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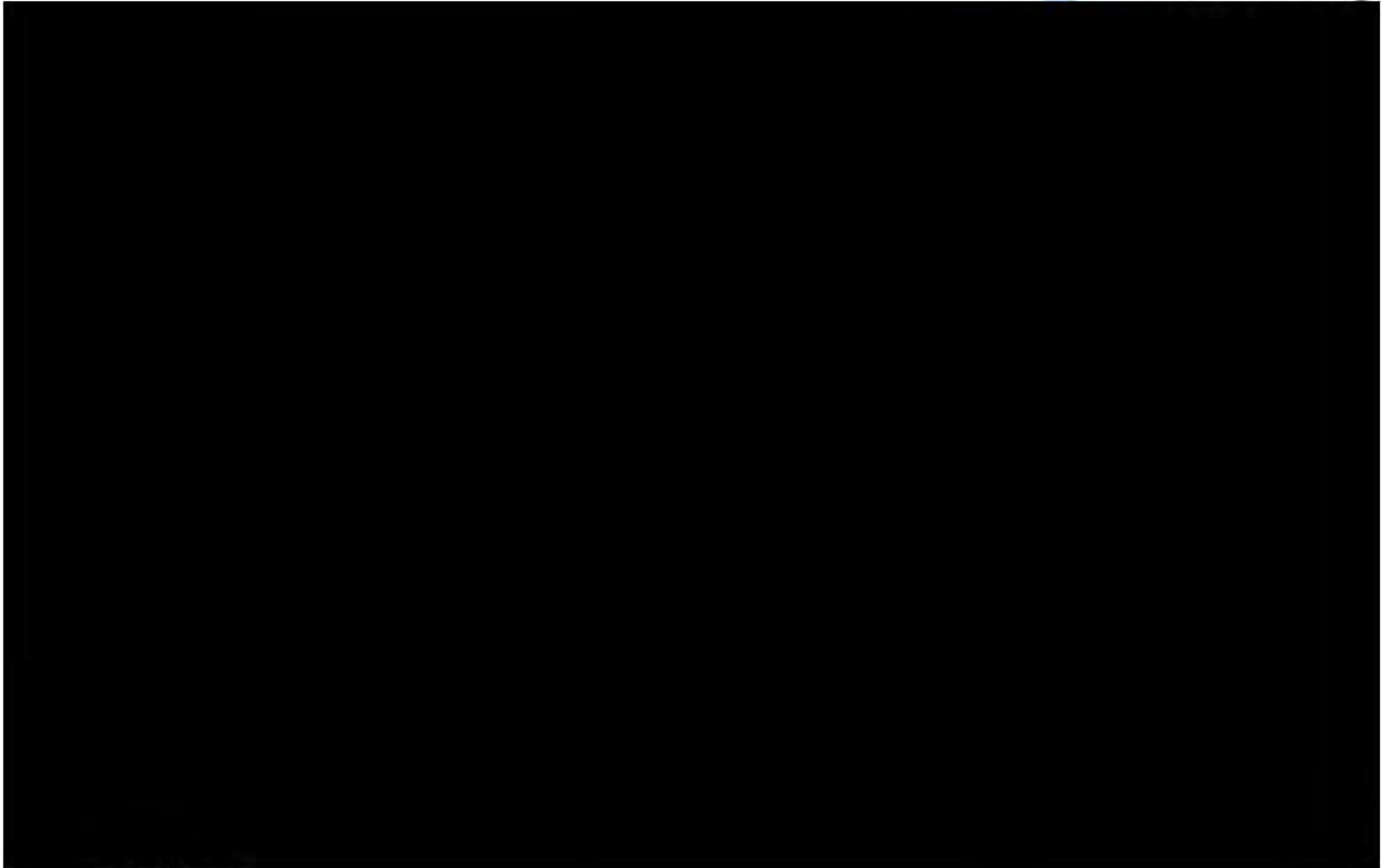
# ARROWSMITH NORTH SILICA SAND PROJECT

## CATEGORY 5 WORKS APPROVAL

SUPPORTING DOCUMENT

15 September 2023

PREPARED FOR VRX SILICA LIMITED  
BY PRESTON CONSULTING PTY LTD



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## **ACKNOWLEDGEMENT OF COUNTRY**

*Preston Consulting acknowledges the Traditional Owners of the lands on which it works, in particular the Whadjuk people of the Noongar Nation and the Yamatji people, the Traditional Custodians of the land on which the activity is proposed. Preston Consulting pays its respects to Elders past and present, to emerging community leaders and to all Aboriginal and Torres Strait Islander peoples.*







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## PROJECT BACKGROUND

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VRX Silica Limited (VRX) proposes to develop a high-grade silica sand mine at Arrowsmith in the Geraldton Sandplain bioregion of Western Australia (WA), approximately 270 kilometres (km) north of Perth (Project). The Project will produce a high-grade silica sand product via extraction and mechanical upgrading.

Proposed activities of the Project are summarised as:

- Sequential block mining of silica sand;
- Progressive rehabilitation using Vegetation Direct Transfer (VDT);
- On site processing of silica sand (mechanical upgrading via gravity separation);
- Water abstraction and storage;
- Product stockpiling;
- Onsite power generation; and
- Loading and haulage.

Further information on the Proposed Activities is provided in Attachment 3B.

## WORKS APPROVAL

The Project includes processing (mechanical upgrading and gravity separation) of 1 Million tonnes per annum (Mtpa) of silica sand for the first three years of operation, increasing to 2 Mtpa thereafter.

Prescribed Premises Category 5 is defined in Schedule 1 of the Environmental Protection Regulations 1878 (WA) (Regulations) as:

*Processing or beneficiation of metallic or non-metallic ore; premises on which -*

*(a) metallic or non-metallic ore is crushed, ground, milled or otherwise processed;*

*(b) tailings from metallic or non-metallic ore are reprocessed; or*

*(c) tailings or residue from metallic or non-metallic ore are discharged into a containment cell or dam.*

*With a Production or design capacity of 50,000 tonnes or more per year.*

The silica sand processing component of the Project (Prescribed Activities) meets the definition of and exceeds the production capacity of a Category 5 Prescribed Premises. The Prescribed Activities trigger the requirement for a Works Approval under Part V of the *Environmental Protection Act 1986* (WA).

This document includes the attachments as required by the Department of Water and Environmental Regulation (DWER) *Application form: Works Approval / Licence / Renewal / Amendment / Registration v16, August 2022* (DWER, 2022) to support a Works Approval Application. As per the application form the following attachments must be submitted:

- Attachment 1A, 1B & 1C (Occupier Status, Australian Securities and Investment Commission (ASIC) company extracts and Authorisation to act as a representative of the occupier);
- Attachment 2 (Premises map);
- Attachment 3A & 3B (Environmental Commissioning Plan and Proposed activities);





- Attachment 5 (Other approvals and consultation);
- Attachment 6A (Emissions and discharges);
- Attachment 7 (Siting and location);
- Attachment 8 (Additional Information);
- Attachment 10 (Proposed fee calculation).

The application form identifies a number of attachments that are optional or may not be required depending on the type and scope of the application. VRX has reviewed the list of information and determined that the following are not required for this Works Approval Application:

- Attachment 3C & 3D (Clearing and Additional information);
- Attachment 4 (Marine surveys);
- Attachment 6B (Waste acceptance);
- Attachment 9 (Category Specific Checklist); and
- Attachment 11 (Request for exemption from publication).





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## ATTACHMENT 1A: PROOF OF APPLICANT STATUS

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The Prescribed Premises Boundary (PPB: see Attachment 2) and Proposed Activities reside within a portion of Mining Lease (M) 70/1389 held by Ventnor Mining Pty Ltd, a wholly owned subsidiary of VRX and issued under the *Mining Act 1978* (WA) (Mining Act) by the Department of Mines, Industry Regulation and Safety (DMIRS).







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## ATTACHMENT 2: PRESCRIBED PREMISES MAP

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Figure 1 shows the PPB and general arrangement of the Project. The PPB lies entirely within mining lease M 70/1389 held by Ventnor Mining Pty Ltd, a wholly owned subsidiary of VRX. The processing and Non-Processing Infrastructure layout is shown in Figure 1 and the Mining Unit design is shown in Figure 3.

Access to the site will be via a single corridor connecting the Mine to Brand Highway (Figure 1).



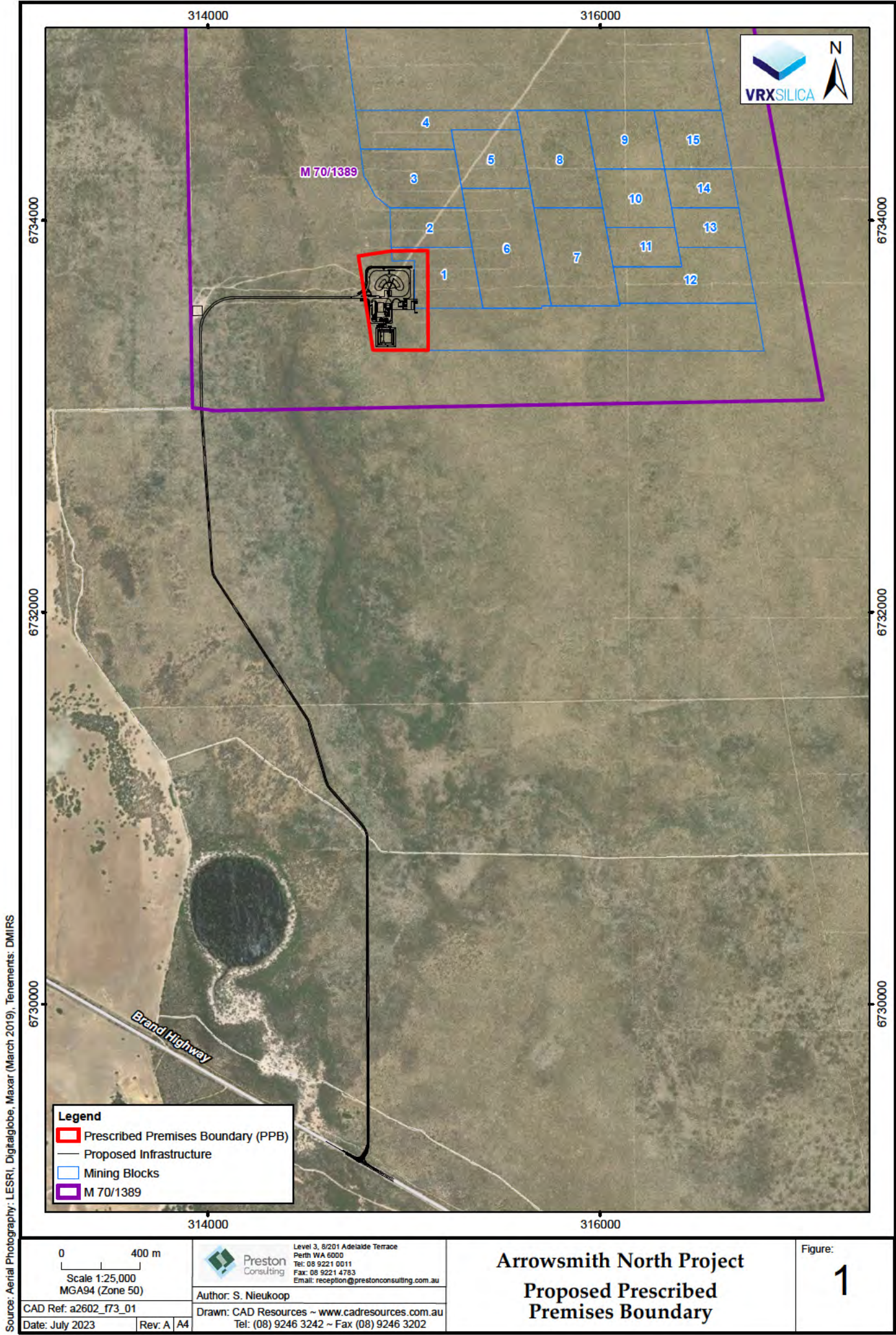
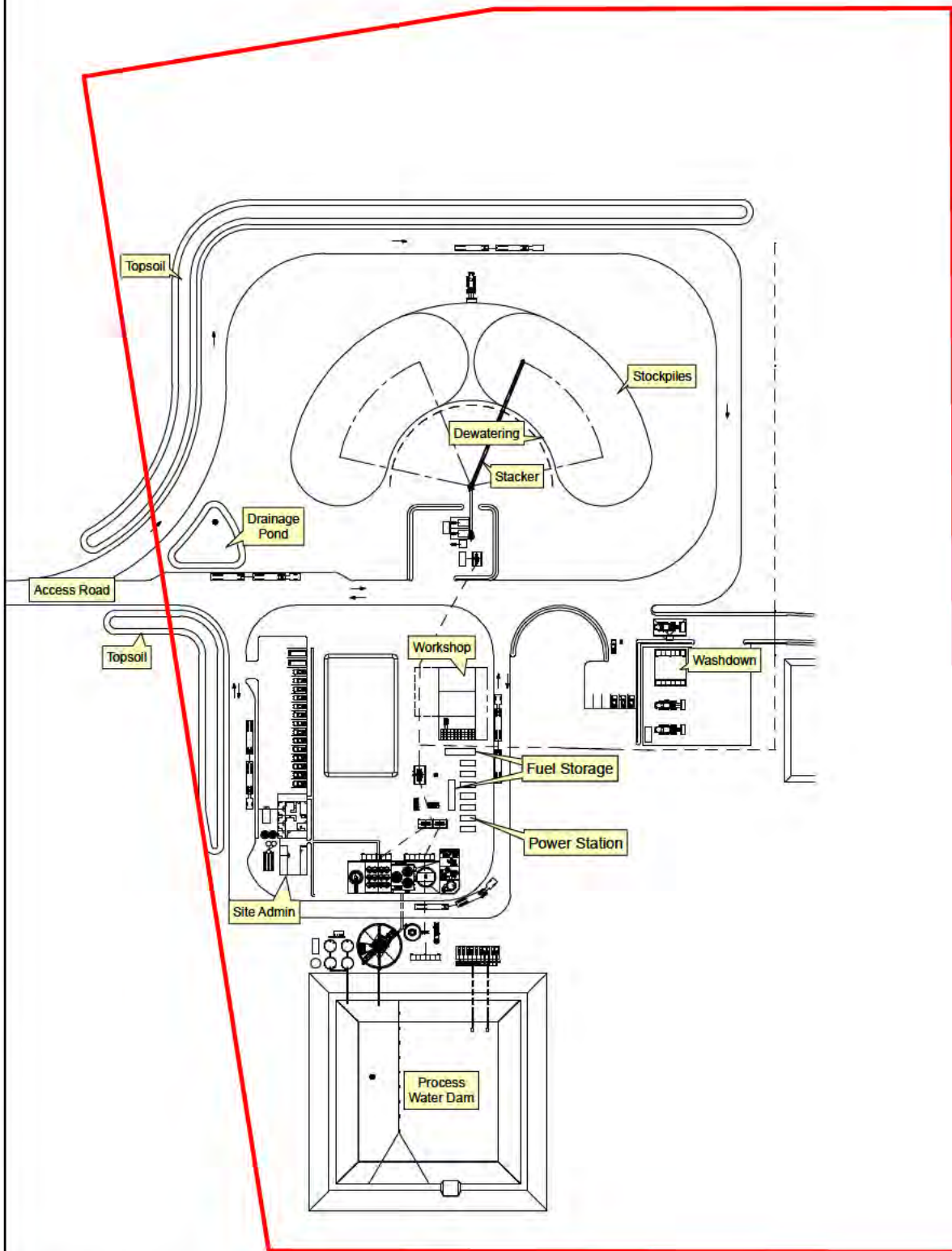


Figure 1: Proposed PPB



**Legend**  
 Prescribed Premises Boundary (PPB)  
 Proposed Infrastructure

Sources: Aerial Photography: LESRI, Digitalglobe, Maxar (March 2019), Tenements: DMIRS

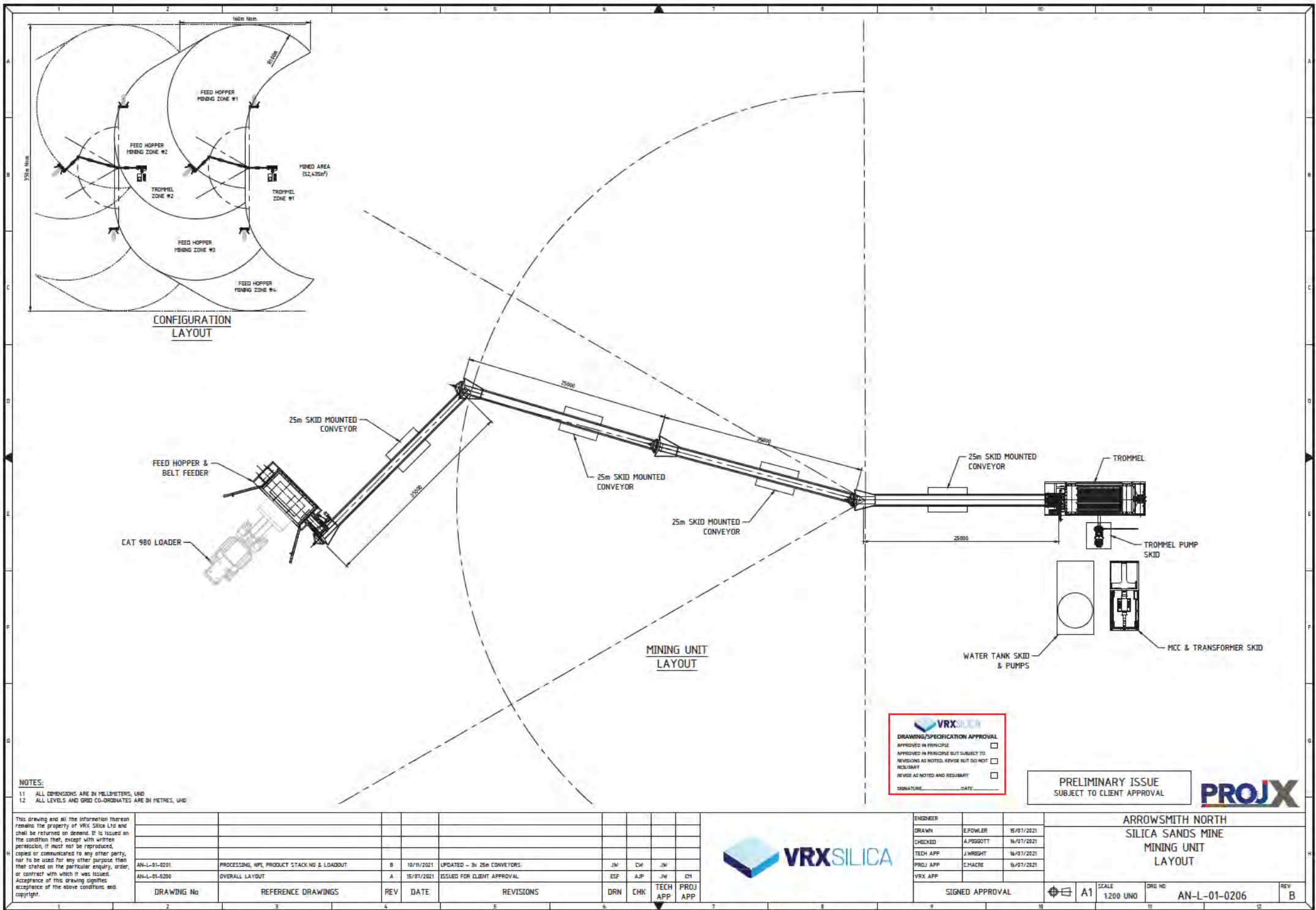
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## Arrowsmith North Project Silica Sand Processing Layout

Figure:  
2

Figure 2: Silica Sand Processing Layout



NOTES:  
 11 ALL DIMENSIONS ARE IN MILLIMETERS, UNO  
 12 ALL LEVELS AND GRID CO-ORDINATES ARE IN METRES, UNO

**VRX SILICA**  
 DRAWING/SPECIFICATION APPROVAL  
 APPROVED IN PRINCIPLE   
 APPROVED IN PRINCIPLE BUT SUBJECT TO REVISIONS AS NOTED, REVISIONS BUT DO NOT RESUBMIT   
 REVISIONS AS NOTED AND RESUBMIT   
 SIGNATURE: \_\_\_\_\_ DATE: \_\_\_\_\_

PRELIMINARY ISSUE  
 SUBJECT TO CLIENT APPROVAL



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DRAWING No	REFERENCE DRAWINGS	REV	DATE	REVISIONS	DRN	CHK	TECH APP	PROJ APP
AN-L-01-0201	PROCESSING, WPI, PRODUCT STACKING & LOADOUT	B	10/11/2021	UPDATED - 3x 25m CONVEYORS	JW	CW	JW	
AN-L-01-0200	OVERALL LAYOUT	A	16/07/2021	ISSUED FOR CLIENT APPROVAL	ESF	AJP	JW	DM



ENGINEER	DATE
E.FOWLER	16/07/2021
A.PREGOTT	16/07/2021
J.WRIGHT	16/07/2021
C.HACRE	16/07/2021

ARROWSMITH NORTH SILICA SANDS MINE MINING UNIT LAYOUT			
SIGNED APPROVAL	A1	SCALE 1:200 UNO	DRG NO AN-L-01-0206
			REV B

Figure 3: Silica sand mining unit and mine feed plant layout sand



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## ATTACHMENT 3A: ENVIRONMENTAL COMMISSIONING PLAN

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### 3A.2 COMMISSIONING ACTIVITIES

Commissioning activities for the prescribed activities include:

- Verification and testing: the locations and specifications of installed infrastructures are checked for compliance with detailed design plans. Components are energised in isolation for inspection and testing purposes;
- Dry Commissioning: equipment is run 'dry' (no Product in the circuit) to ensure proper function. Motors and ancillary equipment such as sensors and lighting are run; and
- Wet Commissioning: equipment is run 'wet' (Product is added to the circuit and stacked in the product storage area to ensure proper function under operational conditions.

An environmental compliance report will be submitted to DWER following the completion of construction, which will initiate the commissioning phase. An environmental commissioning report will be submitted to DWER once wet commissioning and dry commissioning is finalised; this will trigger commencement of time limited operations (TLO - refer below).

Each commissioning activity (verification and testing, dry and wet commissioning) is predicted to take 1 month.

### 3A.3 TIME LIMITED OPERATIONS

VRX proposes a TLO period of 180 calendar days to enable Project operational activities to commence until a Licence is approved by DWER.

### 3A.4 MONITORING

All monitoring required for commissioning and TLO will be undertaken as per the conditions placed on this Works Approval and conditions outlined in the anticipated Ministerial Statement (once approved), including any future amendments to these conditions.





## ATTACHMENT 3B: PROPOSED ACTIVITIES

### 3B.1 PROJECT OVERVIEW

The Project includes the sequential block mining of silica sand to produce a high-grade silica sand product via extraction and mechanical upgrading.

Proposed activities include:

- Sequential block mining of silica sand;
- Rehabilitation by VDT;
- On site processing of silica sand (mechanical upgrading via flotation separation and screening);
- Water abstraction and storage;
- Product stockpiling;
- Onsite power generation; and
- Loading and Haulage.

To support the activities, the Project includes development of a Mine Feed Plant (MFP), moveable surface conveyor, surface slurry pipeline, processing plant, stockpiles, freshwater supply bore, water storage, access corridor, laydown, administration and associated infrastructure including: communications equipment, offices, workshop and additional laydown areas.

Access to the site will be via a 5.5 km access corridor connecting the mine and processing plant to Brand Highway. A groundwater production bore and pipeline will be developed alongside the access corridor to supply fresh processing water for the Project. Product will be hauled via road to Geraldton port where it is exported internationally.

The access corridor, groundwater production bore, pipeline and haulage occurs outside the PPB (Section 2) and are therefore not subject to this Works Approval.

### 3B.2 PRESCRIBED PREMISES CATEGORIES

The Prescribed Premises categories as defined under Schedule 1 of the Regulations relevant to this Works Approval Application are presented in (Table 1).

Table 1: Prescribed premises categories and production details

Category Number and Description	Category capacity	Design Capacity	Expected throughput
<b>Category 5:</b> Processing or beneficiation of metallic or non-metallic ore: premises on which – a) Metallic or non-metallic ore is crushed, ground, milled or otherwise processed; or b) Tailings from metallic or non-metallic ore are reprocessed; or c) Tailings or residue from metallic or non-metallic ore are discharged into a containment cell or dam.	100 tonnes or more per day	2 Mtpa	5,480 tonnes per day





## 3B.3 PREMISES DETAILS

### MINE FEED PLANT

Mined sand is processed through a MFP (Figure 4) that is separate to the processing plant. The MFP is comprised of a hopper, conveyor and trommel screen.

Dry silica sand extracted from the mine face will be tipped across a dump hopper with static grizzly bars to remove oversize rocks and large organic material. The bin will meter feed out to a feed conveyor which will transfer feed to the mouth of a rotating trommel screen. The trommel screen will act to wash the sand and slurry the sand feed and remove +2 mm oversize sand, rocks and organic material. Water will be from the mine water storage tank. Undersize material from the trommel screen will gravitate to a bin and will be pumped to the processing plant via a slurry transfer system.

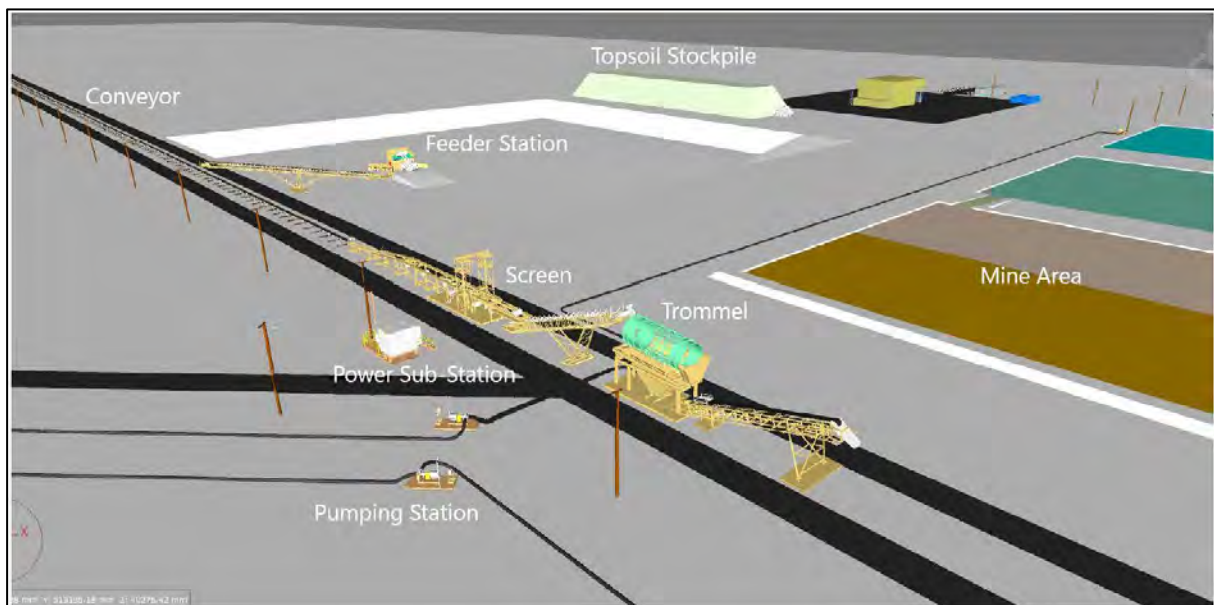


Figure 4: General arrangement of the MFP

### MOVEABLE PIPELINE

Sand slurry will be piped to the processing plant via a moveable surface pipeline. The pipeline is manufactured from polyethylene and has a diameter of 280 mm. The pipeline will transfer approximately 8 m<sup>3</sup> of sand slurry (30% solids) per minute. The pipeline will be fitted with sensors and an alarm system with automatic shutdown in case of a burst or damaged pipe. The sensors measure flow rates at the start and finish of the pipeline, and differences in the flow rates will trigger a shutdown of the system. Conservative estimates suggest that the shutdown of the system would occur within 1 minute (likely to be quicker) of a leak being detected, therefore a complete rupture is only expected to result in a spill of approximately 8 m<sup>3</sup> of sand slurry (2.4 m<sup>3</sup> of solids). The pipeline is proposed to be housed in a 'V' trench approximately 300 mm deep that will have the capacity to hold a complete rupture of the pipeline. Spills are expected to be localised within the trench, and therefore any impacts to surrounding vegetation are unlikely. Infiltration rates are high, and it is anticipated the slurry will dry quickly. Spilled material will be recovered.





## PROCESSING PLANT

Mined sand is pumped as a slurry to the processing plant (Figure 5) located in the southwest corner of the PPB. The sand is upgraded to a commercial grade using flotation and screening separation. A simplified sand processing flow chart is provided in Figure 6. Upgraded sand is pumped to a dewatering screen for drying, and clean moist (3% moisture) product is stockpiled adjacent to the processing plant using a radial stacker conveyor in preparation for export.

Reject material (slimes) will report to a thickener tank with flocculant (discussed in the following section) addition to create a single plant tail. The thickener will utilise a pressure sensor activated underflow pump which will deposit densified tails into a dewatered tailings stack. The tails will stockpiled and then be taken offsite for sale in the local market.

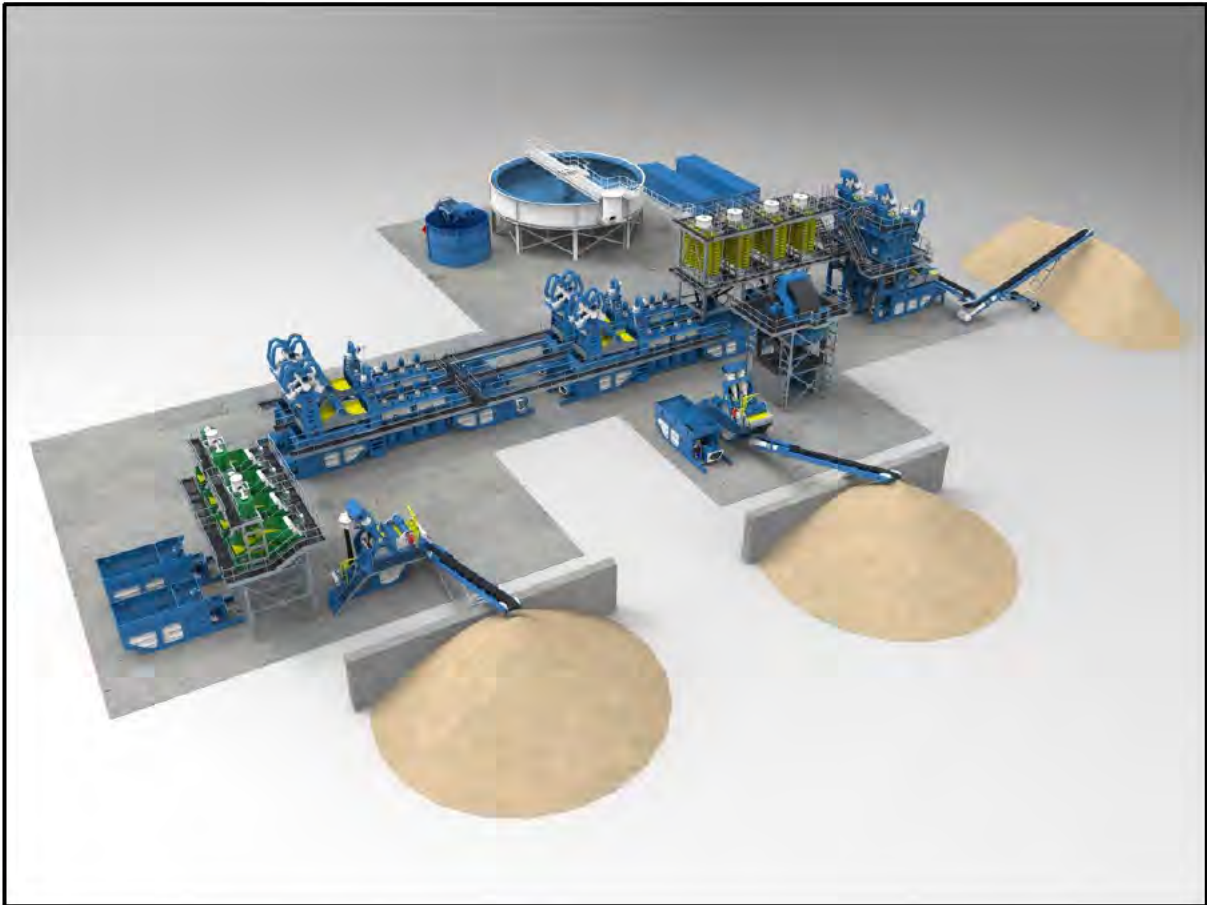


Figure 5: Process Plant indicative layout





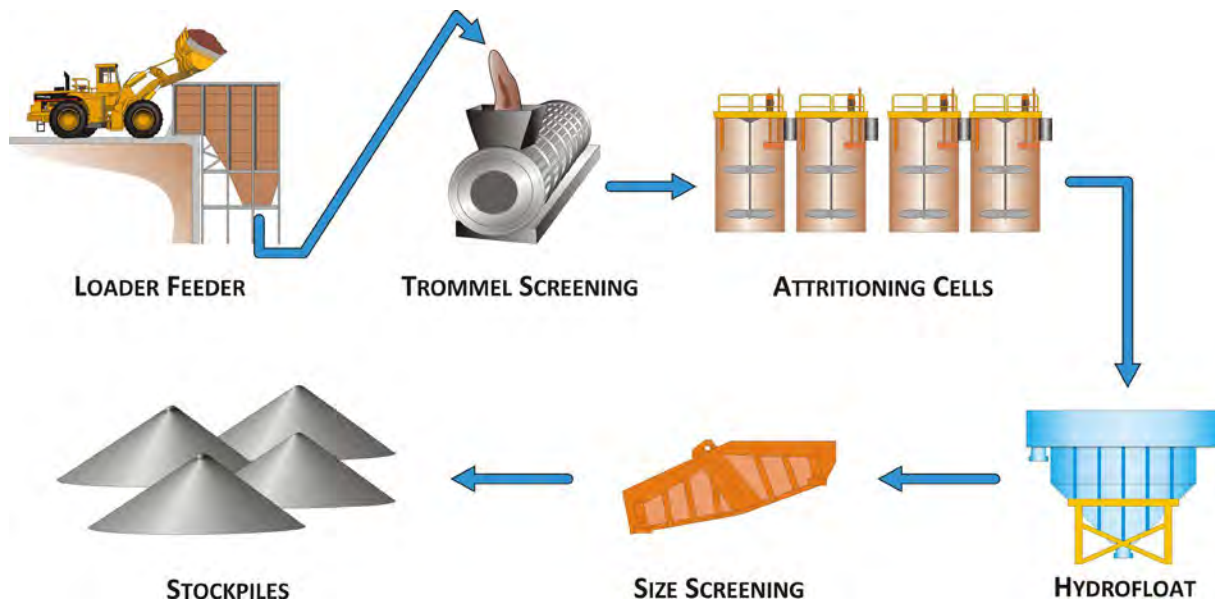


Figure 6: Silica sand processing flow chart

## PONDS

The Project will include construction and operation of a process water pond and drainage pond.

The process water pond will contain approximately 15,000 m<sup>3</sup> of groundwater abstracted from the Yarragadee aquifer. A steady supply of water is required to enable processing (washing and upgrading) of mined silica sand. The process water pond will be located in the southwest corner of the PPB. The pond will be a lined and bunded excavation with associated supporting infrastructure including process circuit pump, plumbing and, water level monitoring and management. The pond will be lined with a HDPE liner with a nominal thickness of 1.5 mm. The pond will be bunded using material excavated during construction and a 1 m freeboard will be maintained automatically using level sensors connect by telemetry to the water supply pump.

The Project also includes the construction of a drainage pond near the western edge of the PPB. The purpose of the drainage pond is to manage surface water flows from the stockpile area in extreme rainfall events. The stockpile area will have a general grade towards the drainage pond. It is highly unlikely that this drain will be required as the permeability of the soils within the PPB is very high (deep sands) however it has been included as a contingency for surface water flows.

## FLOCCULANT

The flocculant used in the process is Floerger AN900 series Anionic Polyacrylamide. The following information is from the environmental data sheet for Floerger AN900 series Anionic Polyacrylamide (SNF Floerger, n.d.). The environmental datasheet is provided as Attachment 8.1.

Anionic polyacrylamide is the generic name for a group of very high molecular weight macromolecules produced by the free-radical polymerization of acrylamide and an anionically charged comonomer, mainly the sodium salt of acrylic acid, sodium acrylate. The combination of molecular weight and ionic charge results in extremely viscous aqueous solutions, one of the main properties of these polymers.





## REJECT MATERIAL

Oversize reject material from the processing circuit will be separated and cyclone stacked (6-10% moisture) in the stockpile area for drying. Dry oversize reject material will be reclaimed using front end loader and trucked offsite for sale into the local market as construction sand. Approximately 50,000 tonnes of oversize material will be produced each year.

Washed silica sand will report to a single thickener tank where non-toxic flocculant is added to separate the clay fraction from the sand, this process will produce a thickener reject (Slimes). Slimes will report to a cyclone stacker which will dewater and stack the material in the stockpile area. Once dried, the Slimes will then be taken offsite for sale in the local market as soil conditioner. Small quantities of thickener reject will be produced.

As all waste products produced will be transported offsite, it is expected that there will be no significant impact to soil infiltration regimes and local hydrology.

## WATER SUPPLY

Process and dust suppression water will be sourced from a groundwater bore (located outside the PPB) that will target the Yarragadee aquifer at a rate of 0.9 GL/year. Potable water will be required for personnel, which will be trucked to site.

## WASHDOWN FACILITIES

A dedicated washdown and inspection area (Washdown) will be constructed and operated adjacent to the processing plant in the mining equipment laydown yard. The Washdown is required to enable cleaning vehicles and equipment in line with VRXs dieback management plan, to prevent introduction and spread of dieback (*Phytophthora cinnamomi*). The Washdown is a standard design and is proposed to include a semi enclosed, ramped wash bay capable of handling light vehicles and heavy equipment. The Washdown will include a containerised water treatment plant comprised of a continuous media system, deep bed media filtration system, oily water separator and pH and Chlorine-dosing system.

All effluent and potentially infested material resulting from a washdown is collected and stored on site, and not permitted to disperse into vegetation surrounding the Washdown. The containerised water treatment plant will enable recycling of effluent. The water treatment plant will be maintained as per the manufacturer's specifications, any solid wastes (mud, debris, exhausted filter media) will be taken offsite for disposal at an appropriate facility.

Washdown facilities are proposed to incorporate:

- Enviro Concept heavy duty structural washpads with 12T per axle weight rating;
- Galvanised steel walls to prevent overspray;
- Galvanised steel rumble grid ramps to permit one-way travel;
- Containerised Water Treatment Plant incorporating a Continuous Media System, Oil and Water Separators, EL Water Recycling; and
- Plant, Disinfection and pH Control systems and Deep Bed Media Filtration kits.





## POWER GENERATION

An onsite power station will be constructed and operated to meet the power demands of the Project. The power station will be comprised of seven (six operational, one standby) 500 kW self-contained gas-fired generators (total potential output of 3.5 MW) located to the south of the Workshop (Figure 2). Each generator will be a fully standalone unit with integrated cooling and lubrication systems. Maintenance will be in accordance with manufacturers specifications, waste oil and coolant will be containerised and removed from site for disposal at each maintenance interval.

## FUEL STORAGE

A supply of diesel fuel will be maintained on site for the mining fleet. Fuel will be stored in two self-bunded ISOtainer fuel storage units, each with a 55,000 L capacity (total 110,000 L). Fuel storage will be located south of the workshop (Figure 2). Additionally, there will be a gas storage vessel for fuel supply to the power station of two 40,000 L (total 80,000 L) ISOtainer pressure vessels. ISOtainer units are approved International Organisation for Standardisation standards and will meet the specific criteria for combustible and pressurised fuel storage.

As the volume of fuel stored on site is above 100,000 L VRX will need to apply for a Dangerous Goods (DG) Licence under the *Dangerous Goods Safety Act 2004* (WA) (DG Act). A DG Licence sets standards for the way in which DGs are stored on site. These standards are aimed at ensuring DGs are stored safely and in such a way that will not result in impacts to the environment. Having a DG Licence ensures potential spills and combustion risks from the Project are mitigated.

## SUPPORTING INFRASTRUCTURE

To facilitate the Project, the following supporting infrastructure will also be developed:

- Administration building;
- Potable water storage;
- Communications;
- Workshop; and
- Laydown.

An indicative layout of site infrastructure is provided in Figure 2





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# ATTACHMENT 5: OTHER APPROVALS AND CONSULTATION

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## 5.1 OTHER APPROVALS

### 5.1.1 PART IV OF THE *ENVIRONMENTAL PROTECTION ACT 1986*

The Project was referred under Section 38 of the EP Act on 17 March 2021. The EPA released its decision to assess the Project as a Public Environmental Review (s. 40(2) (b) and s. 40(4)) on 18 May 2021. A proponent prepared Environmental Scoping Document (ESD) was then submitted to the EPA and formally approved on 15 March 2022. An Environmental Review Document (ERD) was submitted to the EPA for assessment and approved for public review by the EPA on 8 June 2023. The public review period is set for 19 June 2023 to 16 July 2023.

### 5.1.2 *MINING ACT 1978*

A Mining Proposal and Mine Closure Plan for the Project is in preparation and is scheduled to be submitted to DMIRS in Q3 of 2023 for assessment in parallel with this Works Approval application.

### 5.1.5 *ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999*

The Project will be assessed as an ‘accredited assessment’ under Part IV of the EP Act. Section 87 of the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) makes provisions for the EPA to undertake this accredited assessment of the potential impacts to Matters of National Environmental Significance on behalf of Department of Climate Change, Energy, the Environment and Water (DCCEEW).

## 5.2 STAKEHOLDER CONSULTATION

VRXs stakeholder consultation strategy has identified key external stakeholders and determined how they will be impacted by the Project.

Commonwealth, State and Local Government authorities have been briefed on the VRX Silica Project in its entirety to ensure any issues, concerns or suggestions are identified and, where appropriate, addressed or responded to by VRX Silica.

The following Government stakeholders have been consulted:

#### Commonwealth Authorities

- DCCEEW;
- Minister for the Environment.

#### State Authorities

- Department of Biodiversity Conservation and Attractions (DBCA);
- Department of Jobs, Tourism, Science and Innovation;
- Department of Planning, Lands and Heritage;





- Department of the Premier and Cabinet;
- Department of Transport;
- DMIRS;
- DWER (EPA Services, Industry Regulation, Water);
- Main Roads WA;
- Mid-West Chamber of Commerce;
- Mid-West Development Commission;
- Mid-West Ports Authority;
- Minister for Aboriginal Affairs;
- Minister for Energy;
- Minister for Mines and Petroleum;
- Minister for Ports;
- Minister for Regional Development;
- Minister for the Environment and Water;
- Minister for Transport; and
- The Treasurer.

#### Local Authorities

- City of Greater Geraldton;
- Member of the Agricultural Region;
- Member of the Legislative Assembly (MLA) for Butler;
- MLA for Geraldton;
- MLA for Moore;
- Shire of Carnamah; and
- Shire of Irwin.

VRX Silica Ltd recognises that individuals, companies and communities may also be interested in the impacts of the Project.

The following corporate and community stakeholders were deemed to be relevant to this Project:

- Australian and New Zealand Environment and Conservation Council;
- Australian Nature Conservation Agency / Australian Wildlife Conservancy;
- Birdlife WA;
- Birds Australia;
- Conservation Council of WA;
- Greening Australia;
- Southern Yamatji People.
- Threatened Species Scientific Committee (part of DCCEEW);
- Western Power; and
- Wildflower Society of WA.





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# ATTACHMENT 6A: EMISSIONS AND DISCHARGES

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## 6A.1 RELEVANT BACKGROUND INFORMATION

### FLORA AND VEGETATION

A number of flora and vegetation desktop and field surveys and studies have been undertaken within and in close proximity to the PPB by Mattiske Consulting Pty Ltd (Mattiske), Brian Morgan Consultant Botanist Pty Ltd and Glevan Consulting Pty Ltd (Glevan):

- Flora and Vegetation Assessment of Arrowsmith North Survey Area (Mattiske, 2022a)
- *Paracaleana dixonii* Search Arrowsmith North Project – Initial Mine and Plant Area (Brian Morgan Consultant Botanist Pty Ltd, 2023);
- Review of Roots and VDT (Mattiske, 2020a);
- Investigation of Root Systems of the Priority Flora Species Recorded in the Arrowsmith North Mine Survey Area (Mattiske, 2022b);
- Phytophthora Dieback Occurrence Assessment of Arrowsmith North (Glevan, 2020) and
- Phytophthora Dieback Occurrence Assessment of Arrowsmith North Access (Glevan, 2021).

The information contained within the following sections has been sourced from Mattiske (2022a).

#### ***Locally Significant Vegetation Communities***

Seventeen vegetation communities were defined and mapped across the survey areas. Survey quadrat physical data and aerial photographic maps were used to delineate the boundaries of the vegetation communities.

None of the vegetation communities recorded within the survey areas were considered locally or regionally unique and all are well represented in the wider area (Mattiske, 2022a). Eleven of the 17 mapped vegetation communities contained Priority Flora records and therefore would be considered habitat for significant flora species.

#### ***Threatened and Priority Ecological Communities***

No Threatened Ecological Communities (TECs), pursuant to Part 2, Division 1, Subdivision 1 of the BC Act and as listed by the DBCA (2018) or DAWE (2022), or Priority Ecological Communities (PECs) as listed by DBCA (2019) were recorded within the survey areas.

#### ***Significant Flora***

No Threatened Flora listed under the EPBC Act or BC Act were recorded in the survey areas. Eleven priority flora taxa were recorded within the survey areas, one of which, *Hopkinsia anoectocolea* (Priority 3) was recorded only within the southern alignment of the Access Survey Area. Eight species were recorded only within the Mine Survey Area. Two species, *Banksia elegans* and *Stawellia dimorphantha* were recorded in both the Mine Survey Area and Access Survey Area.

The extent of these species and their conservation status are detailed in Table 2 and shown on Figure 7.





Table 2: Significant flora recorded in the survey areas

Species and conservation status	Survey Area Record	Extent within Survey Areas
<i>Banksia elegans</i> (P4)	Mine, Targeted and Access	Recorded throughout the Mine Survey Area from 589 locations totalling 2,601 plants. This species was also recorded throughout the Access Survey Area from 152 locations totalling 794 plants. The 44 records held at the WAH indicates <i>Banksia elegans</i> ranges from Moore River to Geraldton. <i>Banksia elegans</i> occurs on white or red sands, on sandplains and low dunes. This species is not restricted to a unique set of ecological conditions and is present in various vegetation communities within the survey areas.
<i>Beyeria gardneri</i> (P3)	Mine and Targeted	Recorded from eight locations throughout the Mine Survey Area totalling 33 plants. The 37 records held at the WAH show <i>Beyeria gardneri</i> 's distribution range from Cataby to Nerren Nerren, north of Kalbarri. This species often occurs on yellow sand (WAH 1998-). Observations from the survey areas indicated plants were located on yellow/grey/white sand over shallow limestone on top of rises.
<i>Comesperma rhadinocarpum</i> (P3)	Mine and Targeted	Recorded scattered in the southern section of the Mine Survey Area from 47 locations totalling 59 plants. The 17 records held at the WAH indicates <i>Comesperma rhadinocarpum</i> ranges from Perth to Utcha Well Nature Reserve. This species occurs on a wide range of habitats from sandy loams, sandy clay and sand, sometimes over laterite or limestone and appears to be associated with the H1 vegetation community.
<i>Hemiandra</i> sp. Eneabba (H. Demarz 3687) (P3)	Mine and Targeted	Recorded scattered throughout the Mine Survey Area from 161 locations totalling 231 plants. The 35 records held at the WAH indicates this species ranges from Eneabba to the Yandanogo Nature Reserve near Dongara with a preference for sandplain habitat. This species is not restricted to a unique set of ecological conditions and is present in various vegetation communities within the Mine Survey Area.
<i>Hopkinsia anoetocolea</i> (P3)	Access	Recorded from 85 locations totalling 657 plants in the Access Survey Area. The 50 records held at the WAH indicate <i>Hopkinsia anoetocolea</i> ranges from York to Carnamah. <i>Hopkinsia anoetocolea</i> occurs on white or grey sand in seasonally wet depressions, floodplains and salt lakes. This species has only been recorded within the T4 vegetation community and is most likely restricted to winter wet depressions.
<i>Hypocalymma gardneri</i> (P3)	Mine	Recorded scattered throughout the Mine Survey Area from 152 locations totalling 274 plants. The 22 records held at the WAH indicates this species ranges from Dandaragan to Dongara. This species occurs on a wide range of habitat from grey to brown sand, often over laterite. This species is not restricted to a unique set of ecological conditions and is present in various vegetation communities within the Mine Survey Area.
<i>Leschenaultia juncea</i> (P3)	Mine	Recorded in the Mine Survey Area from one location totalling one plant. The 22 records held at the WAH indicates <i>Leschenaultia juncea</i> ranges from Hill River to Mingenew. <i>Leschenaultia juncea</i> occurs on a wide range of habitat including white, grey or yellow sand or sandy gravel. This species has currently only been recorded once in the Mine Survey Area within the H6 vegetation community.





Species and conservation status	Survey Area Record	Extent within Survey Areas
<i>Persoonia rudis</i> (P3)	Mine	<p>Recorded in the north-western part of the Mine Survey Area from one location totalling one plant.</p> <p>The 41 records held at the WAH indicates <i>Persoonia rudis</i> is a wide ranging species which occurs from the Bullsbrook Nature Reserve to Three Springs.</p> <p><i>Persoonia rudis</i> occurs on a wide range of habitat from white, grey or yellow sand often over laterite. This species has currently only been recorded within the W2 vegetation community.</p>
<i>Schoenus</i> sp. Eneabba (F. Obbens & C. Godden I154) (P2)	Mine and Targeted	<p>Recorded in the Targeted Survey Area from 30 locations, totalling 467 plants.</p> <p>The WAH houses 13 specimens of <i>Schoenus</i> sp. Eneabba (F. Obbens &amp; C. Godden I154) (P2), distributed from Eneabba to Dongara.</p> <p><i>Schoenus</i> sp. Eneabba (F. Obbens &amp; C. Godden I154) (P2) occurs on grey, yellow or white sand (Plate 1a; WAH 1998- ).</p> <p>This species has currently only been recorded in two main patches within different vegetation communities.</p>
<i>Schoenus griffinianus</i> (P4)	Mine	<p>Recorded scattered throughout the Mine Survey Area from five locations totalling nine plants.</p> <p>The 40 records held at the WAH indicates <i>Schoenus griffinianus</i> is a wide ranging species which occurs from Perth to Geraldton with a preference for sandplain habitat.</p> <p>This species is not restricted to a unique set of ecological conditions and is present in various vegetation communities within the Mine Survey Area.</p>
<i>Stawellia dimorphantha</i> (P4)	Mine, Targeted and Access	<p>Recorded scattered in the south-western part of the Mine Survey Area from 123 locations totalling 169 plants. This species was also recorded from 125 locations within the Access Survey Area totalling 229 plants.</p> <p>The 23 records held at the WAH indicates <i>Stawellia dimorphantha</i> ranges from Eneabba to Allanooka.</p> <p>This species occurs on a wide range of habitat from white, grey and yellow sand and was mostly recorded within the T1 vegetation community and once within the S3 community.</p>





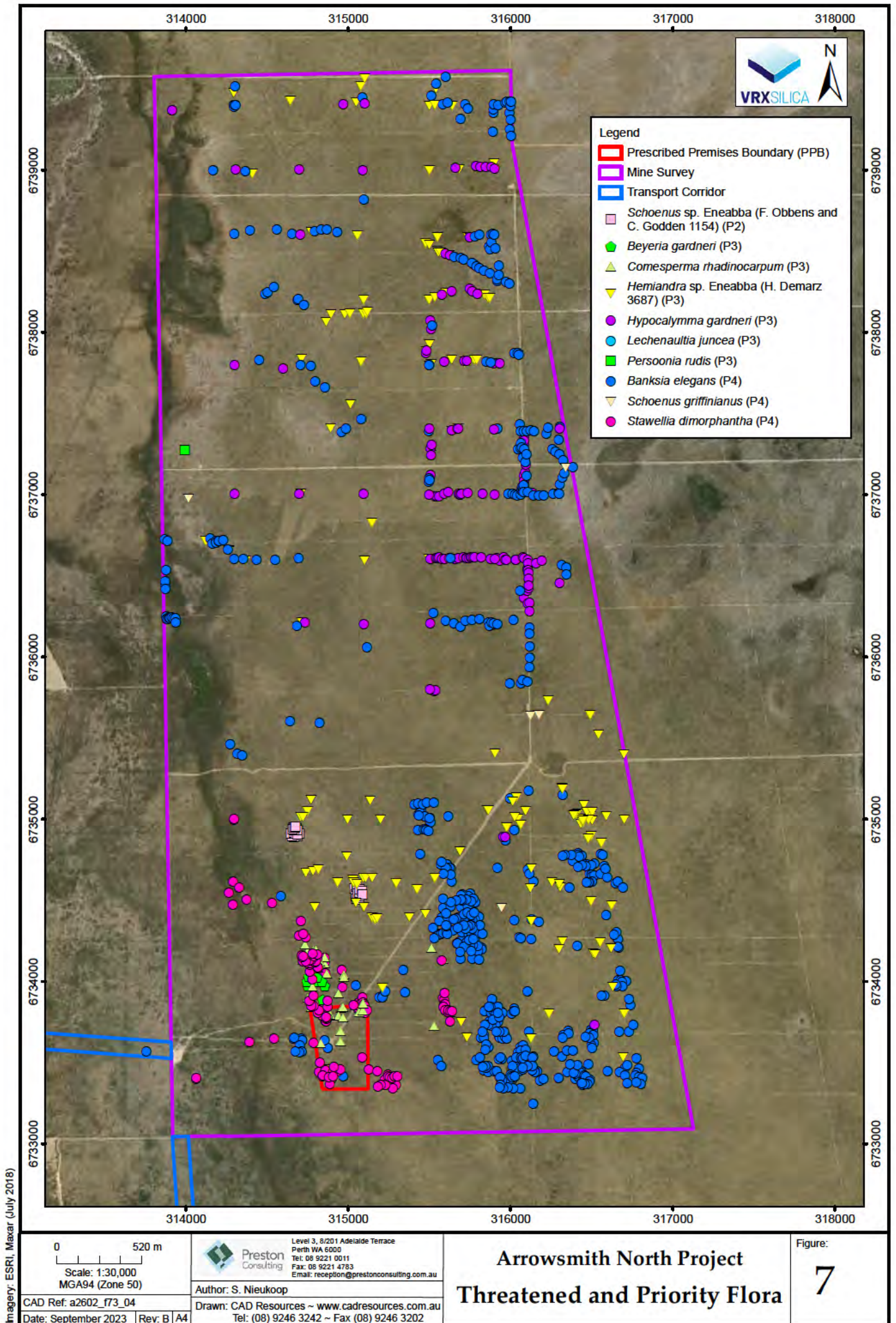


Figure 7: Significant flora recorded within the survey areas (Mine Survey Area)



## TERRESTRIAL FAUNA

The following surveys and desktop assessments were undertaken to identify significant fauna within or in close proximity to the Project:

- Fauna Assessment of Arrowsmith North (Bamford Consulting Ecologists (BCE), 2022);
- Arrowsmith North Project Short-range Endemic (SRE) Invertebrate Desktop Assessment (Bennelongia, 2021); and
- Arrowsmith North Project SRE Invertebrate Survey (Bennelongia, 2021)

The following information in this section has been sourced from these reports unless otherwise stated.

Eight significant fauna species were found to occur within the survey areas including, two invertebrates, one reptile, four bird and one mammal species:

- Carnaby's Cockatoo (*Zanda latirostris*) (Threatened – Endangered);
- Bothriembryontid Land Snail (*Bothriembryon perobesus*) (P1);
- Kwongan Heath Shield-Backed Trapdoor Spider (*Idiosoma kwongan*) (P1);
- Black-striped Snake (*Neelaps calonotus*) (P3);
- Brush Wallaby (*Notamacropus Irma*) (P4);
- Rainbow Bee-eater (*Merops ornatus*) (locally significant);
- Rufous Fieldwren (*Calamanthus campestris*) (locally significant); and
- Shy Heathwren (*Calamanthus cautus*) (locally significant).

One Threatened fauna species (Carnaby's Cockatoo; *Zanda latirostris*) has been confirmed in the general area. Carnaby's Cockatoo may forage on proteaceous and myrtaceous vegetation in the PPB and roost in large trees near watercourses outside of the PPB. Foraging and roosting by Carnaby's Cockatoos have been confirmed adjacent to the Survey Area and vegetation of the PPB has been identified as moderate to high value foraging habitat for this species. Breeding nearby is also a possibility but is unconfirmed.

Overall, Carnaby's Cockatoo is likely to be present in the region for much of the year with the Survey Area representing foraging habitat used by non-breeding birds. There is no roosting or breeding habitat in the development envelopes and no regular surface (drinking) water.

## GROUNDWATER

The information contained within this section has been sourced from HydroConcept (2019) unless otherwise stated. HydroConcept conducted the hydrological feasibility assessment on the Project tenement boundaries and surrounds.

There are two aquifers present beneath the Project; the relatively thin Superficial Formations, which are underlain by a major regional aquifer within the Yarragadee Formation.

The water table within the Superficial aquifer falls from around 50 - 60 m AHD about the eastern margin of the coastal plain to sea-level at the coast (Figure 8). The water table under the Project ranges from 10 – 20 m AHD, or more than 15 m below current ground level. Near the inland margin of the coastal plain, the water table is typically within the Mesozoic formation (Yarragadee Formation) underlying the Superficial Formations, the Superficial aquifer is unsaturated.



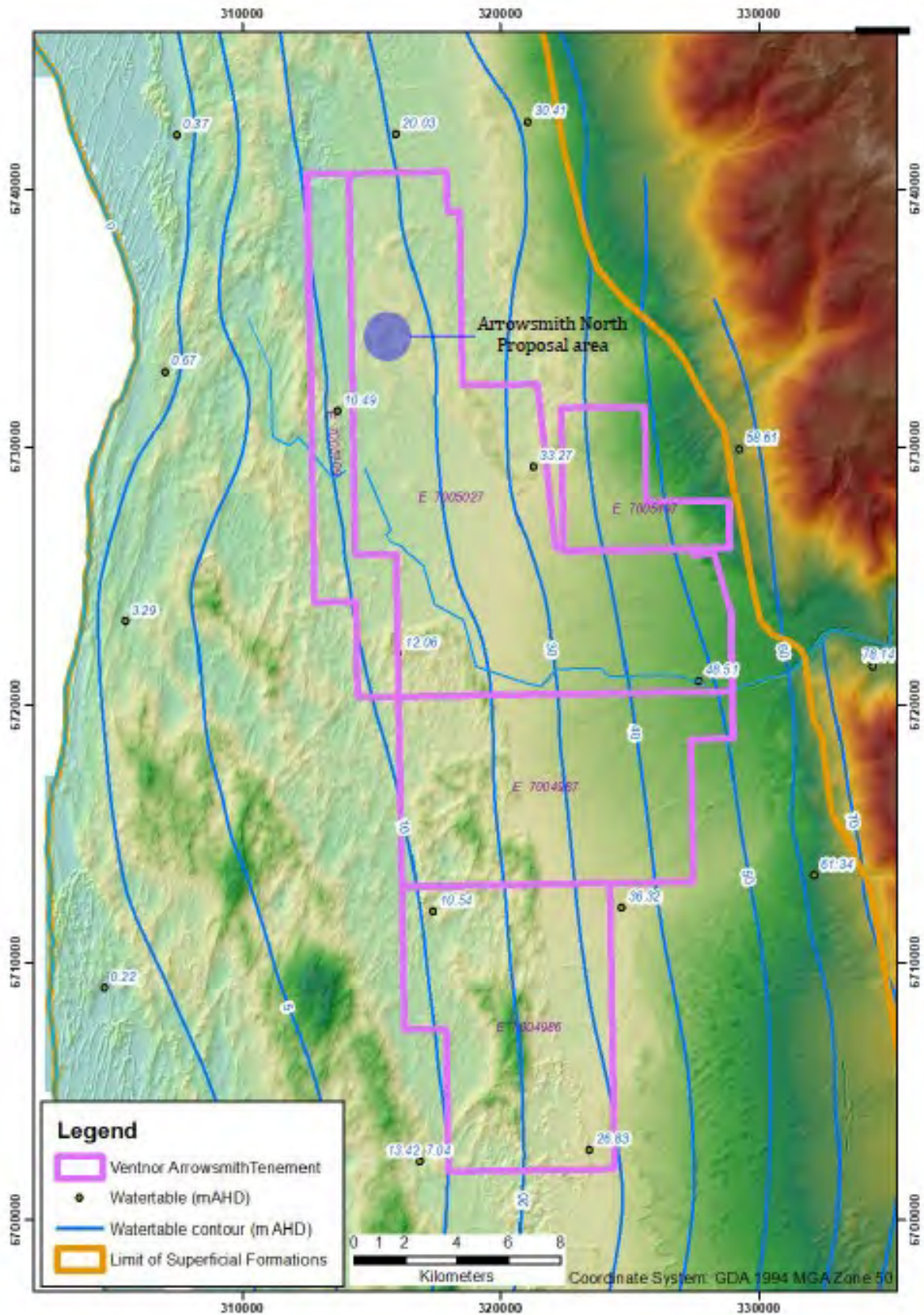


Groundwater salinity within the Superficial aquifer is generally fresh at less than 1,000 mg/L Total Dissolved Solids (TDS) about its eastern margin, increasing toward the coast where it becomes saline. Beneath the PPB, the groundwater salinity is approximately 1,000 – 1,700 mg/L TDS.

There is no direct measure of groundwater salinity from deeper portions of the Yarragadee aquifer at the Project, but the salinity has been recorded from the upper portion of the aquifer in nearby Leeman Shallow monitoring bores. The salinity in deeper sections has been estimated from regional mapping.

Monitoring bore LS31B (94 – 100 m; Figure 9) obtained groundwater from the upper portion of Yarragadee aquifer with a salinity of 860 mg/L (Nidagal, 1995). Regional groundwater salinity mapping suggests that the salinity rises to 1,500 mg/L TDS by around 300 m depth, and 3,00 mg/L TDS toward the base of the Yarragadee aquifer.





*Watertable across the coastal plain*

Figure 8: Water table across the Project (HydroConcept, 2019)



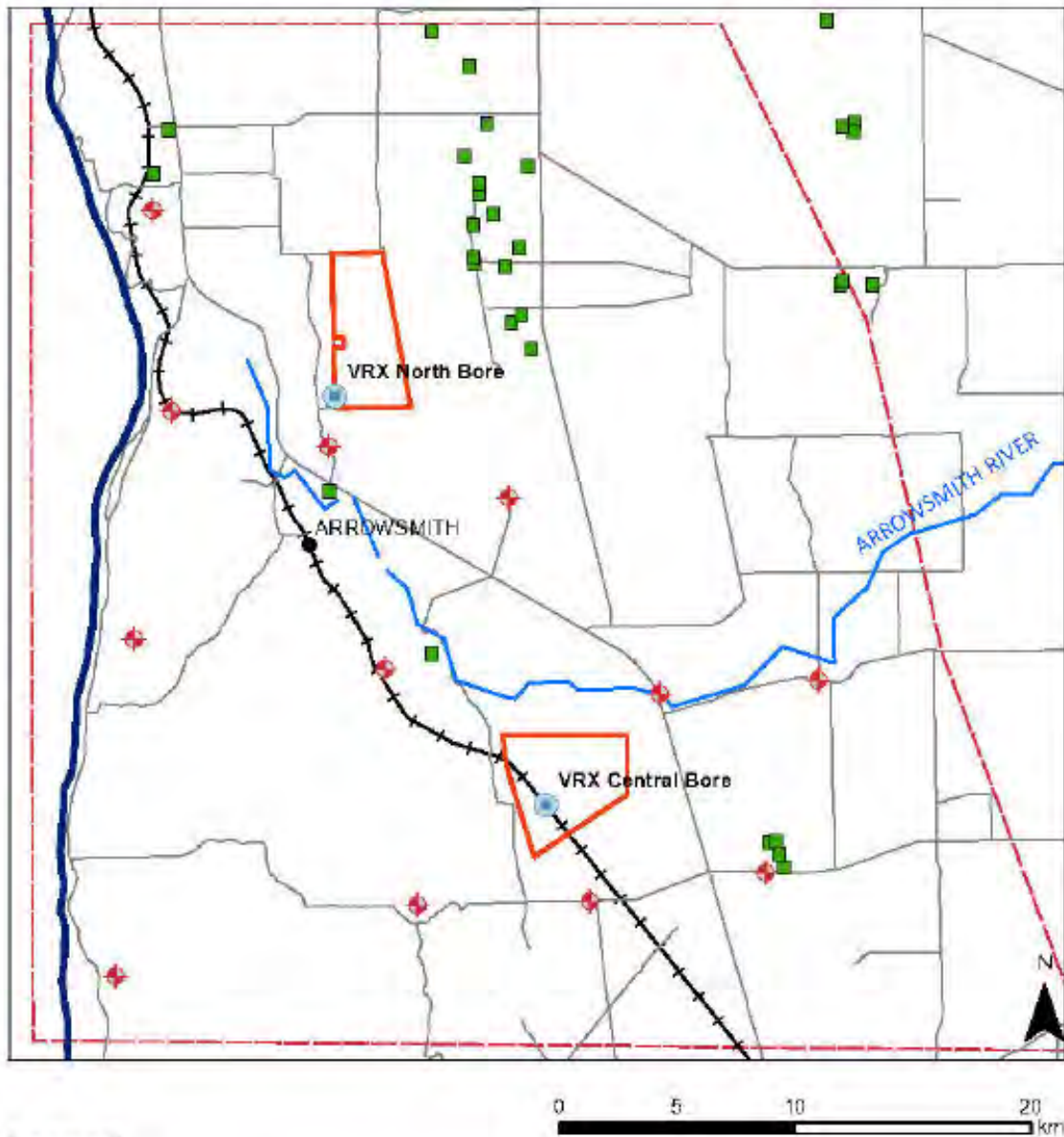


### ***Nearby Water Users***

The Project will require the abstraction of 0.9 GL of water per annum from the Yarragadee aquifer. The Yarragadee Aquifer within the Dongara subarea has a groundwater abstraction allocation limit of 4.5 GL, therefore a 0.9 GL increase in abstraction represents approximately 20% of the total groundwater allocation.

VRX has reviewed the licences allocated to current local groundwater users. There are four active groundwater licences issued by DWER under the *Rights in Water and Irrigation Act 1914* (RIWI Act) that are within close proximity to the Project that target the Dongara subarea. The Project is located well away from any groundwater abstraction bores utilised by other users (Figure 9).





**Legend**

-  VRX North Bore
-  VRX Central Bore
-  Allocations Drawpoints
-  VRX M70/1389
-  VRXM70/1392

Figure 9: Existing Allocation Draw Points





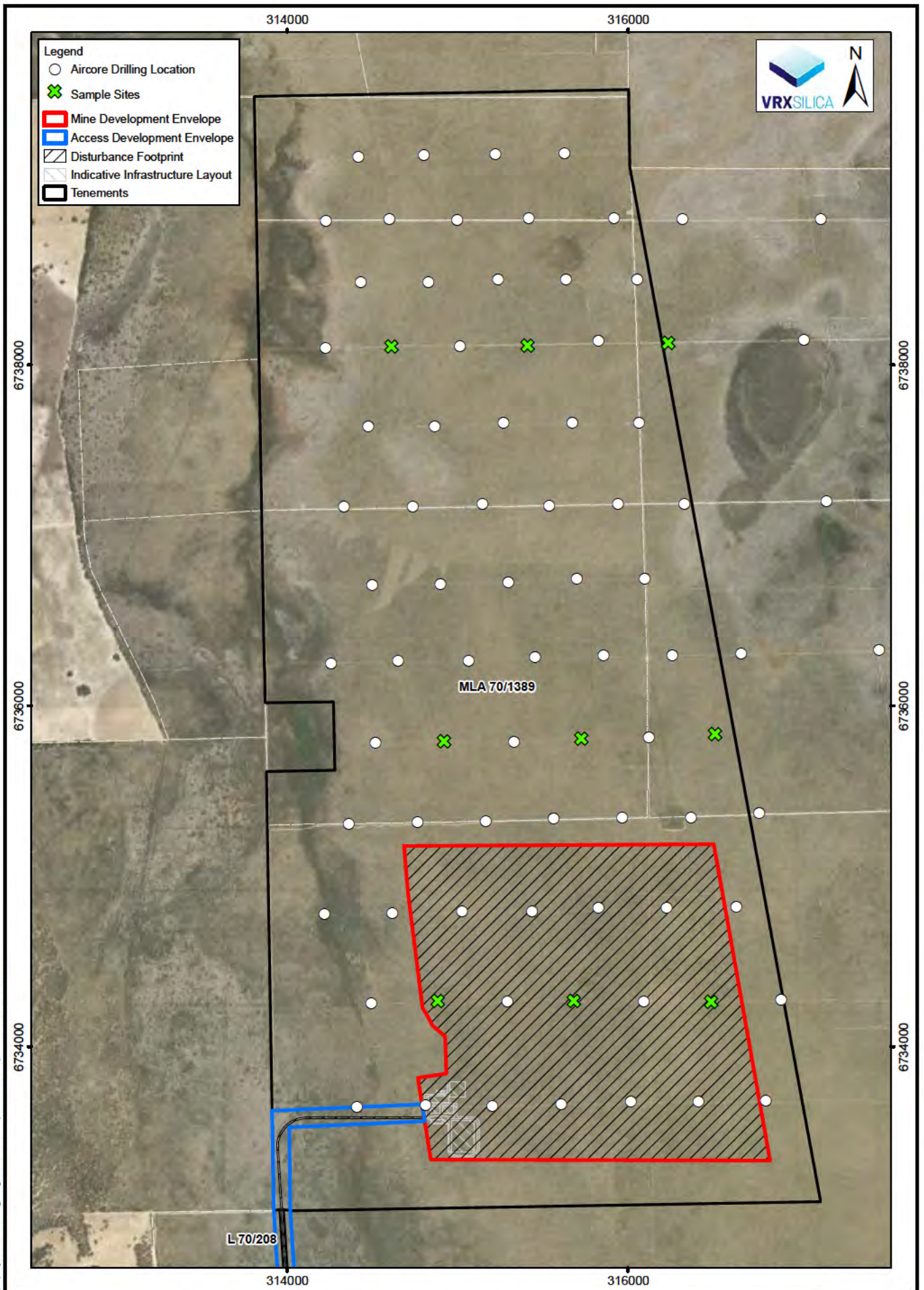
### ***Potential Acid Mine Drainage***

The information contained within this section has been sourced from the ABA analysis of the Project by Mine Waste Management (MWM, 2020) unless otherwise stated. Composited samples used in the Arrowsmith Acid Base Accounting (ABA) analysis were taken from drill holes within the Project tenement (Figure 10). The Project area is a consistent geological formation of aeolian dune sands. The dune is loose well drained deep sand over limestone. Three composite samples comprising nine primary samples were used for analysis. The primary samples were collected from drill holes of varying depths, ranging from 5 – 6 m below ground level (mbgl) to 12 – 13 mbgl. ABA analysis was conducted to predict the acid generation characteristics of geological waste material through determination of the acid neutralising capacity and the maximum potential acidity. Although analysis of pH using distilled water is not a standard ABA test, it was completed to aid in the interpretation of the ABA data as ancillary information. All samples from the survey area were devoid of both acid generating and neutralising potential as demonstrated by total sulphur values less than the reporting limit for all samples and acid neutralising capacity equal to or less than 1 kg H<sub>2</sub>SO<sub>4</sub>/t in all samples.

When combining Nett Acid Production Potential and Nett Acid Generation pH results as per the Australian Mineral Industries Research Association (2002) classification system, all samples are classified as non-acid forming. Rinse pH and electrical conductivity (EC) results demonstrate slightly acidic (5.5 – 6.5) fresh leachates with negligible salinity.

All of the composite samples from the Project that were analysed represent a low acidic drainage risk. The observed lack of acid generation and neutralisation capacity is in line with expectations for material collected from a silica sand deposit. Rinse EC results suggest a low risk of generating saline drainage.





Sources: Aerial Photography: LESRI, Digitalglobe, Maxar (March 2019), Tenements: DMIRS

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 Scale: 1:30,000  
 MGA94 (Zone 50)  
 CAD Ref: a2602\_f56\_22  
 Date: April 2022 Rev: B | A4

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**Arrowsmith North Project**  
**Drill hole and**  
**sampling locations**

Figure:  
**10**

Figure 10: Location of drill holes and sampling locations





## NOISE

The processing plant will be in operation 24 hours a day and is expected to result in noise emissions. The processing plant circuit includes trommel screening, attritioning cells, classifier, spiral separation, gravity separation, size screening, drying and stacking. A series of pumps, drive motors, sprayers and conveyors will operate to support the process circuit. No crushing, grinding or percussive processing is required therefore noise from the processing plant is expected to be primarily from the operation of pumps, drive motors, sprayers and conveyors. The Project will be powered by an on-site power station comprised of several natural gas fired electrical generators to produce up to 3.5 MW. VRX will use off the shelf gas generators with known noise emission values and options for noise attenuating mufflers.

In the absence of noise modelling and predicted noise levels for the Project, VRX has reviewed predicted noise levels for a proposed recent small-scale mineral sands project; the Image Resources Atlas Project. The Atlas Project is located near the Project (approximately 170 km north of Perth) and uses conventional mining methods similar to the Project. Noise emissions defined for the Atlas Project are summarised in Table 3.

Table 3: Noise source levels of the Atlas Project

Source	Noise Level (dB(A))
Cat D7 Dozer	112
Cat D9/D8 Dozer	110
Komatsu PC700 Excavator	108
Komatsu PC1250 Excavator	110
Haul trucks	117
Watercart	106
Cat 16M grader	102
Cat 657G Scraper	113
Cat 980/966 loader	108
Feed Process Plant (FPP)	106
Wet Concentrator Plant (WCP)	113
Genset 1750 KVA Insulated Enclosure with Acoustic Louvres (equiv. to 85 dB(A) at 1 m)	92
HMC Truck Volvo FH16 Prime Mover Triple Wagon 60km/h	108

For context, noise modelling conducted for the Atlas Project demonstrated that compliance with the Environmental Protection (Noise) Regulations 1997 (WA) (Noise Regulations) can be achieved at the nearest sensitive receptor (1.2 km from the mine pit) provided noise mitigation is implemented. While mineral sands projects are likely the most similar, processing activities of mineral sands mines are generally more comprehensive than those of silica sand mining, therefore this comparison serves as a conservative assessment. The Project is also set back further from the nearest sensitive receptor than the Atlas Project (3.6 km as opposed to 1.2 km). VRX expects noise emissions from the Project to be less than those from the Atlas Project and given the significantly larger setback distance to the nearest sensitive receptor it is expected that the Project will easily comply with the Noise Regulations.





Based on the above, modelling of the Project noise emissions and assessment of the potential impact on sensitive receptors is not required.

## COMBUSTION AIR EMISSIONS

Air emission from the Project have been assessed in an Air Emissions Desktop Assessment by Environmental Technologies & Australia (ETA) (ETA, 2021). The assessment considered air emissions ( $\text{NO}_x$ , CO and  $\text{SO}_2$ ) from sources including the power station and the mining fleet. Emissions were evaluated using screening air dispersion modelling that included worst case meteorological conditions (this approach is used to determine if further air quality investigations are required). Maximum 1-hour concentrations for  $\text{NO}_2$ , CO and  $\text{SO}_2$  3 km downwind of the Project were modelled to be well below (less than 20%) the relevant assessment criteria (NEPC, 2021 and WHO, 2021).

Based on this assessment the emissions of combustion products from the Project are not considered to be significant in terms of the potential to cause adverse air quality impacts at the sensitive receptor locations. Further assessment of air emissions from the Project were not deemed to be required (ETA, 2022).

## 6A.2 ASSESSMENT OF EMISSIONS AND DISCHARGES

Table 4 details all potential emissions and discharges from the Project during the construction, commissioning and operations phase. Proposed controls during these phases of the Project will be implemented throughout to minimise the risk of emissions impacting the environment and are outlined in Table 4.





Table 4: Potential emissions and discharges from the Project

Potential emission or discharge source	Emission or discharge type	Volume and frequency	Proposed Controls
<b>Construction</b>			
Vehicle movements, excavation and storage of earthen material.	Dust	Exact dust emissions are unable to be quantified however dust generation is expected to be minimal given the composition of the sandy soils (high coarse fraction and low clay and fines fraction) and relatively small footprint of the processing infrastructure.	<p><b>Management:</b></p> <ul style="list-style-type: none"> <li>Only areas required to be cleared for the construction activities will be cleared.</li> <li>Cleared areas will only remain cleared for the duration required to undertake the construction activities.</li> <li>Cleared areas that are no longer required for construction will be respread with topsoil, treated with a dust suppressant or rehabilitated.</li> <li>Dust suppressants including water will be applied to disturbed, active construction areas by water trucks/sprayers if fugitive dust is observed and persistent.</li> </ul> <p><b>Monitoring:</b></p> <ul style="list-style-type: none"> <li>Employees and contractors will undertake daily visual inspections for fugitive dust in their immediate work areas.</li> <li>All site personnel will be required to identify and report on instances of fugitive dust.</li> <li>Site personnel will have 'Stop Work Authority' and will be required to cease work if fugitive dust cannot be managed.</li> <li>Observed, persistent fugitive dust will be reported as an incident and remedial action will be implemented.</li> </ul> <p><b>Outcome:</b></p> <p>Dust may occur however it is not expected to be at a level that will have an impact on sensitive receptors or the receiving environment. With the implementation of the management and monitoring measures described above, it is expected that fugitive dust emissions from the PPB will be minimal.</p>
Vehicle movements and construction machinery.	Noise	Exact noise emissions are unable to be quantified however they are not expected to be excessive at receptor locations given the setback and type of activities proposed.	<p><b>Management:</b></p> <p>No specific controls expected to be required.</p> <p><b>Monitoring:</b></p> <p>An incident reporting system will be maintained to assist in managing environmental incidents such as reported excessive noise emissions</p> <p><b>Outcome:</b></p> <p>Noise from the Project is unlikely to have an impact on the nearest receptor which is 3.3 km from the Project.</p>
Cleared areas	Erosion and sediment laden stormwater	Exact volumes and frequency of sediment laden stormwater are not able to be determined. Volume and frequency is expected to be low due to the high infiltration rate of the soil within the PPB and relatively	<p><b>Management:</b></p> <p>No specific controls expected to be required.</p> <p><b>Monitoring:</b></p> <p>All site personnel will be required to observe and report mobilisation of sediment as a result of storm events as an incident.</p>





Potential emission or discharge source	Emission or discharge type	Volume and frequency	Proposed Controls
		small footprint of the processing infrastructure.	<p><b>Outcome:</b></p> <p>Sediment laden stormwater is unlikely to be discharged from the PPB. The soils of the PPB are comprised almost entirely of sand (~97%) and therefore have a high infiltration rate. Surface water flows are only expected in extreme weather events. The extent and duration of clearing will be minimised to what is required for construction, if sediment laden stormwater was to occur the area from which it may be mobilised is limited.</p>
Construction waste / litter	Wind-blown rubbish	Unintentional discharge only.	<p><b>Management:</b></p> <ul style="list-style-type: none"> <li>Waste will be collected in skip bins at dedicated waste storage areas around the Project.</li> <li>All employees and contractors will be inducted prior to mobilising to site to ensure all waste is contained appropriately.</li> <li>All waste / litter will be taken off site for disposal in an appropriate landfill facility.</li> </ul> <p><b>Monitoring:</b></p> <ul style="list-style-type: none"> <li>All site personnel will be required to undertake daily visual inspections of the work area.</li> <li>Any observed uncontained waste will be reported as an incident.</li> </ul> <p><b>Outcome:</b></p> <p>Litter will be disposed of appropriately. Windblown rubbish is not expected to be discharged to the surrounding environment.</p>
<b>Commissioning and Operation</b>			
Hydrocarbons or chemicals storage and use	Leaks or spillages onto soils	Unintentional discharge only.	<p><b>Management:</b></p> <ul style="list-style-type: none"> <li>Spill kits will be located at designated points throughout the site</li> <li>Any spills will be controlled, contained and cleaned up in accordance with a Spill Management Procedure</li> <li>Hydrocarbons and chemicals will be stored within suitably bunded areas</li> </ul> <p><b>Monitoring:</b></p> <ul style="list-style-type: none"> <li>Spill kits will be regularly checked and replenished if required</li> <li>All hydrocarbon and chemical spills will be recorded</li> </ul> <p><b>Outcome:</b></p> <p>All fuel will be stored in designated bunded areas or within self-contained storage vessels. Significant volumes of other hydrocarbons will not be required for construction and operations. The likelihood of a significant spill affecting the surrounding environment is considered to be low.</p>
Processing Plant (24 hour operations) MFP, and Vehicles	Artificial light	Exact light emissions are unable to be quantified however they are not expected to be excessive.	<p><b>Management:</b></p> <p>No specific controls expected to be required. Nearest receptors are over 3kms away.</p>





Potential emission or discharge source	Emission or discharge type	Volume and frequency	Proposed Controls
			<p><b>Monitoring:</b> An incident reporting system will be maintained to assist in managing environmental incidents such as reports of excessive light spill</p> <p><b>Outcome:</b> The Project is proposed to operate 24 hours a day. Lighting will be required to ensure safe operation of the plant, MFP and vehicles. Lighting design will consider best practice to minimise light spill. The Project is relatively small and set back from the nearest sensitive receptors by 3.3km, light emissions are not expected to be significant.</p>
Processing Plant (24 hour operations), MFP and Vehicle Movements	Noise	Exact noise emissions are unable to be quantified however they are not expected to be excessive at receptor locations given the setback and type of activities proposed.	<p><b>Management:</b> No specific controls expected to be required.</p> <p><b>Monitoring:</b></p> <ul style="list-style-type: none"> <li>An incident reporting system will be maintained to assist in managing environmental incidents such as excessive noise emissions</li> </ul> <p><b>Outcome:</b> Noise from the Project is unlikely to have an impact on the nearest receptor which is 3.3 km from the Project.</p>
Processing Plant (24 hour operations)	Contaminated Stormwater	Exact contaminated stormwater emissions are unable to be quantified however they are not expected to be excessive	<p><b>Management</b></p> <ul style="list-style-type: none"> <li>Plant design will ensure that all potentially contaminated storm water will be controlled and report to bunded areas or infiltration basins.</li> </ul> <p><b>Monitoring</b></p> <ul style="list-style-type: none"> <li>Bunded areas will be inspected during and after a 10 year ARI to ensure surface water is being managed as intended</li> <li>An incident reporting system will be maintained to assist in managing environmental incidents such as discharge of contaminated stormwater</li> </ul> <p><b>Outcome</b> Due to the extremely permeable nature of the natural ground, and the products that are stockpiled there is not expected to be any surface water runoff from the product stockpiling area. However, the product stockpiling area is designed to capture surface water runoff in the basin in the southwestern corner.</p>
Vehicles movements, dust lift from cleared surfaces	Dust	Exact dust emissions are unable to be quantified however they are not expected to be excessive given the small scale of dust-producing activities required during commissioning and operation	<p><b>Management:</b></p> <ul style="list-style-type: none"> <li>Water will be applied to any roads or cleared areas that pose a dust risk</li> <li>Utilise magnesium compounds as dust suppressants where applicable</li> </ul> <p><b>Monitoring:</b></p> <ul style="list-style-type: none"> <li>Opportunistic inspections for dust emissions will be undertaken during commissioning and operation of the Project to ensure dust control measures are being implemented and are effective</li> <li>If visible dust emissions are noted then an assessment of the source will be made and additional water will be applied to key source areas, or alternative treatments applied</li> </ul>





Potential emission or discharge source	Emission or discharge type	Volume and frequency	Proposed Controls
			<ul style="list-style-type: none"> <li>The potential for high risk weather conditions for dust emissions (i.e. windy conditions) will be monitored and extra water applied in preparation</li> <li>An incident reporting system will be maintained to assist in managing environmental incidents such as excessive dust emissions</li> </ul> <p><b>Outcome:</b> Dust may occur however it is not expected to be at a level that will have an impact on sensitive receptors or the receiving environment. With the implementation of the management and monitoring measures described above, it is expected that fugitive dust emissions from the PPB will be minimal.</p>
Moveable Surface Conveyer			<p><b>Management</b></p> <ul style="list-style-type: none"> <li>The mine feed has a natural moisture component of 2-2.5% water which will suppress dust emissions.</li> <li>The conveyor transfer points will be enclosed type to contain dust. If necessary, fine mist water sprays will be employed at the transfer points for further dust management.</li> <li>The conveyors will have dome shaped covers along the length of the conveyors to manage rainfall and dust that may be due to high winds.</li> </ul> <p><b>Monitoring</b> As above.</p> <p><b>Outcome</b> As above.</p>
Hydrocarbon or chemical use	Leaks or spillages of hydrocarbons or chemicals from vehicles	Unintentional discharge onto soils	<p><b>Management:</b></p> <ul style="list-style-type: none"> <li>Spill kits will be located at design points throughout the Project and with service/utility vehicles.</li> <li>Any spills will be controlled, contained and cleaned up in accordance with a Spill Management Procedure.</li> <li>Hydrocarbon storage will be contained within a bunded area and in line with the relevant standards as required.</li> </ul> <p><b>Monitoring:</b></p> <ul style="list-style-type: none"> <li>Spill kits will be regularly checked and replenished if required.</li> <li>All hydrocarbon and chemical spills will be recorded.</li> </ul> <p><b>Outcome:</b> Significant volumes of hydrocarbons will not be required, storage of hydrocarbons will be in accordance with relevant standards. With the implementation of the proposed management and monitoring, the likelihood of a significant spill affecting the surrounding environment is considered to be low.</p>





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## ATTACHMENT 7: SITING AND LOCATION

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### 7.1 SENSITIVE LAND USES

EPA Guidance Statement No. 3 (EPA, 2005) provides advice on the use of generic separation distances (buffers) between industrial and sensitive land uses to avoid conflicts between incompatible land uses. The generic separation distances are a tool to assist in the determination of suitable distances between industry and sensitive land uses where industry may have the potential to affect the amenity of a sensitive land use. Where the separation between the industrial and sensitive land uses is greater than the generic distance, there will not usually be a need to carry out site-specific technical analyses to determine the likely area of amenity impacts due to emissions from the industry. These generic separation distances are also referenced in the Guideline for Dust Emission, released as a draft for external consultation by DWER in July 2021 (DWER, 2021).

Under the separation distances guidance (EPA, 2005), the Project is best described as an 'Extractive Industry – sand and limestone extraction', involving no grinding or milling works. The corresponding generic buffer distance that is recommended is 300 to 500 m, depending on size.

Sensitive receptors in close proximity to the PPB are shown in Figure 11. The closest sensitive receptor to the mining operations and processing plant is the residence to the southwest (Receptor 4), located 3,300 m away and the residence to the northwest (Receptor 1), located 3,200 m away.

There is one Registered Aboriginal Heritage Site, the Arrowsmith River, located approximately 5 km south of the PPB. Several Other Heritage Places were identified within proximity to the PPB including Arrowsmith Lake (3 km south west of the PPB), a common place of mythological and spiritual significance. Mungenuoka Springs and Arramall Cave also reside close to the PPB (9.5 km and 5 km northwest, respectively). No heritage sites will be impacted by the Project.



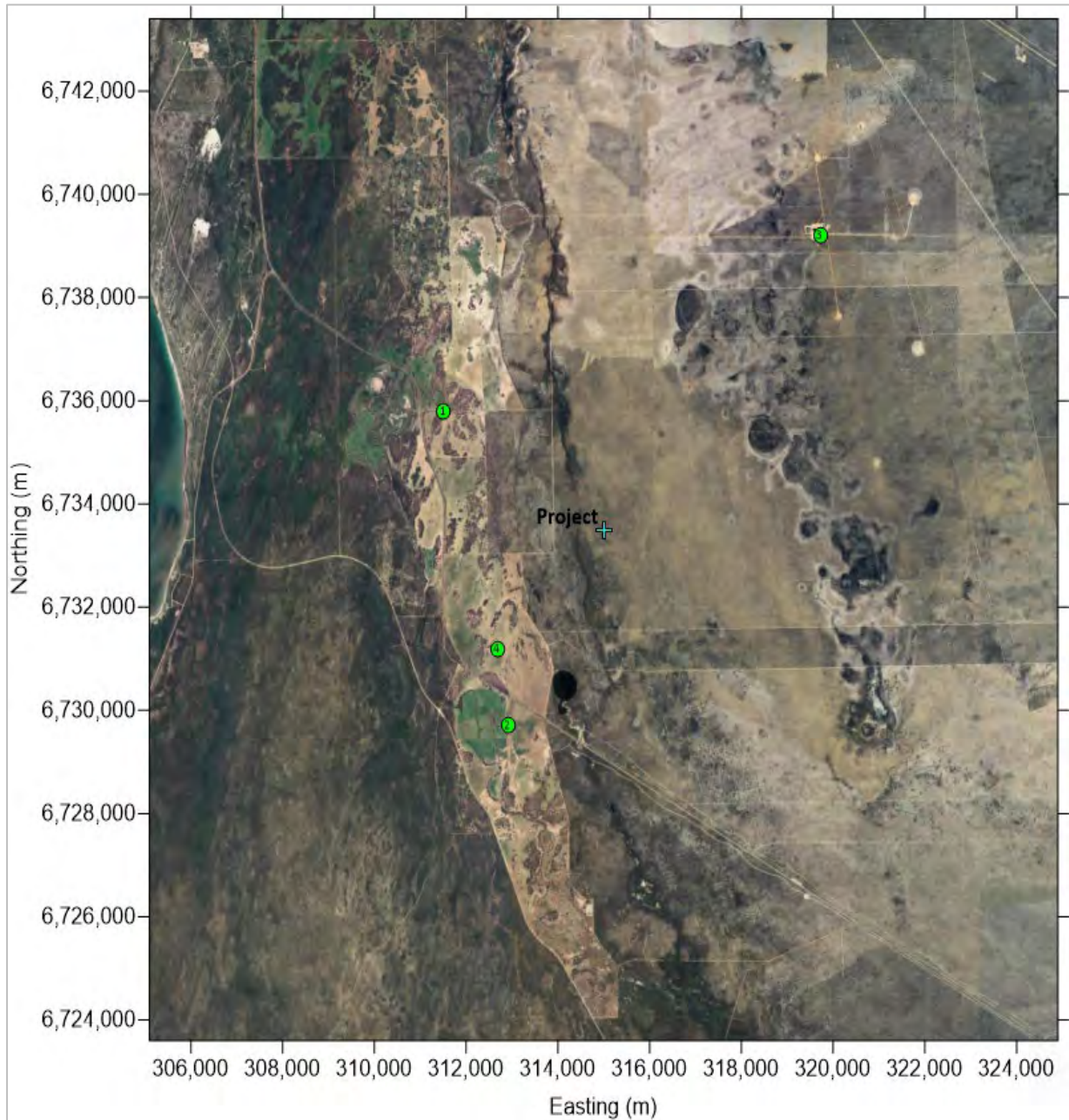


Figure 11: Location of sensitive receptors in proximity to the Project







## 7.2 ENVIRONMENTALLY SENSITIVE RECEPTORS AND ASPECTS

No conservation reserves are located within the PPB. The closest conservation reserve is Beharra Springs Nature Reserve (Crown Reserve Number I47436) located approximately 5.3 km southeast of the PPB. Other reserves surrounding the Project are the Beekeepers Nature Reserve (R 24496) located approximately 7 km to the west and Yandanogo Nature Reserve (R 36203) located 5 km to the north. The Lake Logue Nature Reserve (R 29073) and nature reserves R 39744 and R 25495 are located well to the south of the Project (Figure 12). These Nature Reserves are managed by the DBCA for the conservation of flora and fauna.

Part of the Project lies within the Arrowsmith Lake Area defined under section 51B of the EP Act and mapped on DWER's clearing permit system (object ID 6561) as an Environmentally Sensitive Area. The Arrowsmith Lake Area was registered as a natural place in the Register of the National Estate in March 1978 under the *Australian Heritage Council Act 2003*. Further information on the Arrowsmith Lake Area is held by the DCCEEW on the Australian Heritage Database. The registered status means the place was entered in the RNE prior to its closure in 2007. The existence of an entry for a place in the RNE does not in itself create a requirement to protect the place under Commonwealth law. Nevertheless, information in the register may be current and may be relevant to statutory decisions about protection (DAWE, 2021).



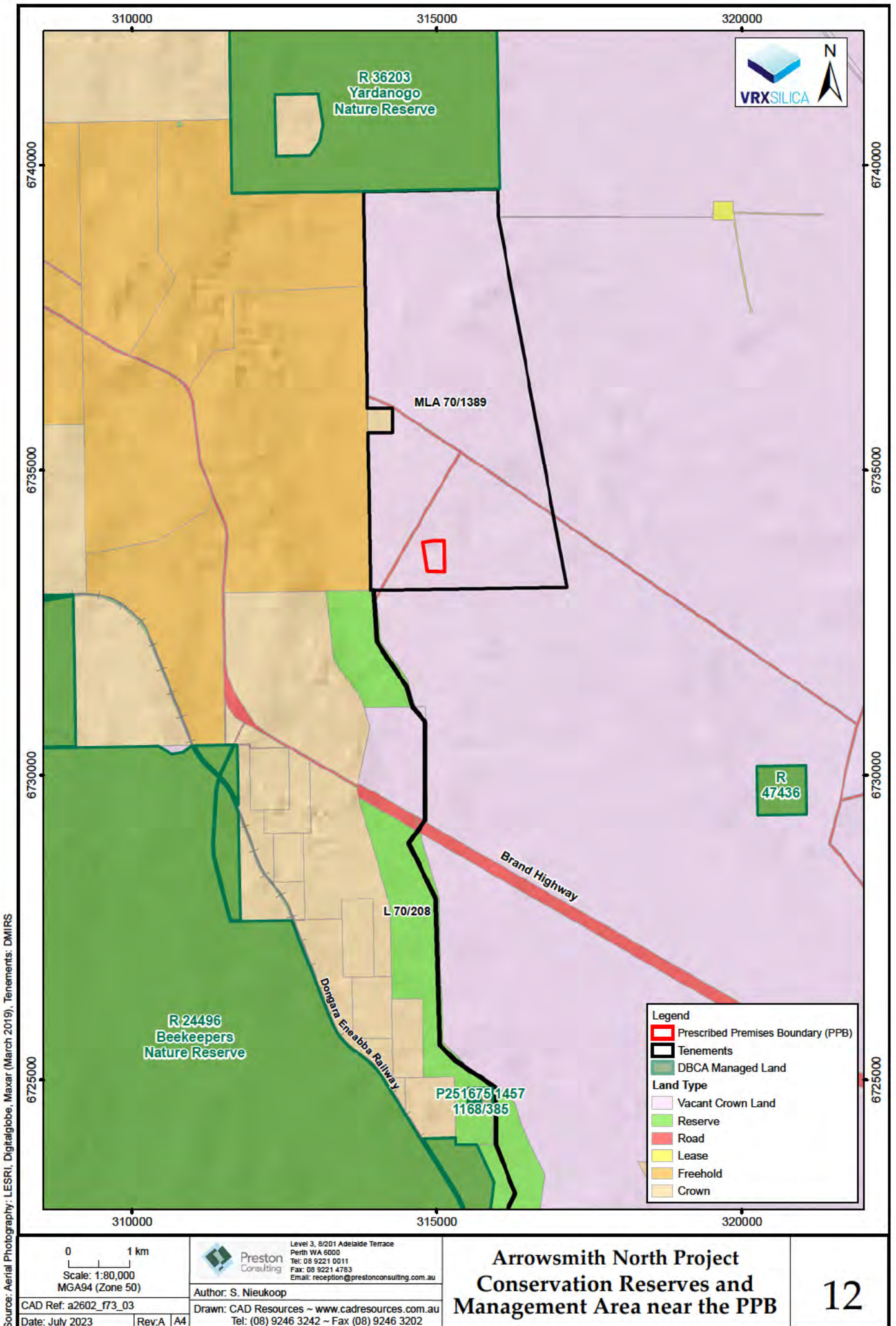


Figure 12: Conservation Reserves and Management Areas near the PPB



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## **ATTACHMENT 8: ADDITIONAL INFORMATION**

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### **8.1 FLOERGER AN900 SERIES ANIONIC POLYACRYLAMIDE DATASHEET**

See additional information folder.

### **8.1 ARROWSMITH NORTH SILICA SAND PROJECT – AIR EMISSIONS DESKTOP ASSESSMENT**

See additional information folder.







## GLOSSARY

Term	Meaning
ABA	Acid Base Accounting
ASIC	Australian Securities and Investment Commission
BCE	Bamford Consulting Ecologists Pty Ltd
DBCA	Department of Biodiversity Conservation and Attractions
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DMIRS	Department of Mines, Industry Regulation and Safety
DWER	Department of Water and Environmental Regulation
EC	Electrical conductivity
EP Act	<i>Environmental Protection Act 1986 (WA)</i>
ERD	Environmental Review Document
ESD	Environmental Scoping Document
GL	Giga Litres
Glevan	Glevan Consulting Pty Ltd
km	Kilometres
M	Mining Lease
Mattiske	Mattiske Consulting Pty Ltd
mbgl	Metres below ground level
mg/L	milligrams per litre
Mining Act	<i>Mining Act 1978 (WA)</i>
MLA	Member of the Legislative Assembly
Mtpa	Million tonnes per annum
MWM	Mine Waste Management
Project	Arrowsmith North Project
PPB	Prescribed Premises Boundary
TDS	Total Dissolved Solids
TLO	Time Limited Operation
VRX	VRX Silica Limited
WA	Western Australia
Washdown	Washdown and inspection area



