

SURFACE WATER SAMPLING PROCEDURE

Document No: ARMS-0000-H-PRO-N-0002 Rev 1

Project Name: Nolans Rare Earths

SURFACE WATER SAMPLING PROCEDURE

REVISION HISTORY

					
July 2022	Rev 1 Issued to DITT	Michael Robinson, ESG Manager	Michael Robinson, ESG Manager	Stewart Watkins, GM Projects	
23/07/2021	Rev 0 Draft	Michael Robinson, ESG Manager	Brian Fowler, GM NT & Sustainability	Stewart Watkins, GM Projects	
Date	Description	Prepared	Reviewed	Approved	3rd Party Approval

SURFACE WATER SAMPLING PROCEDURE

TABLE OF CONTENTS

1.0	INTRODUCTION.....	5
1.1	Background	5
1.2	Purpose.....	5
1.3	Objectives	5
1.4	Planning and Equipment	5
2.0	SURFACE WATER SAMPLING PROCEDURE	7
2.1	Sampling Equipment	7
2.2	Sampling Locations.....	7
2.2.1	Surface Water Sample Assay Suite	12
2.3	Sampling Frequency	12
2.3.1	Seepages	12
2.3.2	Discharges / Emergency Overflows	13
3.0	SURFACE WATER SAMPLING PROCEDURES	14
3.1	Field Measurements	14
3.2	Field and Laboratory Measurements	14
3.3	Sample Dispatch	15
4.0	DISCHARGE NOTIFICATIONS	16

SURFACE WATER SAMPLING PROCEDURE

APPENDICES

APPENDIX A Surface water quality sheet (Example)

APPENDIX B Chain of Custody Form (Example)

INDEX OF FIGURES

Figure 2—1 Potential Mine Site Surface Water Monitoring Locations	10
Figure 2—2 Potential Processing Plant and Accommodation Surface Water Monitoring Locations	11

INDEX OF TABLES

Table 1—1 Summary of Planning	6
Table 2—1 Surface Water Monitoring Locations.....	8
Table 4—1 Formal Notification Requirements	16

SURFACE WATER SAMPLING PROCEDURE

1.0 INTRODUCTION

1.1 Background

The Nolans Rare Earths Project (the Project) is located approximately 135 km north west of Alice Springs, Northern Territory. The Project targets the Nolans Bore mineral deposit for rare earth elements. Activities will focus on construction, mining, processing, rehabilitation and decommissioning of an open-cut, rare earth mine, and its associated infrastructure.

1.2 Purpose

The Water Management Plan (WMP) for the Nolans Project (Project) provides a framework for the management of summary of sampling requirements at the site. The WMP has been designed to collect data throughout the construction and operations phase to assess the performance of water management onsite. In order to facilitate consistency in sampling, and comply with quality assurance and control methodologies, a series of sampling procedures have been established including:

- Surface Water Sampling Procedure (this procedure);
- Mine Site Groundwater Sampling Procedure; and
- Sediment Sampling Procedure.

1.3 Objectives

The primary objective of the Surface Water Sampling Procedure is to prevent contamination or alteration in water chemistry during sample collection. The collected sample should represent the physical, chemical and biological characteristics of surface water in the targeted water body as closely as possible.

1.4 Planning and Equipment

A number of factors must be considered during the field planning phase, prior to surface water sampling. These include consideration of ground condition at targeted locations and safety requirements. A summary of equipment and associated suppliers are provided in Table 1—1. All equipment in relation to surface water sampling should be ordered a minimum of four weeks prior to sampling.

SURFACE WATER SAMPLING PROCEDURE

Table 1—1 Summary of Planning

Timing	Details	Supplier
At least 4 weeks prior to sampling potential sampling at start of wet season	Order Lab Bottles Laboratory bottles Eskies and Cool Bricks	tbc
	Hire / Maintenance Check Long arm sampler	Eco Environmental 6/509-511 South Rd, Ashford SA 5031 08 8293 3355 adelaide@ecoenvironmental.com.au Thermo Fisher Scientific 5 Caribbean Dv, Scoresby Vic 3179 03 9757 4377 RentalsAU@thermofisher.com
	Purchase 0.45µm Stericup filters Stericup vacuum pump Nitrile gloves Decon N	Eco Environmental 6/509-511 South Rd, Ashford SA 5031 08 8293 3355 adelaide@ecoenvironmental.com.au Thermo Fisher Scientific 5 Caribbean Dv, Scoresby Vic 3179 03 9757 4377 RentalsAU@thermofisher.com
1 day prior to sampling	Calibrate Water quality meter	

SURFACE WATER SAMPLING PROCEDURE

2.0 SURFACE WATER SAMPLING PROCEDURE

2.1 Sampling Equipment

Surface water sampling requires the following:

- Surface Water Quality Sheet (Appendix A);
- Long arm sampler;
- Water quality meter (calibrated);
- 0.45µm water filters and suction pump;
- Eskies and cool bricks;
- Laboratory bottles;
- Nitrile gloves;
- Decontaminated plastic or stainless-steel bucket;
- Tool kit including screw drivers, tape measure and shovel; and
- Permanent marker.

2.2 Sampling Locations

There are a number of surface water sampling locations across the Mine and Processing Project Area. These sampling locations are positioned to assess upstream, onsite and downstream impacts from the Mine Site Project. Rising stage samplers have been installed at a number of location in the Kerosene Camp Creek, the Nolans Creek and the western tributary of the Kerosene Camp Creek where the intended diversion will flow to. These gauging stations are both up and downstream of the project and creek confluences. In addition, gauging stations have been installed downstream of the processing site in drainage lines to try and capture run-off quality. This area is difficult to sample because of the very poorly defined drainage and the frequency of rainfall resulting in stream flows. The area typically only has sheet flow with minor drainage gutters intermittently scattered across the area. These limited drainage lines ultimately fan out and disperse. If significant rainfall occurs, sampling will not be possible and many locations due to boggy and muddy ground access conditions, but opportunistic sampling may be possible at other locations. All sample locations are approximate and will vary depending on rainfall amounts and ground conditions.

The sampling program has been primarily designed to assess Nolans Creek, Kerosene Camp Creek, the Kerosene Camp Creek western tributary and other minor drainage lines in and around the Project. Down gradient of the processing facility, modified sampling techniques are being investigated to enable capture of surface flows because of the nature of the runoff when it occurs.

A summary of sampling locations, frequency and suites are provided in Table 2—1 and illustrated on Figure 2—1 and Figure 2—2.

SURFACE WATER SAMPLING PROCEDURE

Table 2—1 Surface Water Monitoring Locations

Site ID	Coordinates		Type	Description	Sample Frequency	
	Easting	Northing			Baseline	Operation
Surface Water						
SW01	████	████	Control	Nolans Creek Eastern boundary inflow of the Mine Site, upstream of the South Eastern WRD.	Early and late flows with a minimum of 0.1 m flowing water.	
SW02	████	████		Schafer Creek, upstream tributary to Kerosene Camp Creek, southern border of the mine site area.		
SW03	████	████	Control	Kerosene Creek, upstream of the LOM Pit and stage 1 and 2 diversion		
SW04	████	████	Impact	Kerosene Creek Realignment Downstream of West WRD within the inlet to the creek realignment.		
SW05	████	████	Impact	Kerosene Creek, downstream of Sediment Control Downstream of pit and Sediment control		
SW06	████	████		Nolans Creek Downstream of Sediment Control and East WRD		
Stormwater sediment retention ponds						
SB01	████	████	Impact-	Down gradient of western sediment control	Not required.	Field measurements monthly when rain accumulates. Field and laboratory sample assay suite quarterly when rain
SB02	████	████	Impact-	Down gradient of sediment control		
SB03	████	████	Impact-	Topsoil stockpile, up gradient of sediment control		
SB04	████	████	Impact-	South Eastern WRD		

SURFACE WATER SAMPLING PROCEDURE

Site ID	Coordinates		Type	Description	Sample Frequency	
	Easting	Northing			Baseline	Operation
SB05	████	████	Impact-	Mine Facilities		accumulates. Field and laboratory sample assay suite quarterly.
SB06	████	████	Impact-	Western WRD		
SB07	████	████	Impact	South Eastern WRD		
SB08	████	████	Impact-	RSF Event Pond		
SB09	████	████	Impact-	Accommodation		
Mine Pit and Processing Infrastructure						
Mine pit sump water and RSF ponded water should be monitored during operation of the mine site. The location of these monitoring points should be developed during construction to ensure that accessible / production efficient points can be determined. Once determined, the location should be labelled clearly, such as Mine Pit Sump, with a monitoring location marker surveyed in for continuity of monitoring across the operational period.						
Notes						
1: Coordinates are approximate and should be used as a guide. Locations should be chosen to provide safe access. Many locations remain inaccessible after rainfall.						
2: All permanent surface water sampling points should be defined with a marker post, surveyed and clearly marked.						
3: Any event-based monitoring points should be surveyed to note Easting / Northing so that they can be referenced in future events to determine if a permanent location should be established.						
4: If concentrations are noted at boundary locations, additional down gradient locations should be assessed and installed as appropriate.						
5: During the operational period, the monitoring schedule should be reviewed annually to focus on any potential trends of operational impacts on surface water.						

MINE SITE GROUNDWATER SAMPLING PROCEDURE

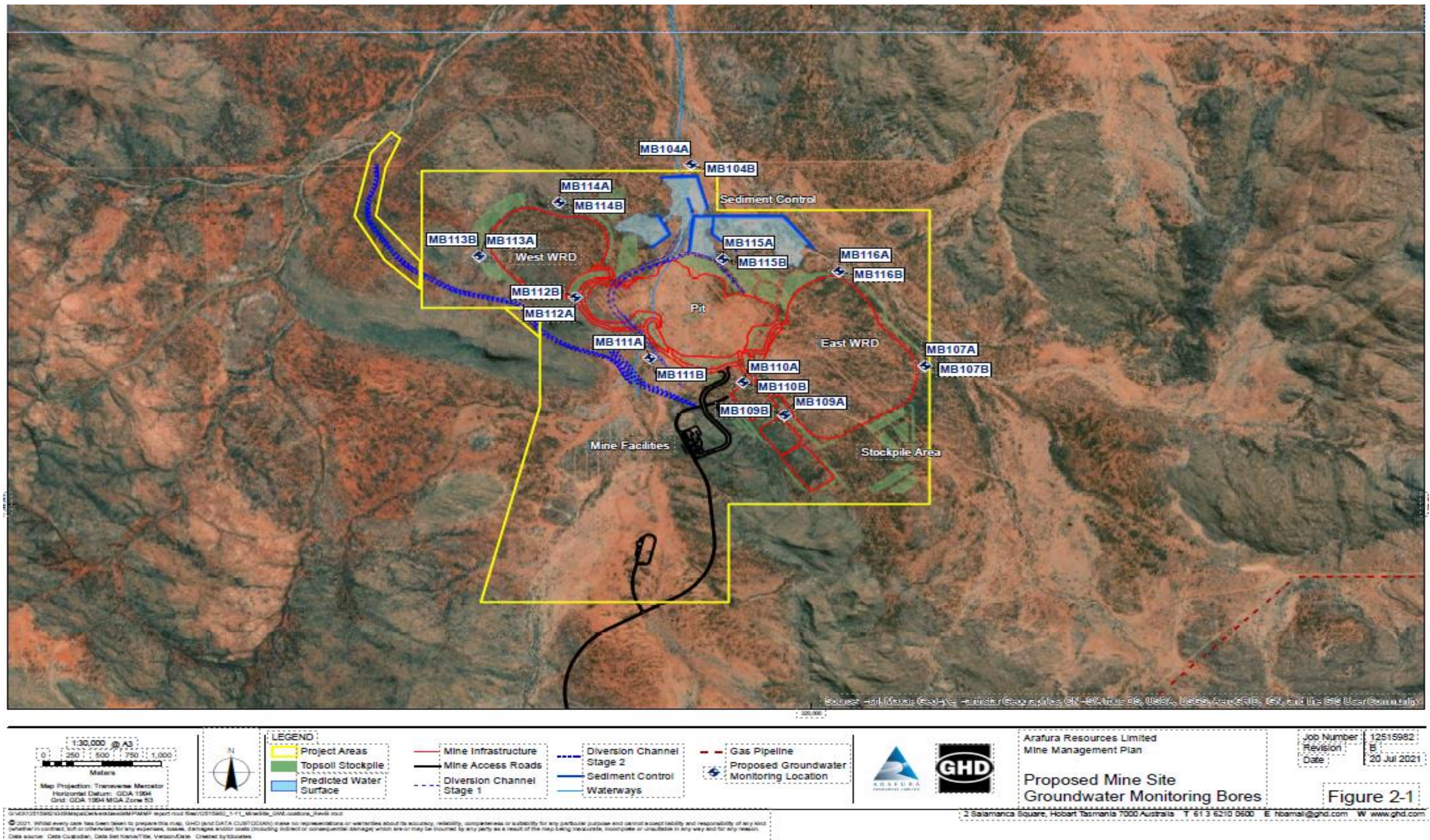


Figure 2-1 Potential Mine Site Groundwater Monitoring Bores

MINE SITE GROUNDWATER SAMPLING PROCEDURE

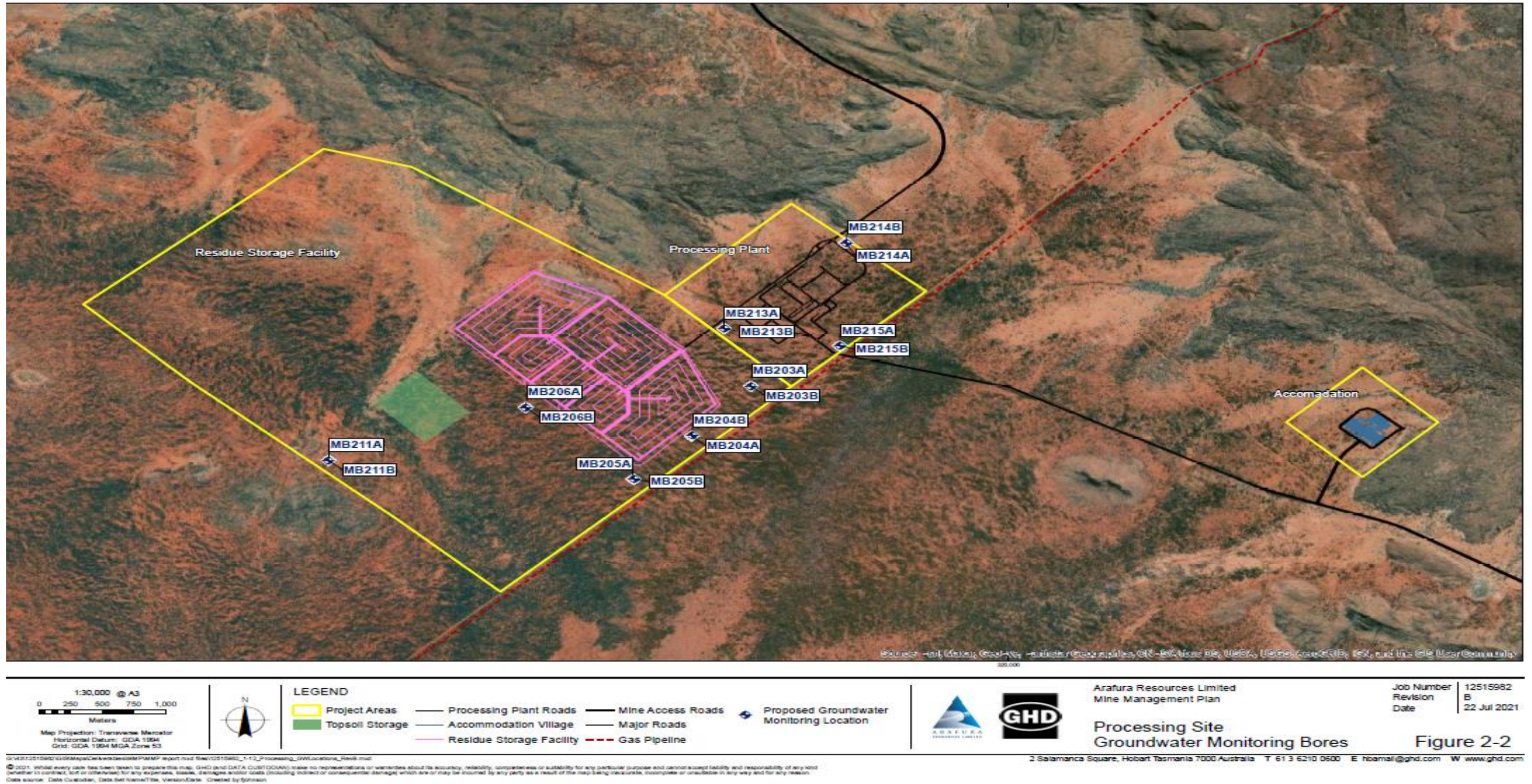


Figure 2-2 Potential Processing Site Groundwater Monitoring Bores

SURFACE WATER SAMPLING PROCEDURE

2.2.1 Surface Water Sample Assay Suite

The sampling suite for surface water quality includes either field measurement or field and laboratory measurements. The suites are summarised as follows:

Field Measurements

Temperature, pH, Electrical Conductivity, Total Dissolved Solids, Turbidity and Oxidation Reduction Potential. Depth at location and photo point monitoring (photos of sample location, upstream and downstream).

Field and Laboratory Measurements

In field: Temperature, pH, Electrical Conductivity, Total Dissolved Solids, Turbidity and Oxidation Reduction Potential. Depth at location and photo point monitoring (photos of sample location, upstream and downstream).

- Laboratory Analysis
 - Total Dissolved Solids
 - Total suspended solids (TSS)
 - Total hardness
 - Total acidity and alkalinity;
 - Major ions (CaCO_3 , CO_3 , HCO_3 , Ca, Mg, K, Na, Cl, SO_4 , NO_3)
 - Metals total and dissolved¹: Al, As, B, Ba, Cd, Co, Cu, Fe, Li, Pb, P, Mn, Hg, Mo, Ni, Rb, Se, Sr, Ag, U, Th and Zn

Note – these are indicative analytes. The final suite of analytes will be determined following review the baseline data. Sampling is to be completed in accordance with the sampling procedure provided in Section 3.0.

2.3 Sampling Frequency

Sampling will be completed in accordance with the frequency identified in Table 2—1 when sufficient water is available to collect a sample without sediments being disturbed. Depending on the amount of rainfall and ground access conditions, surface water sampling will attempt to be completed during flow events where a minimum of 0.1m of flowing water is present, but may occur after flowing water ceases.

2.3.1 Seepages

Water retention structures including stormwater sediment retention ponds will be installed across the site to reduce potential impacts on the receiving environment from floatation tailing storage facility, residual storage facility and evaporation pond. If seepage is identified during routine inspections the following will be completed:

¹ Samples for dissolved metals are field filtered using 0.45 μm Stericup filter or similar

SURFACE WATER SAMPLING PROCEDURE

- Location and Extent: a summary of the location of the seep will be recorded and indicated on map (Figure 2—2). The extent of the seep will be recorded including visible on the ground and surface water influence;
- Volume: the volume of seepage will be recorded as an estimate in (L/minute or L/day);
- Duration: the duration including commencement and ceasing date will be recorded;
- Photographs: a photographic log will be taken to visualise the seep;
- Sampling: Field: field water quality of the seep will be completed;
- Sampling: Laboratory: if sufficient water can be collected and/or the seep continues for three consecutive days a laboratory sample will be collected.

2.3.2 Discharges / Emergency Overflows

Mine site infrastructure has the potential to overflow during significant rainfall events. In the event of a discharge (stormwater overflowing basins), the discharge water and receiving waterbodies will be sampled. Sampling will be completed as soon as practical after an overflow is noted, and will be analysed for field and laboratory suites. The standard surface water sampling procedures will be followed in addition to the following:

- Location and Extent: a summary of the location of the discharge will be recorded and indicated on map including estimation of its extent.
- Volume: the volume of discharge will be recorded daily as an estimate in L/minute.
- Duration: the duration including commencement and ceasing date will be recorded.
- Photographs: a photographic log will be taken at the Sample locations (discharge location, upstream and downstream).
- Sampling – Field: daily field water quality of the discharge will be completed.
- Sampling – Laboratory: daily laboratory sampling of discharge, upstream and downstream receiving environment locations.

3.0 SURFACE WATER SAMPLING PROCEDURES

3.1 Field Measurements

Surface water gauging is to be completed in accordance with the following:

- Complete surface water quality sheet for location (Appendix A)
- Water Quality Parameters - Record field water quality parameters by either suspending the water quality meter within the water body or collecting a sample and placing into a clean bucket for measurements to be taken
- Photographs - Photographs of the sample location should be taken include the sampling point, upstream and downstream. Photographs to be logged into a filing system indicating site location and date.

3.2 Field and Laboratory Measurements

Surface water sampling is only to be completed during periods of flow greater than 0.1m deep. The process is to be completed in accordance with the following:

- Complete surface water quality sheet for location (Appendix A)
- Water Quality Parameters - Record field water quality parameters by either suspending the water quality meter within the water body or collecting a sample and placing into a clean bucket for measurements to be taken
- Photographs - Photographs of the sample location should be taken where access is possible, likely including the sampling point, upstream and downstream. Photographs to be logged into a filing system indicating site location and date;
- Grab Sample - Rinse long arm sampler container in the water body to be sampled three times. Place long arm sampler directly into water body, open end vertically down and fill with an arc motion with the bottle mouth facing upstream. Take care to avoid collecting surface films.
For waters less than half a metre in depth, collect a grab sample at half the water depth. For waters greater than half a metre in depth, a grab sample should be taken at 20 to 30 cm below the surface water.
 - Field Filtering
A total metals sample (not filtered) and a dissolved metal sample should be collected.
The dissolved metal sample requires field filtration through a disposable 0.45 µm filter;
- Waste Disposal - Excess surface water is to be returned to ground and all disposable sampling equipment used should be stored for disposal at the Process Site including filters; and
- Electronic Transfer - All water quality results, duplicate locations and Chain of Custody (CoC) are to be scanned and kept on file. The purging results are to be entered into the surface water database.

SURFACE WATER SAMPLING PROCEDURE

3.3 Sample Dispatch

Water samples have a high potential to deteriorate following collection. Samples are to be placed into onsite fridge pending dispatch to laboratory. At completion of the sampling round, bottles are to be packed into eskys and ice bricks placed on top of samples and transferred to Alice Springs haulage depot. Samplers are to contact the haulage companies and the laboratory to inform them of sample delivery and requirements to keep refrigerated.

The sampler is to inform the laboratory of sample postage and provide a completed Chain of Custody (CoC). A blank CoC is provided in Appendix B.

4.0 DISCHARGE NOTIFICATIONS

Discharges from the Site will be assessed on a case-by-case basis to determine if formal notifications to the DME and NTEPA are required. All external communication of incidents will be signed and approved by Arafura Resources Management Team. In general, if there is a discharge of contained/managed water from the Project (i.e. collapse of flood levees or overflow of stormwater basins) the DME and NTEPA will be notified. A summary of the notification requirements is provided in Table 4—1.

Table 4—1 Formal Notification Requirements

Entity	Trigger	Timeframe and Contact Details	Incident Reporting Details
Department of Industry, Tourism and Trade Mines Division (DITT)	Incident which causes minor environmental impact with some minor actual or potential harm to the environment.	As soon as practicable. Mineral.Info@nt.gov.au	The Section 29 Notification of Environmental Incident Form requires the following details: Site and operator details. Location occurred and area impacted (GPS coordinates); Date and time; Description of incident Emergency and remedial actions taken. Nature of impact and severity; Current situation; Details of sampling completed; and Notification status internally and externally. The form is to be signed by the HSEC Manager and/or General Manager for submission.
Northern Territory Environmental Protection Authority (NTEPA)	Incident which causes, or is threatening or may threaten to cause pollution resulting in material environmental harm or serious harm. Qualifying triggers requiring submittal of Section 14 Incident Report to NTEPA are any of the following: is not trivial or negligible in nature; or consists of an environmental nuisance of a high impact or on a wide scale; or results, or is likely to result in \$50,000 or more in taking	< 24 hrs post incident ntepa@nt.gov.au pollution@nt.gov.au	The Section 14 Incident Report Form requires the following details: Incident causing or threatening to cause pollution; Location occurred and area impacted; Date and time; How the pollution has occurred, is occurring or may occur; Attempts made to prevent, reduce, control, rectify, investigation and/or clean up the pollution or resultant environmental harm caused or threatening to be caused by the incident; and Operator details.

SURFACE WATER SAMPLING PROCEDURE

Entity	Trigger	Timeframe and Contact Details	Incident Reporting Details
	action to prevent or minimise environmental harm or rehabilitate the environment; or results in actual or potential loss or damage to value of \$50,000 or more of the prescribed amount (whichever is the greater).		The form is to be signed by HSEC Manager and/or General Manager for submission.



SURFACE WATER QUALITY FIELD SHEET										
Date				Sampler						
FIELD PARAMETERS										
Location ID	Time	pH	D.O (%)	ORP (mV)	E.C (µS/cm)	TDS (mg/L)	Temp (°C)	Turbidity (NTU)	Salinity (ppt)	Comments (water flow, colour, suspended sediments)
Additional Comments										

[illegible]