilitation activities.

3.5.6.7 Methodology to verify predicted success of the final landform

Rehabilitation strategies will be continually refined as the outcomes of earlier rehabilitation events are monitored and evaluated.

3.5.7 Hydrology

3.5.7.1 Operational water management

During mining operation, water will be managed in accordance with a mine water management system, which involves the separation of water types based on the anticipated water quality and disturbance type the water comes into contact with. Project water management infrastructure includes dams, sediments ponds and diversion channels. The water management strategy involves the following key strategies:

- clean catchment water is diverted around the mine infrastructure and disturbed land using diversion drains, minimising the catchment areas reporting to the pit and site water storages. Clean water diversion drains are small, approximately 1 m deep and are planned to be mostly excavated with small earthen bunds;
- water is captured onsite as:
    - ‘mine affected’ water, water that has interacted with mine activities and is stored in dedicated storages for re-use onsite;
    - ‘sediment’ water, runoff from disturbed landforms including waste rock dumps, cleared areas and areas where revegetation has not yet established which is captured in sediment dams;
    - ‘raw water’, water that is supplied from external groundwater or surface water sources including water supply from streamflow harvesting from the Saxby River and the raw water dam; and
    - ‘clean water’, water that is captured from undisturbed areas or areas where revegetation has established;
- the Project will preferentially use water mine affected water and sediment water for operational water demands; and
- progressive rehabilitation / stabilisation on site to reduce the generation of sediment water.

A schematic of the operational water management system is provided in Figure 34.

Water stored in the sediment dams is expected to contain elevated concentrations of suspended solids only following rainfall events. Seepage from these structures is not expected to contain dissolved concentrations of contaminants that could have a significant impact to the receiving groundwater or surface water environment (Engeny 2023). Overflows from the sediment dams are not expected to contain concentrations of contaminants that could have a significant impact to the receiving environment.

The Process Water Dam is an excavated storage within the processing plant area used to supply process water demands and receive recycled water flows from the plant. The process water dam will also capture runoff from the plant area and receives pump inflows from the other site storages to maintain supply to water demands. Overflows from the dam report to the Southern Sediment Dam and are expected to be of low volume and duration.

The Pit Dewatering Dam is an excavated storage used for pit dewatering and supply of water to the process plant via the Process Water Dam. The structure receives mine water from the pit which is considered to have greater potential for contamination. The Pit Dewatering Dam has no external catchment area, with overflows from the dam reporting to the Southern Sediment Dam. Overflows from the Pit Dewatering Dam are expected to be of low volume. Seepage from the water storage is considered unlikely due to low hydraulic conductivity of the underlying geology and due to the close proximity of the pit, any seepage is expected to report to the active mining pit for containment.

The Interim Residue Storage Facility is an excavated storage used for the temporary storage of residue from the processing plant when access to the mining pit is unavailable. When access to the pit becomes available, water and residue material from the storage will be removed and is to be maintained empty. The water storage has no external catchment area with overflows reporting to the Southern Sediment Dam. Overflows from the Interim Residue Storage Facility are expected to be of low volume and duration.

A preliminary consequence category assessment indicates that the Process Water Dam, Pit Dewatering Dam, Northern Sediment Dam, Southern Sediment Dam and Interim Residue Storage Facility are not likely to be deemed regulated structures and have a low risk of ‘Failure to contain – seepage’, ‘failure to contain-overtopping’ and dam break scenarios (Engeny 2023).

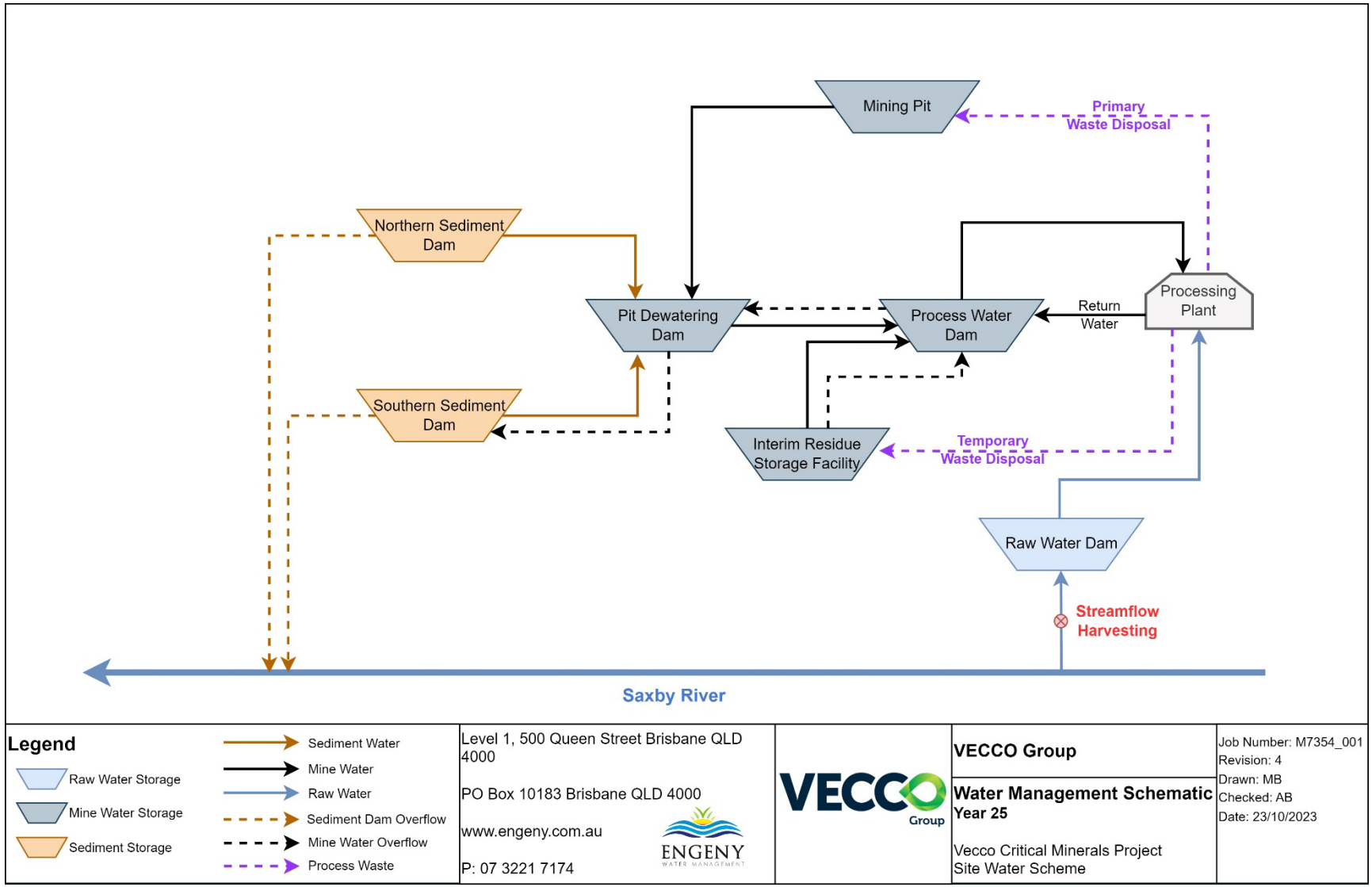

Figure 34: Schematic of the operational water management system

3.5.7.2 Closure water management

All water storages, with the exception of the interim residue storage, will be retained as the PMLU of Water Storage for stock watering to achieve a stable condition in accordance with RM10. Rehabilitation activities will include removal of sediments and contaminants, revegetation of embankments and provision of permanent, safe access for wildlife.

Water quality will be monitored against the trigger values for livestock drinking water defined in Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG 2018).

The Interim Residue Storage Facility will be decommissioned, with all residue removed and rehabilitated to the PMLU of low intensity cattle grazing in accordance with RM8. Clean water diversion drains will be removed and rehabilitated to the PMLU of low intensity cattle grazing on native vegetation.

Table 15: Project water storages

Storage	Volume (ML)	Description
Raw water dam	2,500	Contains water sourced from either stream flow harvesting from the Saxby River or groundwater bores authorised by a water licence granted under the Water Plan (Gulf) 2007 or the Water Plan (Great Artesian Basin and Other Regional Aquifers) 2017.
Northern Sediment Dam	467	Water storage to manage sediment runoff generated from northern areas of the Project.
Southern Sediment Dam	247	Water storage to manage sediment runoff generated from southern areas of the Project.
Process Water Dam	70	Water storage receives process return flows from the processing plant which is considered to have greater potential for contamination.
Pit dewatering dam	300	Excavated storage used for pit dewatering and supply of water to the process plant via the Process Water Dam.
Interim Residue Storage Facility	247	Used for storage of processing residue when the pit is inaccessible which is then rehandled for disposal in the mining pit during dry conditions. The storage will be actively dewatered and maintained empty (other than for temporary storage of residue) during operations.

3.5.7.3 Flooding

The Project area (excluding the mine access road) is situated north of the Saxby River. There are multiple channels of the Saxby River at the Project location, covering a width of 3 km. The Saxby River floodplain is restricted on the northern side of the river at the Project production MLA boundary, with the topography rising by around 5 m over 800 m to where the project site is located. The southern bank floodplain extends out around 10 km from the Saxby River channel to the border of the Flinders River sub-catchment with water during significant floods flowing from the Saxby River into the Flinders River.

The closest channel of the Saxby River lies approximately 900 m south of the production MLA. The relatively wide and shallow channels of the Saxby River experience occasional flooding during high rainfall events.

Flood modelling assessment undertaken by Engeny (2023) modelled flood depths and extents of probable maximum flood (PMF) and 0.1% annual exceedance probability (AEP) events, shown in Figure 35 and Figure 36, respectively. These show that except for the cross-Saxby River access road and raw water pump infrastructure, the Project area is outside the extent of both events.

Drainage around the MIA, open-cut pit, and sediment dams are designed to control overland flow during operation will be removed during rehabilitation.

The Saxby River crossing culverts will be retained as an ancillary to the retention of the mine access roads. The culvert design is only 100 mm above natural topography and is expected to become inundated and drowned out at low flood flows. The culvert is expected to have negligible impact on existing flood behaviour. Peak flood velocity in the Saxby River, at the river crossing, is expected to range from 1 m/s to 2 m/s in the 0.1% AEP flood event.

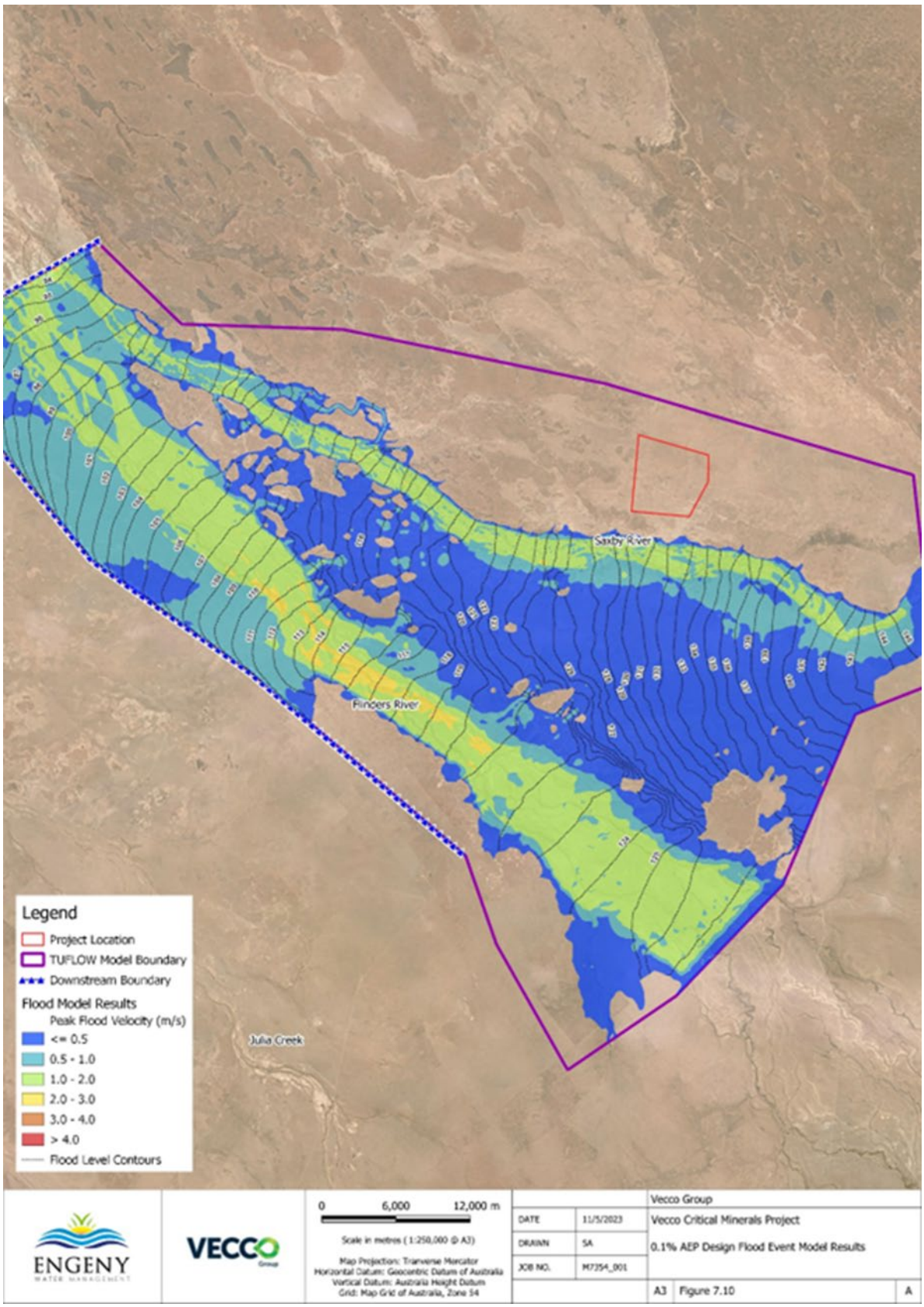

Figure 35: Flood modelling of 0.1% AEP depth of flooding

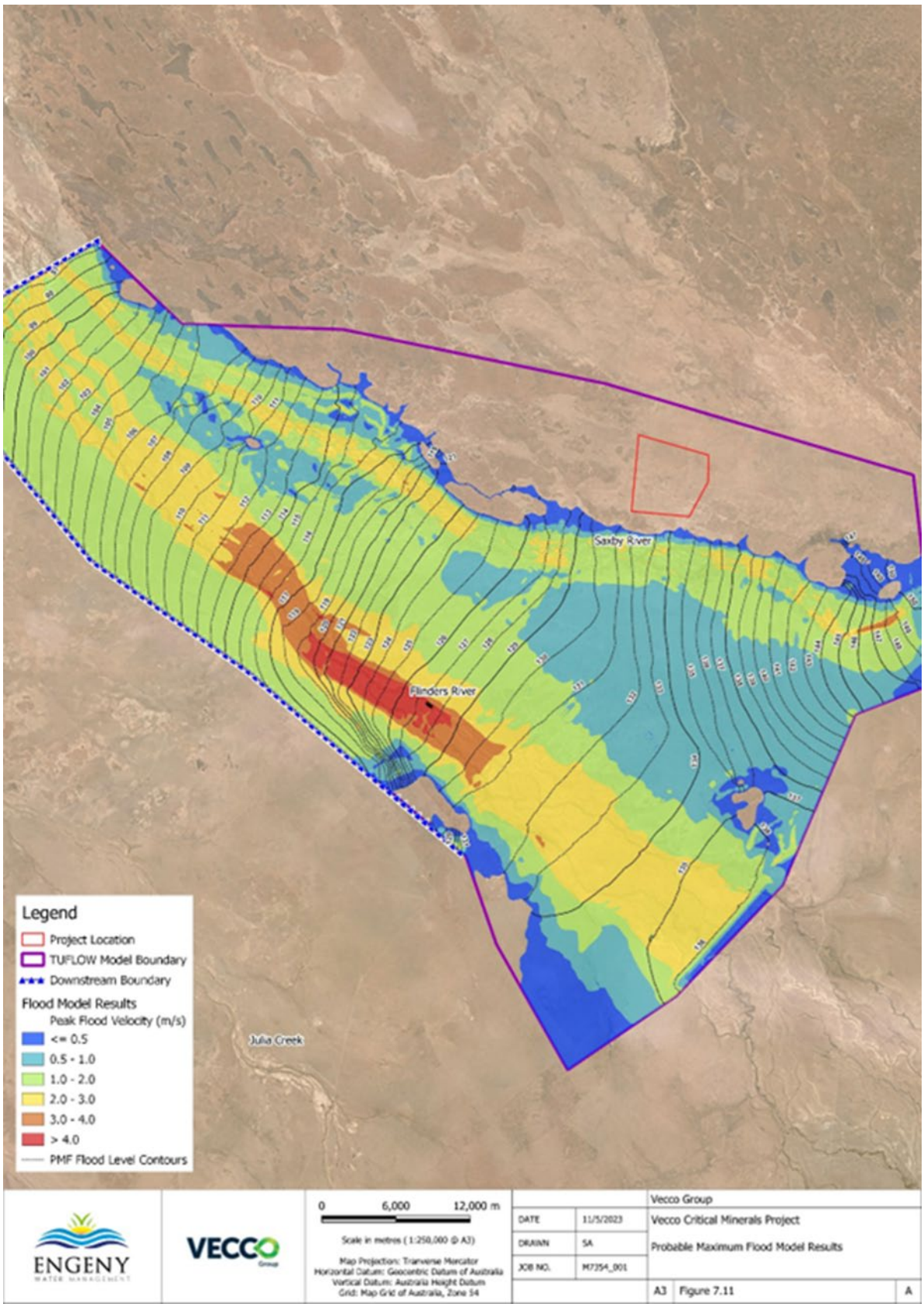

Figure 36: Flood modelling of probable maximum depth of flooding

3.5.8 Hydrogeology

Mining will occur below the regional water table, to a maximum depth below the water table of approximately 14 m. The average depth of mining below the water table is predicted to be 6.7 m.

Groundwater modelling was undertaken for the Project by JBT (2023) using the Modflow-Surfact (Hydrogeologic Inc., USA) model. The Modflow-Surfact model is based on the standard USGS MODFLOW groundwater modelling code and incorporates additional computational modules to enhance the simulation capabilities and robustness (JBT 2023). The groundwater model was calibrated to steady state and an uncertainty analysis undertaken for six scenarios.

Groundwater inflows to the mine are predicted to be minor with inflow rates under base-case/ sensitivity scenarios peak at a rate that is less than 2.5 L/s, with the calculated rate of evaporation being in the order of 12 to 20 L/s, greatly exceeding the predicted groundwater inflow rate for the base-case and uncertainty scenarios.

Mining impacts on groundwater levels are predicted to be relatively minor with a maximum drawdown predicted of approximately 11 m, in the south-eastern area of the mine, however, drawdown only extends relatively short distances, within 700 m from the edge of mining. It is predicted that the 0.5 m drawdown contour from mining will extend to approximately 2,000 m north of the Saxby River before contracting back towards the mining area. Groundwater drawdown, where it occurs will be limited to the shallow groundwater units of the Project, that is the St Elmo Coquina and Willats Crossing/Arolla Oil Shales of the Toolebuc Formation.

The mine pit will be completely backfilled, leaving no residual void. Groundwater level recovery occurs within the backfilled waste. Groundwater level recovery begins in the central mining area with 0.5 m residual groundwater drawdown to occur. Residual groundwater drawdown is predicted to extend to approximately 2 km from the closest point of the Saxby River at approximately 400 years after end of mining before contracting back to towards the mining area.

The post-mining conceptual groundwater model for the Project is provided below in Figure 37.

Groundwater drawdown resulting from mining activities is not predicted to impact any potential groundwater dependent ecosystems due to:

- geological drilling at site indicates that the Quarternary/Tertiary (Cainozoic) sediments are dry within the Production MLA;
- the groundwater system at the Project location is developed within the Toolebuc Formation, which is hydraulically disconnected from the Cainozoic sediments by the low-permeability Allaru Mudstone;
- groundwater level drawdown due to mining is predicted to be isolated to the Toolebuc Formation and to be of limited extent;
- there is low risk of the Project impacting any perched water in shallow Cainozoic sediments, which could be expected to be seasonal and located within lenses that appear to be isolated from those in the MLA area;
- the 0.5 m end of mining drawdown contour is approximately 3.7 km north of the closest location of Saxby River alluvium (Figure 22); and
- the Toolebuc Formation between the Saxby River is hydraulically isolated from the alluvium.

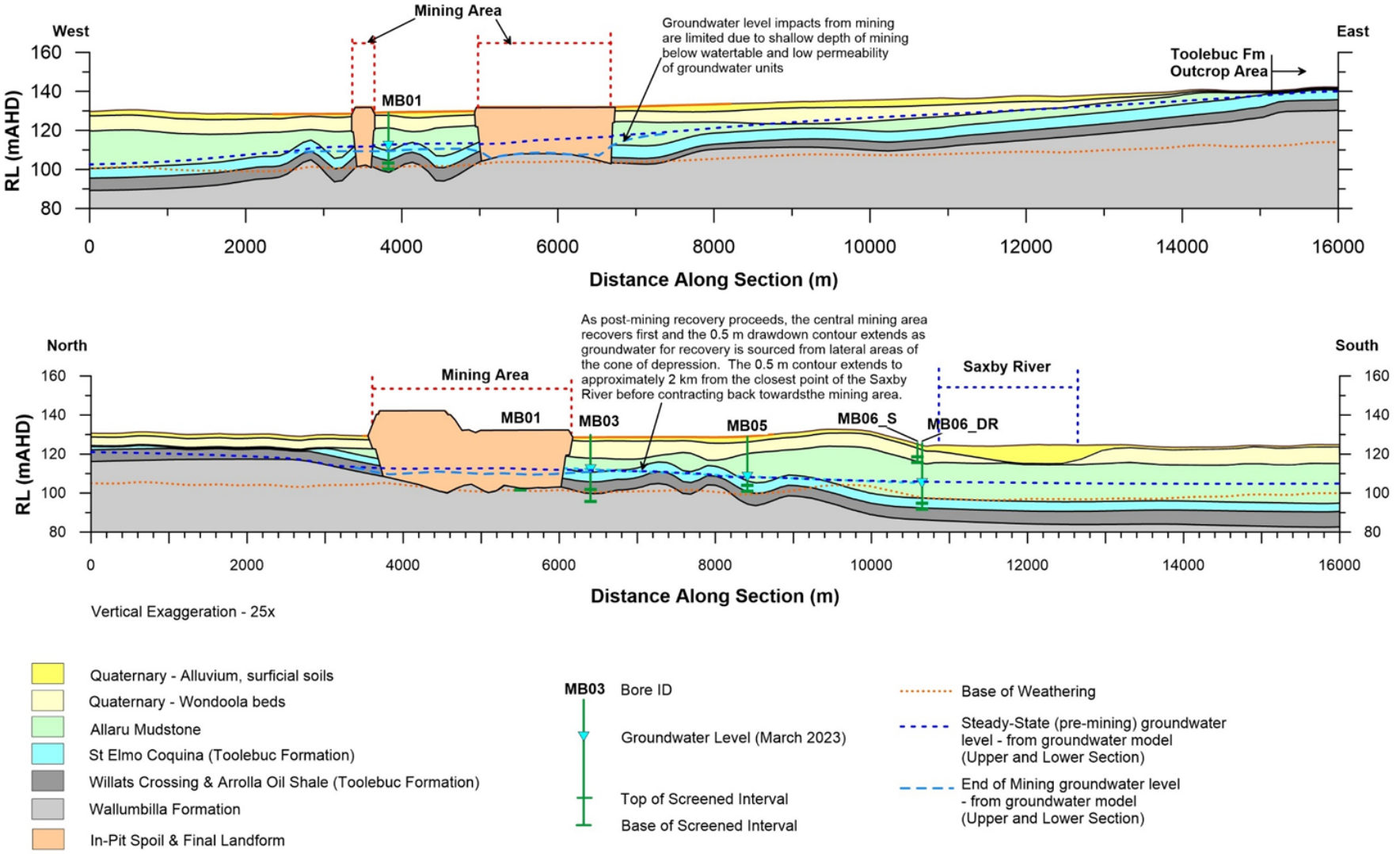

Figure 37: Post mining conceptual groundwater model (JBT 2023)

3.5.9 Waste characterisation

An assessment of waste streams that will be produced during mining operation and chemical analysis of soils was undertaken by RGS (2023). The geochemical assessment assessed the potential for acid, saline and metalliferous drainage for Project topsoils, subsoils, waste materials (residue material, waste rock and low-grade ore) ore (targeted material for processing) and mudstone floor material. The geochemical assessment of materials is summarised in the subsections below. The geochemical assessment has been provided in Appendix E.

3.5.9.1 Alluvium (Wondoola Beds) characterisation

The Wondoola Bed material has a mildly alkaline to alkaline pH, with pH ranging between 8.2 to 9.9. Material has negligible total sulphur content, low to high acid neutralising capacity and are classified as either non-acid forming – low capacity, non-acid forming or are acid consuming materials. Analysis of Wondoola Bed material indicate that acid drainage is not expected to occur, and the risk of sulfate leaching is low.

The Wondoola Bed material has variable EC, ranging between 59-3,380 µS/cm resulting from the variability in silty sand lenses that vary within the formation profile. Material is classified as having potentially dispersive properties with the rapid release of salts possible. Results from groundwater monitoring indicates moderate to highly saline groundwater is typical of the Project site.

Concentrations of total metals and metalloids increase gradually with depth and are higher than topsoils and subsoils, however, concentrations remain low and present negligible environmental risk.

Soil texture within the Wondoola Bed ranges from clay to sandy loam, and silt /sand samples have an even proportion of clay, silt, and sand compared to other material types. CEC is variable (8 to 58 meq/100g), and ESP also ranges widely (<0.2 to 38%). Overall, silt /sand is less suitable as a growth medium due to the potential for salinity and sodicity, but nevertheless this material type presents negligible risk in terms of acid generation. Sand-mudstone transition materials display similar geochemical and physical characteristics to silt /sand samples and for the purposes of management can be regarded as the same unit.

3.5.9.2 Regolith (Allaru mudstone) characterisation

Allaru Mudstone material is mildly alkaline to alkaline, with a pH ranging between 8 to 9.7. Allaru Mudstone material has low total sulphur content (0.2 to 0.8%), with 26% of samples containing the presence of total sulphur as gypsum. Chromium reducible sulphur is present in Allaru Mudstone samples at concentrations less than 0.56%, indicating the presence of some reactive sulphur which can oxidise to produce acid. The acid neutralising capacity of this unit is low to very high at 8 to 954 kg H2SO4/t within these units, with excess acid neutralising capacity to neutralise any acid production that occurs. As such, Allaru Mudstone materials are predominately classified as non-acid forming (49%) or acid consuming (46%).

Allaru Mudstone samples have low to moderate EC, ranging between 168 to 3,310 µS/cm. Salts are dominated by calcium sulfate with lesser sodium chloride. Allaru mudstone may be subject to mild dispersion or slaking. The Allaru Mudstone has a high CEC (28.9 meq/100g) and elevated exchangeable sodium potential (36%).

Concentrations if total metals and metalloids increase with depth, with the exception of barium and magnesium. Kinetic leachate concentrations demonstrate a moderate to rapid initial flush followed by steady but slow salt release, with low concentrations of trace elements.

Soil textures for these materials range from silty clay to sandy clay loam and are characterised by high proportions of clay. Samples have low permeability when compacted and high plasticity compared to topsoils and subsoils and if crushed may be suitable in the construction of impermeable barriers.

Geochemical assessment indicates that Allaru Mudstone material is considered suitable as rocky soil mulch. The crushed material has potential applications due to its high plasticity.

3.5.9.3 Limestone roof (TLBA) material

The Limestone roof has mildly alkaline pH ranging between 8.1 to 9.2. Total sulphur is highly variable, ranging from 0.01 to 2.2%. Limestone roof samples are acid consuming and have excess acid neutralising capacity to neutralise any acid produced and are completely acid consuming (100%). The Limestone roof is mineralogically distinctive from the Allaru Mudstone, silt/sand, and orebody.

The Limestone roof samples have low to moderate EC, ranging between 178 to 3,840 µS/cm. The Limestone roof has less water-soluble sodium chloride compared to the Allaru Mudstone. Salts are dominated by calcium sulfate with lesser sodium chloride. The presence of high total concentrations of calcium carbonate (neutralising mineral) indicates that the Limestone roof is unlikely to be sodic.

Concentrations of total metals and metalloids are varied and elevated for some metals/metalloids compared to topsoils. Soluble trace metal and metalloid concentrations are low or below the limit of reporting. Kinetic leachate concentrations are similar to Allaru Mudstone and demonstrate a moderate to rapid initial flush followed by steady but slow salt release, with low concentrations of trace elements.

Soil textures for these materials range from silty clay to sandy clay loam and are characterised by high proportions of clay. Samples have low permeability when compacted and moderate permeability when loosely compacted e.g., as backfill. Samples demonstrate low plasticity (PI 11%) and classify as Emerson Class 4c. These materials have good structure as a soil material and are not dispersive.

Geochemical assessment indicates that limestone roof samples are a beneficial resource as an acid consuming material.

3.5.9.4 Ore (Willats Crossing Shale to Arolla Shale)

It is assumed that the entire Arolla Shale formations will be processed and returned to the pit as non-acid forming process waste residue. The mudstone floor will be exposed periodically during this process. The geochemical properties of the orebody and mudstone floor is described below.

The Arolla Shale is mildly alkaline with pH ranging between 7.9 to 9.3. Total sulphur is greatest in the Allora Shale with a maximum total sulphur of 7.31% recorded. Approximately 83% of samples indicate that most of the sulphur present is not a reduced form of sulphur. Acid neutralising capacity of ore is variable. Based on total sulphur content, ore material is predominately (76%) classified as acid consuming, with 5% of samples classified as potentially acid forming and 2% classified as potentially acid forming-high capacity. The proportion of acid consuming materials decreases with depth, with 100% of material classified as acid consuming the Willats Crossing Shale and 16% classified as acid consuming in the lower Arolla Shale unit.

The orebody samples have mild to moderate salinity ranging between 441 to 2,100 µS/cm. Concentrations of total metals/metalloids in the orebody are similar the Limestone roof. Saline leachate is either low or below the limit of reporting metal and metalloid concentrations except for manganese, molybdenum, nickel, selenium, strontium and zinc. Kinetic leachate concentrations demonstrate a slow initial flush and salt release, with variable concentrations of trace elements. The mobility of potassium, lithium, rubidium, selenium, strontium and uranium are higher in orebody samples than other materials.

Geochemical assessment indicates that any Toolebuc orebody materials disposed of as waste due to low grade should be treated as deleterious due to the potential for neutral metalliferous drainage.

3.5.9.5 Black shale (mudstone floor) material

The mudstone black shale floor is also mildly alkaline with pH ranging between 7.8 to 9.4. Total sulphur is high in this unit with 85% of samples have recording total sulphur content greater than 0.2%, present predominately as reducing forms of sulphur. The geochemical classification for Mudstone floor samples (based on TS) is predominately acid forming with only 17% of samples classified as non-acid forming and 12% as non-acid forming-low capacity. The kinetic leach column testing indicates that potentially acid forming shale will oxidise rapidly and produce acid drainage in less than a month. However, it is noted that the distribution of sulphide minerals is in the lower part of the deposit, limited to two areas at 103 mRL.

Although the mudstone floor is expected to oxidise and produce acid quickly, the readily available and abundant acid consuming materials in the waste rock ensures that this hazard can be managed through strategic mining and mine waste placement.

Mudstone floor samples have mild to moderate salinity ranging between 594 to 1,600 cS/cm. Concentrations of total metals/metalloids in the mudstone are lower than orebody concentrations. Saline leachates are low or below the limit of reporting metal and metalloid concentrations with the exception of nickel, selenium, strontium and zinc. Kinetic leachate concentrations are typical for potentially acid forming materials, demonstrating a decline in pH over time (from pH 6.8 to pH 3.8) and an increase in the concentration of acid mobilised elements with successive leach events.

Geochemical assessment indicates that although unlikely to be mined, any mudstone floor waste should be treated as deleterious and encapsulated due to potential acidic metalliferous drainage issues.

3.5.10 Process residue material

Mineral extraction, processing and treatment of vanadium, HPA and REE will create waste process waste residue streams in the form of:

- thickened calcite rich rejects from flotation circuits;
- filtered waste from sulphuric acid leach and filtration; and
- filtered waste from HCl leach and filtration.

Residue streams from these processes will first be filtered to recover additional minerals prior to process waste residue disposal. The filtered process waste residues will then be neutralised separately prior to in-pit disposal. This will be achieved through contact with the Calcium rich concentrate collected in the flotation process in a series of stirred tanks. Additional Calcium rich material may be sourced from the waste rock if required. Final pH adjustment will be achieved through the addition of calcined lime. The neutralised process waste residues will then be filtered in large plate and frame filters to reclaim water.

The filtered, neutralised process waste residue streams are to be co-disposed into the pit with acid consuming waste rock. All process waste residue streams will be mixed prior to disposal via a scrubber. The mixed process waste residue will be trucked to the pit where it will be placed and allowed to dry and compact. Additional mechanical assistance (i.e. dozing/ripping/rolling) may be needed to assist the drying and compacting process. As it meets compaction objectives, fresh process waste residue can then be placed on top of compacted process waste residue. The interim storage facility will be used to aid in process waste residue drying and provide short term contingency storage.

Residue material can be characterised into three components with their properties and proposed management strategies (RGS 2023) briefly described as follows:

- Process water supernatant is an aqueous product with a pH of 7.4 due to the addition of limestone and calcium hydroxide. Salinity is predicted to be moderately saline. Concentrations of major cations, anions, and trace elements in treated supernatant are predicted to be low or below the limit of reporting and comparable to leachate from Allaru Mudstone unit. The treated supernatant is suitable for re-use as recycled water or may be suitable for environmental release depending on flow conditions.
- Calcite neutralised supernatant is an aqueous phase with a pH of between 9.3 to 9.7, is mildly alkaline and moderately saline. Soluble concentrations of major cations, anions, and trace elements in the treated supernatant are low or below the limit of reporting with the exception of molybdenum, strontium, and vanadium. The calcite treated supernatant is suitable for re-use as recycled water or may be suitable for environmental release depending on flow conditions.
- Calcite neutralised residue are a solid phase material with a pH ranging between 9.9 to 10.6 and are moderately alkaline and saline. The total sulphur is 7.5 and are classified as non-acid forming, with a negligible risk of net acid producing potential. Soluble concentrations of major cations, anions, and trace elements in treated residue are low or below the limit of reporting with the exception of molybdenum,

strontium, and vanadium. Overall, pilot analysis undertaken by RGS (2023) of treated residue have a slight risk in terms of saline drainage but a low risk of acid of metalliferous drainage.

Raw HPA residue stream includes an aqueous and solid component that is acidic and contains elevated salts and metals and can be categorised as follows:

- HPA residue pH 4 supernatant is an aqueous phase sample with pH 3.0 and titratable acidity of 3,030 mg/L (as CaCO3). The measured titratable acidity value infers that the equivalent mass of Ca(OH)2 would be required to bring the pH up to 8 to 9. The supernatant is strongly saline at 7,480 µS/cm and is dominated by sulfate at 6,580 mg/L. Concentrations of major, minor and trace metal(loids) are elevated, especially for some elements that have increased solubility at low pH (e.g., Cd, Cs, Co, Cu, Fe, Mn, Ni, Y, and Zn). The supernatant will need to be neutralised to precipitate major, minor and trace metal(loids). The precipitates are an increased risk due to the potential for AMD and will require management such as encapsulation with other hazardous material.
- HPA residue pH 4 had a small sample mass (140 g) and due to its water holding characteristics, could not generate sufficient leachate for a full soluble ME analysis suite. pH was measured as pH1:5 4.5 with total sulfur at 22.4% and was classified as Acid Forming. This sample is saline with an EC of 2,440 µS/cm. Soluble sulfate is 1,440 mg/L in a 1:3 w:v 16 hour leach. Measurements of major cations and anions verified lower concentrations of Mg, Na, K, and SO4 compared to the pH 2 sample, but higher concentrations of calcium and chloride. Overall, concentrations of soluble minor and trace metal(loids) were much lower in the HPA residue pH 4 sample due to the precipitation of metal(loids) and some major ions (sulfate); conversely there is a much higher high concentration of Ca (179,000 mg/kg).

To mitigate the environmental risk posed by the raw HPA residue the residue will be pH neutralised with the calcite flotation stream or the addition of limestone from the TLBA unit to reach a pH of 8.5 to 9. This waste stream will then be blended with the main vanadium process residue.

Combined process waste streams will be placed on the potentially reactive pit floor quickly, in accordance with the Mine Waste Management Plan (RGS 2023b).

3.5.11 Backfilled void assessment

As mining progresses, the open-cut pit will be backfilled to surface. Waste material will be rehandled at the end of mining to ensure that no residual void remains. Mixed, non-acid forming residue is to be placed over the mudstone floor and covered with approximately 50% of the limestone waste rock at a ratio of 1:5 (residue: limestone material). All of the Wondoola Beds, Allaru Mudstone. Quaternary Alluvium and remaining soils will then be placed over the limestone material. The process of residue placement and backfill in detailed in the Mine Waste Management Plan (RGS 2023b).

The surface of all rehabilitated landforms will comprise a 2 m growth medium cover with 1.5 m of suitable sub-soils and 0.5m of topsoil (A and upper B horizons). Soil covers systems proposed aim to reinstate pre-mine vadose conditions that will minimise seepage to the regolith.

An assessment of the post closure backfilled void water quality was undertaken by RGS (2023). The rate that water will percolate through the backfilled material or drain laterally into the backfilled pit as seepage of groundwater is assumed to be very low due to low average annual recharge rate to groundwater from rain (1 or 2%) in this region and the projected groundwater flows into the operating pit and then into the backfilled pit determined in the Groundwater system (JBT 2023). It is expected that when water does penetrate through the backfilled material above the residue material, lateral flow of water will direct pore water across the residue rather than vertically through to the groundwater system (RGS 2023).

Maintaining mildly alkaline pH (pH 8 to 9) in the backfilled mine voids will result in low concentrations (or concentrations below detection) of some elements (aluminium, cadmium, cobalt, copper, iron, manganese, nickel, and zinc). The elements such as molybdenum, strontium and vanadium present at low mg/L concentration will maintain environmental mobility as they are less prone to precipitation, but other attenuation mechanisms with organic components, and clay minerals under anoxic or reducing conditions or co-precipitation with other metalloids, is likely to reduce soluble concentrations of these elements over time.

The quality of the water for the backfilled scenarios was modelled as not being significantly different to the measured groundwater quality so adverse impacts to groundwater quality are considered unlikely. Further, adverse effects to the receiving environment from porewater in the voids of the backfilled material is further mitigated by the fact that the characteristics of the Saxby River, located south of the Project area, including (JBT 2023):

- the Saxby River is conceptualised as being disconnected from the regional groundwater system in the Project area and is neither a gaining, or losing stream in the Project area; and
- the water in the Toolebuc Formation where any future backfilled void water table will develop decades or centuries into the future is not a source of groundwater extraction for landowners who preferentially draw on groundwater from the much deeper Gilbert River Formation.

Adverse effects to groundwater in the receiving environment are further decreased as the accumulation of porewater within the backfilled void will occur over many decades or even centuries.

The Groundwater Assessment (JBT 2023) and the backfilled void assessment (in RGS 2023) have been provided in full in Appendix E.

3.5.12 Mine Waste Management Plan

A Mine Waste Management Plan (MWMP) was developed for the Project (RGS 2023b) to ensure that mine waste materials (including overburden and process residues) are managed in accordance with Queensland mining industry standards and regulatory requirements. Key objectives of the MWMP are:

- effective characterisation of mine waste to predict, under the proposed placement and disposal strategy, the quality of any surface runoff and seepage generated concerning potentially environmentally significant effects including salinity, acidity, alkalinity and dissolved metals, metalloids and non-metallic inorganic substances;
- a program of progressive sampling and characterisation to identify dispersive and non-dispersive waste rock and the salinity, acid and alkali producing potential, metal and acid concentrations of mine waste materials;
- a material balance and disposal plan demonstrating how potentially acid forming mine waste will be selectivity placed and/or encapsulated to minimise potential generation of acid and metalliferous drainage (AMD), where relevant;
- re-testing of mine waste geochemistry and water quality limits of parameters;
- where relevant, a sampling program to verify encapsulation and/or placement of potentially acid forming (PAF) mine waste materials;
- data for run-off water quality;
- how often the performance of the plan will be assessed; and
- the indicators or other criteria on which the performance of the plan will be assessed.

Monitoring of solid materials and contact water associated with the backfilled areas will be an important part of the on-site management of mine waste materials and will be completed in accordance with the approved EA and the MWMP.

An annual review of the MWMP will be undertaken, and where management practices are not effective, changes to the plan will be made and implemented where practicable.

3.5.13 General rehabilitation methodology

The rehabilitation practices used at any mining site inevitably evolve as knowledge is gained from experience in the following areas:

- early rehabilitation successes and failures;
- weather, subsoils, soils, local flora and fauna and revegetation species; and
- site preparation, seeding practices, the maintenance and repair of previously rehabilitated areas and/or local agricultural practices.

For this reason, the rehabilitation practices outlined in the following subsections should not be interpreted as the precise method that will be used from this point on, but rather as a record of the current rehabilitation knowledge and intent at the time of writing; and with the expectation that rehabilitation practices will further evolve and develop from this point on.

While rehabilitation objectives, performance indicators and completion criteria for the Project are detailed at sections 3.5.1 to 3.5.4, from the perspective of operational rehabilitation planning and practice, the following overarching principles are considered key:

- Ensuring that reshaped areas proposed for rehabilitation meet the required landform design principles, that prepared areas meet the rehabilitation design specification for the area, and that local site drainage has been considered and surrounding areas graded to mitigate any rainfall run-off from adjacent areas to impact prepared rehabilitation areas.
- Topdressing materials, final surface preparation methods and soil amelioration activities have the objective of supporting vegetative growth.
- Revegetation species selection, seeding and/or planting methods, and fertiliser applications target rapid vegetative ground cover effective at mitigating soil erosion, during the period of initial revegetation when areas are most at risk.
- Ongoing monitoring and maintenance are used both to assess rehabilitated area performance against completion criteria as well as to feedback to, and update rehabilitation practices; and to identify maintenance or modification requirements such that rehabilitation areas are proceeding along a trajectory towards the designated PMLU.

3.5.13.1 Topsoil and subsoil resources

Geochemical characteristics – topsoils

Topsoil for this assessment is based on viable mine scale soil stripping approaches (not soil morphology) and is defined as soil from 0 to ~ 0.5 mbgl (RGS 2023). The topsoil is likely to include the A and the Upper B horizon. The pH of topsoils is neutral to mildly alkaline, ranging between 6.6 to 9.5. The pH of topsoils is attributed to the prevalence of calcite in the soil and regolith strata. Topsoil samples have < 0.4% total sulphur and essentially no reducing sulphur. Sulphur in topsoils is present as sulfate minerals such as gypsum and barite and acid conditions are highly unlikely due to the moderate acid neutralising capacity. Geochemically, topsoils are classified as either non-acid forming, non-acid forming-low capacity or acid consuming. As such, topsoils remain neutral to mildly alkaline at 6.6 to 9.5.

Approximately 88% of topsoil samples have negligible to mild EC, ranging between 17 to 616 µS/cm, with the potential for salts leaching considered very low. Exchangeable sodium potential results indicate that topsoil resources have a low risk of dispersion. Based on exchangeable sodium potential results, some soils could be considered sodic, however, most of the samples have a very low ESP due to the prevalence of calcium in the system.

Concentrations of total and dissolved metals/metalloids and water soluble are consistently in the lower range of results for the deposit. Topsoils have some potential to be dispersive, however, the balance of the samples are non-dispersive due to the low ESP and higher proportion of calcium in the soil matrix.

Topsoils have a moderate clay content (31%) that is similar to the Allaru Mudstone. The cation exchange capacity is 6 to 22.7 meq/100g, which is considered low for clay and is due to the even proportions of silt and

sand sized fractions. Physical analysis indicates that topsoils are moderately plastic, have moderate moisture retention and moderate shrink/swell.

Based on geochemical assessment results, nutrients within topsoils are considered adequate to support native vegetation and are suitable for use in rehabilitation. Soils of the Project region are known to be susceptible to erosion and this hazard has been addressed through the landform designs aspects such as slope design.

Geochemical characteristics – subsoils

Subsoil for this assessment is based on viable mine scale soil stripping approaches (not soil morphology) and is defined as soil from 0.5 to 2 mbgl (RGS 2023). The subsoil is likely to include the B and C horizon. Subsoils have a neutral to mildly alkaline pH ranging between 7.6 to 9.6. Subsoils contain no sulphide-sulphur and as such have low to high acid neutralising capacity. There is not potential for acid mine drainage. Total sulphur in subsoils, where present, is likely due to the presence of gypsum in the deposit. Geochemically, the subsoils are predominately non-acid forming, with 12% of samples classified as acid consuming.

Electrical conductivity in subsoils is highly variable, ranging from 18 to 2,830 µS/cm. Variability in EC is likely a result of sampling methods and variability in the depth of the soil horizons. The salinity in the subsoil is attributed to sodium chloride and sulfate.

Soil texture ranges from clay to loam. There is a correlation between CEC and exchangeable sodium potential, suggesting that clay particles are an important factor. Plasticity and moisture retention properties are influenced by particle size distribution and are slightly lower in subsoils compared to topsoils. Subsoils have some potential for dispersion. Metal/metalloid concentrations are mostly higher in subsoils compared to topsoils/ Overall, the subsoil samples are considered suitable for use in rehabilitation.

Soil characterisation and stripping depth

Analysis of soil properties were also undertaken as part of the Soils and Land Suitability Assessment for the Project to provide an analysis of soil suitability for rehabilitation activities and to advise management practices (AARC 2023a).

The Mitchell soil mapping unit contains moderate CEC, contributing to relatively good capacity to retain nutrients on aggregate and clay mineral surfaces and the small amount of organic matter throughout the profile. The top 0.5 m of the solum does not indicate any sodicity or salinity concerns. Dispersive characteristics are observed only from 0.5 m depth. The lower solum is also limited by strongly alkaline pH limiting the availability of essential nutrient for plant growth at 0.6 m depth and deeper. Therefore, maximum stripping depths should not exceed 0.5 m for Mitchell soils, with deeper materials reserved for use as sub-soils to be placed on waste rock landforms.

The profile of Soapberry soils is non-sodic but presents slaking characteristics below 0.3 m and is therefore potentially susceptible to erosion if exposed. The proposed rehabilitation strategy is to strip topsoils to 0.5m and mix this soil type with other less dispersive soils before placement. Alternatively, this topsoil unit may treated with gypsum or segregated use on flat areas that are not subject to erosion. Deeper materials will be reserved for use as sub-soils to be placed on waste rock landforms.

The Gum soil mapping unit is suitable for rehabilitation purposes to a depth of 0.5 m as the topsoil does not indicate concerns with pH, salinity or sodicity. Although the subsoil below 0.2 m is considered non-sodic, minor dispersion may be expected to occur upon wetting (evidenced by Emerson aggregate stability test), causing possible issues with erosion and soil stability. The proposed rehabilitation strategy is to strip the soil unit to a depth of 0.5m, to be used as topsoil. Amelioration and hay mulch may be added to improve topsoil properties, subject to ongoing soil testing. Deeper materials will be reserved for recreation of subsoils on waste rock landforms.

Amelioration of Gum and Soapberry soils is recommended with an admix of the Mitchell SMU clay material, particularly as a replacement topsoil (A horizon) to aid soil water retention and cohesive structure and to avoid rapid drainage to rock substrate, and erosion. A surface application of gypsum at a low rate before seeding, would serve to improve structural stability. Any application of organic matter as a mulch would benefit both erosion protection, retain soil moisture, improve topsoil organic matter and improve structural stability.

Estimates of the topsoil and subsoil material balance indicates there will be sufficient soil resources available for rehabilitation activities. It is estimated that approximately 3,450,500 m^3 of suitable topsoil material and 6,385,000 m^3 is required for rehabilitation activities. It is estimated that there approximately 6,290,000 m^3 of topsoil material and 11,737,000 m^3 will be available from on-site stripping (Table 16).

Table 16: Recommended stripping depth and volume of soil resources

Soil type	Area (m^2)	Topsoil stripping depth (m)	Potential topsoil volume (m^3)	Subsoil stripping depth (m)	Potential subsoil volume (m^3)
Mitchell	23,020,000	0.5	11,510,000	0.5 – 1.5	34,530,000
Soapberry[1]	420,000	0.5	210,000	0.5 – 1.5	630,000
Gum[1]	8,010,000	0.5	4,005,000	0.5 – 1.5	12,015,000
		Total topsoil = 15,725,000 m^3		**Total subsoil = 47,175,000 m^3**	

1. soils where amelioration measures (e.g., gypsum), or actions (e.g., mixing) are considered beneficial to achieve a satisfactory grazing land use outcome

Topsoil stockpiling

Where possible, topsoil should be directly placed in prepared rehabilitation areas, rather than stockpiled, to assist in maintaining a viable seedbank and promote timely revegetation. Stockpiling of topsoil for extended periods can lead to physiochemical and biological deterioration in the soil and affect the viability of the soil seed bank.

For the soils in the Project area it is recommended that the top 0.5 m of all soils be stripped and stockpiled separately to sub-soils to maintain the valuable vegetative organic matter, seedstock, and limited nutrients that occur in the surface layers.

Where stockpiling of topsoil is required, the following recommendations for soil management will reduce the risk of soil degradation and improve the chances of rehabilitation success (IECA 2008):

- Stockpiles should be located in areas outside of mining activities and well away from any existing drainage courses or zones of overland flow that may pose and erosion threat;
- Locations should be protected from wind erosion where possible and be restricted from stock, vehicles or other mechanical disturbances;
- Stockpiles should generally be less than 3 m high with a batter no steeper than 1:4 and be constructed and positioned in a manner that encourages water drainage and discourages erosion. The surface of the stockpile should be flat;
- If stockpiles are to remain for six weeks or more without addition, then appropriate erosion and sediment controls need to be put in place (refer IECA 2008);
- If stockpiles are to remain for substantial periods, then revegetation with appropriate grass seeding should be undertaken. This is to minimise erosion, encourage increases in organic matter, microbial activity and nutrient levels whilst minimising weed growth and encouraging native vegetation regrowth;

- If there is a risk of a grass cover not establishing voluntarily, stockpiles will need to be ripped and seeded with a quick establishment pasture. Topsoil should ideally be stockpiled for the minimum time. Studies in the Hunter Valley have shown that most deterioration occurs within the first year (Keipert et al. 2005);
- Stockpiles should be monitored for erosion and weeds and control measures implemented as appropriate as required, or at least every three months; and
- Where soil has been stockpiled for extended periods (more than 12 months), soil testing is recommended before use for rehabilitation purposes. If required, fertilisers and soil ameliorants should be applied.

Topsoil placement

Topsoil resources will be sourced predominantly from the Mitchell SMU and will also be uses as material to mix with the sandier soil materials from the other two soil units. Organic matter, in the form of degrading mulch, should be applied to Mitchell topsoils to support vegetation growth.

The use of Soapberry and Gum topsoil resources require management practices such as mixing with Mitchell soils prior to respreading of topsoil to reduce erosional risk.

It is important to establish a sufficient vegetative cover to mitigate erosion risk, particularly as rehabilitated slopes increase. To promote revegetation success, topsoil from both SMUs will require application of one or more of the ameliorations with organic matter or fertilises is recommended.

Topsoil will be placed at a minimum thickness of 0.5m on waste rock landforms and 0.2 m elsewhere to create a growth medium of sufficient depth to hold water and support revegetation. A 1.5m subsoil layer will also be placed on waste rock dumps to assist water retention in the rooting medium and to minimise infiltration. For all rehabilitated areas, deep ripping to a depth of at least 0.3 m – 0.5 m of the landform after topsoil placement should be undertaken to key the topsoil and subsoil layers / waste rock material together, and to improve seed germination conditions (Corbett 1999; Australian Government 2016).

Amelioration

The addition of organic matter improves soil structure by creating a binding effect and also provides a source of nitrogen, phosphorus, and sulphur. Significant improvement to revegetation response has been observed through increased phosphorus and nitrogen uptake in sandy soils (Fierro *et al*. 1999).

Depending on availability, additional organic matter such as hay mulch should be laid as a surface cover and incorporated into the topsoil. Application rates will vary depending on mulch type. Hay mulch is recommended to be applied at a rate of 8 t/ha.

Application of fertilizers is not expected to be necessary to re-establish native grassland species but may be considered where alternate species are desirable. If applying fertilisers they should be incorporated into the soil, preferably to a depth of approximately 0.3 m (using a scarifier or ripper tines) prior to mulching. This is to prevent loss of nutrients through wind erosion or water erosion.

Natural methods of increasing soil nitrogen levels may be applied through the incorporation of native leguminous forbs such as Barrel Medic (*Medicago truncatula*), Spineless Burr Medic (*Medicago polymorpha var. brevispina*) and Disc Medic (*Medicago tornata*) to the seed mix at 2 – 3 kg/ha. It is best sown at the end of the dry season or early in the wet season. The legume species are capable of fixing nitrogen, as well as establishing a natural nitrogen cycle within the topsoil resulting in long-term improvements in soil fertility and self-sustaining vegetation.

Gypsum application

Gypsum is recommended for use on Soapberry and Gum soils. Application rates will vary based on soil testing, however, application of 2.5 – 5 t/ha broadcasted has been shown to provide long term improvement to soil structure (Abbott and McKenzie 1996; GRDC 2021).

Cover crops

Subject to soil testing, cover crops may be used to provide a rapid ground cover and assist in achieving soil stabilisation on slopes. *Echinochloa esculenta* (Japanese Millet) could be used for summer applications and *Avena strigose* (Saia Oats) for cooler season applications. In the transition between cool and warm-hot seasons, a combination of both species can be used.

3.5.13.2 Landform preparation

The final landform will be reshaped and profiled according to the final landform design and specifications outlined in section 3.5.6.

3.5.13.3 Surface preparation

The approach to surface preparation will involve:

- Identification of the topsoil resource to be utilised for a given rehabilitation area, and the carrying out composite soil sampling and agronomic laboratory analyses.
- Determination and procurement of type and quantity of ameliorants that would be beneficial for the topsoil resource (if needed).
- Subsoil and topsoil should be placed by scraper or truck at the top of the profiled slope and pushed by dozer or grader to achieve desired thickness;
- Following fine spreading of topsoil, the dump surface should be ripped (dozer or grader) to a depth of between 0.3 m -0.5 m with a distance between rips of approximately 1 m, to encourage infiltration of water for plant growth.
- Seeding of topsoil is to occur as soon as possible to encourage plant growth and prevent soil loss erosion.

3.5.13.4 Revegetation

The key objective of the Project's revegetation plan is to ensure that a self-sustaining vegetation community is established. The plant species should aim to conform to the agreed PMLU and/or reproduce the pre-existing community composition.

To maximise revegetation success, revegetation activities will be scheduled during spring before the heavy wet season rainfall begins. Seeding may also occur during the summer months, depending on rainfall. Seeds will be sown using direct seeding or tube stock depending on the species and areas to be revegetated.

Seed stocks will be checked for viability upon purchase and seeded as soon as possible. Seeds may be spread by hand or tractor. Hand seeding is suitable for small areas up to 5 ha, tractor with a rear spreader attached is more suitable for larger areas. Seeds should not be buried over 5–10 mm in depth in the soil.

Areas will be seeded at rates indicated in Table 17 for the applicable PMLU. A provisional seed selection has been developed from a complete list of identified flora species within the Project area identified during the Terrestrial Ecology Assessment (AARC 2023b) including the dominant species found within the field verified vegetation communities. The seed mixes listed are indicative and are subject to change with season, availability, and following assessment of rehabilitation performance. However, it is noted that a minimum of four species will be seeded with the total seeding rate to be retained. All species listed are suited to the central Queensland climate and site-specific environmental conditions.

Recommended seed sowing rates have been selected based on recommendations from the Department of Agriculture and Fisheries (2017), relevant guidelines (DAFF 2013; CoA 2016), and Future Beef (2022).

To improve soil condition and reduce erosion during vegetation establishment, legume species and a high density of cover crop have been included into the seed mix as per the recommendations in the Soil and Land Suitability Assessment (AARC 2023a).

Monitoring of rehabilitated areas will commence at the wet season following rehabilitation works and will be carried out in conjunction with the Rehabilitation monitoring and maintenance program (section 3.7.1).

Table 17: Indicative pasture species seed mix[1]

Common name	Species name	Indicative seeding rate (kg/ha)
Mitchell Grass	*Astrebla sp.*	6
Feathertop Wiregrass	*Aristida latifolia*	5
Silky Browntop	*Eulalia aurea*	3
Golden Beardgrass	*Chrysopogon fallax*	2
Common native couch	*Brachyachne convergens*	2
Katoora grass	*Sporobolus actinocladus*	2
Currant bush	*Scaevola spinescens*	0.5
Medic sp.	*Medicago tsp.*	2
Japanese Millet (Summer cover crop)	*Echinochloa utilis*	30
Saia Oats (Winter cover crop)	*Avena strigosa*	30
Total		**22 (excluding cover crop)**

1. Minimum of four species listed within the table to be seeded, with the total seeding rate to be retained.

3.5.13.5 Built Infrastructure

All built infrastructure, apart from mine water storages (excluding Interim Residue Storage Facility) and mine access roads/tracks, will be decommissioned and removed following the cessation of mining activities. For any roads or infrastructure to be retained, a written agreement will be entered into with the underlying landowner that transfers liability for the structure and its use to the landowner.

Plant, equipment, sewage treatment plant, effluent infrastructure and building infrastructure footings will be excavated to a depth of at least 1 m below ground level. Disturbed areas will then be recontoured to the approximate pre-mining landform and revegetated. Carparks and hardstands will be removed, reprofiled, topsoiled and seeded. Any compacted areas will be deep ripped.

All residue material will be removed from the Interim Residue Storage Facility. The top 0.25 m of material surface will be removed and disposed of in-pit. The storage facility will be topsoiled with 0.25 m of topsoil material.

Rehabilitation activities associated with the retained dams will include the revegetation of embankments for erosion stabilisation and permanent access for wildlife and stock. Retained dams will have a PMLU of water storage for stock watering.

Where required, a land contamination investigation will be undertaken by an appropriately qualified person confirming the land does not present an unacceptable risk to proposed future land uses or the environment. Any identified contaminated material incompatible with the proposed PMLU will be either treated *in-situ* or on-site, confined by burial, or removed, transported to an approved landfill for disposal or alternatively risk assessed and listed on the environmental management register to the extent necessary.

3.6 Risk assessment

3.6.1 Risk assessment requirements

Section 126C(1)(f) of the EP Act requires the PRCP to identify the risks, for each PMLU, of a stable condition not being achieved and how the applicant intends to manage or minimise the risk.

A risk assessment has been carried out in accordance with the following standards:

- AS/NZS ISO 31000:2018 Risk management – Guidelines; and
- HB203:2012 Managing environment-related risk.

3.6.2 Risk assessment process

Any risk assessment needs to be undertaken with consideration of the scope, context and criteria relevant to the assessment. For this risk assessment, the following scope and purpose was discussed and agreed to:

> *The purpose of this risk analysis is to identify the risks of a stable condition for land not being achieved for the agreed PMLUs nominated, and the approach to be taken to manage and minimise the risks identified.*

For this risk assessment, risk scenarios (or 'threats') were identified and considered for each rehabilitation area associated with the Project. The causes attributable to each risk scenario were documented as well as the potential impacts. Existing controls were noted, defined as those reasonably expected to be in place for a Project of this nature and having appropriate and contemporary management systems. Each risk scenario was then assessed with respect to health, safety, the environment, and compliance against the risk assessment schema outlined in Section 3.6.3.

3.6.3 Risk assessment schema

Risks specific to the rehabilitation of the Project were classified using the risk classification schema described below. The risk assessment schema used is comparable to those used widely within the mining industry and comprises the following components:

- a control effectiveness ranking (Table 18) used for assessing the operational controls expected to be in place for a project of this type;
- a likelihood classification descriptors table (Table 19); and
- a consequence classification descriptors table (Table 20) intended to guide a consistent assessment of consequence.

Following a consensus determination of likelihood and consequence, the risk level was determined using the matrix shown in Table 21. For any risks classified as 'significant' or above, additional mitigation and management measures were identified and documented. Mitigation and management measures were also documented for some lower-level risks, where these were feasible if required.

Table 18: Control effectiveness ranking

Control Rank	Description	Guidance
C1	Substantially effective/adequate design	Controls considered adequate and operating effectively on almost all occasions
C2	Mostly effective/adequate design	Controls considered adequate and operating effectively on most occasions
C3	Inadequate design/partially effective	Controls considered inadequate or only operating to partial effectiveness on most occasions
C4	No controls/ineffective	There are no controls, or the existing controls are operating ineffectively on all occasions

Table 19: Likelihood of exposure to the hazard

Level of Risk Probability	Descriptive Guidance	Probability	Frequency
Highly Likely	The event is expected to occur in most circumstances	>25%	The event and consequence are expected to occur at least twice per year
Likely	The event will probably occur in most circumstances	10% - 25%	The event and consequence are expected to occur once to twice per year
Possible	The event could occur at some time	1% - 10%	The event and consequence are expected to occur at least once in 1 to 10 years
Unlikely	Not expected but the event may occur at some time in the future	0.1% - 1%	The event and consequence are expected to occur at least once in 10 to 100 years
Rare	The event may occur only in exceptional circumstances	<0.1%	The event and consequence are expected to occur less than once in every 100 years

Table 20: Consequence classification descriptors

Category	Consequence Scale				
	1. Very Low	**2. Low**	**3. Moderate**	**4. High**	**5. Very High**
Safety & Health	• Reversible health effects of little concern • Low-level, short-term subjective symptoms • First aid treatment	• Reversible health effects of concern • Medical treatment • Reversible injuries requiring treatment, but not leading to restricted duties	• Severe reversible health effects of concern • Lost time illness/injury • Reversible injury or moderate irreversible damage to one or more persons	• Single fatality or irreversible health effects or disabling illness or severe impairment to one or more persons	• Multiple fatalities or serious disabling illness to multiple people
Environmental	• Near-source confined and promptly reversible impact (a shift)	• Near-source confined and short-term, promptly reversible impact (a week)	• Near-source confined and medium-term recovery impact (on-site a month, off-site a week)	• On-site impact that is unconfined and requiring long-term recovery or residual impact • off-site impact that is near source confined • recovery on-site = years, off-site a month	• Impact that is widespread unconfined and requiring long-term recovery, leaving major residual damage
Legal/ Compliance/ Regulatory	• Non-conformance with internal requirement with very low potential for impact • Non-compliance with community commitment goes unnoticed by external parties, minimal effort to correct	• Non-compliance with external or internal requirement with low potential for impact • Formal censure • Non-compliance with community commitment, requiring limited effort to correct	• Non-compliance with internal/external requirement with moderate impact • Moderate penalties for breach of permit • Non-compliance with community commitment reported formally	• Breach of licence(s), regulation with high potential for prosecution • Systemic internal standards breach-high impact • Community commitment breach	• Suspended or severely reduced operations imposed by regulators • Breach of community commitment results in direct loss of established consents

Table 21: Risk level classification matrix

Likelihood	Consequence				
	Very Low	**Low**	**Moderate**	**High**	**Very High**
Highly Likely	Class II	Class III	Class IV	Class IV	Class IV
Likely	Class II	Class III	Class III	Class IV	Class IV
Possible	Class I	Class II	Class III	Class IV	Class IV
Unlikely	Class I	Class I	Class II	Class III	Class IV
Rare	Class I	Class I	Class II	Class III	Class III

3.6.4 Risk assessment outcomes and management

In total, 54 risk scenarios or hazards were identified and assessed. Risks were identified then re-assessed to identify if additional controls that could be introduced to lower the risk ranking. The final outcomes of the risk assessment are detailed in which provides a summary of the risk classifications made by rehabilitation area. Thirty-five Class II risks were identified and have been classified into the following categories:

- sustainable PMLU, relating to the inherent risk of pests, weeds, reduced groundcover and backfilling the void;
- erosional risk, relating to landform stability and consequences of ongoing erosion if adequate groundcover is not achieved;
- natural hazards, relating to the inherent consequence of fires and extreme weather;
- safety, relating to the inherent consequence resulting from dam failure or overtopping;
- non-polluting/other, relating to the inherent consequence of land contamination and mobilisation of acid mine drainage, saline drainage and metals/metalloids through waste rock;
- geochemical, relating to the inherent consequence of mine affected water and geochemical characteristics impacting the groundwater system; and
- geotechnical risk, relating to the inherent consequence of slope failure.

The final outcomes of the risk assessment are summarised in Table 22. Risks associated with the Project have been considered in the rehabilitation management and monitoring methodology used to inform the completion criteria and PRCP schedule. The detailed risk assessment outcomes are included at Appendix F.

Table 22: Risk assessment outcomes considering management controls

Risk area	Risk level				
	Class I	Class II	Class III	Class IV	Total
Mine infrastructure area	5	2	0	0	**7**
Retained water infrastructure	3	2	0	0	**5**
Rehabilitated water infrastructure	4	6	0	0	**10**
Out of pit waste rock dump	4	7	0	0	**11**
In-pit waste rock dump	3	16	0	0	**19**
Natural hazard	0	2	0	0	**2**
Total	**19**	**35**	**0**	**0**	**54**

3.7 Monitoring and maintenance

3.7.1 Annual rehabilitation monitoring

Rehabilitation will be monitored on an annual basis, with the survey period occurring post wet season, as monitoring at this time allows for more accurate identification of the species present and a clearer understanding of species richness on-site. Where sufficient data is acquired that demonstrates that rehabilitation is clearly on a trajectory to achieve milestone criteria, the frequency of monitoring may be reviewed.

The rehabilitation monitoring program aims to achieve data collection at sufficient spatial and temporal resolution to ensure statistically valid results. The following methods are employed at each monitoring site and described in detail in the following sections:

- permanent vegetation monitoring transects (ground cover monitoring and species richness);
- photographic monitoring;
- erosion monitoring;
- topsoil characterisation (every 2–3 years).

Rehabilitation areas will be visually assessed to identify signs of fauna utilisation, noticeable issues such as erosion, vegetation cover deficiencies, or weed and / or pest infestations. Satellite imagery technology may also be employed. These observations are incorporated with the results of each rehabilitation progress report.

3.7.1.1 Permanent vegetation monitoring transects

This method involves the collection of quantitative data on ground cover, species richness, and tree and shrub density within each plot at monitoring sites. Each monitoring site is demarcated by a 50 m long transect and observations/ measurements are taken 5 m on either side of the transect, thereby representing an effective plot size of 50 m by 10 m. A plastic delineator post guide is installed at each end of the transect

to ensure the exact location of the permanent transect can be identified, ensuring robust sampling repetition.

To measure species richness, all vascular plants occurring within 5 m of either side of the 50 m transect are recorded. Any species unable to be identified are collected for later identification. Percentage ground foliage cover for each species is recorded within ten 1 m x 1 m quadrats placed every 5 m along the 50 m transect, alternating sides. In each quadrat, the percentage cover of rock, bare ground, organic litter (for slopes ≥10%), and each plant species present is recorded. Species are classified into one of the following six groups for reporting purposes:

- native pasture species;
- exotic pasture species;
- trees;
- shrubs;
- forbs; and
- noxious weeds.

This methodology is used to record species richness and the projective foliage cover (PFC) on the transects to assess against milestone criteria. It should be noted that due to the pastoral nature of rehabilitation sites, the PFC is inferred from the vegetation cover measured at each transect.

The above methodology has been adapted based on information contained within the *BioCondition Assessment Framework* (Eyre *et al.* 2015), the *Vegetation Assessment Guide* (DoE 2013), and the *Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland* (Neldner *et al.* 2022).

3.7.1.2 Photographic monitoring

Photographic monitoring at monitoring sites shows a visual comparison over time of the vegetation, ground cover, erosion, and general appearance of each monitoring site.

A digital camera is used to take photos. Photos will be retained in a database to provide a permanent record for each monitoring site. The process consists of taking one photograph from the beginning of the transect facing towards the end of the transect, and another from the end of the transect facing towards the beginning.

3.7.1.3 Canopy cover

Tree canopy cover is an established means of characterising stand productivity, and the distribution and abundance of biomass (Eyre *et al.* 2017). It refers to the estimation of the percentage canopy cover of the living, native tree layer along a 50 m transect, using the line intercept method (Greig-Smith 1964). For this attribute, the vertical projection of tree canopy cover of the species making up the tree canopy cover is assessed. The vertical projection of the tree canopy over the 50 m transect is recorded as illustrated in Figure 38. The total length of the projected canopy of each layer is then divided by the total length of the tape to give an estimate of percentage canopy cover on the site.

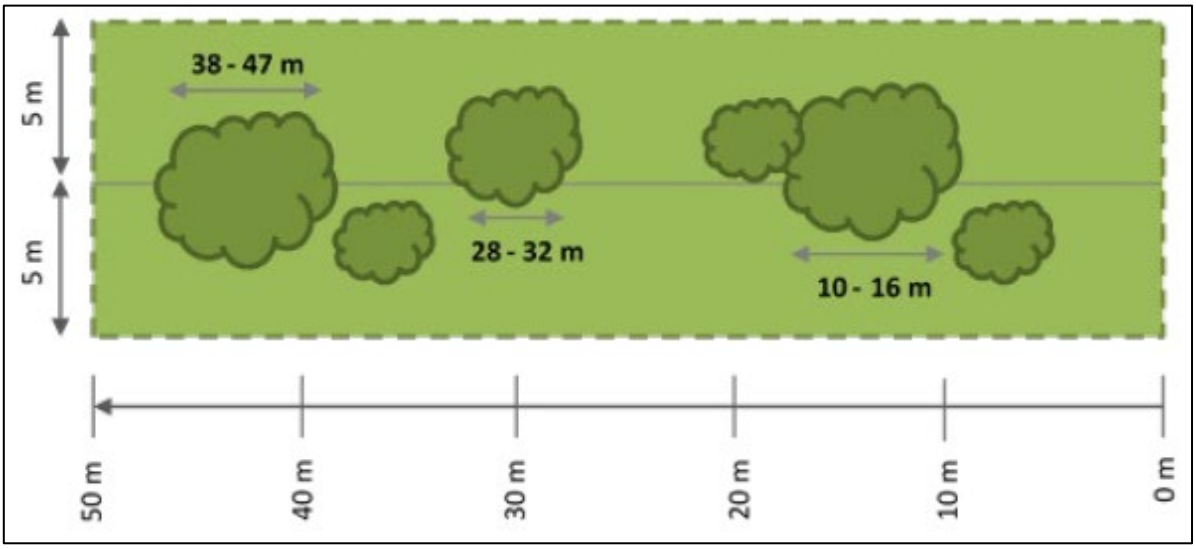

Figure 38: Guide to monitoring canopy cover (Eyre et al. 2017)

3.7.1.4 Fauna observations

Observations of any fauna species or indicators of fauna presence (e.g. scats, tracks or other signs of fauna activity) within or in the vicinity of the rehabilitation areas will be noted as part of rehabilitation monitoring.

3.7.1.5 Erosion monitoring

Erosion at survey sites is monitored through visual assessment over time. Assessment is undertaken by traversing the 50 m transects and recording the number and average depth of any erosion features, rill lines or gullies. It should be noted that the placement of permanent transects may not be representative of the level of erosion across the entire rehabilitated landform. To compensate for this, general observations undertaken during the survey are also utilised in assessing rehabilitation performance.

Table 23 outlines how erosion observed on site is classified. The overall classification of the erosion on each transect is determined by the highest classification attributed to either the number of rills/gullies or the maximum depth. For example, a transect may present only one or two rills but if these are recorded as being 25 cm deep, the transect will be classified as presenting a Moderate erosion classification. The occurrence of a gully requires a classification of 'Severe' or 'Extreme'.

Some erosion is expected in the first years due to topsoil ripping, an absence of vegetation and the frequency and severity of storm events. Therefore, erosion stability will be assessed from year four following seeding and/or planting. Monitoring will commence in the first year and the first three years will represent landform establishment.

The following information is recorded at each site:

- GPS reading of location;
- general description of type of erosion (gully [>30 cm], rill line [<30 cm]) and possible causes;
- depth of erosion;
- width of erosion;
- length of erosion;
- where eroded material is being deposited; and
- whether the erosion line is stabilised by vegetation.

Table 23: Erosion classification

Erosion classification	Minor	Moderate	Severe	Extreme
No. of rill/gully*	<15	15-30	31-50	>50
Maximum observed depth (cm)	<10	10-30	30-60	>60

*Gully: highly visible form of soil erosion, with steep-sided, incised drainage lines greater than 30 cm deep.

3.7.1.6 Satellite-derived fractional vegetation cover

Fractional vegetation cover (FVC) can be derived from operational satellite images by spectral unmixing when calibrated using field or extremely high-resolution imagery. The Project proposes to apply satellite based FVC to monitor the rehabilitation the progress against vegetation cover criteria for grazing PMLU areas. Fractional cover model will use the Landsat JRSRP v1 algorithm but apply local site calibration using extremely high resolution orthophotos or published field methods (Muir et al. 2011) to directly calibrate coincident satellite imagery. It is proposed to update fractional cover algorithms to maintain best scientific practise against published methods.

Green and non-photosynthetic vegetation cover within one meter of the surface is functional in preventing erosion. Most erosion on rehabilitated waste rock dumps occurs during vegetation establishment (Carroll *et al*. 2000). Establishment and maintenance of functional vegetation cover is essential. This cover must be tolerant of drought, maintain the required level of effective cover and provide a beneficial post mining land use that can be quantified.

Green fractional vegetation cover forms a small component of fractional vegetation cover for waste rock rehabilitation under permanent dryland conditions. Non-photosynthetic grass material is the dominant cover source for soil and waste rock at the end of the dry season. Confirming that functional protection in maintained is essential to demonstrating safe, stable, and sustainable rehabilitation.

Rehabilitation areas FVC will be compared to FVC of reference sites. Sustained high levels of fractional vegetation cover are essential to the safety, stability, non-polluting and sustainability (protection of limited topsoil) of post mining landforms.

A remote sensed FVC analysis allows monitoring of all rehabilitated pasture compared to ~1% assessed by transects. Further, satellite imagery can sustain monitoring at better than seasonal intervals. Fractional cover is defined as that fraction of a satellite imagery pixel condition across three ground cover classes being:

1) photosynthetic vegetation;

2) non-photosynthetic vegetation; and

3) bare ground.

A median value of FVC can be determined for all satellite imagery pixels within a defined polygon area (or set of combined polygons). Subject to certain limitations, a median FVC value can be determined for polygons enclosing a rehabilitation area which is then able to be compared with polygons enclosing a reference/analogue area that is representative of unmined land having similar landform, land cover and land use.

Satellite-derived indices will be reported annually based on one imagery acquisition per calendar month (12 per annum). Except where cloud cover or cloud shadow occlude the Project site in a calendar month, imagery of the area and acquisition metadata are assessed.

FVC is reported in graphical form with median and interquartile ranges for each rehabilitation polygon and combined reference area polygons. In addition, dates and duration of failure to achieve the target are reported in tabular form with mapping information for sources of non-compliance.

3.7.1.7 Topsoil characterisation

Topsoil sampling is not considered to be an annual requirement of the rehabilitation monitoring program. It is, however, to be undertaken approximately every 2–3 years to monitor development of the soil profile or to address any deficiencies in the chemical composition of the soil that may be detrimental to vegetation health.

Topsoil analysis will typically include the following suite of parameters:

- pH;
- EC/chloride concentration;
- exchangeable sodium percentage;
- cation exchange capacity;
- soil carbon;
- macronutrients (nitrogen, phosphorus, potassium and sulphur); and
- micronutrients.

Topsoil data collected as part of the monitoring program will ultimately be compiled into a land suitability assessment of the rehabilitated land.

3.7.1.8 Surface water and groundwater monitoring

Surface water and groundwater sampling will be carried out in accordance with the Queensland Monitoring and Sampling Manual (DES 2018) methodology. In situ measurements will be taken with a multi-parameter water quality meter that has been calibrated to the manufacturer's specifications. Monitoring locations will include:

- toe of the rehabilitated waste rock dump;
- within on-site water storages;
- at groundwater monitoring bores as specified in the EA; and
- surface water monitoring locations as specified in the EA.

Measurements will be taken following the wet season and/or after a significant rainfall event that enables surface water runoff to be collected from the surface of rehabilitated waste rock material. Field readings of pH, EC and TDS will be measured and compared against the milestone criteria. Measurements will also be taken from retained dams and compared against the milestone criteria. Data for each monitoring event will be compiled and used to identify trends in water quality over time. Measurements of molybdenum. Strontium and vanadium will be compared to both reference sites and pre-mining records.

3.7.2 Maintenance

Rehabilitation indicators and visual observations will be used to identify any aspects of the rehabilitated area that are of concern or suggest rehabilitated land is not on a trajectory of meeting the required completion criteria. These may include:

- evidence of active erosion;
- inadequate vegetation cover or growth;
- invasive weed or pest species;
- soil dispersion / instability; and

- soil infertility.

Following the annual monitoring process, areas of rehabilitation will be assessed for maintenance. An annual visual inspection of all rehabilitated areas will be undertaken to provide an overview of the status of the rehabilitation and identify any noticeable issues such as erosion or inadequate vegetation cover or growth. This information, along with monitoring results, will be used to inform the maintenance schedule.

Maintenance may include repairing areas of excessive soil erosion or undertaking supplementary plantings or seeding to increase floristic diversity and cover to assist in achieving completion criteria.

If issues re-occur, an investigation will be carried out to determine the reason and allow for remediation. Modification of rehabilitation methods and specifications may be required, and rehabilitation and maintenance planning updated accordingly.

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Appendix A. PRCP Schedule

Rehabilitation Area											
Rehabilitation area	RA1: Mine infrastructure area										
Relevant activities	Mineral processing plant, ore handling facilities and associated infrastructure, workers village accommodation, sewage treatment plant and effluent irrigation infrastructure, solar array and associated infrastructure, water extraction / release infrastructure and airstrip and associated fencing.										
Total size of rehabilitation area (ha)	154.5										
Commencement of first milestone: RM1	10 June 26										
PMLU	Grazing native vegetation										
Date area is available	10 Dec Year 26	10 Dec Year 30									
Cumulative area (ha)	134.3	154.4									
Milestone completed by	10 Dec Year 30	10 Dec Year 35	10 Dec Year 40	10 Dec Year 44							
Milestone reference	**Cumulative area achieved (ha)**										
RM1	134.3	154.4									
RM2	134.3	154.4									
RM5	134.3	154.4									
RM6	134.3	154.4									
RM7		134.3	154.4								
RM8			134.3	154.4							

Rehabilitation Area											
Rehabilitation area	RA2: Retained infrastructure										
Relevant activities	Mine access roads and tracks and Saxby River low level crossing.										
Total size of rehabilitation area (ha)	247.7										
Commencement of first milestone: RM10	10 June Year 27										
PMLU	Retained infrastructure										
Date area is available	10 Dec Year 26	10 Dec Year 30									
Cumulative area (ha)	8.0	247.7									
Milestone completed by	10 Dec Year 30	10 Dec Year 31									
Milestone reference	**Cumulative area achieved (ha)**										
RM10	8.0	247.7									

Rehabilitation Area											
Rehabilitation area	RA3a: Water Management infrastructure (rehabilitated to low intensity grazing)										
Relevant activities	Diversion drains regraded to natural landform and rehabilitated to low intensity grazing.										
Total size of rehabilitation area (ha)	52.4										
Commencement of first milestone: RM4	10 June Year 27										
PMLU	Grazing native vegetation										
Date area is available	10 Dec Year 26	10 Dec Year 30									
Cumulative area (ha)	39.5	52.4									
Milestone completed by	10 Dec Year 30	10 Dec Year 35	10 Dec Year 40	10 Dec Year 44							
Milestone reference	**Cumulative area achieved (ha)**										
RM4	39.5	52.4									
RM5	39.5	52.4									
RM6	39.5	52.4									
RM7		39.5	52.4								
RM8			39.5	52.4							

Rehabilitation Area											
Rehabilitation area	RA3b: Water management infrastructure (retained for stock watering)										
Relevant activities	Raw water dam, sediment dams, Pit Dewatering Dam and Process Water Dam.										
Total size of rehabilitation area (ha)	69.8										
Commencement of first milestone: RM10	10 June Year 27										
PMLU	Water storage (on-site stock watering for farm activities)										
Date area is available	10 Dec Year 26										
Cumulative area (ha)	69.8										
Milestone completed by	10 Dec Year 30										
Milestone reference	**Cumulative area achieved (ha)**										
RM9	69.8										

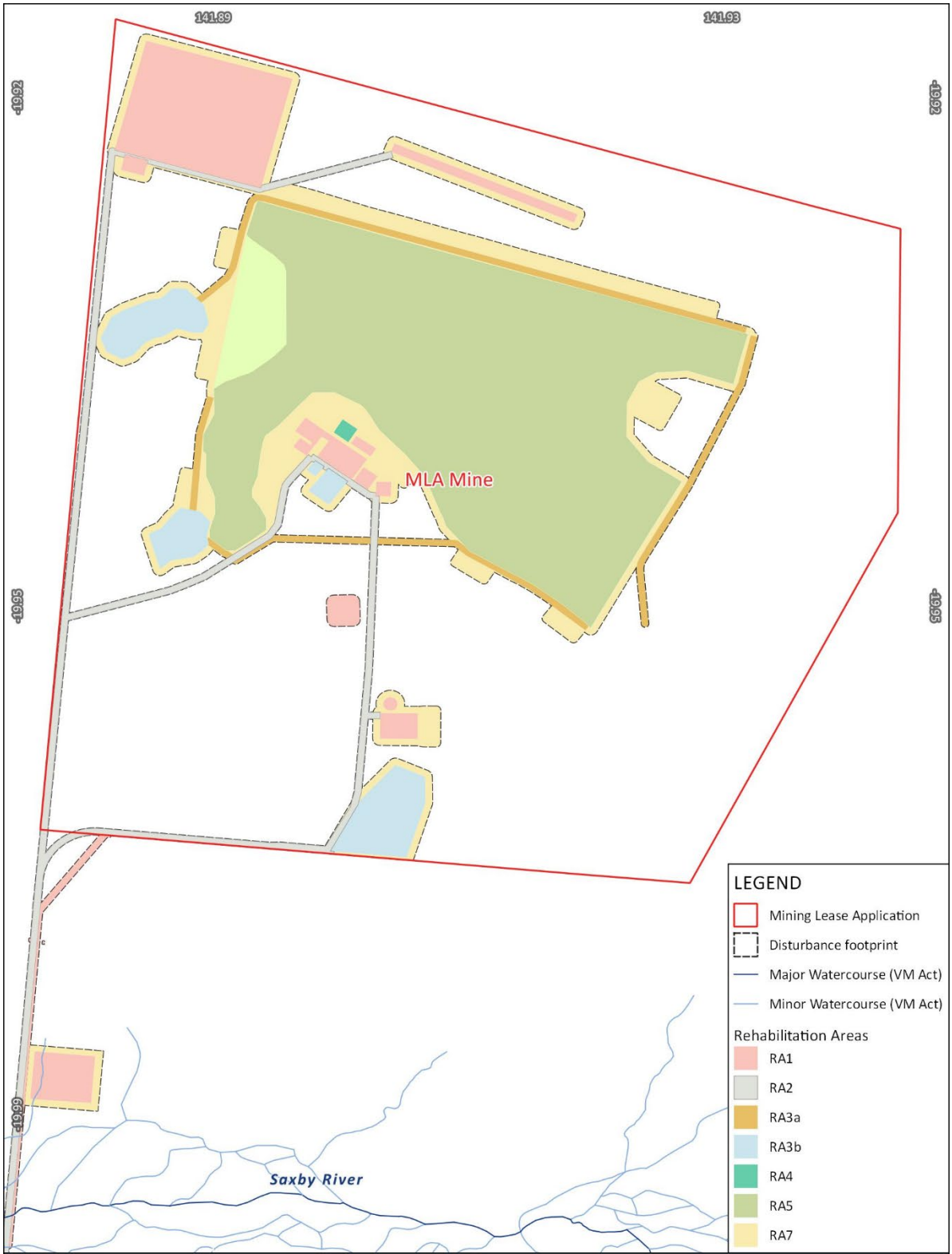
Rehabilitation Area											
Rehabilitation area	RA4: Interim Residue Storage Facility										
Relevant activities	Interim residue storage										
Total size of rehabilitation area (ha)	1.5										
Commencement of first milestone: RM3	10 June Year 27										
PMLU	Grazing native vegetation										
Date area is available	10 Dec Year 26										
Cumulative area (ha)	1.5										
Milestone completed by	10 Dec Year 30	10 Dec Year 35	10 Dec Year 39								
Milestone reference	**Cumulative area achieved (ha)**										
RM3	1.5										
RM6	1.5										
RM7		1.5									
RM8			1.5								

Rehabilitation Area											
Rehabilitation area	RA5: Backfilled void										
Relevant activities	Residue material placed in-pit and waste rock material placed in the backfilled pit.										
Total size of rehabilitation area (ha)	599										
Commencement of first milestone: RM4	10 June Year 6										
PMLU	Grazing native vegetation										
Date area is available	10 Dec Year 5	10 Dec Year 10	10 Dec Year 15	10 Dec Year 20	10 Dec Year 25	10 Dec Year 30					
Cumulative area (ha)	17	49.8	147	259.2	319.1	599					
Milestone completed by	10 Dec Year 10	10 Dec Year 15	10 Dec Year 20	10 Dec Year 25	10 Dec Year 30	10 Dec Year 35	10 Dec Year 40				
Milestone reference	**Cumulative area achieved (ha)**										
RM4	17	49.8	147	259.2	319.1	599					
RM5	17	49.8	147	259.2	319.1	599					
RM6	17	49.8	147	259.2	319.1	599					
RM7		17	49.8	147	259.2	599					
RM8			17	49.8	147	259.2	599				

Rehabilitation Area											
Rehabilitation area	RA6: Out-of-pit waste rock dump										
Relevant activities	Out-of-pit waste rock dump.										
Total size of rehabilitation area (ha)	39.2										
Commencement of first milestone: RM4	10 June Year 6										
PMLU	Grazing native vegetation										
Date area is available	10 Dec Year 5	10 Dec Year 10	10 Dec Year 15	10 Dec Year 20	10 Dec Year 25	10 Dec Year 30					
Cumulative area (ha)	9.4	19.6	31.3	31.5	37.7	39.2					
Milestone completed by	10 Dec Year 10	10 Dec Year 15	10 Dec Year 20	10 Dec Year 25	10 Dec Year 30	10 Dec Year 35	10 Dec Year 40				
Milestone reference	**Cumulative area achieved (ha)**										
RM4	9.4	19.6	31.3	31.5	37.7	39.2					
RM5	9.4	19.6	31.3	31.5	37.7	39.2					
RM6	9.4	19.6	31.3	31.5	37.7	39.2					
RM7		9.4	19.6	31.3	31.5	39.2					
RM8			9.4	19.6	31.3	31.5	39.2				

Rehabilitation Area											
Rehabilitation area	RA7: Other minor disturbance										
Relevant activities	Minor disturbance from other approved disturbance activities resulting in compacted land requiring rehabilitation including topsoil stockpiles on natural surfaces.										
Total size of rehabilitation area (ha)	221.2										
Commencement of first milestone: RM5	10 June Year 27										
PMLU	Grazing native vegetation										
Date area is available	10 Dec Year 26	10 Dec Year 30									
Cumulative area	177.2	221.2									
Milestone completed by	10 Dec Year 30	10 Dec Year 35	10 Dec Year 40	10 Dec Year 44							
Milestone reference	**Cumulative area achieved (ha)**										
RM5	177.2	221.2									
RM6	177.2	221.2									
RM7		177.2	221.2								
RM8			177.2	221.2							

Appendix B. Reference map and final site design



Rehabilitation Area Reference Map - Mine MLA

Vecco Critical Minerals Project

Client	Vecco Industrial Pty Ltd
Date	26-05-2023
Author	N.Jensen
Projection	GDA2020
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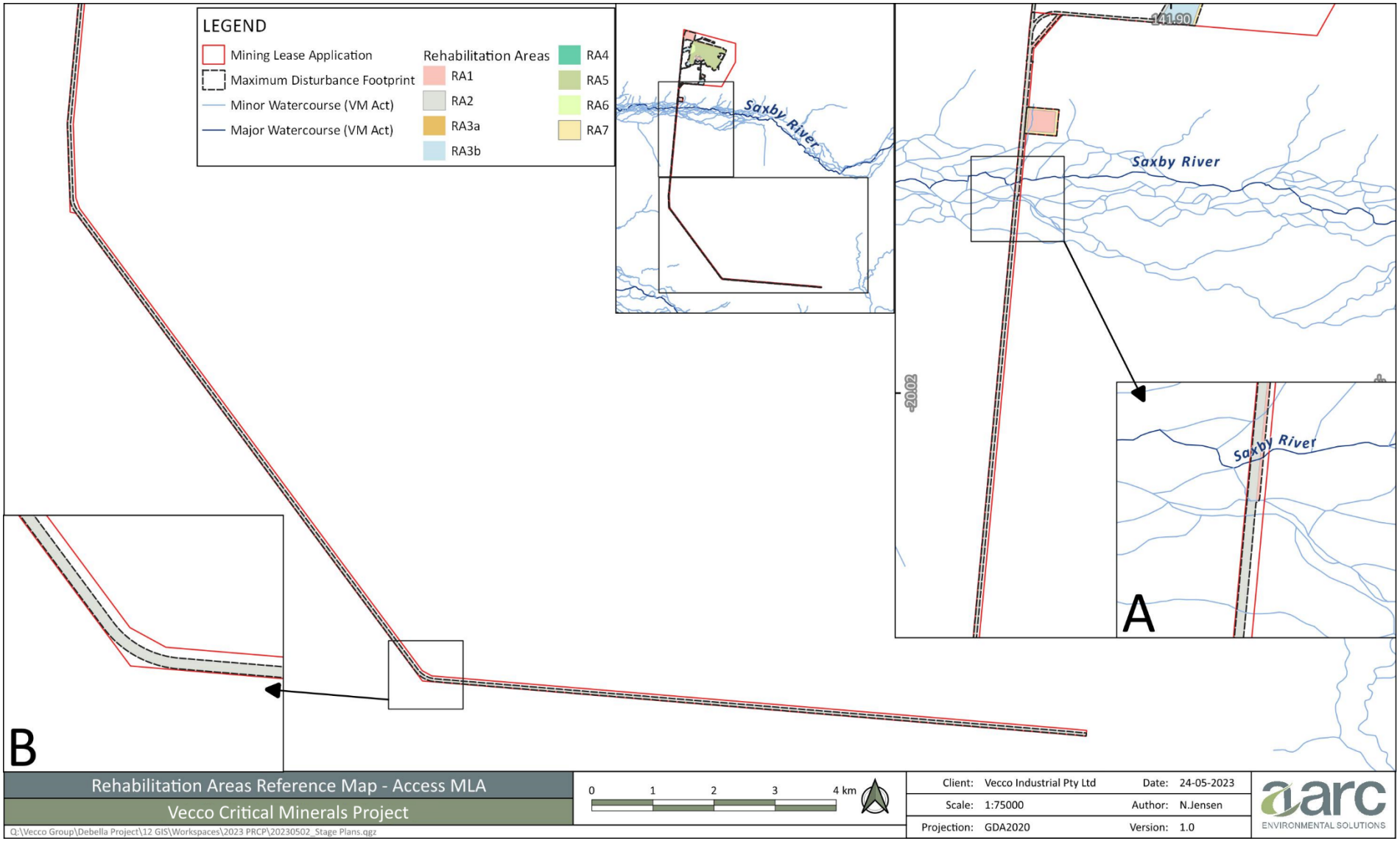
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Mining Lease Application
Maximum Disturbance Footprint
Minor Watercourse (VM Act)
Major Watercourse (VM Act)
Rehabilitation Areas
RA1
RA2
RA3a
RA3b
RA4
RA5
RA6
RA7
Saxby River
Saxby River
Saxby River
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A
B
Rehabilitation Areas Reference Map - Access MLA
Vecco Critical Minerals Project
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Client: Vecco Industrial Pty Ltd
Date: 24-05-2023
Scale: 1:75000
Author: N.Jensen
Projection: GDA2020
Version: 1.0
ENVIRONMENTAL SOLUTIONS


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-19.92
-19.95
-19.95
-19.99
Saxby River
LEGEND
Mining Lease Application
Maximum Disturbance Footprint
Flood Plain Extent (DoR 2022)
Major Watercourse (VM Act)
Minor Watercourse (VM Act)
Post Mining Land Use (Disturbed)
Water Storage
Grazing Native Vegetation
Retained Infrastructure
Current Land Use (Undisturbed)
Grazing native vegetation
Marsh/wetland
Final Site Design - Mine MLA
Vecco Critical Minerals Project
Client
Vecco Industrial Pty Ltd
Date
26-05-2023
Author
N.Jensen
Projection
GDA2020
Scale
1:35000
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ENVIRONMENTAL SOLUTIONS
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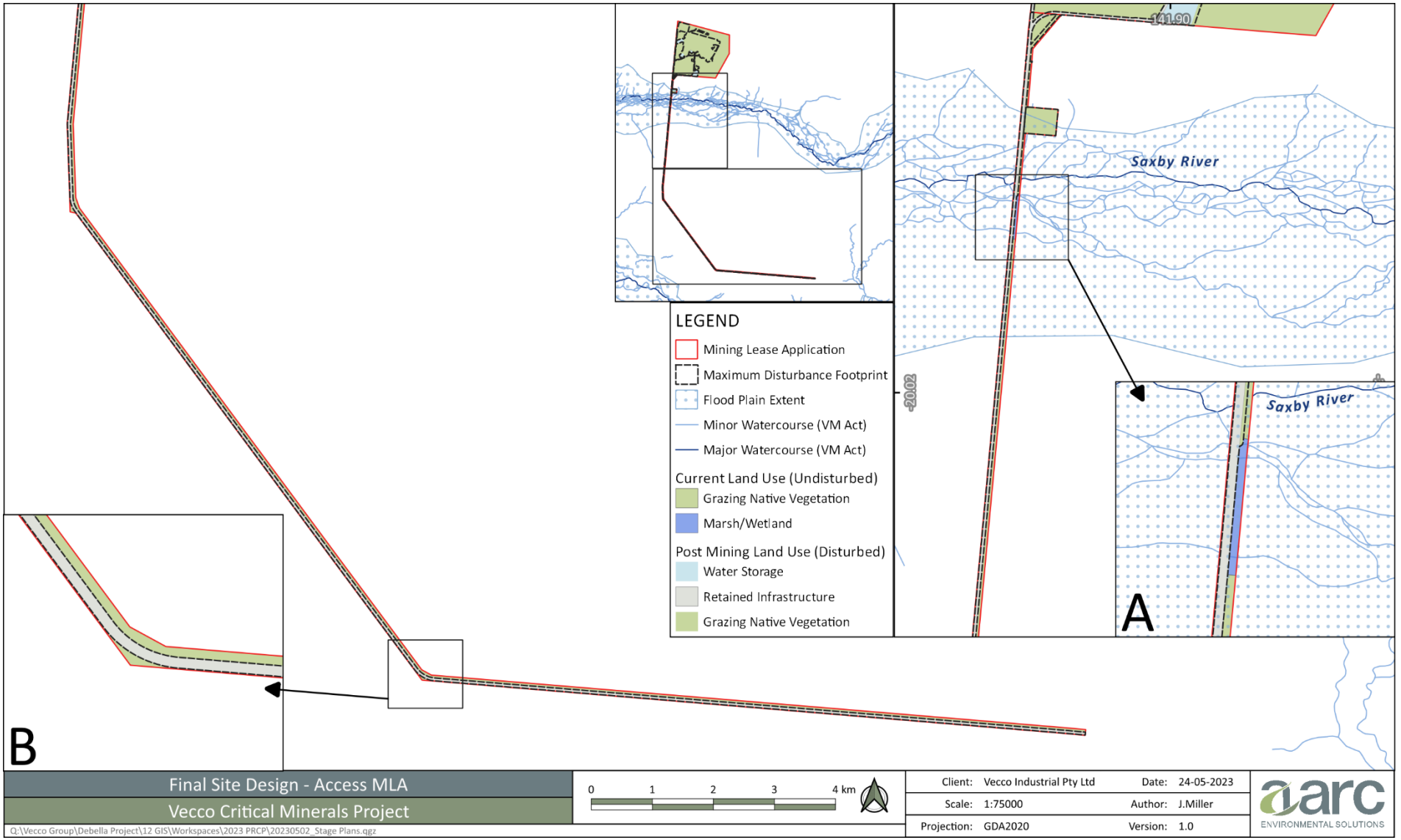
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Mining Lease Application
Maximum Disturbance Footprint
Flood Plain Extent
Minor Watercourse (VM Act)
Major Watercourse (VM Act)
Current Land Use (Undisturbed)
Grazing Native Vegetation
Marsh/Wetland
Post Mining Land Use (Disturbed)
Water Storage
Retained Infrastructure
Grazing Native Vegetation
Saxby River
Saxby River
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Final Site Design - Access MLA
Vecco Critical Minerals Project
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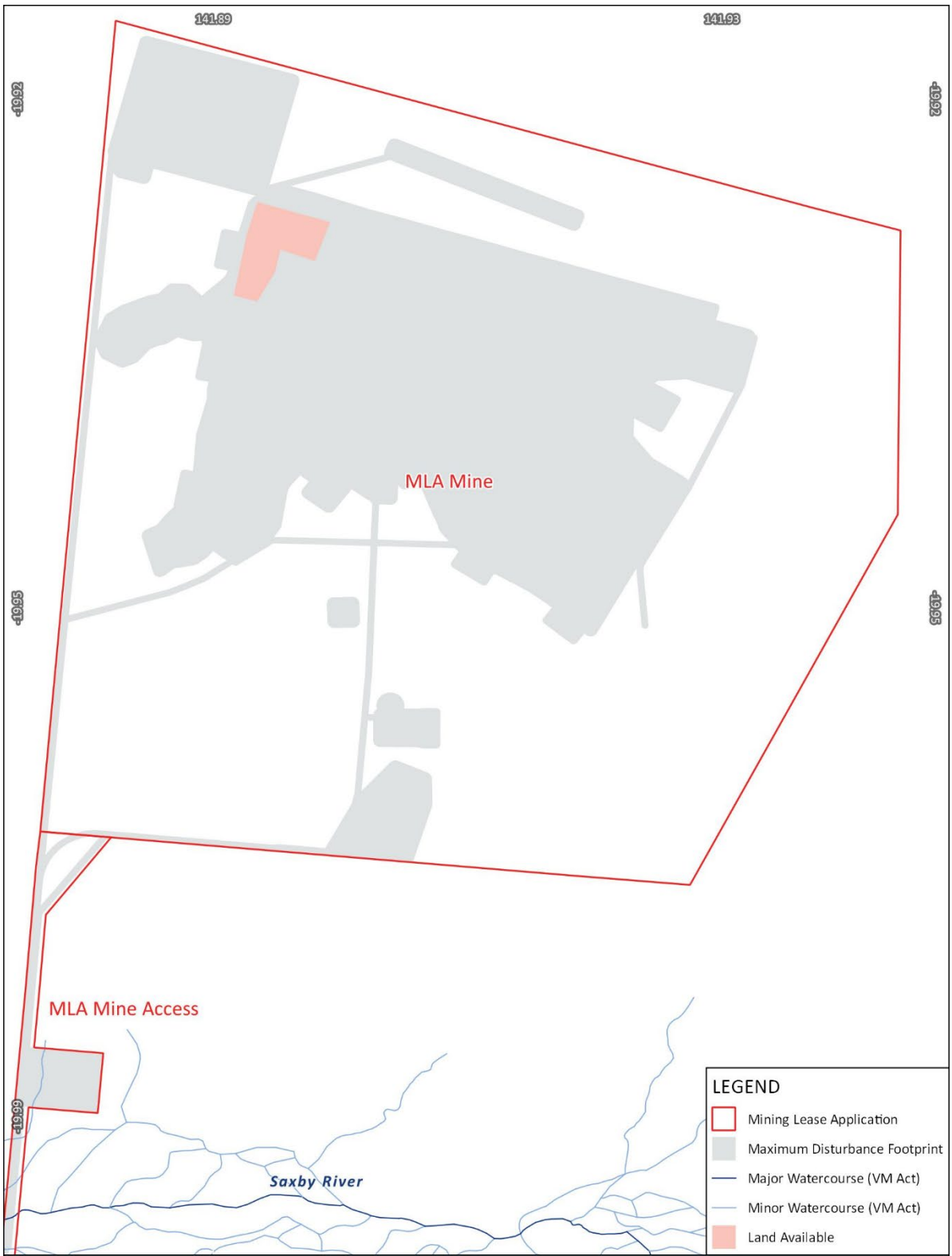
Client: Vecco Industrial Pty Ltd
Date: 24-05-2023
Scale: 1:75000
Author: J.Miller
Projection: GDA2020
Version: 1.0

Appendix C. Stage plans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MLA Mine
MLA Mine Access
Saxby River
LEGEND
Mining Lease Application
Maximum Disturbance Footprint
Major Watercourse (VM Act)
Minor Watercourse (VM Act)
Land Available
Stage Plan - Year 5
Vecco Critical Minerals Project
Client
Vecco Industrial Pty Ltd
Date
28-05-2023
Author
N.Jensen
Projection
GDA2020
Scale
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1.5 km
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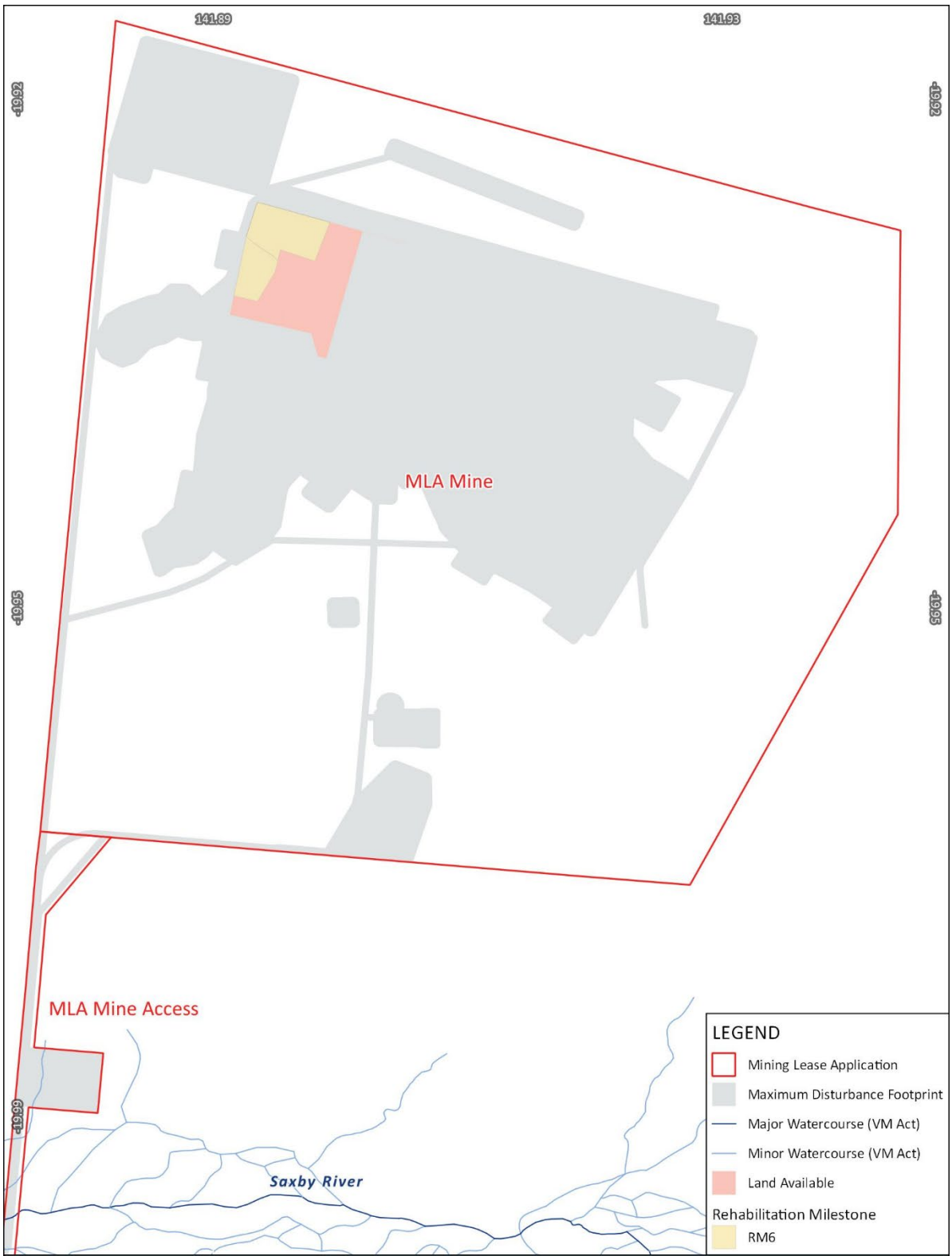

Stage Plan - Year 10

Vecco Critical Minerals Project

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Date	28-05-2023
Author	N.Jensen
Projection	GDA2020
Scale	1:35000

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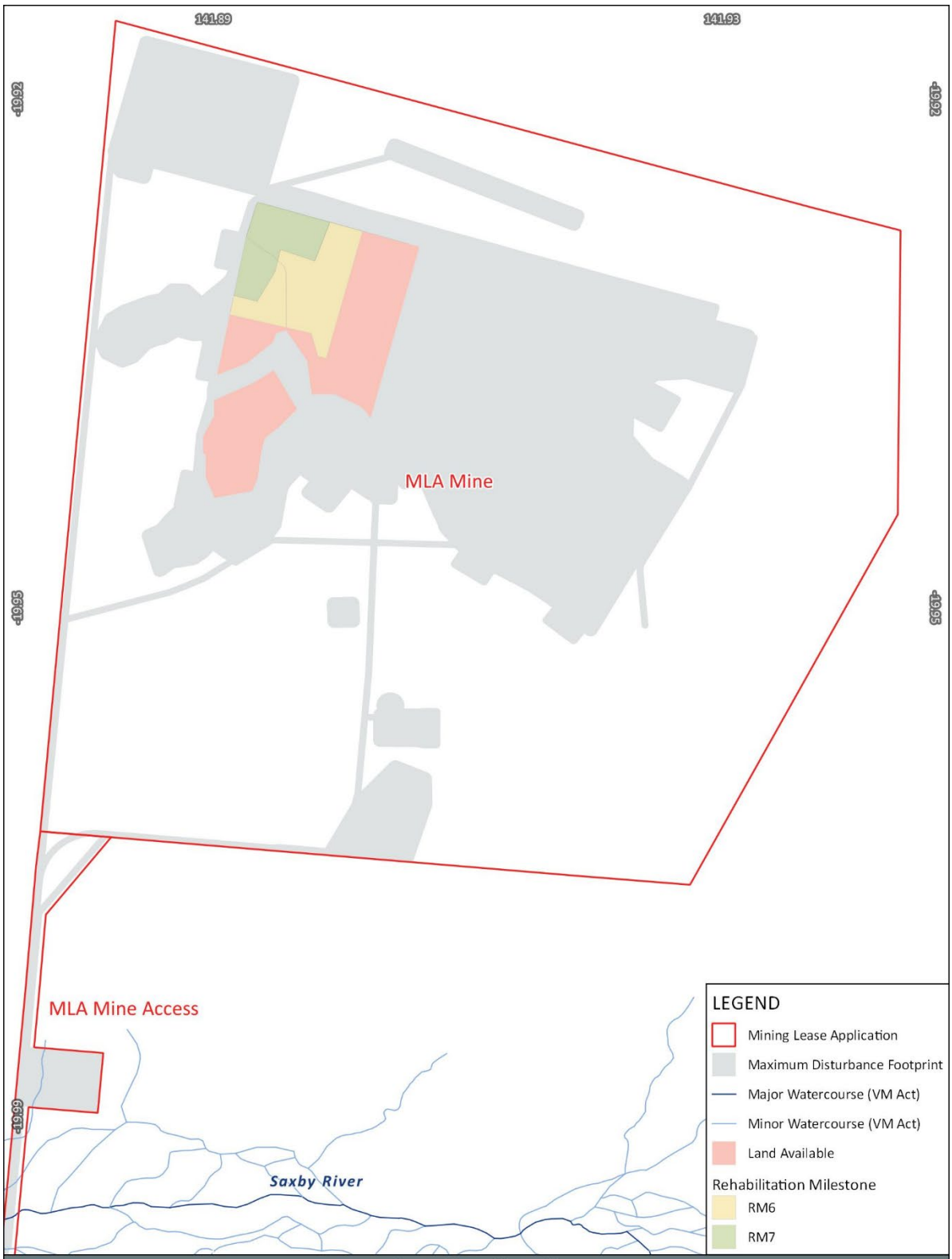
Q:\Vecco Group\Debella Project\12 GIS\Workspaces\2023 PRCP\20230526_Stage Plans.qgz


141.89
141.93
-19.92
-19.96
-19.95
-19.99
-19.99
MLA Mine
MLA Mine Access
Saxby River
LEGEND
Mining Lease Application
Maximum Disturbance Footprint
Major Watercourse (VM Act)
Minor Watercourse (VM Act)
Land Available
Rehabilitation Milestone
RM6
RM7
Stage Plan - Year 15
Vecco Critical Minerals Project
Client
Vecco Industrial Pty Ltd
Date
28-05-2023
Author
N.Jensen
Projection
GDA2020
Scale
1:35000
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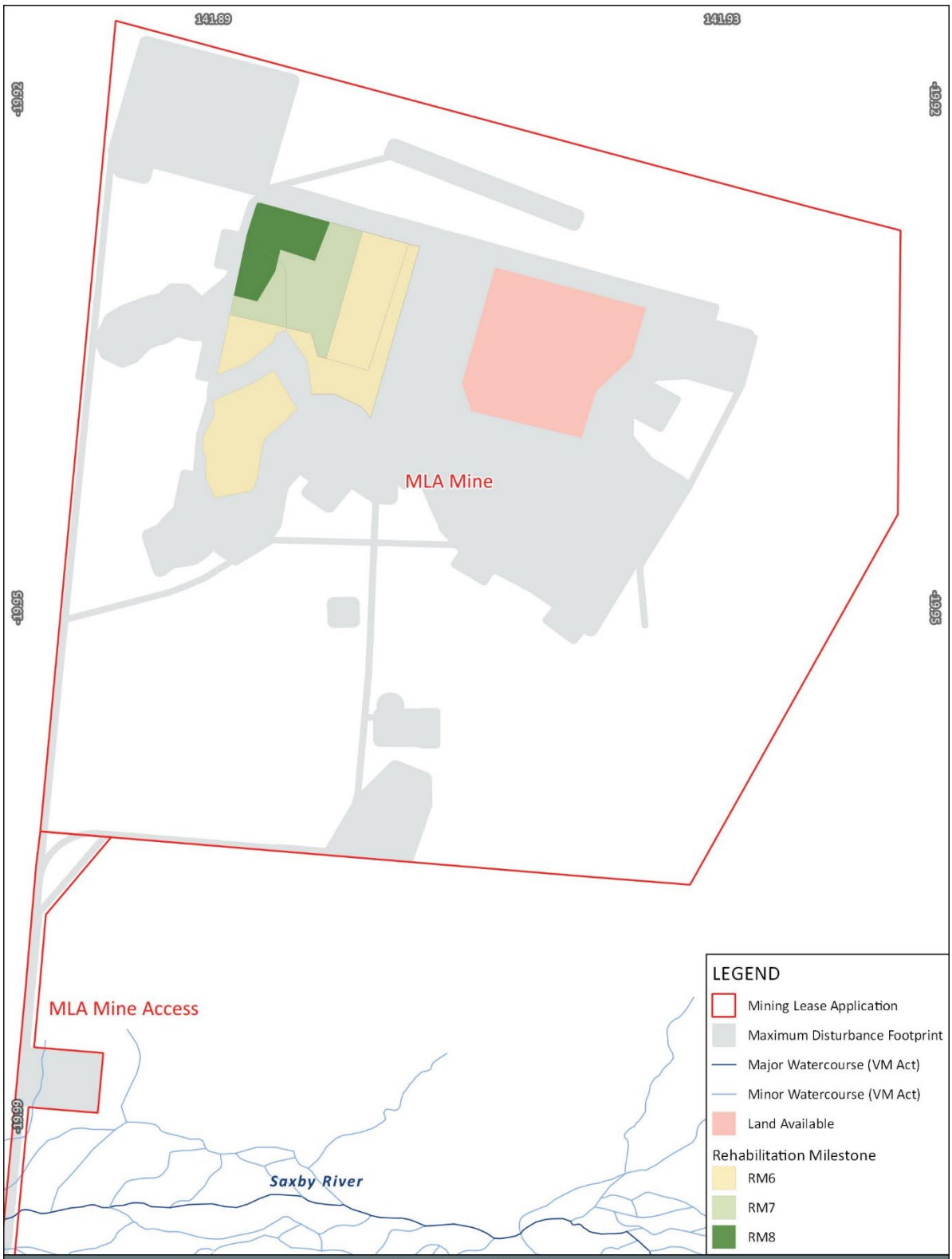
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Stage Plan - Year 20
Vecco Critical Minerals Project
Client
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Date
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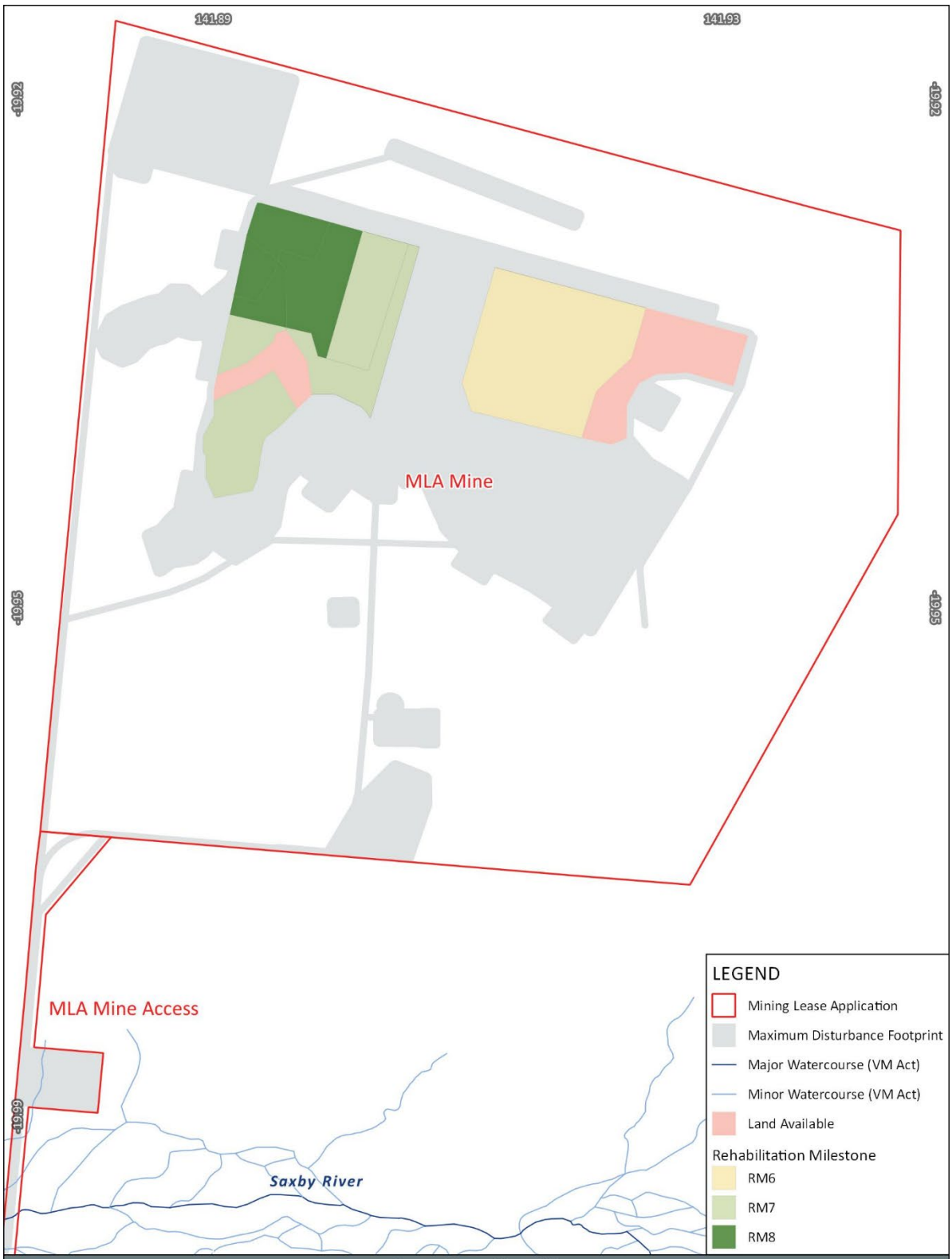

Stage Plan - Year 25

Vecco Critical Minerals Project

Client	Vecco Industrial Pty Ltd
Date	28-05-2023
Author	N.Jensen
Projection	GDA2020
Scale	1:35000

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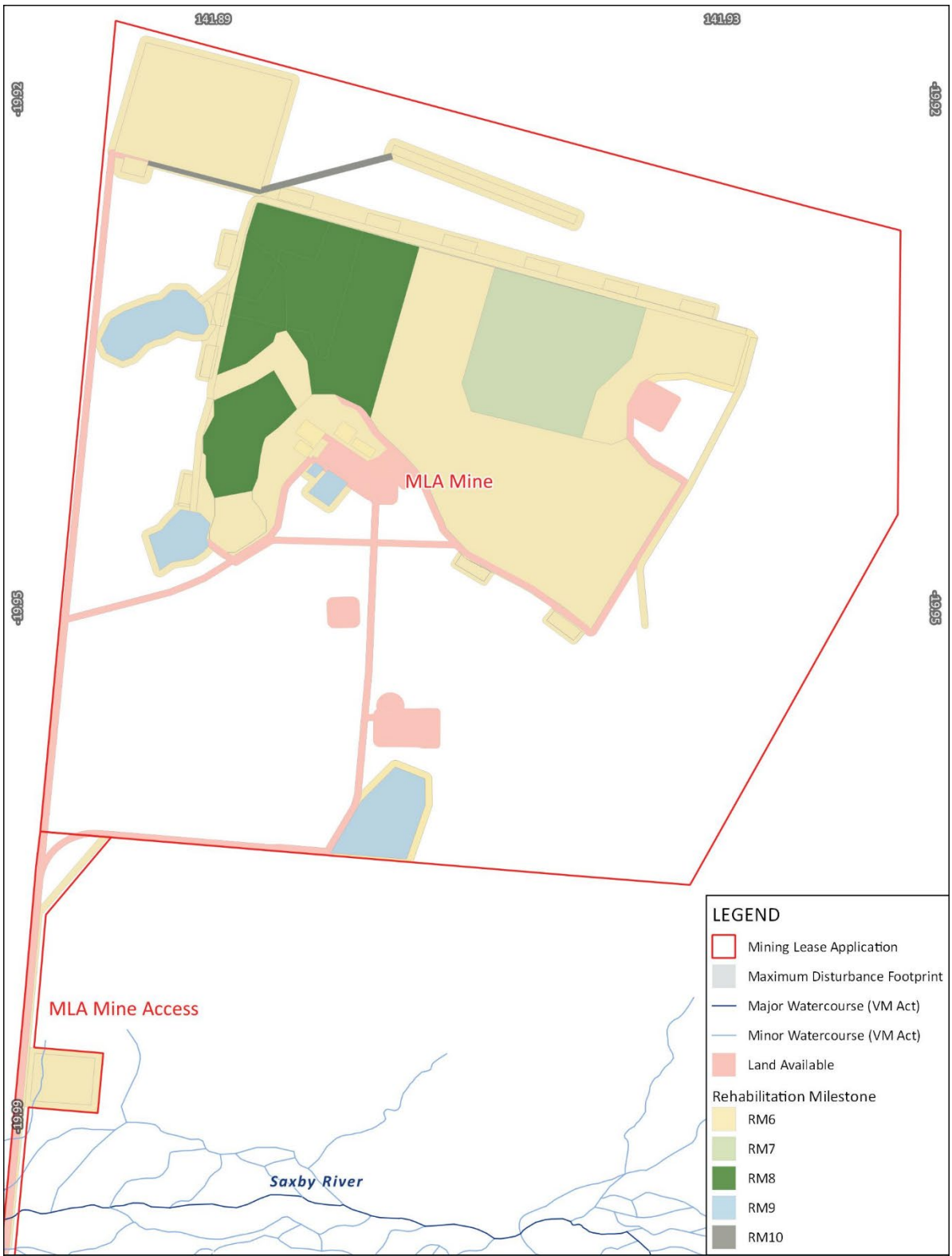

Mine MLA Stage Plan - Year 30

Vecco Critical Minerals Project

Client	Vecco Industrial Pty Ltd
Date	30-05-2023
Author	N.Jensen
Projection	GDA2020
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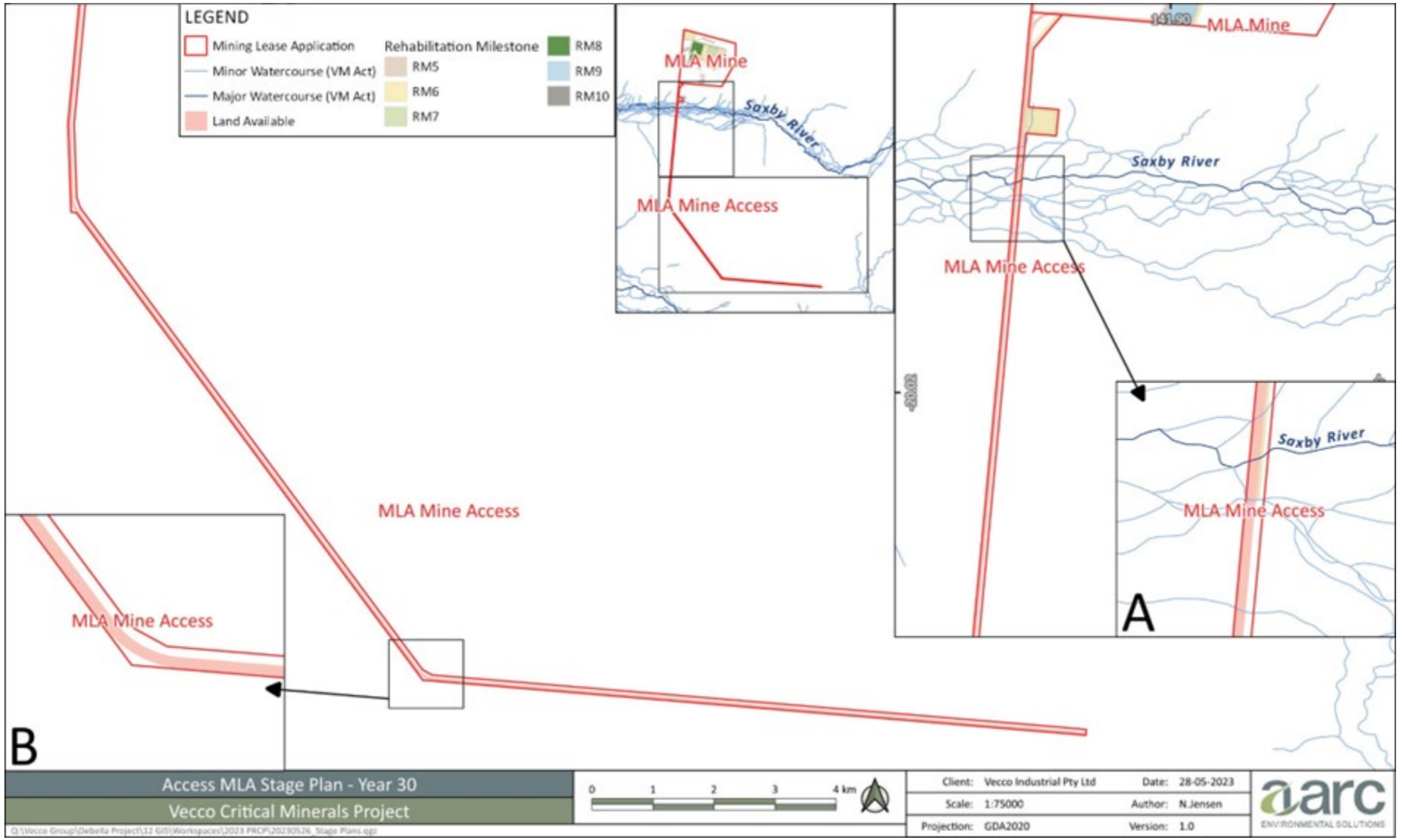
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Date: 28-05-2023
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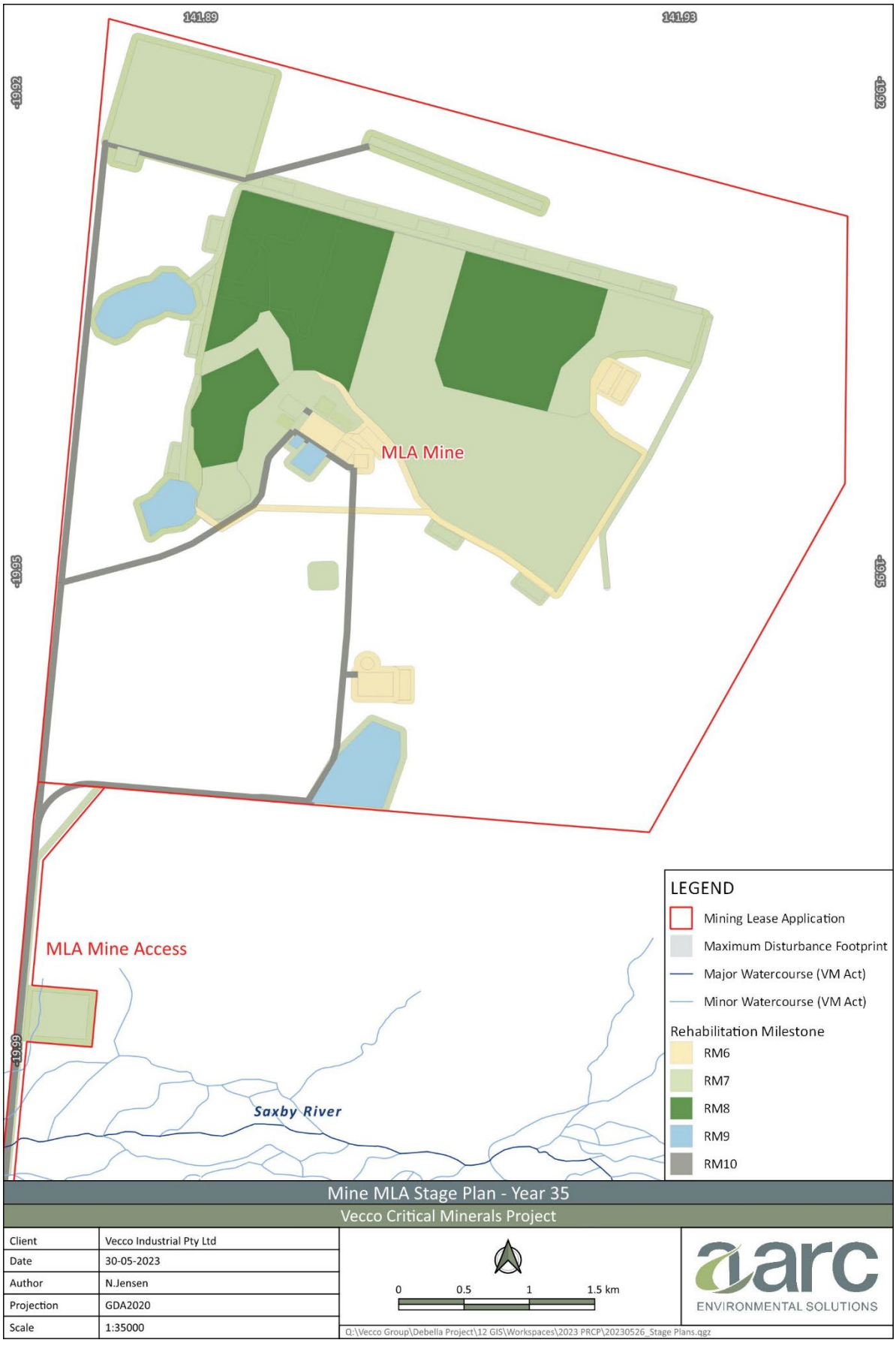
Version: 1.0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Mine MLA Stage Plan - Year 35
Vecco Critical Minerals Project
Client
Vecco Industrial Pty Ltd
Date
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Author
N.Jensen
Projection
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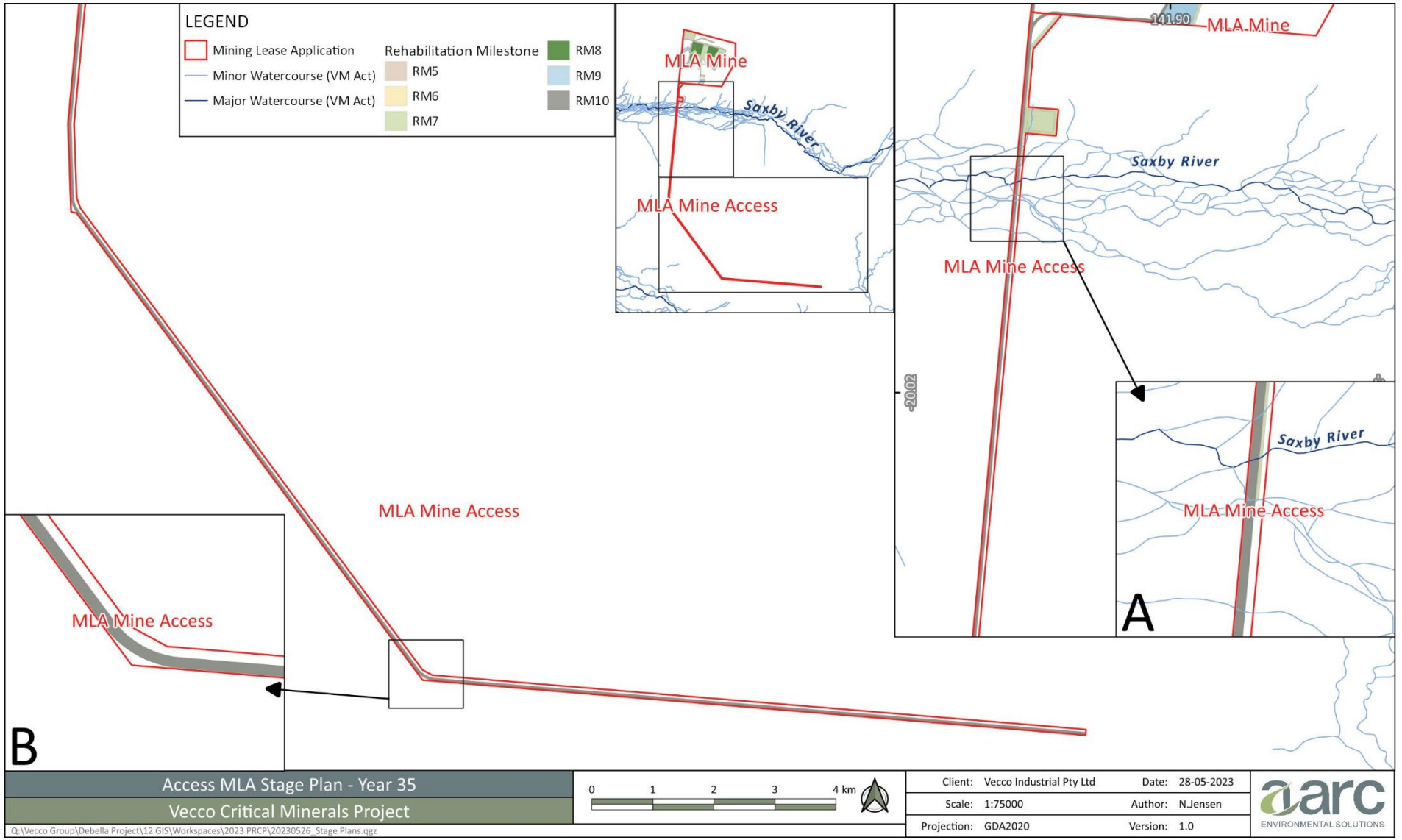
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Client: Vecco Industrial Pty Ltd
Date: 28-05-2023
Scale: 1:75000
Author: N.Jensen
Projection: GDA2020
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Appendix D. Community consultation plan

COMMUNITY CONSULTATION PLAN

VECCO CRITICAL MINERALS PROJECT

PREPARED FOR
VECCO INDUSTRIAL PTY LTD

JUNE 2023

aarc
ENVIRONMENTAL SOLUTIONS

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Document Control

Project Name:	**Vecco Critical Minerals Project**
Report Title:	Community Consultation Plan
Client:	Vecco Industrial Pty Ltd
Project Manager:	Gareth Bramston

Version	Comments	Author	Reviewer	Date
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Final issued to client		NJ	GB	22/10/2023

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Table of Abbreviations

AARC	AARC Environmental Solutions Pty Ltd
DES	Department of Environment and Science
DIP	Department of Infrastructure and Planning
EA	Environmental Authority
EP Act	*Environmental Protection Act 1994*
EPM	Exploration permits for minerals
HPA	High purity alumina
LGA	Local government area
MLA	Mining lease application
Mtpa	Million tonnes per annum
PRCP	Progressive rehabilitation and closure plan
CCP	Community Consultation Plan
REE	Rare earth elements
Tpa	Tonnes per annum
The Project	Vecco Critical Minerals Project
Vecco	Vecco Industrial Pty Ltd
V_2O_5	Vanadium pentoxide

1 Introduction

AARC Environmental Solutions Pty Ltd (AARC) has been commissioned by Vecco Industrial Pty Ltd (Vecco) to develop a Community Consultation Plan (CCP) for Vecco Critical Minerals Project (the Project). The CCP addresses the requirements of the Progressive Rehabilitation and Closure Plan (PRCP) Guideline (DES 2023).

1.1 Purpose

The purpose of the plan is to define how community consultation will be carried out in relation to the rehabilitation of land, in accordance with the Project's PRCP. The plan assists to demonstrate compliance with the requirements set out in sections 126C(1)(c)(iii) and 126C(1)(c)(iv) of the *Environmental Protection Act 1994* (EP Act).

1.2 Project description

The Project is located approximately 70 km north of Julia Creek township and approximately 515 km west of Townsville in north-west Queensland (Figure 1). The townships of Cloncurry and Richmond are located approximately 125 km west and 145 km east of the Project, respectively.

The Project is a greenfield operation targeting the underlying vanadium deposit for vanadium pentoxide (V_2O_5) and High Purity Alumina (HPA), with minor quantities of other Rare Earth Elements (REE) available opportunistically as saleable biproducts of the mining and processing process.

The Project will tap into Queensland's rich natural resources to extract key minerals to support the global shift in decarbonising energy production. Demand for high purity alumina and vanadium is rapidly growing as renewable energy demand increases. Vanadium is used in the manufacture of vanadium flow batteries, associated with renewable energy generation and the global shift to decarbonisation. Vanadium does not degrade over the 25-year battery life and can be recycled thereafter making it a truly green energy storage solution. The Project can produce vanadium with a low carbon footprint, offering an in-demand product in the decarbonising movement.

The Project will also target the production of HPA, and REE, recognised by the Queensland Government and the Commonwealth Government as Critical Minerals that can be used in battery and other renewable energy applications. The Project will significantly contribute to the critical resource objectives on both state and federal levels.

The Project will be supported by Vecco's Australia first manufacturing facility which will produce the electrolyte crucial for vanadium flow batteries. The facility is currently operational, using imported vanadium until the Project is ready for integration.

The Project will consist of a shallow, open-cut mine that will process up to 1.9 Mtpa Run of mine feed to produce up to approximately 5,500 tpa V_2O_5 and 4,000 tpa HPA over an operational life of approximately 26 years. Processing will occur following on-site crushing and screening of the ore. Mineral products will be packed in containers and transported by truck or rail to Townsville, for secondary processing into battery electrolyte or export from the Port of Townsville to international markets.

The Project site will consist of (Figure 3):

- open-cut mining pit and waste rock dumps;
- mine infrastructure area, including, administration buildings, bathhouse, crib rooms, storage warehouse, workshop, fuel storage, refuelling facilities, wash bay, laydown area, and a helipad;
- mineral processing plant and ore handling facilities;
- mine access road from Punchbowl road;
- an airstrip to provide access for the Royal Flying Doctors Service;

- a 10 MW solar farm and associated energy storage system;
- a raw water supply pumping system and pipeline from the Saxby River;
- on-site workers village and associated facilities, including a sewage treatment plant and effluent irrigation area; and
- water storages and sediment dams.

1.3 Existing community

Human settlement is relatively sparse in the area surrounding the Project, with beef cattle production undertaken on properties in the immediate area. Julia Creek is the nearest township, located approximately 70 km south of the Project. The rural townships of Cloncurry and Richmond are located approximately 125 km west and 145 km east of the Project, respectively.

The Project ML is wholly located within the Shire of McKinlay local government area (LGA), and the local authority is the McKinlay Shire Council. The LGA has been identified as a priority area in the North West Regional Plan 2010 (DIP 2010). The McKinlay LGA covers an area of 40,818 km^2 and supports a population of approximately 1,050 residents, with key localities including Julia Creek, McKinlay, Kynuna, and Nelia.

Nearby mining operations include the proposed Saint Elmo Vanadium Project, located approximately 70 km south of the Project. There are no other advanced mining projects within close proximity to the Project location.

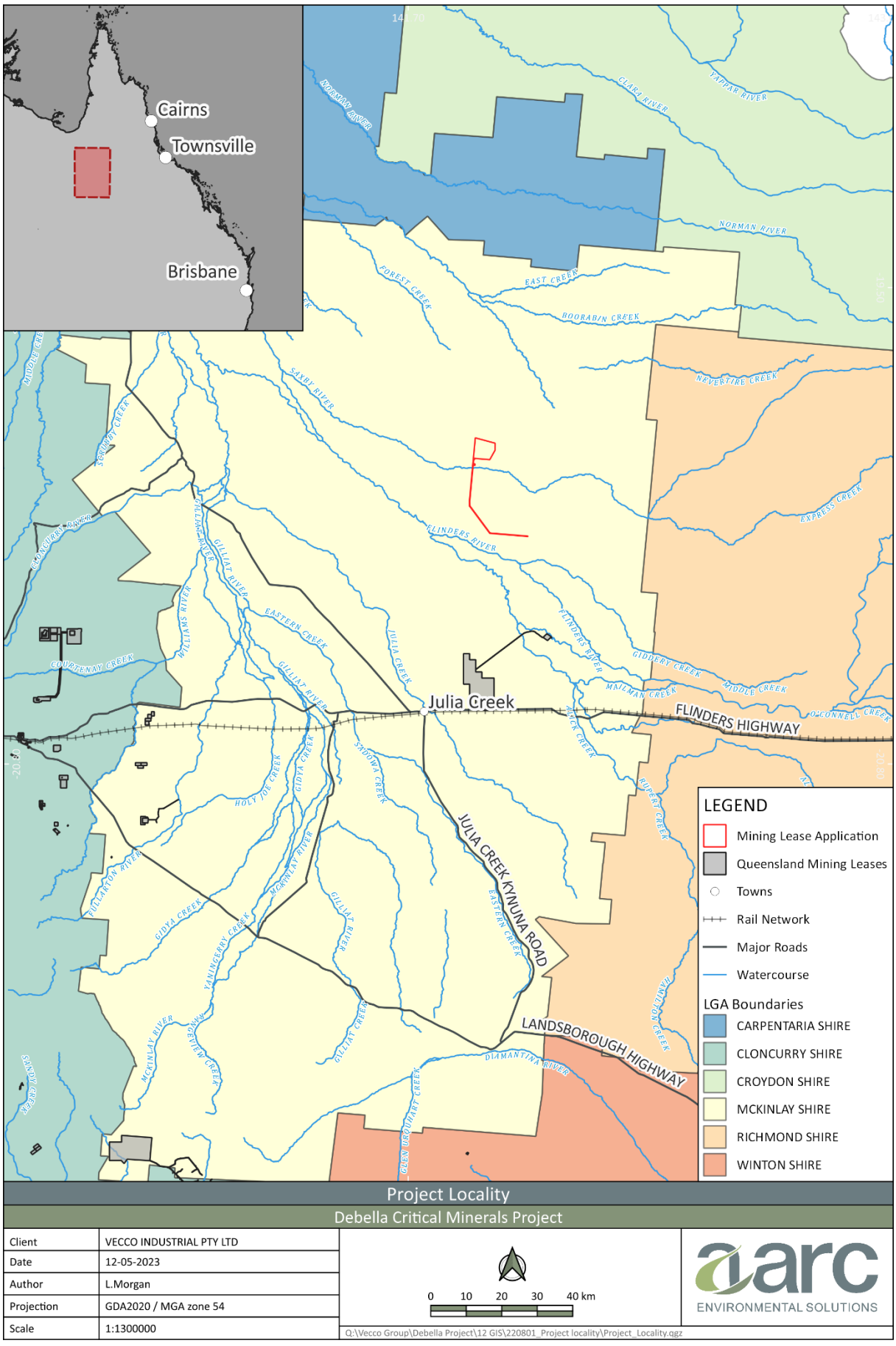


Figure 1: Project locality

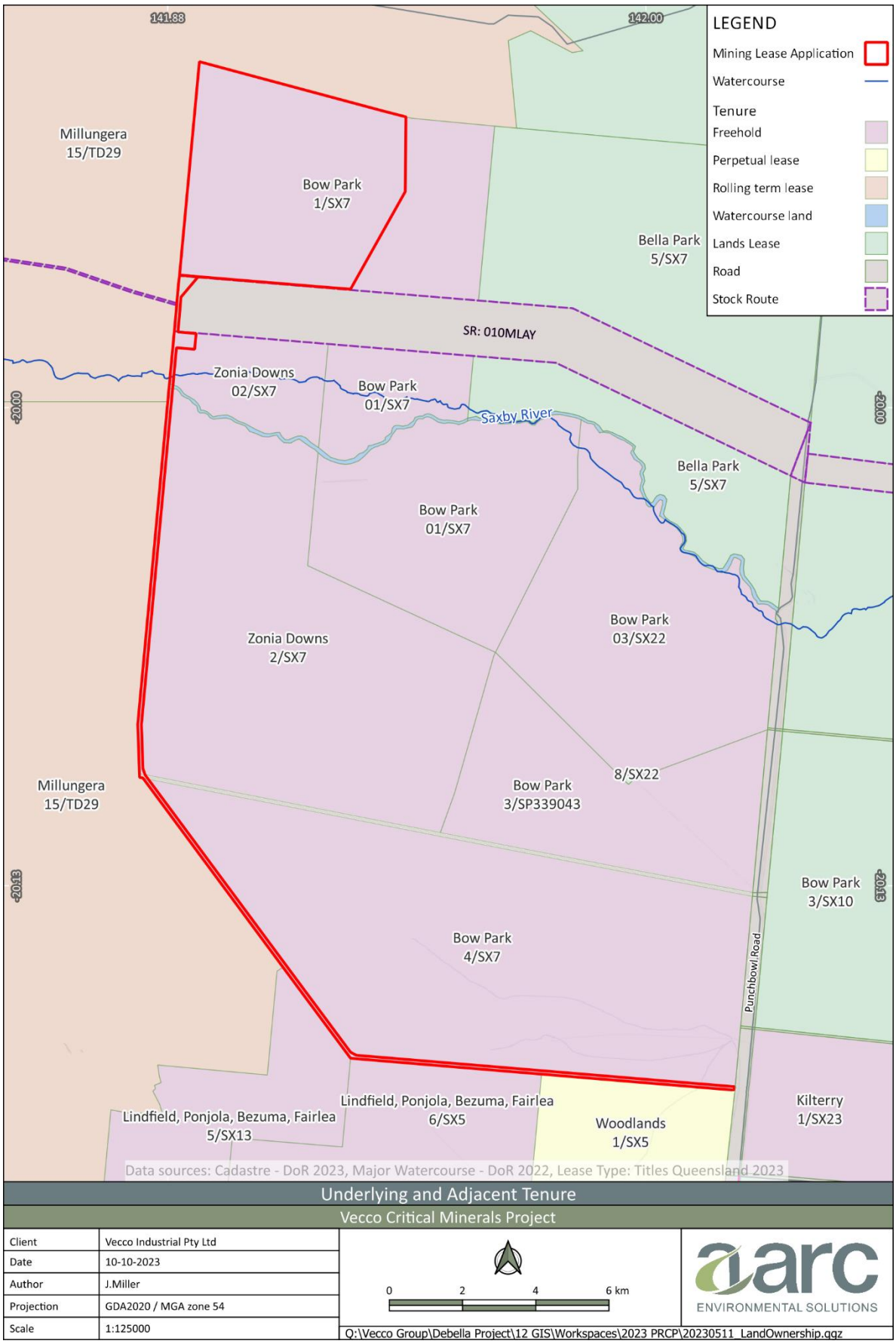


Figure 2: Mining Lease Application over underlying tenure

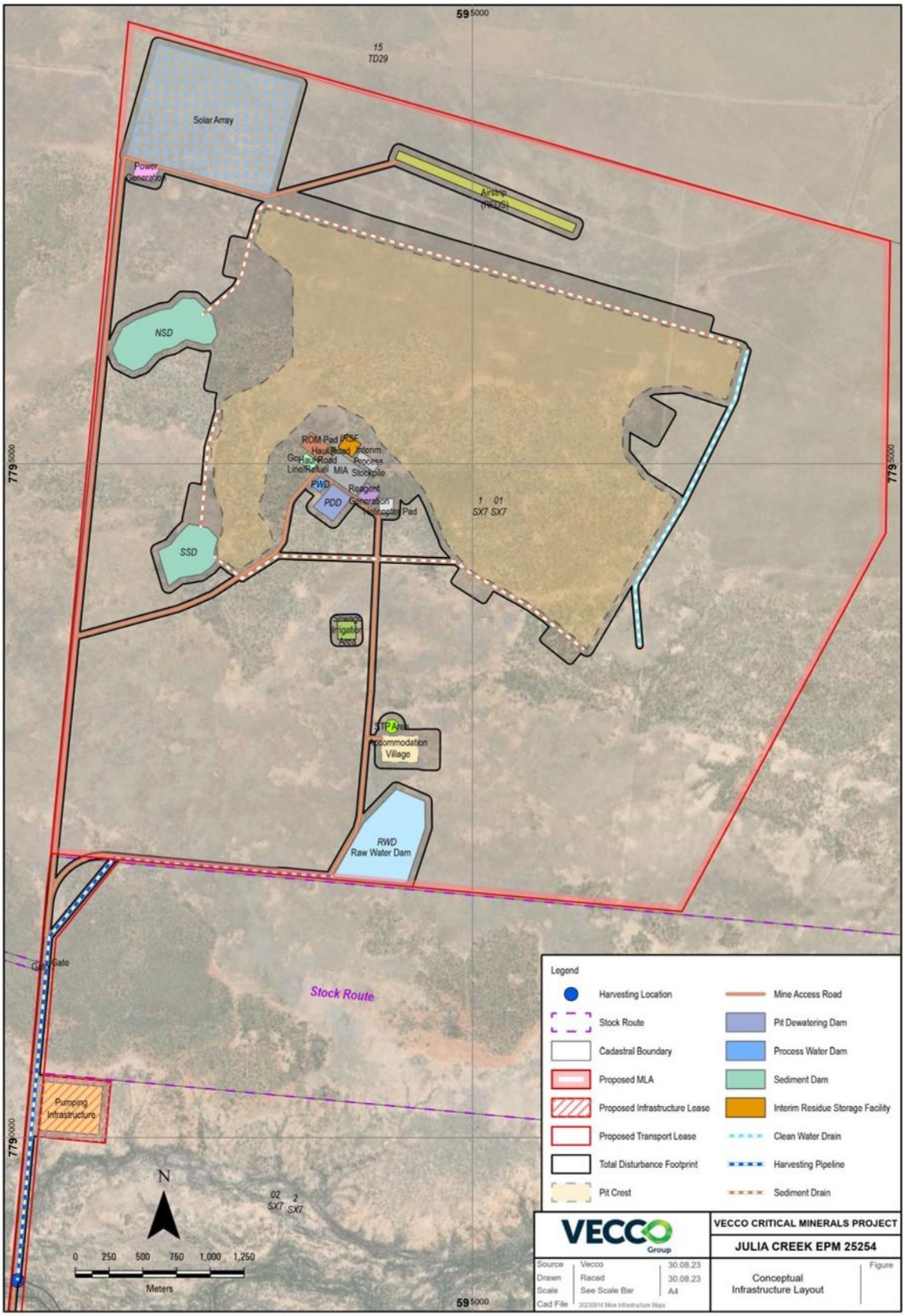


Figure 3: Project conceptual layout

2 Consultation approach

2.1 Key objectives

The objectives of the CCP are to achieve the following:

- to identify community members, including:
  - affected landholders (such as underlying and adjoining land holders, and holders of land necessary for access to the land to which the proposed PRC plan relates);
  - traditional owners;
  - local government; and
  - local community groups.
- to build awareness and understanding of their needs and objectives, while managing community expectations of how the applicant would operate;
- to establish and maintain engagement practices that promote ongoing relationships with the community;
- to inform the outcomes stated in the PRCP;
- to provide the community with appropriate opportunity to express their opinions and concerns in relation to the project activities; and
- to provide a complaint mechanism to affected stakeholders to register complaints and concerns.

2.2 Responsibilities

The responsibility to facilitate and uphold the CCP objectives are distributed to the following roles:

- Directors:
  - ultimate responsibility for environmental and social governance; and
  - final approval of all company policy.
- Executive Management:
  - management responsibility for the Project; and
  - interacts with community and engages on issues/concerns.
- Site Management:
  - manage direct, formal notification of intentions and actions relating to the Project;
  - complaint investigation;
  - internal reporting to Executive Management; and
  - interacts with community and engages on issues/concerns at local level.
- Environmental Consultants:
  - technical investigations and reporting

3 Community members

Community groups have been identified and classified broadly into potentially 'affected' and 'interested' persons. The EP Act (sections 38 and 41) defines 'affected' and 'interested' persons based on the predicted level of impact, the perceived level of stakeholder involvement in site activities, and the perceived level of interest in site activities or the outcomes of decisions.

3.1 Affected persons and interested community groups

The EP Act defines 'affected' and 'interested' persons based on the predicted level of impact, the perceived level of involvement in site activities, and the perceived level of interest in site activities or the outcomes of decisions.

A 'potentially affected' person as defined by the EP Act is:

- a person who is (among others) the registered proprietor/s of any freehold land, the registered holder/s of any land that is held from the state, any holder/s or applicant/s of mining tenures or other resource related tenures, a trustee of any land under the *Nature Conservation Act 1992* or *Land Act 1994*, and a holder of any unallocated State land, State forests or Conservation parks or State Controlled Roads;
- a registered Native Title body corporate, claimant or representative Aboriginal/Torres Strait Islander body; or
- a relevant local government.

A 'potentially interested' person as defined by the EP Act may be an unincorporated community or environmental body with a financial or non-financial interest in the local government area that the operational land is in.

3.2 Identified stakeholders

Affected and interested stakeholders for the Project that have been identified are provided in Table 1. The stakeholder relationship with the Project is also provided in Table 1.

Table 1: Project community as defined by the EP Act

Group	Member	Relationship to the Project
Affected persons		
Employees	Vecco employees and contractors	• Project and job continuity. • Interest in human resource management. • Workplace Health and Safety.
Local government	McKinlay Shire Council	• Support for community and local business. • Information on significant variations to the Project. • Worker and contractor accommodation Impacts. • Use of local government infrastructure including roads.
Landowners underlying the MLA	Owner of 'Bow Park' and 'Zonia Downs' properties	• Landowner of: o Lot 1 on Plan SX7, underlying MLA on EPM 25254; and o Lot 2 on Plan SX7, underlying MLA on EPM 25254 and EPM 26928.

Group	Member	Relationship to the Project
		○ Lot 4 on Plan SX7, underlying the mine access lease located along the southern and western property boundaries on EPM 26928. • Potential future user of the category 3 stock route 010MLAY located to the east of the mine access MLA and to the south of the mine MLA.
Landowners adjacent the Project MLA boundaries	Landowner of 'Millungera' property	• Landowner of Lot 15 on Plan TD29 located to the west of the mine access MLA on EPM 25254.
	Landowner of 'Woodlands' property	• Landowner of Lot 1 on Plan SX5 located to the south of the mine access MLA on EPM 27954.
	Landowner of 'Lindfield, Ponjola, Bezuma, Fairlea' property	• Landowner of Lot 6 on Plan SX5 and Lot 5 on Plan SX5 located to the south, south-west of the mine access MLA on EPM 27954.
	Landowner of 'Kilterry' property	• Landowner of Lot 1 on Plan Sx23 located to the east of the proposed intersection of the mine access road with Punchbowl Road.
Traditional Owners	No native title claimant Consultation with Mitakoodi People	• Interest in any impacts to cultural heritage. • Employment opportunities. • Interest in rehabilitation activities and methods.
Interested stakeholders		
Local community members	Julia Creek residents	• Employment opportunities. • Regional business support through involvement with community schools, sporting clubs and funding for local projects. • Community cohesion impacts.
Local businesses (construction)	Crockers Earthmoving	• Business procurement opportunities.
	Ricky Slater (Carpenter)	
	Aurizon	
	Adam White Earthmoving	
Local community groups	Country Women's Association	• Community investment initiatives. • Community cohesion impacts. • Demand on services.
	Julia Creek Lions Club	
	Julia Creek Lions Ladies	
	Julia Creek RSL	
Social and public services	Julia Creek Local Ambulance Committee	• Emergency response.
	Fire Captain	• Emergency response.
	Julia Creek Police Station	• Workforce behaviour. • Emergency response. • Traffic management.

Group	Member	Relationship to the Project
Housing and accommodation providers	Julia Creek Caravan Park Julia Creek Villas	• Potential for mine operations to impact to housing availability and affordability.
Retail businesses	Corinna's Cafe	• Interest in procurement opportunities. • Demand for services.
	Elders Rural	
	Information Central	
	Julia Creek News	
	Australia Post – Julia Creek	
	Julia Creek Hardware	

4 Previous community consultation

The surrounding community and affected stakeholders have been engaged during 2022 and early to mid-2023 in preparation of the Environmental Authority application for the Project to ensure that all relevant community members are aware of the Project, its aspects, and potential impacts. Consultation has provided the opportunity for comment on issues of relevance to the community. Objectives of Project consultation have included the following principles:

- Ensure community members have understood the Project details, timing and workforce arrangements so that discussions about impacts and benefits are meaningful.
- Provide community members with the opportunity to identify and assess potential social impacts and applicable.
- Ensure transparent and inclusive community engagement to facilitate the ongoing management and monitoring of potential social impacts.
- Ensure Project planning and delivery are informed by community views.
- Ensure post-mining land use and rehabilitation outcomes are consistent with community expectations.

Vecco has developed a Community Consultation Register, consistent with Section 126C(1)(c)(iii) of the EP Act, and the PRCP Guidelines. This register has been used to record consultation date(s), engaged community member(s), consultation type, information provided, key issues raised, response actions and/or outcomes and any commitments made by Vecco.

5 Community consultation methods

5.1 Consultation meetings

Consultation via face-to-face meetings or phone calls will be the principal engagement method during both the operational and rehabilitation phases of the Project. These meetings will occur on a 'as need be' basis. Consultation meetings provide persons the opportunity to discuss any concerns or issues relating to rehabilitation in accordance with the PRCP.

Regular meetings are important to:

- establish on-going relationships with the community;
- provide accurate, relevant and timely information to the community;
- allow an opportunity for the community to express concerns and issues with the Project activities; and
- provide feedback to community concerns in a prompt manner.

5.2 Website

The Vecco group website provides a source of basic information about the Project available to the community to access at any time. The Vecco group website is kept up to date with Project background, progress and highlights.

5.3 Contact telephone, website and email

The company contact telephone number, email and contact form on the website are three primary engagement tools to facilitate timely communication. These contact details are as follows:

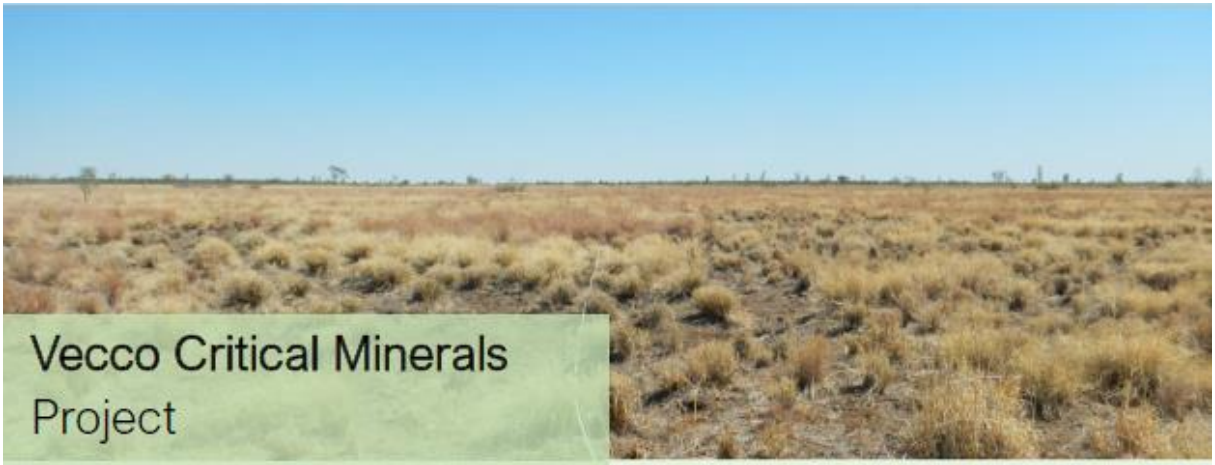
- telephone number (Vecco head office) +61 7 3155 6311;
- email contact@veccogroup.com.au; and
- website 'contact us' page https://veccogroup.com.au/contact/.

The general contact telephone number is available to the stakeholders between 8:30am – 5:00pm Monday to Friday. Emails and website contact as available at any time for persons to send enquiries or concerns. Out-of-office phone traffic, emails and website enquiries will be responded to as soon as possible. Enquiries and concerns will be forwarded to the appropriate personnel for action and recording.

5.4 Printed materials

Printed communication materials are a simple tool to publicize and provide information on a project/issue, including project factsheets, newsletter, and internet publications. Materials may be distributed to directly impacted persons to raise awareness of the project and opportunities to be involved. Information will be provided and distributed to support planned engagement activities or as required in response to emerging project issues.

During 2023 community consultation, printed materials were used to provide information and raise awareness on the Project. This includes a two-sided A4 flier, shown in Figure 4 and Figure 5.



Vecco Critical Minerals Project

The Project

Located approximately 70 km north of Julia Creek, Vecco's proposed critical minerals mine includes:

- Mining of up to 1.9 Million tonnes / year run of mine ore, to a maximum depth of 35m;
- Production of up to 5,500 tonnes of vanadium (V_2O_5), 4,000 tonnes of high purity alumina (HPA) and small quantities of other critical minerals per year;
- Operations commencing in 2024/2025 (subject to approvals) and continuing for approximately 26 years.
- Progressive rehabilitation to return the land to a grazing use, with all voids completely backfilled.
- Product minerals to be hauled by road train along Punchbowl Road and the Flinders Highway to Townsville, where it will be turned into battery electrolyte.

By prioritising local employment and sourcing local contractors, Vecco will assist long term regional development and growth.

Why vanadium?

Vanadium is required for vanadium flow batteries, which are essential for long lasting renewable energy storage. Vanadium batteries are non-flammable, recyclable and perfectly suited for large-scale energy storage needs.

The Project will help to achieve the state's targets for renewable energy generation and emissions reduction through creation of grid scale energy storage.

Who are we?

The proponent is Vecco Industrial Pty Ltd (Vecco), a wholly owned subsidiary of Vecco Group Pty Ltd. Vecco Group is a private Australian company founded in 2014.

"Vecco believes that the solution to Australia's energy transition can be found in Queensland minerals, which should be both mined and processed locally."

Vecco has developed Australia's first commercial scale vanadium electrolyte manufacturing plant in Townsville, with plans to expand production capacity in the future. When combined with a steady, mineral supply from the proposed mine, Vecco can provide electrolyte security for battery projects throughout Australia.

Figure 4: Project factsheet – 2023 community consultation handout, front page

Frequently Asked Questions

How big will the mine be?

The mine pit itself will be relatively shallow, with a maximum depth of 35 m. The total area to be mined is approximately 600 ha, though the area will be progressively backfilled and rehabilitated as the mining face advances.

What waste will be created and how will Vecco handle it?

Once the vanadium and other minerals have been extracted, mineral residue from the processing circuit will be neutralised with lime and dried before being returned to the floor of pit prior to backfilling. Testing and modelling of waste and water properties has been undertaken as part of the application to ensure protection of environmental values.

Will the Project cause dust and noise issues?

The nearest residence is more than 7km from the mining operations. Dust and noise impacts are not anticipated to impact any residences.

Have flood risks been considered?

As seen in 2019, flooding risks in the Gulf are significant. All mine pit, plant and waste dump areas will be located outside of the probable maximum flood extent for the Saxby River. Detailed flood modelling has been undertaken as part of the application.

Will the Project impact the Julia Creek Dunnart population?

Multiple targeted surveys have been completed over the site by specialist ecologists. No populations or individuals were identified, and potential habitat values are limited.

What impacts or opportunities will the Project present to the local community?

The Project will employ up to 250 staff during construction and 160 across the mining operations. Local employment opportunities will be prioritised for residents. Fly-in/fly-out workers will be bused to an on-site accommodation village from the most suitable regional airport. Where possible, sourcing of local contractors and service providers will be prioritised, leading to economic growth for the region.

A social impact assessment is being prepared as part of the application.

How will the mine be powered?

By developing a solar array and battery on-site, the Project seeks to be almost entirely powered by renewable energy. This means the mine will not need to be connected to the grid for electricity.

What comes next?

An Environmental Authority application, supported by a thorough environmental impact assessment, is planned to be lodged in 2023. The mining lease applications will be lodged at the same time.

How can I get more information?

Please contact us for more information about the Vecco Critical Minerals Project, the application process, or to have your say:

T 07 3155 6311
E contact@veccogroup.com.au
W veccogroup.com.au/contact/
A Level 10, 40 Creek Street, Brisbane QLD 4000

VECCO Group

Figure 5: Project factsheet – 2023 community consultation handout, back page

5.5 Site visits

Site visits may be available from time to time and will be designed to cater for specific community groups including preparation of a presentation or demonstration. A site visit will provide the person with an opportunity to gain on the ground knowledge of the Project area and proposed activities. During site visits, persons will be provided the opportunity to raise and discuss related issues and concerns.

All visitors will be required to undertake a health and safety induction prior to visiting work sites.

5.6 Consultation register

In accordance with section 126C(1)(c)(iii) of the EP Act, and the PRCP Guideline, Vecco has developed a community consultation register as part of the approval requirements for the PRCP. The register is a record of present and past engagement activities. It provides a starting point to review information about previous consultations that may be able to assist with planning engagement for the Project. The register will also provide information about what was effective and ineffective in different engagement scenarios.

The register will continue to be maintained to inform the ongoing development of the PRCP.

5.7 Complaints handling

To facilitate open communication and active complaint resolution the Project has an established complaints program, which includes consultation with persons to ensure any disruption to operations or assets are minister. Vecco and the mine operator will work proactively, taking preventive impact mitigation measures to minimise complaints.

Concerns and issues raised by persons will be recorded and responded to in a timely and consistent manner, and in accordance with regulatory standards. All complaints will be recorded on the Vecco consultation register.

6 Feedback and reporting strategy

Routine protocols will be implemented to effectively facilitate engagement and issues/concerns received from the general public and/or other stakeholders. A transparent and timely formal feedback process is designed to respond to all communications. The feedback process is outlined below:

1) Feedback, comments and submissions received via the website, email, phone or meeting.
2) Feedback distributed to project team, consultants or nominated team responder.
3) Response drafted, peer reviewed and approved.
4) Formal response provided via email, letter, or presentation.
5) Corresponding action determined (if required).
6) Community consultation register updated, documenting details of communication.

In some cases, less formal enquires may warrant other forms of response such as email or phone calls.

7 References

Department of Environment and Science (DES) 2023, *Guideline – Progressive rehabilitation and closure plans,* ESR/2019/4964, version 3.00, DES, Queensland Government, Brisbane.

Department for Infrastructure and Planning (DIP) 2010, *North West Regional Plan 2010-2031,* prepared by the Honourable Stirling Hinchcliffe MP, Minister for Infrastructure and Planning, DIP, State of Queensland, Brisbane.

Appendix E. Provided technical studies

- AARC Environmental Solutions (AARC) 2023, *Soils and Land Suitability Report*, prepared for the Vecco Critical Minerals Project, Spring Hill, Brisbane
- AARC Environmental Solutions (AARC) 2023, *Terrestrial Ecology Assessment Report*, prepared for the Vecco Critical Minerals Project, Spring Hill, Brisbane.
- AARC Environmental Solutions (AARC) 2023, *Aquatic Ecology Assessment Report*, prepared for the Vecco Critical Minerals Project, Spring Hill, Brisbane.
- Engeny Water Management (Engeny) 2023, *Surface Water Assessment,* Vecco Critical Minerals Project, prepared for Vecco Group, Engeny, Brisbane.
- JBT Consulting (JBT) 2023, *Vecco Project Groundwater Assessment,* prepared for Vecco Industrial Pty Ltd, JBT, Brisbane.
- RGS Mine Waste and Water Management (RGS) 2023, *Soil capping, mine waste and final void assessment,* prepared for Vecco Group, RGS, Brisbane.
- RGS Mine Waste and Water Management (RGS) 2023b, Mine Waste Management Plan, prepared for Vecco Group, RGS, Brisbane.

Appendix F. Risk assessment

Ref.				Risk Description				Control Effectiveness	Risk Evaluation						Risk Rating				Count				Final Risk Rating
Risk Type (T=Threat)	Category	Subcategory	Item	Risk Scenario/Threat Title	Causes (Triggers / Indicators)	Impacts (Consequences)	Controls and Justification		Likelihood - Frequency	Likelihood - Probability	Health	Safety	Environment	Compliance	Health	Safety	Environment	Compliance	IV	III	II	I	
T	A			**Mine infrastructure area**																			
T	A	01		**Safe**																			
T	A	01	01	Surface roughness (rockiness, depressions) in excess of that expected for PMLU	Inadequate surface preparation, localised settlement, erosion gullies	Safety hazard for personnel, stock and wildlife	Surface preparation measures (initial), monitoring, maintenance controls (pre-closure).	C1		U		VL	L			I	I		0	0	0	2	I
T	A	02		**Stable - geotechnical risk**																			
T	A	02	01	Low risk of geotechnical instability	Adverse weather conditions, natural ground instability	Does not achieve target PMLU	Low slope grades (1:10), adequate water drainage features, prompt revegetation, completion criteria includes final geotechnical assessment.	C1		U		L				I			0	0	0	1	I
T	A	03		**Stable - erosional risk**																			
T	A	03	01	Initial/ongoing gully, pipe and/or sheet erosion of rehabilitated areas	Erodible topsoils and subsoils, adverse weather events	Localised land impacts and downstream water quality impacts	Landform design moderating slope, adequate/effective subsoil and topsoil amelioration, prompt revegetation establishment, revegetation monitoring and management as required.	C2		U		VL	VL			I	I		0	0	0	2	I
T	A	05		**Non-polluting - other environmental harm**																			
T	A	05	01	Contaminants from buildings/workshop areas and laydown areas	Hydrocarbon or heavy metal contamination from operational activities at infrastructure areas, inappropriate reporting of environmental incidents.	Land contamination, surface water impacts, delays to proposed timeframes for achievement of rehabilitation milestones.	Appropriate infrastructure management including storage and bunding of hazardous materials, housekeeping and proactive spills management. Site inductions to ensure all employees and visitors understand their reporting obligations and process. Contaminated land investigation and remediation as required.	C2		U		VL	M			I	II		0	0	1	1	II
T	A	06		**Sustainable - PMLU**																			
T	A	06	01	Insufficient pasture density/diversity and recruitment	Weather, poor soil characteristics, poor management practices impacting germination, vegetation establishment and PMLU density/diversity metrics	Insufficient pasture productivity	Improving rehabilitation methodologies, management and maintenance activities, rehabilitation performance monitoring and assessment, undertake repairs and improvement works as required.	C2		P			L				II		0	0	1	0	II
T	A	06	02	Insufficient management of contractors for closure and rehabilitation works	Poorly executed rehabilitation work	Delays to completing milestone criteria and increased costs of rehabilitation	Ensure appropriate contractual agreements are in place prior to commencement of works.	C1		R			L	L			I	I	0	0	0	2	I
T	A	06	03	Pests and weeds	Poor local, regional or site property management practices.	Increased risk of not achieving designated PMLU	Pest and weed management practices, monitoring programs to allow early detection and management, intensify monitoring and management measures as appropriate.	C2		U			L				I		0	0	0	1	I
T	B			**Retained water infrastructure**																			
T	B	01		**Safe**																			
T	B	01	01	Dam failure (overtopping) of retained structures	Extreme rainfall events	Downstream hazard to public	Only engineered water storages to be retained at closure; dam will be assessed as safe and stable by appropriately qualified person prior to relinquishment; volume is relatively small and water will be free of contaminants.	C1		U			M				II		0	0	1	0	II
T	B	02		**Stable - geotechnical risk**																			
T	B	02	01	Wall failure/dam break of retained structures	Extreme rainfall events	Downstream hazard to public	Only engineered water storage to be retained at closure; dam will be assessed as safe and stable by appropriately qualified person prior to relinquishment; volume is relatively small and water will be free of contaminants.	C1		U			M				II		0	0	1	0	II
T	B	03		**Stable - erosional risk**																			

Ref.				Risk Description				Control Effectiveness	Risk Evaluation						Risk Rating				Count				Final Risk Rating
Risk Type (T=Threat)	Category	Subcategory	Item	Risk Scenario/Threat Title	Causes (Triggers / Indicators)	Impacts (Consequences)	Controls and Justification		Likelihood - Frequency	Likelihood - Probability	Health	Safety	Environment	Compliance	Health	Safety	Environment	Compliance	IV	III	II	I	
T	B	03	01	Off-site erosion caused by the uncontrolled release of stormwater runoff from Project sites	Concentrated water flows, increased turbidity in receiving Saxby River	Off-site erosion, contamination of offsite surface water due to increased turbidity and non-compliance with EA conditions	Engineering designs for roads and Project infrastructure in accordance with best practice and Australian Standards. Mitigation measures relating to stormwater, erosion and sediment control and receiving environment management, are in accordance with the Project Water Management System. Monitoring of water storages and receiving waters undertaken in accordance with the EA conditions.	C1		U			L				I		0	0	0	1	I
T	**B**	**04**		**Non-polluting - geochemical risk**																			
T	B	04	01	Poor water quality in retained water storages	Adverse geochemical characteristics of disturbed materials in catchment	Downstream water quality impacts	Mine affected water to be removed from dam, water quality monitoring program to allow early detection and management of poor water quality. Completion criteria to demonstrate water storages meet water quality criteria for stock.	C1		U	L	L	L		I	I	I		0	0	0	3	I
T	**B**	**06**		**Sustainable - PMLU**																			
T	B	06	01	Water quality in retained storages not meeting PMLU water quality requirements	Adverse geochemical characteristics of disturbed materials in catchment	Livestock health	Mine affected water to be removed from dam, water quality monitoring program to allow early detection and management of poor water quality. Completion criteria to demonstrate water storages meet water quality criteria for stock.	C1		U			L				I		0	0	0	1	I
T	**C**			**Rehabilitated water infrastructure**																			
T	**C**	**01**		**Safe**																			
T	C	01	01	Surface roughness (rockiness, depressions) in excess of that expected for the PMLU	Erosion gullies etc due to some dispersive subsoils/ topsoils, inadequate surface preparation, localised settlement	Safety hazard for personnel, stock and wildlife	Surface preparation measures (initial), maintenance controls (pre-closure), rehabilitation monitoring and assessment, undertake repairs and maintenance as required.	C1	U			VL				I			0	0	0	1	I
T	C	01	02	Slope steepness in excess of that expected for the PMLU	Landform not constructed to design	Safety hazard for personnel, stock and wildlife	Land survey controls, reshaping to design criteria. Land survey used to determine that slopes of less than 10 degrees have been achieved.	C1	U			VL				I			0	0	0	1	I
T	**C**	**02**		**Stable - geotechnical risk**																			
T	C	02	01	Low risk of geotechnical instability	Adverse weather conditions, natural ground instability	Does not achieve target PMLU	Low slope grades (1:10), adequate water drainage features, prompt revegetation, completion criteria includes final geotechnical assessment.	C1		U		L				I			0	0	0	1	I
T	**C**	**03**		**Stable - erosional risk**																			
T	C	03	01	Initial/ongoing gully, pipe and/or sheet erosion of rehabilitated areas	Dispersive topsoils and subsoils, adverse weather events	Localised land impacts and downstream water quality impacts	Landform design moderating slope, adequate/effective subsoil and topsoil amelioration, prompt revegetation establishment, sediment controls during vegetation establishment, revegetation monitoring, revegetation maintenance and repairs as required.	C1	U			M	M			II	II		0	0	2	0	II
T	C	03	02	Initial/ongoing gully, pipe and/or sheet erosion of rehabilitated areas	Inadequate rehabilitation drainage capacity and/or design	Localised land impacts and downstream water quality impacts	Drainage network design with acceptable design standards for drainage structures, avoidance of flow concentration, sub-catchment delineation, sufficient water storage structures, engineered flow channels, effective revegetation techniques, rehabilitation monitoring, regular (typically annual) review of water management design parameters, monitoring of drainage network performance, prompt remediation and causal feedback loop to water management system review.	C1	U			M	M			II	II		0	0	2	0	II

Ref.				Risk Description				Control Effectiveness	Risk Evaluation						Risk Rating				Count				Final Risk Rating
Risk Type (T=Threat)	Category	Subcategory	Item	Risk Scenario/Threat Title	Causes (Triggers / Indicators)	Impacts (Consequences)	Controls and Justification		Likelihood - Frequency	Likelihood - Probability	Health	Safety	Environment	Compliance	Health	Safety	Environment	Compliance	IV	III	II	I	
T	C	03	03	Initial/ongoing gully, pipe and/or sheet erosion of rehabilitated areas	Adverse climatic events and/or climatic sequences beyond design capacity	Localised land impacts and downstream water quality impacts	Existing rehabilitation of spoil, downstream sedimentation controls, prompt revegetation, regular (typically annual) review of water management design parameters, monitoring of drainage network performance, undertake repairs and maintenance as required, prompt remediation and causal feedback loop to water management system review.	C1	U			M	M			II	II		0	0	2	0	II
T	C	03	04	Initial/ongoing gully, pipe and/or sheet erosion of rehabilitated areas (medium-long term risk)	Rehabilitation failure/ vegetation disease/loss, climatic events (drought), other	Localised land impacts and downstream water quality impacts	Landform design moderating slope, adequate/effective subsoil and topsoil amelioration, prompt revegetation establishment, sediment controls during vegetation establishment, revegetation monitoring, revegetation maintenance and repairs as required.	C1	U			M	M			II	II		0	0	2	0	II
T	**C**	**04**		**Non-polluting - geochemical risk**																			
T	C	04	01	Residue material remains within the interim residue waste storage	Not all residue removed from storage facility	Insufficient soil nutrients to support vegetative growth.	Removal of 0.5 m surface material to be disposed of in pit, prior to the reprofiling of the landform. Soil monitoring to determine sufficient soil resources.	C1	U				M				II		0	0	1	0	II
T	**C**	**05**		**Non-polluting - other environmental harm**																			
T	C	05	01	Not applicable															0	0	0	0	
T	**C**	**06**		**Sustainable - PMLU**																			
T	C	06	01	Insufficient pasture density/diversity and recruitment	Weather, poor soil characteristics, poor management practices impacting germination, vegetation establishment and PMLU density/diversity metrics	Insufficient pasture productivity	Improving rehabilitation methodologies, management and maintenance activities, rehabilitation performance monitoring and assessment, undertake repairs and improvement works as required.	C2		P			L				II		0	0	1	0	II
T	C	06	02	Pests and weeds	Poor local, regional or site property management practices.	Increased risk of not achieving designated PMLU	Pest and weed management practices, monitoring programs to allow early detection and management, intensify monitoring and management measures as appropriate.	C2		U			L				I		0	0	0	1	I
T	**D**			**Out-of-pit waste rock dump**																			
T	**D**	**01**		**Safe**																			
T	D	01	01	Surface roughness (rockiness, depressions) in excess of that expected for the PMLU	Erosion gullies etc due to some dispersive subsoils/ topsoils, inadequate surface preparation, localised settlement	Safety hazard for personnel, stock and wildlife	Surface preparation measures (initial), maintenance controls (pre-closure), rehabilitation monitoring and assessment, undertake repairs and maintenance as required.	C1	U			L				I			0	0	0	1	I
T	D	01	02	Slope steepness in excess of that expected for the PMLU	Landform not constructed to design	Safety hazard for personnel, stock and wildlife	Dump and slope survey controls, reshaping to design criteria. Land survey used to determine that slopes of less than 10 degrees have been achieved.	C1	U			L	L			I	I		0	0	0	2	I
T	**D**	**02**		**Stable - geotechnical risk**																			
T	D	02	01	Significant slope failure	Landform not constructed to design, excessive slope steepness, physical material properties, inadequate drainage controls, adverse rainfall event	Localised land impacts and downstream water quality impacts	Slope moderation, maximum slopes subject to engineered design resulting in a target factor of safety >1.5. Provision of adequate drainage infrastructure, rapid revegetation, rehabilitation monitoring and assessment, undertake repairs and maintenance as required.	C1	R			L	M			I	II		0	0	1	1	II
T	**D**	**03**		**Stable - erosional risk**																			
T	D	03	01	Initial/ongoing gully, pipe and/or sheet erosion of rehabilitated areas	Dispersive topsoils and subsoils, adverse weather events	Localised land impacts and downstream water quality impacts	Landform design moderating slope, adequate/effective subsoil and topsoil amelioration, prompt revegetation establishment, sediment controls during vegetation establishment, revegetation monitoring, revegetation maintenance and repairs as required.	C1	U			M	M			II	II		0	0	2	0	II

Ref.				Risk Description				Control Effectiveness	Risk Evaluation						Risk Rating				Count				Final Risk Rating
Risk Type (T=Threat)	Category	Subcategory	Item	Risk Scenario/Threat Title	Causes (Triggers / Indicators)	Impacts (Consequences)	Controls and Justification		Likelihood - Frequency	Likelihood - Probability	Health	Safety	Environment	Compliance	Health	Safety	Environment	Compliance	IV	III	II	I	
T	D	03	02	Initial/ongoing gully, pipe and/or sheet erosion of rehabilitated areas	Inadequate rehabilitation drainage capacity and/or design	Localised land impacts and downstream water quality impacts	Drainage network design with acceptable design standards for drainage structures, avoidance of flow concentration, sub-catchment delineation, sufficient water storage structures, engineered flow channels, effective revegetation techniques, rehabilitation monitoring, regular (typically annual) review of water management design parameters, monitoring of drainage network performance, prompt remediation and causal feedback loop to water management system review.	C1	U			M	M			II	II		0	0	2	0	II
T	D	03	03	Initial/ongoing gully, pipe and/or sheet erosion of rehabilitated areas	Adverse climatic events and/or climatic sequences beyond design capacity	Localised land impacts and downstream water quality impacts	Existing rehabilitation of spoil, downstream sedimentation controls, prompt revegetation, regular (typically annual) review of water management design parameters, monitoring of drainage network performance, undertake repairs and maintenance as required, prompt remediation and causal feedback loop to water management system review.	C1	U			M	M			II	II		0	0	2	0	II
T	D	03	04	Initial/ongoing gully, pipe and/or sheet erosion of rehabilitated areas (medium-long term risk)	Rehabilitation failure/ vegetation disease/loss, climatic events (drought), other	Localised land impacts and downstream water quality impacts	Landform design moderating slope, adequate/effective subsoil and topsoil amelioration, prompt revegetation establishment, sediment controls during vegetation establishment, revegetation monitoring, revegetation maintenance and repairs as required.	C1	U			M	M			II	II		0	0	2	0	II
T	**D**	**04**		**Non-polluting - geochemical risk**																			
T	D	04	01	Acid and saline drainage generation	Adverse waste rock geochemistry	Revegetation performance impacts, downstream receiving environment water quality and dependent ecosystem impacts.	The geochemical assessment of the Project material indicates that when construction of the final landform is undertaken in accordance with the rehabilitation methods, there is no risk of acid saline generation. The mudstone floor and the Toolebuc orebody are potentially acid forming. Neutralised residue material will be placed at a ratio of limestone waste rock to residue material of 5:1. Followed by a minimum cover of 2 m of subsoil/topsoil material.	C1		U			M					II		0	0	1	0	II
T	**D**	**05**		**Non-polluting - other environmental harm**																			
T	D	05	01	Total suspended solids in site drainage in excess of that expected for the PMLU	Dispersive materials used in construction of WRDs	Downstream water quality impacts	Soil testing and amelioration and prompt vegetation establishment, revegetation monitoring and management.	C1		P			L				II		0	0	1	0	II
T	**D**	**06**		**Sustainable - PMLU**																			
T	D	06	01	Insufficient pasture density/diversity and recruitment	Weather, poor soil characteristics, poor management practices impacting germination, vegetation establishment and PMLU density metrics, and shortage of topsoil resources	Insufficient pasture productivity	Review rehabilitation methodologies as required, rehabilitation area monitoring and assessment, undertake repairs and maintenance works as required. Monitoring pasture dieback and undertaking reparation activities as required.	C2	U				L				I		0	0	0	1	I
T	D	20	03	Pests and weeds	Poor local, regional or site property management practices.	Increased risk of not achieving designated PMLU	Pest and weed management practices, monitoring programs to allow early detection and management, intensify monitoring and management measures as appropriate.	C2		U			L				I		0	0	0	1	I
T	**E**			**In-pit waste rock dump**																			
T	**E**	**01**		**Safe**																			

Ref.				Risk Description				Control Effectiveness	Risk Evaluation						Risk Rating				Count				Final Risk Rating
Risk Type (T=Threat)	Category	Subcategory	Item	Risk Scenario/Threat Title	Causes (Triggers / Indicators)	Impacts (Consequences)	Controls and Justification		Likelihood - Frequency	Likelihood - Probability	Health	Safety	Environment	Compliance	Health	Safety	Environment	Compliance	IV	III	II	I	
T	E	01	01	Surface roughness (rockiness, depressions) in excess of that expected for the PMLU	Erosion gullies etc due to some dispersive subsoils/ topsoils, inadequate surface preparation, localised settlement	Safety hazard for personnel, stock and wildlife	Surface preparation measures (initial), maintenance controls (pre-closure), rehabilitation monitoring and assessment, undertake repairs and maintenance as required.	C1	U			L				I			0	0	0	1	I
T	E	01	02	Slope steepness in excess of that expected for the PMLU	Landform not constructed to design	Safety hazard for personnel, stock and wildlife	Dump and slope survey controls, reshaping to design criteria. Land survey used to determine that slopes criteria have been achieved.	C1	U			L	L			I	I		0	0	0	2	I
T	**E**	**02**		**Stable - geotechnical risk**																			
T	E	02	01	Low risk of geotechnical stability	Landform not constructed to design, excessive slope steepness, physical material properties, inadequate drainage controls, adverse rainfall event	Localised land impacts and downstream water quality impacts	Slope moderation, maximum slopes subject to engineered design resulting in a target factor of safety >1.5. Provision of adequate drainage infrastructure, rapid revegetation, rehabilitation monitoring and assessment, undertake repairs and maintenance as required.	C1	R			L	M			I	II		0	0	1	1	II
T	**E**	**03**		**Stable - erosional risk**																			
T	E	03	01	Initial/ongoing gully, pipe and/or sheet erosion of rehabilitated areas	Dispersive topsoils and subsoils, adverse weather events	Localised land impacts and downstream water quality impacts	Landform design moderating slope, adequate/effective subsoil and topsoil amelioration, prompt revegetation establishment, sediment controls during vegetation establishment, revegetation monitoring, revegetation maintenance and repairs as required. Soils used on the outer surface of the slopes will be managed in such a way so to minimise dispersion potential.	C1	U			M	M			II	II		0	0	2	0	II
T	E	03	02	Initial/ongoing gully, pipe and/or sheet erosion of rehabilitated areas	Inadequate rehabilitation drainage capacity and/or design	Localised land impacts and downstream water quality impacts	Drainage network design with acceptable design standards for drainage structures, avoidance of flow concentration, sub-catchment delineation, sufficient water storage structures, engineered flow channels, effective revegetation techniques, rehabilitation monitoring, regular (typically annual) review of water management design parameters, monitoring of drainage network performance, prompt remediation and causal feedback loop to water management system review.	C1	U			M	M			II	II		0	0	2	0	II
T	E	03	03	Initial/ongoing gully, pipe and/or sheet erosion of rehabilitated areas	Adverse climatic events and/or climatic sequences beyond design capacity	Localised land impacts and downstream water quality impacts	Existing rehabilitation of spoil, downstream sedimentation controls, prompt revegetation, regular (typically annual) review of water management design parameters, monitoring of drainage network performance, undertake repairs and maintenance as required, prompt remediation and causal feedback loop to water management system review.	C1	U			M	M			II	II		0	0	2	0	II
T	E	03	04	Initial/ongoing gully, pipe and/or sheet erosion of rehabilitated areas (medium-long term risk)	Rehabilitation failure/ vegetation disease/loss, climatic events (drought), other	Localised land impacts and downstream water quality impacts	Landform design moderating slope, adequate/effective subsoil and topsoil amelioration, prompt revegetation establishment, sediment controls during vegetation establishment, revegetation monitoring, revegetation maintenance and repairs as required.	C1	U			M	M			II	II		0	0	2	0	II
T	**E**	**04**		**Non-polluting - geochemical risk**																			

Ref.				Risk Description				Control Effectiveness	Risk Evaluation						Risk Rating				Count				Final Risk Rating
Risk Type (T=Threat)	Category	Subcategory	Item	Risk Scenario/Threat Title	Causes (Triggers / Indicators)	Impacts (Consequences)	Controls and Justification		Likelihood - Frequency	Likelihood - Probability	Health	Safety	Environment	Compliance	Health	Safety	Environment	Compliance	IV	III	II	I	
T	E	04	01	Acid generation	Adverse waste rock geochemistry	Revegetation performance impacts, downstream receiving environment water quality and dependent ecosystem impacts	The geochemical assessment of the Project material indicates that when construction of the final landform is undertaken in accordance with the rehabilitation methods, there is no risk of acid generation. The mudstone floor and the Toolebuc orebody are potentially acid forming. Neutralised residue material will be placed at a ratio of limestone waste rock to residue material of 5:1. Followed by a minimum cover of 2 m of subsoil/topsoil material.	C1		U			M				II		0	0	1	0	II
T	E	04	02	Saline drainage generation	Adverse waste rock geochemistry	Revegetation performance impacts, downstream receiving environment water quality and dependent ecosystem impacts	Saline drainage within the backfilled voids is likely but should not exceed measured groundwater conditions. Measured groundwater data from one sample event verify that the groundwater is moderately to highly saline. Groundwater monitoring will continue to be undertaken in accordance with EA conditions.	C2		U			M				II		0	0	1	0	II
T	E	04	03	Metalliferous drainage	Adverse waste rock geochemistry	Revegetation performance impacts, downstream receiving environment water quality and dependent ecosystem impacts	Metalliferous drainage within the backfilled voids is likely, but should by limited to elements such as molybdenum, strontium and vanadium whose concentrations should not exceed measured groundwater conditions. Groundwater monitoring will continue to be undertaken in accordance with EA conditions.	C2		U			M				II		0	0	1	0	II
T	E	04	04	Impacts to groundwater	Adverse waste rock geochemistry	Groundwater impacts (incl. GDEs)	The backfilled void assessment indicates that mine activities will have netlabel risk to the receiving environment. Predicted water quality results from the backfilled assessment are comparable to the groundwater quality values observed from the groundwater monitoring event undertaken in 2022.	C1		R			M				II		0	0	1	0	II
T	E	04	05	Exposure of materials from the mudstone basement migrate to the topsoil	Insufficient cover material and depth used	MAW released to receiving environment Poor revegetation of rehabilitation area as a result of contaminants	Neutralised residue material will be placed at a ratio of limestone waste rock to residue material of 5:1. Followed by a minimum cover of 2 m of subsoil/topsoil material. Geochemical assessment indicates that the Allura mudstone and Toolebuc limestone cover material have low permeability when compacted.	C2		R			M				II		0	0	1	0	II
T	E	04	06	Contaminants from residue material migrate to top of the dump	Insufficient cover material and depth used	MAW released to receiving environment Poor revegetation of rehabilitation area as a result of contaminants	Neutralised residue material will be placed at a ratio of limestone waste rock to residue material of 5:1. Followed by a minimum cover of 2 m of subsoil/topsoil material. Geochemical assessment indicates that the Allura mudstone and Toolebuc limestone cover material have low permeability when compacted.	C2		R			M				II		0	0	1	0	II
T	**E**	**05**		**Non-polluting - other environmental harm**																			
T	E	05	01	Total suspended solids in site drainage in excess of that expected for the PMLU	Dispersive materials used in construction of WRDs	Downstream water quality impacts	Soil testing and amelioration and prompt vegetation establishment, revegetation monitoring and management.	C1		P			L				II		0	0	1	0	II

Ref.				Risk Description				Control Effectiveness	Risk Evaluation						Risk Rating				Count				Final Risk Rating
Risk Type (T=Threat)	Category	Subcategory	Item	Risk Scenario/Threat Title	Causes (Triggers / Indicators)	Impacts (Consequences)	Controls and Justification		Likelihood - Frequency	Likelihood - Probability	Health	Safety	Environment	Compliance	Health	Safety	Environment	Compliance	IV	III	II	I	
T	E	05	02	Acid and saline drainage generation	Adverse waste rock geochemistry	Revegetation performance impacts, downstream receiving environment water quality and dependent ecosystem impacts.	The geochemical assessment of the Project material indicates that when construction of the final landform is undertaken in accordance with the rehabilitation methods, there is no risk of acid saline generation. The mudstone floor and the Toolebuc orebody are potentially acid forming. Neutralised residue material will be placed at a ratio of limestone waste rock to residue material of 5:1. Followed by a minimum cover of 2 m of subsoil/topsoil material. All material used as cover (waste rock) has been classified as non acid forming or acid consuming.	C1		U			M				II		0	0	1	0	II
T	E	05	03	Impacts to groundwater	Adverse waste rock geochemistry	Groundwater impacts (incl. GDEs)	The backfilled void assessment indicates that mine activities will have negligable risk to the receiving environment. Predicted water quality results from the backfilled assessment are comparable to the groundwater quality values observed from the groundwater monitoring event undertaken in 2022. The elements such as Mo, Sr and V present at low mg/L concentration will maintain environmental mobility as they are less prone to precipitation, but other attenuation mechanisms with organic components, and clay minerals under anoxic or reducing conditions or co-precipitation with other metalloids, is likely to reduce soluble concentrations of these elements over time. Surface water monitoring and groundwater monitoring will be undertaken in accordance with the EA.	C1		R			M				II		0	0	1	0	II
T	**E**	**06**		**Sustainable - PMLU**																			
T	E	06	01	Insufficient pasture density/diversity and recruitment	Weather, poor soil characteristics, poor management practices impacting germination, vegetation establishment and PMLU density/diversity metrics	Insufficient pasture productivity	Improving rehabilitation methodologies, management and maintenance activities, rehabilitation performance monitoring and assessment, undertake repairs and improvement works as required	**C2**		P			L				II		0	0	1	0	II
T	E	06	02	Failure to completely backfill the pit	Insufficient resources to achieve final landform design	Depression remaining in the final landform	Final landform survey to indicate that the landform design criteria has been achieved. The pit will be returned to the pre-mining land contours.	C1		P			L	L			II	II	0	0	2	0	II
T	E	06	03	Pests and weeds	Poor local, regional or site property management practices.	Increased risk of not achieving designated PMLU	Pest and weed management practices, monitoring programs to allow early detection and management, intensify monitoring and management measures as appropriate.	**C2**		U			L				I		0	0	0	1	I
T	**F**			**Natural hazards**																			
T	F	01	01	Heavy rainfall or Droughts after initial planting	Natural event	Poor seed establishment, erosion of rehabilitated areas, loss of topsoil and surface water contamination through flooding	Weather monitoring prior to seeding. Monitoring for early detection of poor seed germination. Extreme droughts may require extra seeding and supplementary irrigation as required.	**C2**		U			M				II		0	0	1	0	II
T	F	01	02	Fires	Natural event	Loss of planted stock. Increased erosion and soil loss due to decreased groundcover	Maintaining a fire break. Immediate action through re-seeding and hay mulching to minimize soil loss and erosion.	**C2**		U			M				II		0	0	1	0	II
T	**F**	**02**		**0**																			
				End of record																			