MINE MANAGEMENT PLAN

Document No: NRE-0000-O-PLN-O-0001 Rev 2

Project Name: Nolans Rare Earths

REVISION HISTORY

Date	Rev	Description	Prepared	Reviewed	Approved
08/09/2022	Rev 2	Issued for final DITT approval	M.Robinson, ESG Manager	M. Robinson, ESG Manager	S..Watkins, GM Projects
31/07/2022	Rev 1	Issued for final DITT approval	M.Robinson ESG Manager	M. Robinson, ESG Manager	S.Watkins, GM Projects
23/07/2021	Rev 0	Issue for Use	M.Robinson ESG Manager	Brian Fowler, GM NT & Sustainability	S.Watkins, GM Projects

TABLE OF CONTENTS

APPENDICIES

INDEX OF TABLES

MINING MANAGEMENT PLAN CHECKLIST

A checklist of the requirements of the Mining Management Plan (MMP) (this report) has been outlined below. Where a requirement has not been completed, a comment and reason has been outlined.

Y/N	Page	Requirement	Department's Comment
Y	13	Has the plan been endorsed by a senior representative of the company?	
Y	13	**Introduction:** Have Operator details been included?	
Y	13	Is the company structure described?	
Y	16	Are title details included?	
Y	29	Is there a project summary and description improvements?	
Y	30	**Site Conditions:** Have all the physical environment conditions for the site and surrounds been identified?	
Y	34	Have the current land uses and users and stakeholders been identified?	
Y	34	Have Community Affairs been described?	
Y	37	**Statutory and Non-Statutory Requirements:** Has all legislation relevant to the operation and associated permits and approvals been identified? Have all non-statutory obligations been identified and included?	
Y	43	Have Aboriginal and heritage sites been identified?	
Y	45	**Operational Activities:** Have all operational activities relating to mining, processing, exploration and any related activities for the site been addressed in the MMP?	
Y	APPENDIX L	**Waste Rock Characterisation:** Have results of waste rock characterisation been included and discussed? Has a waste characterisation report been included? Does the MMP include a waste rock management plan?	
Y	106	**Environmental Management:** Has the Environmental Management structure and responsibilities been outlined?	

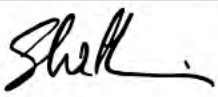
Y/N	Page	Requirement	Department's Comment
Y	106	Has the Environmental Policy been included?	
Y	106	Has a register of environmental commitments been included? Has a summary of all recommendations from the Environmental Impact Assessment been included and addressed if the project has been formally assessed?	
Y	118	Has training and induction been addressed?	
Y	118	Is there an Environmental Emergency and response plan?	
Y	119	Have all environmental aspects and potential impacts been identified? Has a risk assessment been carried out?	
Y	120	Have Environmental Management Plans (EMP's) for identified risks been developed and included?	
Y	120	**EMP's:** Do all EMP's include: objectives and targets management and mitigation strategies monitoring and measurement discussion and analysis of results non-conformances and corrective actions?	
Y	124	**Water Management:** Has a comprehensive description of surface water conditions been included?	
Y	125	Has a comprehensive groundwater model been described?	
Y	126	Have information or knowledge gaps been identified and described for water management?	
Y	126	Are there comprehensive details (including scopes of work) on actions proposed to be taken to respond to any identified information or knowledge gaps?	
Y	126	Have hazards been identified that could result from activities related to the operation and rank the associated risks of impacts to both surface and groundwater?	
Y	126	Are all strategies and actions that will be undertaken to manage any risks identified included?	

Y/N	Page	Requirement	Department's Comment
Y	127	Has the water monitoring program been detailed?	
N/A		Has all monitoring data been included?	
N/A		Has an interpretation of data by a suitably qualified person been included?	
N/A		Has a discussion of trends over time been detailed?	
N/A		Have details of remedial/corrective strategies and scopes of work been included?	
Y	127	Have proposed actions been detailed?	
Y	128	**Incident Reporting:** Has a table of all incidents recorded on site been included and discussed?	
Y Y Y N	129 137 APPENDIX S	**Closure Planning:** Has a Life of Plan – Unplanned Closure plan been included? Are all disturbances described? Are remediation activities that would be required in the event of unplanned closure described? Are activities required to achieve end land use objectives, described?	
N Y & N	137	Does the MMP include a detailed costing of closure activities for the life of plan? Have all past disturbances and those proposed for the next reporting period been identified and included?	
Y	Multiple Pages – See Index of Figures Above	**Maps and Plans:** Maps and plans have scale, scale bar, legend and north point? Datums used are MGA94 or GDA94 (expressed in decimal degrees) with elevations based on AHD?	

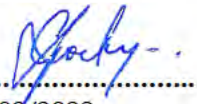
MINE MANAGEMENT PLAN
Mining Operations
Mining Management Plan

- Operator Name: Arafura Nolans Project Pty Ltd
- Project Name: Nolans Rare Earth
- Authorisation Number: ML 26659 ML 30702 ML 30703 ML 30704 ML 32411 ML 32412 ML 32413 ML 32414 ML 32415 ML 32416
- MMP Reporting Year: 2021
- Date: 30/07/2021
- Document Distribution List: NT Government, Arafura Resources Limited

The MMP must be endorsed by a senior representative of the company who has the appropriate level of delegation.

	Author	Reviewed by	Approved by
Date	08/09/2022	08/09/2022	14/09/2022
Name	Michael Robinson	Stewart Watkins	Gavin Lockyer
Signature			

I Gavin Lockyer **, declare that to the best of my knowledge the information contained in this mining management plan is true and correct and commit to undertake the works detailed in this plan in accordance with all the relevant Local, Northern Territory and Commonwealth Government legislation.**

SIGNATURE: 
DATE: 14/09/2022

1.0 INTRODUCTION

1.1 Operator Details

The project operator and contact details are:

- Name of operator or company: Arafura Nolans Project Pty Ltd
- ABN: 88 118 158 900
- Key contacts: Stewart Watkins, General Manager Projects
- Registered office: Level 6, 432 Murray St, Perth WA 6000, PO Box 5773 St Georges Terrace Perth WA 6831, T: +61 8 6370 2800, E: arafura@arultd.com, E: nolansproject@arultd.com
- Darwin office: Unit 34, 119 Reichardt Rd Winnellie NT 0820, PO Box 37220 Winnellie NT 0821

Arafura Resources is an Australian mineral exploration and development company focusing on Neodymium and Praseodymium (NdPr) rare earths. It is headquartered in Perth, Western Australia and was listed on the Australian Stock Exchange (ARU) in 2003. The company's flagship project is this project, the Nolans Rare Earth Project, located in Australia's Northern Territory.

1.1.1 Organisational Structure and Responsibility

The current site management structure relevant to this MMP is presented in Figure 1-1.

The proposed organisation structures are presented as overall, HSEC and for mining in Figure 1-2, Figure 1-3 and Figure 1-4 respectively. Changes to the proposed management and organisational structure will be reported at the end of each reportable period. While these structures may change in the run-up to operations, the current management and organisational structure is limited to:

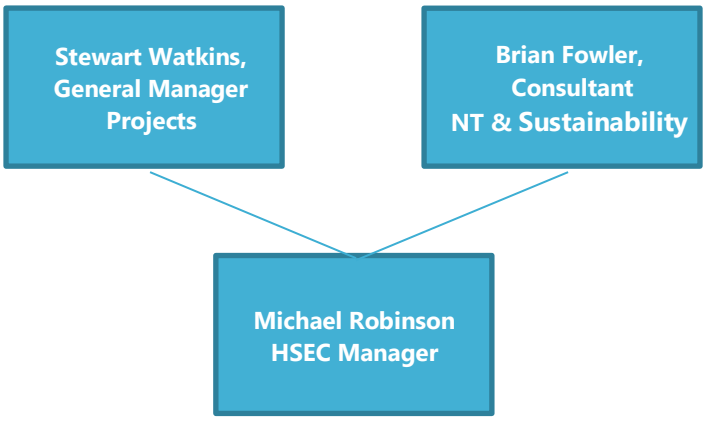


Figure 1-1 Current Site Management Structure

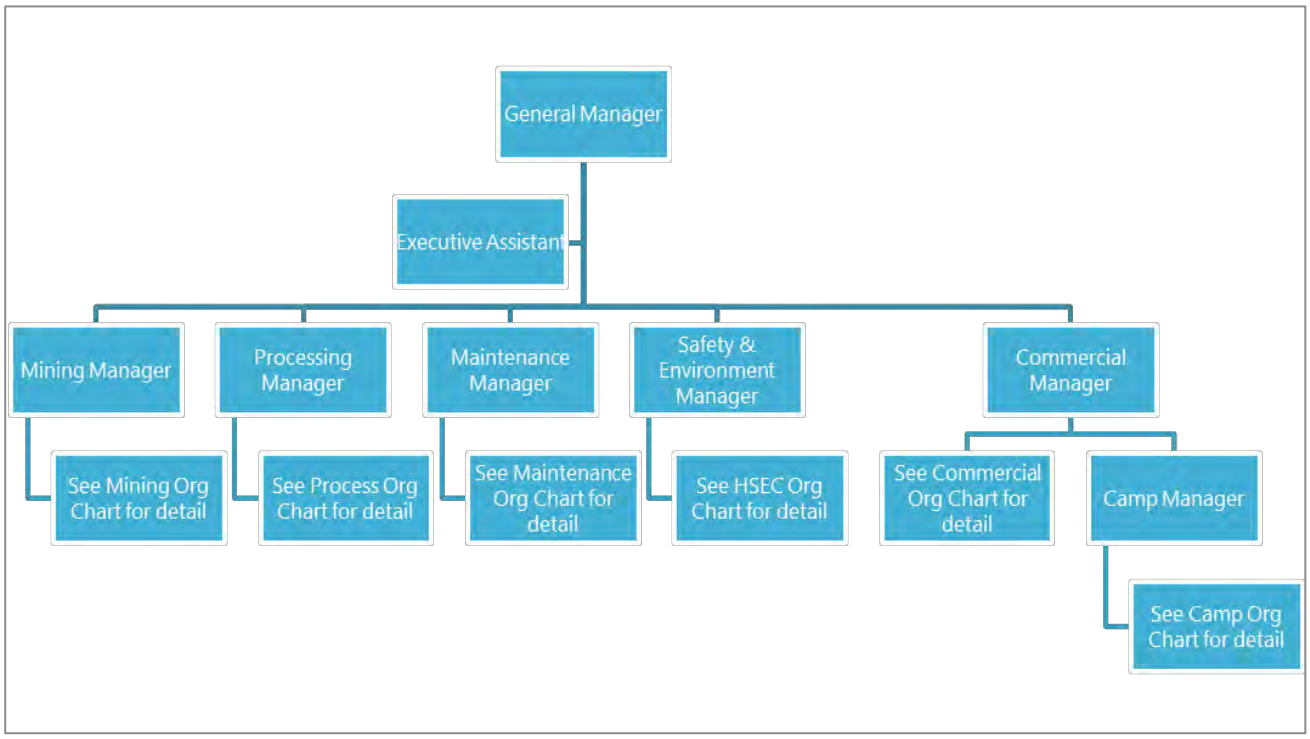


Figure 1-2 Proposed Overall Organisation Chart

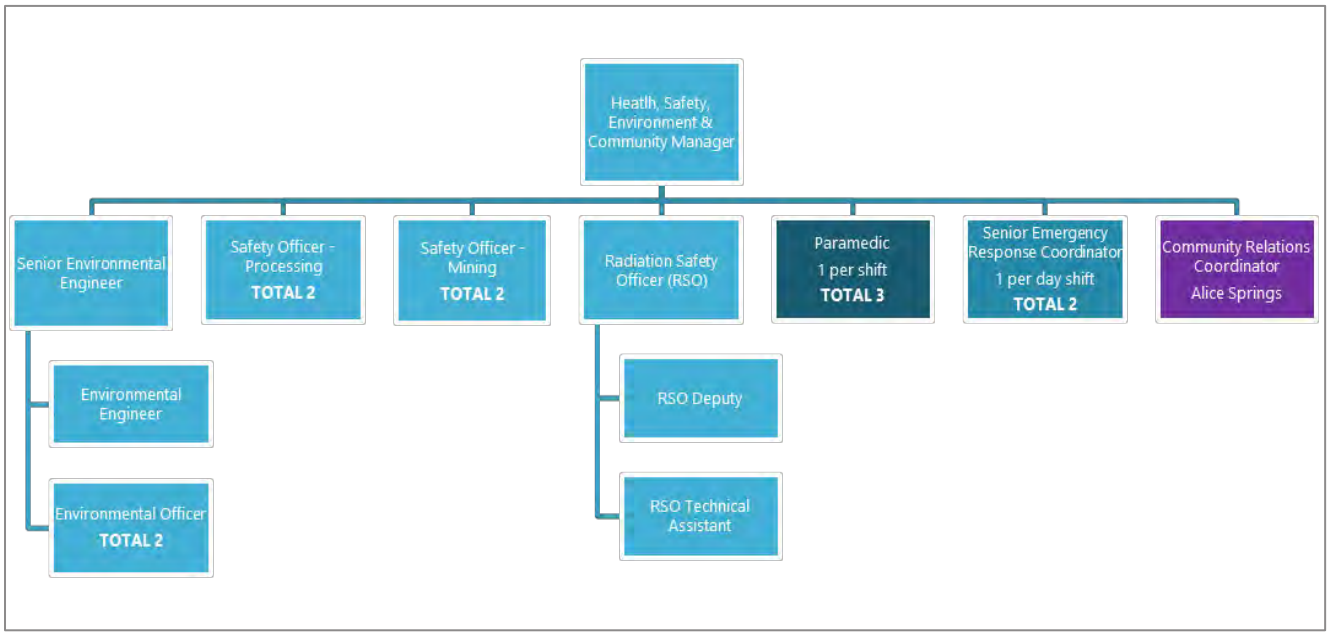


Figure 1-3 Proposed HSEC Organisation Chart

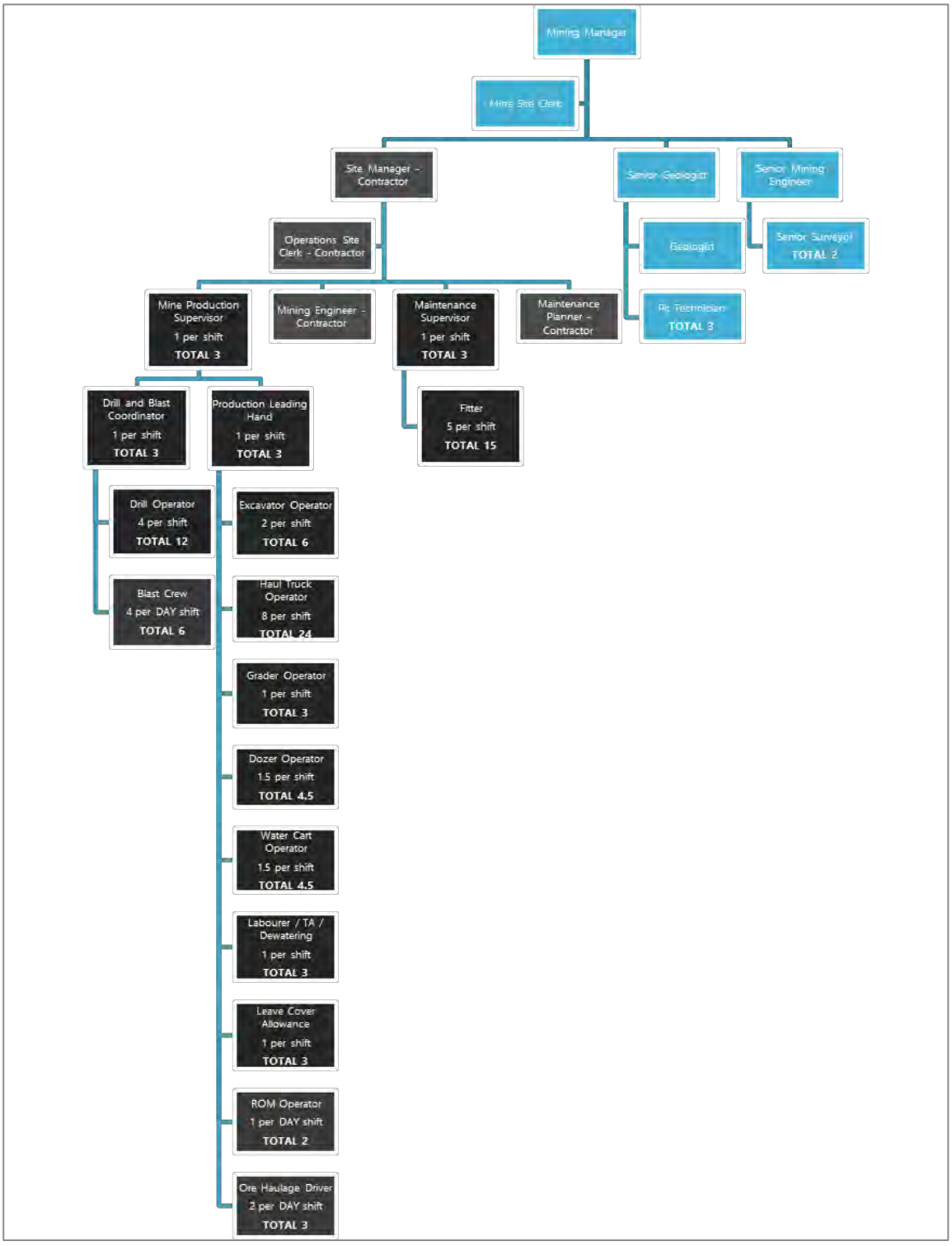


Figure 1-4 Proposed Mining Organisation Chart

1.2 Title Details

Table 1-1 provides a register of ownership for the mining interests associated with the project including the title numbers, title holders and status.

Table 1-1 Registration of Ownership

Title Number	Title Holder	Grant Date	Expiry Date
ML 26659	Arafura Nolans Project Pty Ltd – primary mineral lease	21/07/2020	20/07/2045
ML 30702	Arafura Nolans Project Pty Ltd - camp	21/07/2020	20/07/2045
ML 30703	Arafura Nolans Project Pty Ltd - RSF	21/07/2020	20/07/2045
ML 30704	Arafura Nolans Project Pty Ltd – processing plant	21/07/2020	20/07/2045
ML 32411	Arafura Nolans Project Pty Ltd - borefield	29/01/2021	20/07/2045
ML 32412	Arafura Nolans Project Pty Ltd - borefield	29/01/2021	20/07/2045
ML 32413	Arafura Nolans Project Pty Ltd - borefield	29/01/2021	20/07/2045
ML 32414	Arafura Nolans Project Pty Ltd - borefield	29/01/2021	20/07/2045
ML 32415	Arafura Nolans Project Pty Ltd - borefield	29/01/2021	20/07/2045
ML 32416	Arafura Nolans Project Pty Ltd – creek diversion	29/01/2021	20/07/2045

In addition, access authorities that are mentioned in the Native Title Agreement include:

Table 1-2 Access Authorities

Nature of Access Authorities	Area
Access Authority #1	Access and Haul Road: From the Processing Area (ML 30704) to the Stuart Highway and from the Accommodation Area (ML 30702) to Stuart Highway, known as the site access road and village access road, respectively;
Access Authority #2	Access Road: Between the Productive Area (ML 26659) and the Processing Area (ML 30704), known as the mine access road;
Access Authority #3	Water pipeline and access roads (Between the Borefield Mineral Leases (ML 32411, ML 32412, ML 32413, ML 32414 and ML32415), and from ML 32412 to the Residue Area (ML 30703)), known as the borefield access tracks.

Access Authority IDs were issued from the DITT Mineral Titles Department on 29/7/2022 with the following title numbers: AA33279, 33280 & 33281.

1.3 Project description

1.3.1 Location

Arafura Resources Ltd (Arafura) proposes to develop and operate the Nolans Rare Earth Project (Nolans, or the Project) which is a rare earth mine located approximately 135 kilometres (km) north-northwest of Alice Springs in the Northern Territory (NT). The Project is situated approximately 10 km west of Aileron Roadhouse. The main access to the Project site will be from the Stuart Highway, 5km south of Aileron roadhouse. The majority of the Project site is situated on the Aileron Perpetual Pastoral Lease (PPL 1097), with the exception of the western part of the planned borefield area, which is situated on the Napperby Perpetual Pastoral Lease (PPL 1178), and the very northern portion of the Kerosene Creek diversion (ML32416) that is located on Pine Hill Station.

The Project site comprises four main areas linked by access roads and pipelines:

- The mine site
- Processing site
- Accommodation village
- Borefield.

1.3.1.1 Key Project Information

The following key project information and settings are presented on the following figures:

Figure 1-5 Regional Plan of Project

Figure 1-6 Site Plan including Mine Site, Processing Site and Accommodation Village (Ref: 801-140-A30001-010,EPA Amendment KP)

Figure 1-7 Borefield Layout and Setting

Figure 1-8 Pastoral Title Intersection Key Project Areas

In addition, key project features are described in the following sections and presented on the setting has been summarised in the following figures:

Figure 1-9 Areas of Environmental Importance or Significance

Figure 1-10 Cultural Heritage Areas

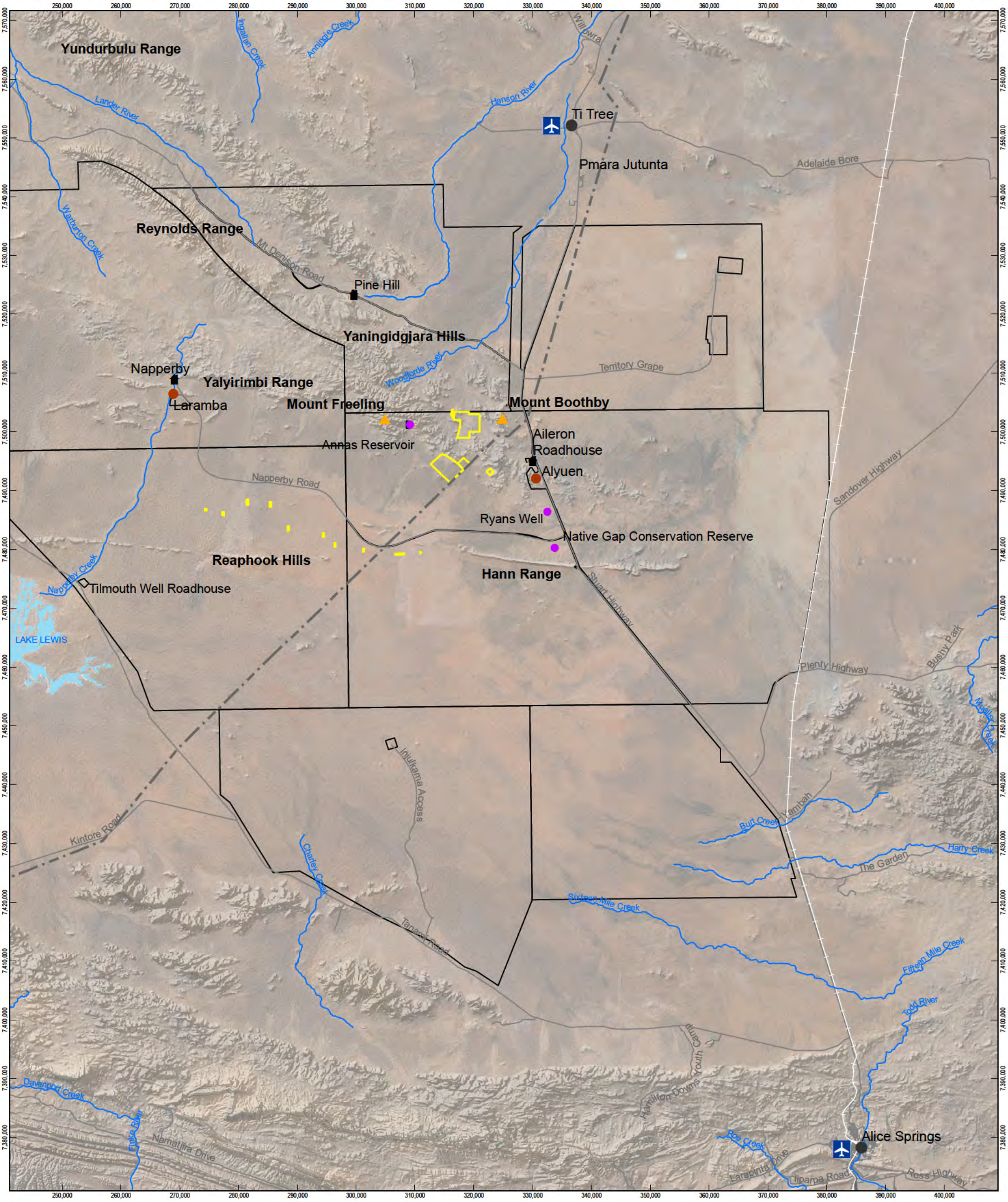
Figure 1-11 Potential Mine Site Groundwater Monitoring Bores

Figure 1-12 Potential Processing Site Groundwater Monitoring Bores

Figure 1-13 Potential Additional Borefield Groundwater Monitoring Bores

Figure 1-14 Vegetation Communities

Figure 1-15 Threatened and Near Threatened Fauna Species Observations



LEGEND

- Town
- Community
- Mountain
- Station
- Site of Interest
- Airport
- Major Waterways
- Gas Pipeline
- Major Roads
- Project Areas
- Waterbodies
- Stations_20210414

1:600,000 @ A3

0 5 10 15 20

Kilometers

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 53

N

Arafura Resources Limited
Mine Management Plan

Job Number	12515982
Revision	A
Date	23 Jul 2021

Regional Plan of Project

Figure 1-5

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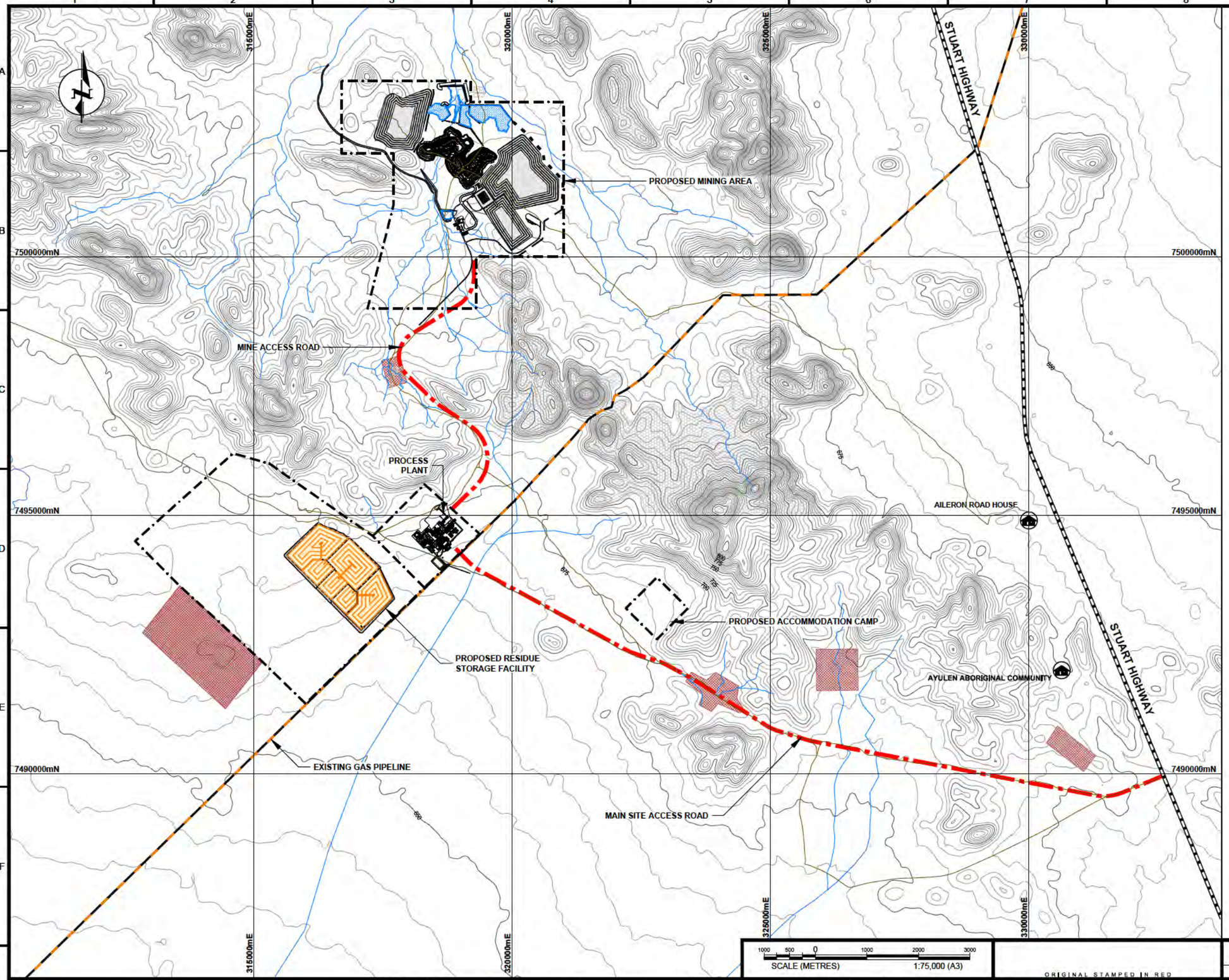
2 Salamanca Square, Hobart Tasmania 7000 Australia T 61 3 6210 0600 E hbamail@ghd.com W www.ghd.com

Data source: GA - Roads, Waterways, Placenames, Placenames, Lakes (2015). ESRI - Shaded Relief (2009). Google Earth Pro - Imagery (Date extracted: 15/12/2015). ARL - Project Areas (2020). Created by:fjohnson



LEGEND:

- L MITED WORK ZONES
- EXCLUSION ZONES
- EXIST NG DRAINAGE COURSE
- EXIST NG GAS PIPEL NE
- EXIST NG HIGHWAY
- EXIST NG ROAD (SEALED)
- EXIST NG ROAD (UNSEALED)
- LEASE BOUNDARY
- SITE ROAD ALIGNMENT

NOTES:

1. 5m CONTOUR INTERVALS SHOWN.TOPOGRAPHIC NFORMATION DERIVED FROM 1 SECOND SRTM DATA, OBTAINED FROM GEOSC ENCE AUSTRALIA, (2011).

Figure 1-6 Site Plan including Mine Site, Processing Site and Accommodation Village

SCALE (METRES) 1:75,000 (A3)

ORIGINAL STAMPED IN RED

REVISIONS								
REV	DATE	DESCRIPTION	DRN	DESIGN	CKD	APP	CLIENT APP
A	28/11/2018	ISSUED FOR DEFINITIVE FEASIBILITY STUDY	PRK	AM	AM	BAS	

DATE	DESIGNED	CHECKED	APPROVED	CLIENT APP'D

SHEET SIZE A3

REFERENCES

DRAWING No.	DRAWING TITLE

Knight Piésold CONSULTING

CONSULT AUSTRALIA Member Firm

ARAFURA RESOURCES
NOLANS PROJECT
RESIDUE STORAGE FACILITY
SITE GENERAL ARRANGEMENT

SCALE 1:75,000
STATUS: DFS
DRAWING NUMBER **801-140-A3001-010**
REV **A**

287

280,000 290,000 300,000 310,000

7,500,000

Borefield A
SBB006
PB7
SBB001

Borefield B
SBB007
PB6
SBB002

Borefield C
SBB011
SBB005
SBB010

Borefield D
SBB008
PB1
SBB003

Borefield E2
SBB004

7,490,000

DAY CREEK
I
H
F
G
A
B
C
D
E1
E2
NW#23
NW#19
NW#16
NW#17
NW#5
NW#4
NW#27
NW#3
NW#2
NW#7
Rabbit Creek
NW#6
NW#61
NW#1
NW#28
NW#8
NW#14
NW#59
NW#60
NW#13

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

280,000 290,000 300,000 310,000

1:120,000 @ A3

0 1 2 3 4 5

Kilometers

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 53

N

LEGEND

- Pumping Bores
- Contingency Bores
- Existing Bores
- ML Boundaries
- Potential Pipeline Alignment
- Creeks

Arafura Resources Limited
Mine Management Plan

Job Number	12515982
Revision	B
Date	22 Jul 2021

Borefield Layout

Figure 1-7

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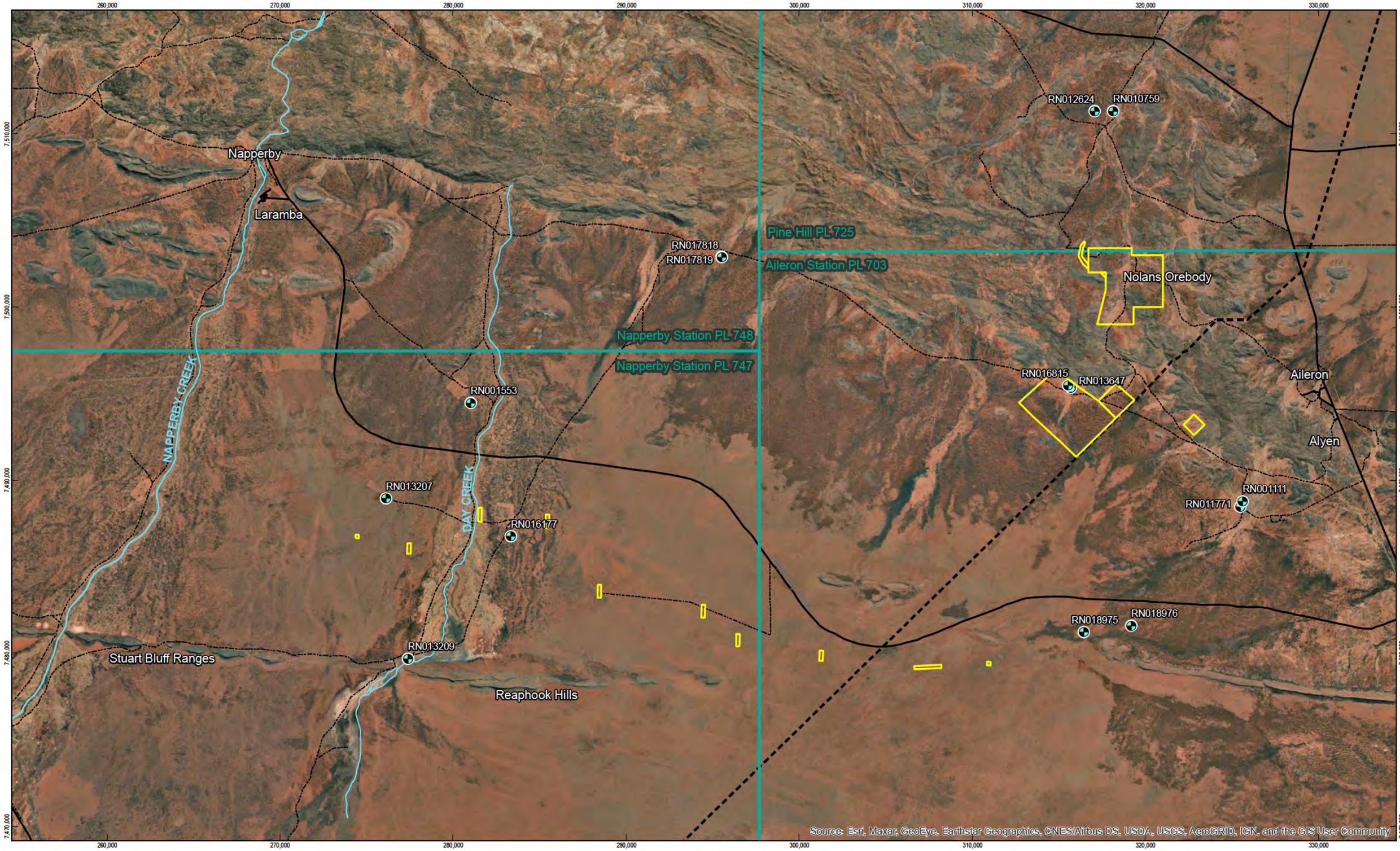

1:200,000 @ A3

0 1 2 4 6 8 10

Kilometers

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 53

N

LEGEND

- Project Areas
- Creeks
- Station Outlines
- Major Roads
- Track
- Gas Pipeline
- Groundwater User Monitoring Point

Arafura Resources Limited
Mine Management Plan

Job Number	12515982
Revision	A
Date	22 Jul 2021

Pastrol Titles Intersecting Key Project Areas

Figure 1-8

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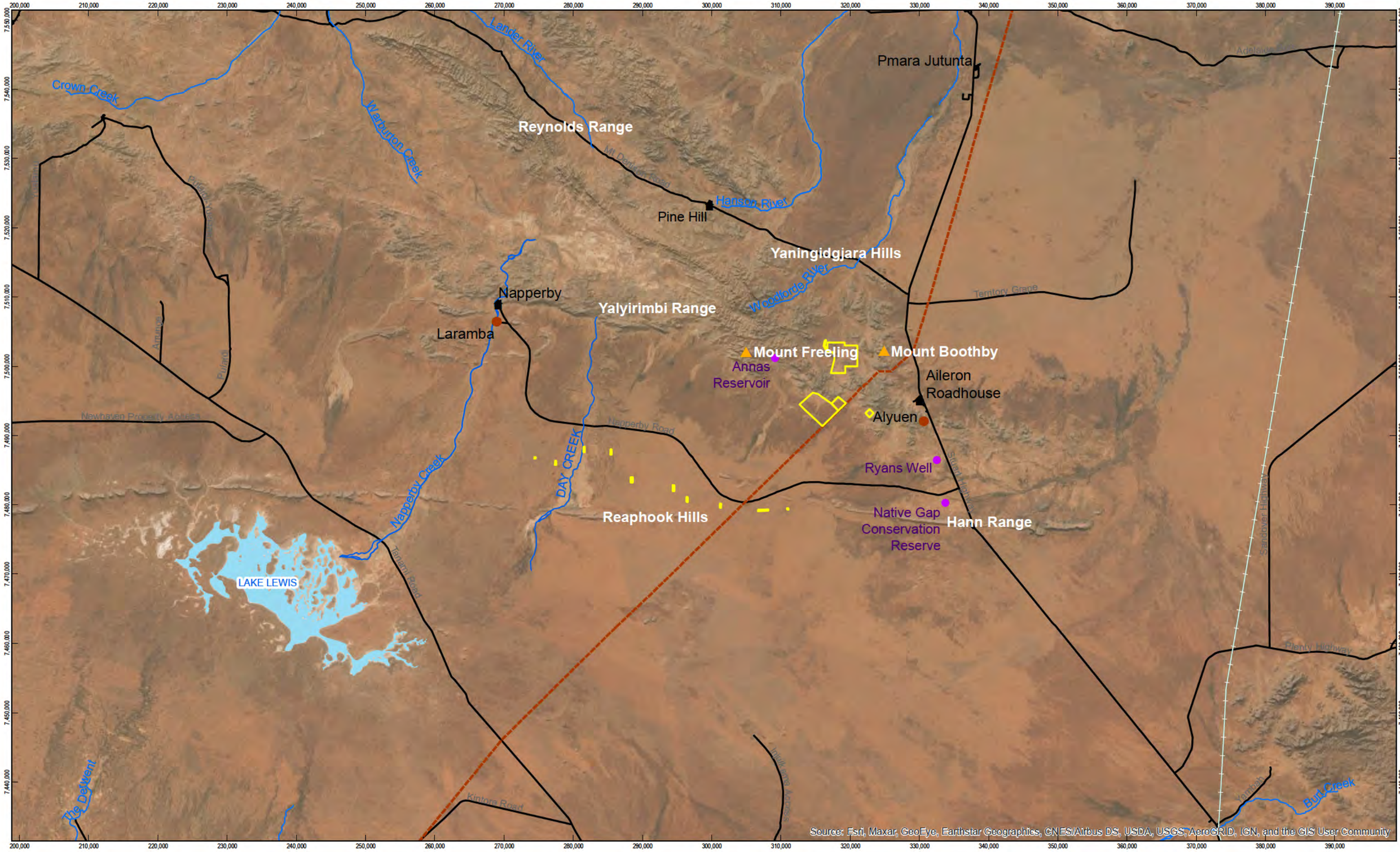

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0 2 4 6 8 10
Kilometers

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 53

N

LEGEND

- Project Areas
- Major Roads
- Creeks
- Town
- Community
- Mountain
- Station
- Site of Interest

Arafura Resources Limited
Mine Management Plan

Job Number	12515982
Revision	A
Date	23 Jul 2021

Areas of Environmental Importance or Significance

Figure 1-9

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Data source: Data Custodian, Data Set Name/Title, Version/Date. Created by:fjohnson

2 Salamanca Square, Hobart Tasmania 7000 Australia T 61 3 6210 0600 E hbamail@ghd.com W www.ghd.com

320,000

MB104A
MB104B
MB114A
MB114B
Sediment Control
MB113B
MB113A
West WRD
MB115A
MB115B
MB116A
MB116B
MB112B
MB112A
Pit
MB111A
East WRD
MB107A
MB107B
MB110A
MB111B
MB110B
MB109A
MB109B
Mine Facilities
Stockpile Area

7,500,000

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

320,000

1:30,000 @ A3
0 250 500 750 1,000
Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 53

N

LEGEND

- Project Areas
- Topsoil Stockpile
- Predicted Water Surface
- Mine Infrastructure
- Mine Access Roads
- Diversion Channel Stage 1
- Diversion Channel Stage 2
- Sediment Control
- Waterways
- Gas Pipeline
- Proposed Groundwater Monitoring Location

Arafura Resources Limited
Mine Management Plan

Job Number 12515982
Revision B
Date 20 Jul 2021

Potential Mine Site Groundwater Monitoring Bores

Figure 11

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Data source: Data Custodian, Data Set Name/Title, Version/Date. Created by:tdcoates

2 Salamanca Square, Hobart Tasmania 7000 Australia T 61 3 6210 0600 E hbamail@ghd.com W www.ghd.com

320,000

Residue Storage Facility

Processing Plant

Accomadation

MB214B
MB214A
MB213A
MB213B
MB215A
MB215B
MB203A
MB203B
MB206A
MB206B
MB204B
MB204A
MB211A
MB211B
MB205A
MB205B

Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

320,000

1:30,000 @ A3

0 250 500 750 1,000

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 53

N

LEGEND

- Project Areas
- Topsoil Storage
- Processing Plant Roads
- Accommodation Village
- Residue Storage Facility
- Mine Access Roads
- Major Roads
- Gas Pipeline
- Proposed Groundwater Monitoring Location

Arafura Resources Limited
Mine Management Plan

Job Number	12515982
Revision	B
Date	22 Jul 2021

Potential Processing Site Groundwater Monitoring Bores

Figure 1-12

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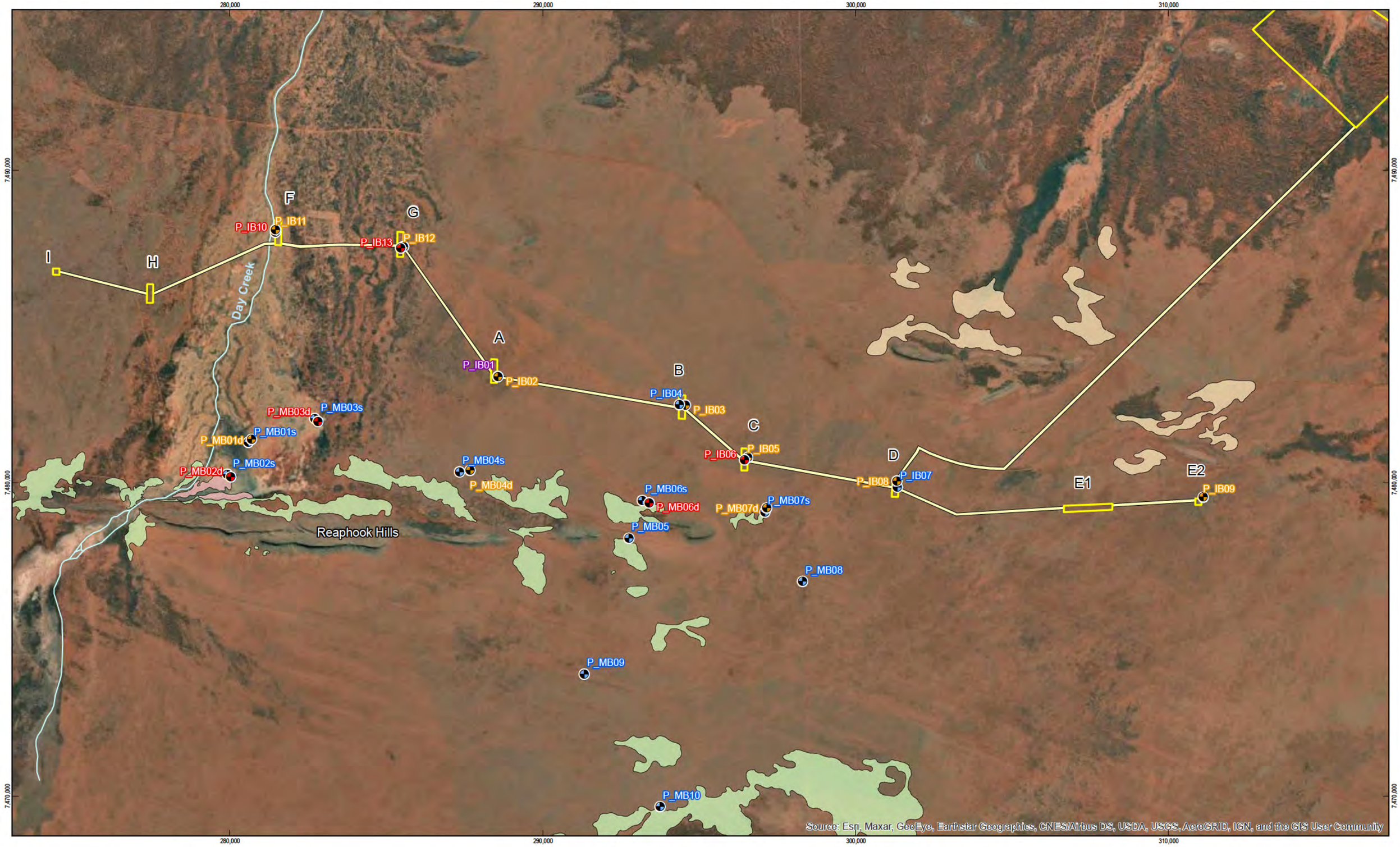

1:100,000 @ A3

0 1 2 3 4

Kilometers

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 53

N

LEGEND

Target Aquifer

- Q
- T2
- T1
- Ngalia
- ML Boundaries
- Priority Potential GDE
- Potential GDE
- Non GDE
- Potential Pipeline Alignment
- Creeks

Arafura Resources Limited
Water Abstraction Management Plan

Job Number	43-22875
Revision	A
Date	22 Jul 2021

Potential Additional Monitoring Bore Locations

Figure 1-13

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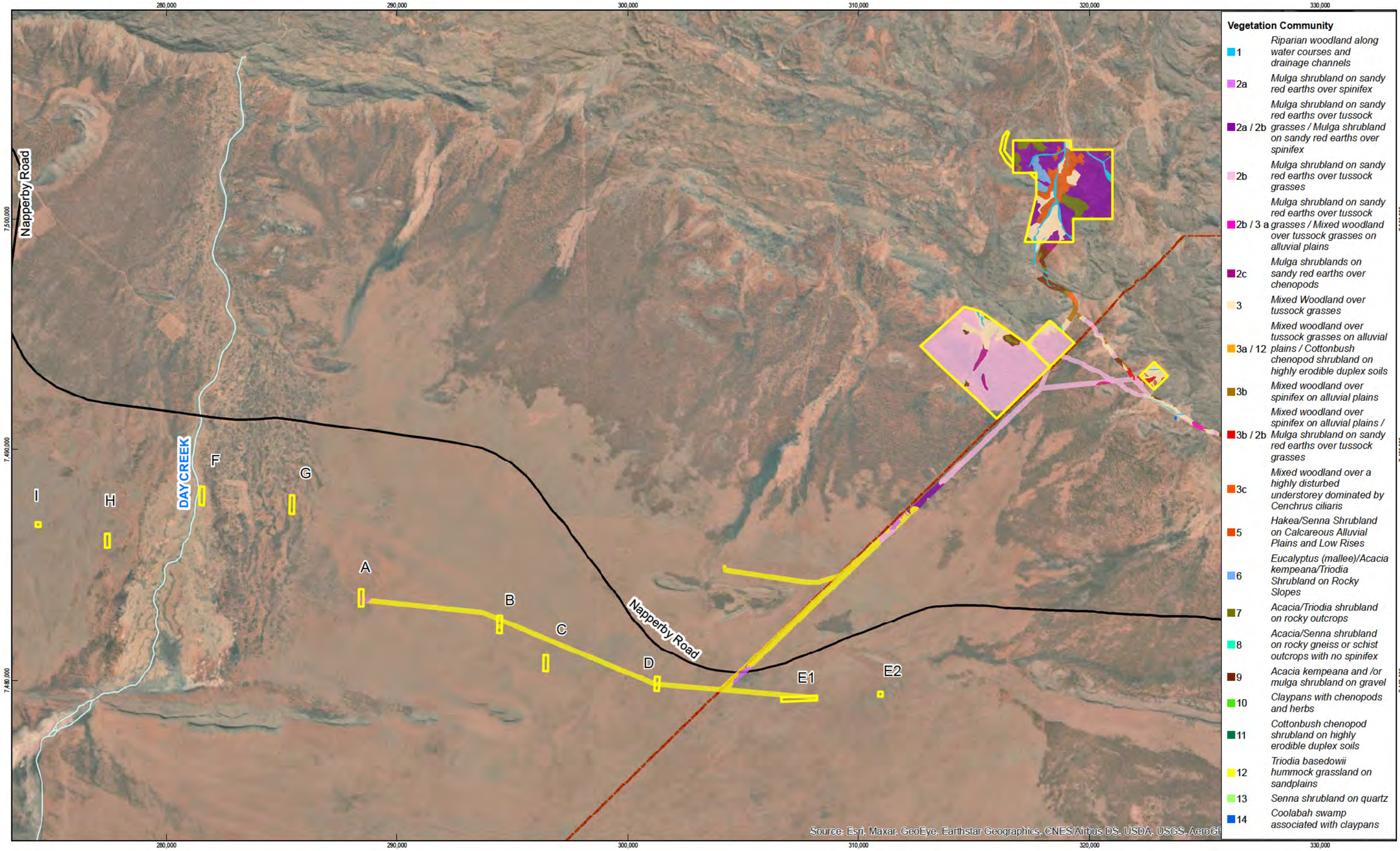

Vegetation Community

1	*Riparian woodland along water courses and drainage channels*
2a	*Mulga shrubland on sandy red earths over spinifex*
2a / 2b	*Mulga shrubland on sandy red earths over tussock grasses / Mulga shrubland on sandy red earths over spinifex*
2b	*Mulga shrubland on sandy red earths over tussock grasses*
2b / 3 a	*Mulga shrubland on sandy red earths over tussock grasses / Mixed woodland over tussock grasses on alluvial plains*
2c	*Mulga shrublands on sandy red earths over chenopods*
3	*Mixed Woodland over tussock grasses*
3a / 12	*Mixed woodland over tussock grasses on alluvial plains / Cottonbush chenopod shrubland on highly erodible duplex soils*
3b	*Mixed woodland over spinifex on alluvial plains*
3b / 2b	*Mixed woodland over spinifex on alluvial plains / Mulga shrubland on sandy red earths over tussock grasses*
3c	*Mixed woodland over a highly disturbed understorey dominated by Cenchrus ciliaris*
5	*Hakea/Senna Shrubland on Calcareous Alluvial Plains and Low Rises*
6	*Eucalyptus (mallee)/Acacia kempeana/Triodia Shrubland on Rocky Slopes*
7	*Acacia/Triodia shrubland on rocky outcrops*
8	*Acacia/Senna shrubland on rocky gneiss or schist outcrops with no spinifex*
9	*Acacia kempeana and /or mulga shrubland on gravel*
10	*Claypans with chenopods and herbs*
11	*Cottonbush chenopod shrubland on highly erodible duplex soils*
12	*Triodia basedowii hummock grassland on sandplains*
13	*Senna shrubland on quartz*
14	*Coolabah swamp associated with claypans*

1:150,000 @ A3

0 1 2 3 4

Kilometers

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 53

N

LEGEND

Project Areas
Creeks
Major Roads
Gas Pipeline

Arafura Resources Limited
Mine Management Plan

Job Number	12515982
Revision	A
Date	22 Jul 2021

Vegetation Communities

Figure 1-14

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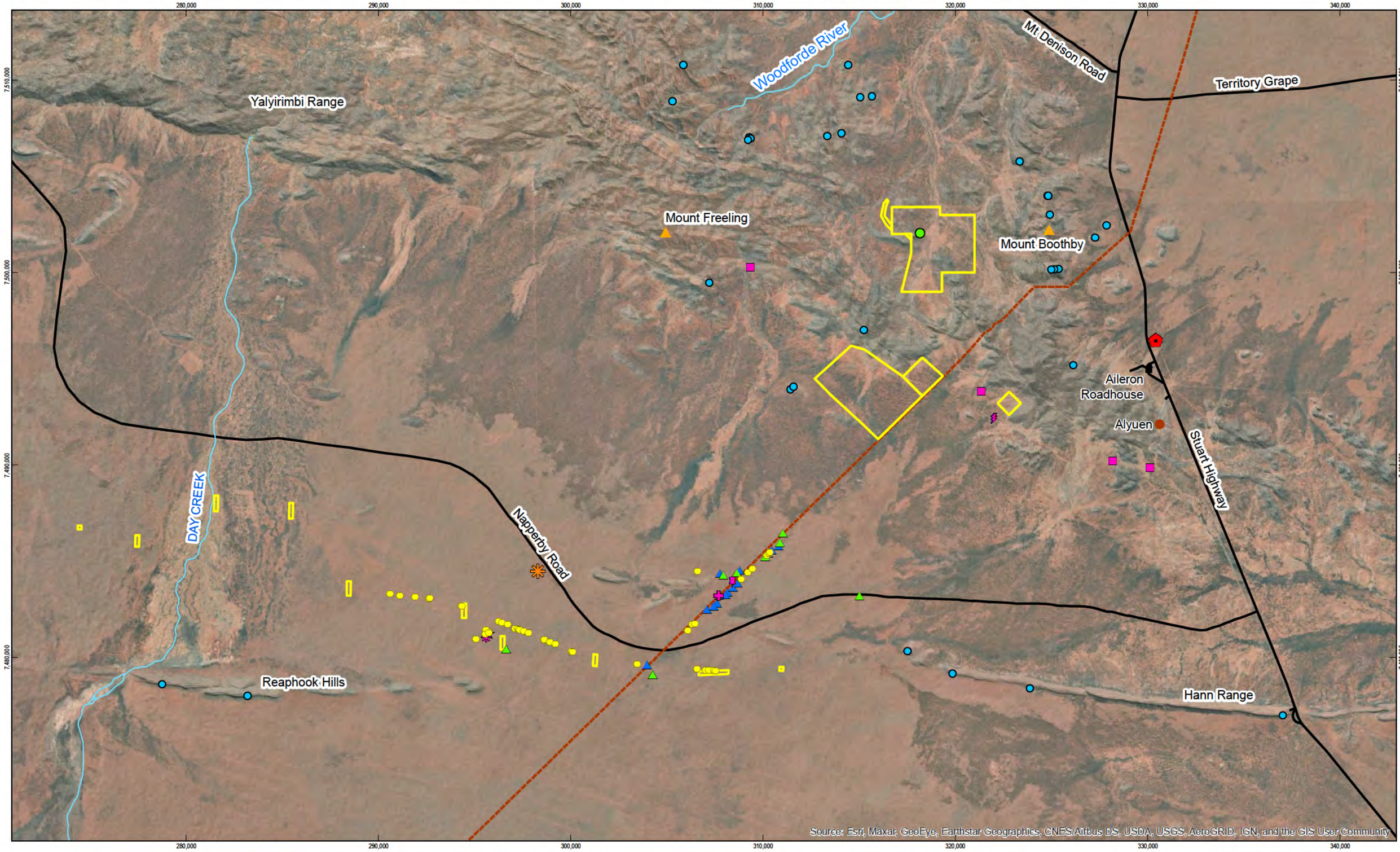
Data source: Data Custodian, Data Set Name/Title, Version/Date. Created by:fjohnson

2 Salamanca Square, Hobart Tasmania 7000 Australia T 61 3 6210 0600 E hbamail@ghd.com W www.ghd.com



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Kilometers

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 53

N

LEGEND

- Project Areas
- Major Roads
- Creeks

Threatened Fauna

- Australian Bustards (2010, 2015)
- Black-footed Rock-wallaby, 2010
- Brush-tailed Mulgara, 2015
- Bush Stone-curlew, 2015
- Emu, 2015
- Great Desert Skink, 2015
- Northern Nailtail Wallaby, 2015
- Spectacled Hare-wallaby, 2015
- Emus
- Black-footed Rock-wallaby, 2015
- Great Desert Skink (DURM)
- Malleefowl (DURM)
- Mulgara Burrows

ARAFURA RESOURCES LIMITED

GHD

Arafura Resources Limited
Mine Management Plan

Job Number	12515982
Revision	A
Date	20 Jul 2021

Threatened and Near Threatened Fauna Species Observations

Figure 1-15

G:\43\12515982\GIS\Maps\Deliverables\MMP\MMP report mxd files\12515982_1-15_ThreatenedFauna_RevA.mxd

Data source: GHD, DLRM database and GHD survey 2010/11 and 2015, Version/Date. Created by:tdcoates

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1.3.2 Project Summary and Improvements

Following is a summary of the main milestones for the Nolans project development to date:

- 2001 Exploration drilling at Nolans.
- 2006 Cultural heritage and baseline environmental studies at the Nolans site.
- 2012 Southern Basins groundwater exploration.
- 2015 Resource model upgraded to life of mine (LOM) 56Mt.
- 2016 Draft Environmental Impact Statement (EIS).
- 2017 Supplementary EIS.
- 2017 NT EPA Assessment Report 84.
- 2018 Definitive Feasibility Study.
- 2018 EPBC Approval for the Nolans project subject to 14 conditions.
- 2019 NT EPA approval of the Section 14A variation.
- 2020 Native Title Agreement executed by the project's native title holders (through their prescribed body corporates), the Central Land Council (CLC) and Arafura.
- 2020 and 2021 Primary mineral leases (MLs) for the Nolans project granted.

No mining has occurred at Nolans, with the disturbance limited to the location of exploration drilling activities at the mine site and borefield. These areas are quantified in Section 2.2.

2.0 SITE CONDITIONS

2.1 Physical Environment

The physical environment of the project setting has been assessed as part of the following bodies of work:

- GHD, 2016, Nolans Project, Environmental Impact Statement (EIS), Arafura Resource Ltd, February 2016.
- GHD, 2017, Nolans Project, Environmental Impact Statement (EIS) – Supplementary Report, October 2017.
- GHD, 2019, Arafura Resources Ltd, Nolans Project Section 14A Notification, June 2019.

2.1.1 Climate

The study area climate consists of low rainfall and high summer maximum temperatures (average of 37°C) and low minimum winter temperatures (average 6°C), typical of the central Australian arid zone. Temperatures follow the expected seasonal pattern of cycling between warmer temperatures in the summer (peaking in December-January) and cooler temperatures (lowest in July) in the winter. Relative humidity is higher in summer and winter, whilst spring has the lowest humidity. Rainfall follows a seasonal trend of a wet season in the summer to early autumn months, and dry conditions for the rest of the year.

2.1.1.1 Precipitation

A detailed description of the precipitation patterns across the site is outlined in EIS, Appendix K – Section 2.2 Study Area Climate.

https://www.arultd.com/images/EIS/DOCUMENTS/Volume2/Nolans_EIS_Appendix_K_web.pdf

Of note, the design climatic conditions used for sizing the residue storage facility (RSF) infrastructure is summarised in Table 2-1 which also presents the annual exceedance probability (AEP) and probable maximum precipitation (PMP) data for the project area (KP, 2018). Likewise, the short duration storm rainfall depths are provided in Table 2-2.

Table 2-1 Design climate conditions (EA Amendment 14- KP RSF Design)

Item	Value (mm)
Annual Rainfall	
1 in 100 yr AEP Dry	30
1 in 100 yr AEP Wet	847
Design Storm Depth	
1 in 100 yr AEP 24 hr storm	196
1 in 100 yr AEP 72 hr storm	298
PMP 24 hr storm	670
PMP 72 hour storm	1,090
Annual Penmen Lake Evaporation	1,982

Short duration storm depth for a range of Average Reoccurrence Interval (ARI) were estimated using the Australian Government Bureau of Meteorology IFD Tool, as well as the methods as discussed in the Australia Rainfall and Runoff Guidelines (KP, 2018).

Table 2-2 Short Duration Storm - Rainfall Depth (EA Amendment 14 - KP RSF Design)

Storm Duration			Precipitation Depth (Mm) For AEP Storm Frequency (%)							
Min	Hour	Day	50%	20%	10%	5%	2%	1	0.5%	0.1%
5			7	11	13	16	19	22	25	33
10			11	17	20	24	30	34	38	51
15			14	21	26	30	37	42	48	64
30	0.5		19	29	35	42	52	59	67	89
60	1		24	37	46	55	68	78	89	118
180	3		34	51	63	76	93	108	123	163
	6		41	61	75	90	111	129	147	195
	12	0.5	50	74	92	109	135	156	178	236
	24	1	62	93	114	135	169	196	230	313
	48	2	76	116	144	172	218	255	300	413
	72	3	84	131	164	198	252	298	347	481
	168	7	95	153	196	242	308	362	427	592

The PMP rainfall depth for the site for a 24-hour event is estimated at 670 mm and for a 72 hour event at 1,090 mm, based on the Generalised Tropical Storm Method Revised (GTSMR) Inland Zone as defined by the Australian Government Bureau of Meteorology (KP, 2018).

2.1.1.2 Evaporation

Evaporation is greatest during months of higher mean rainfall, with the highest average evaporation occurring in December and January at 375 mm per month. Rates of evaporation are significantly lower from May to August, coinciding with lower mean rainfall and temperatures. The annual average evaporation is 3,000 mm, approximately 850% greater than the annual average rainfall of 316.7 mm.

2.1.1.3 Wind

The prevailing wind direction is from the south-east with an average wind speed of 2.77 m/s, (~10 km/hr) remaining fairly constant throughout the year. There are also a small proportion of winds from the north-east. In terms of poor dust conditions, the incidence of light winds is important for poor dispersion while the strongest winds create the most wind erosion. This suggests sensitive receptors west and north-west of the site would be the most vulnerable.

A detailed description of wind speed, seasonal changes and direction is outlined in the EIS, Appendix Q – Air Report – Section 2.3 Wind Dispersion

https://www.arultd.com/images/EIS/DOCUMENTS/Volume4/Nolans_EIS_Appendix_Q_web.pdf

2.1.1.4 Seismic activity

Historical earthquake data was obtained from the Geoscience Australia earthquake database for the extended area surrounding the Project. The data includes all recorded earthquakes (M3.0 and above) within the region from June 1968 to November 2013. The earthquake database indicates that 11 earthquakes have occurred within 200 km of the site with earthquake magnitude in the range of 3.0 to 4.8, including a M4.8 event that occurred within 38.0 km of the site on 3rd August 1968, 3 earthquakes in the Geoscience Australia database have occurred within 100 km of the site, including a M4.8 event 96.0 km from the site. A M6.7 earthquake occurred 315.6 km of the site on the Tennant Creek strike slip fault on 22nd January 1988.

2.1.2 Land Systems

Land systems are described in Landloch (2021a) which is provided as APPENDIX Y. The Landloch (2021a) work uses broad scale CSIRO land systems mapping. This land systems mapping describes and groups land with a recurring pattern of topography, soil, and vegetation.

2.1.2.1 Topsoil and Subsoil

Topsoil and subsoil are described in Landloch (2021a) which is provided as APPENDIX Y. The Landloch (2021a) report describes intrusive field based assessments which has grouped the sites into four soil profile classes (SPC), and delineated these classes into three soil mapping units (SMUs).

The Landloch (2021a) works have concluded:

"All the soils assessed within the three study areas present are more similar than they are different. They are all free drained, loamy, non-saline, non-sodic, low fertility, friable earths. The main difference that is likely to have management implications was the depth to parent rock, and the associated presence/absence of rock fragments within the soil profile. SPC C differed from all the other soils in

that it was calcareous throughout. However, the alkalinity of this SPC is within limits suitable for many plants, and is unlikely to be a significant limitation to the land capability.

The soils are relatively stable if undisturbed. However, due to their highly weathered, kaolinitic mineralogy, their weak structure, their loamy texture, and their low organic matter content, they are susceptible to being physically degraded. Over-trafficking when wet are likely to lead to compaction. The soil is also likely to become powdery and loose if over worked.

With appropriate management, the soils of the study areas present few plant growth limitations."

2.1.2.2 Topography and Geology

The topography of the mine site and borefield has been outlined in the following documents;

- The topography of the area is outlined in the Water Abstraction Management Plan (WAMP) Section 6.0 – Topography, and Figure 3 of the WAMP.
- The geology of the area is outlined in the DFS Section 2 (Nolans Project, DFS Summary Report, February 2019 – Published at (https://www.arultd.com/projects/nolans/definitive-feasibility-study.html)

2.1.3 Flora and Fauna

The flora and fauna of the project area is outlined in detail in the following documents:

- EIS – Chapter 09 – Biodiversity (https://www.arultd.com/projects/nolans/eis.html)
- EIS, Volume 3, Appendix M: Biodiversity – Flora and Vegetation Report https://www.arultd.com/images/EIS/DOCUMENTS/Volume3/NolansEIS_AppendixM_web.pdf
- EIS, Volume 3, Appendix N: Biodiversity - Fauna and Threatened Species Report https://www.arultd.com/images/EIS/DOCUMENTS/Volume3/NolansEIS_AppendixN_web.pdf
- EIS Supplement Appendix 15 – Stygofauna Pilot Study (GHD, 2011) https://www.arultd.com/images/EIS/Supplement/Appendix-15_Stygofauna-Report_WEB.pdf
- Aquatic Ecology Services, 2020 Nolans Bore Rare Earth Mine Southern Borefield Stygofauna Pilot Study

No Stygofauna were identified in any of the 7 bores investigated as part of the mine site assessment (GHD, 2011). Likewise, the field investigation which sampled 18 bores within the southern borefield and the margins area, concluded that stygofauna were not present in these shallow alluvial aquifers (Aquatic Ecology Services, 2020).

2.1.3.1 Vegetation

The vegetation of the project area is outlined in detail in the following documents:

- Draft EIS Volume 1 – Chapter 09 – Biodiversity (https://www.arultd.com/projects/nolans/eis.html)
- EIS Supplement Appendix 9 – Vegetation of Day Creek (https://www.arultd.com/projects/nolans/eis.html)

- WAMP – GDE Assessment Section 2.16 and Appendix 5 GDE Assessment
- EIS, Volume 3 - Appendix M: Biodiversity – Flora and Vegetation Report (https://www.arultd.com/images/EIS/DOCUMENTS/Volume3/NolansEIS_AppendixM_web.pdf)wit

2.2 Socio-Economic Environment

The background socio-economic environment of the surrounding communities is described in the EIS Chapter 15: Socio-Economic, providing the latest information gathered as part of the project.

https://www.arultd.com/images/EIS/DOCUMENTS/Volume1/NolansEIS_Chapter15_LOWRESweb.pdf

The risk and associated management measures to mitigate the potential to socio-economic risks is outlined in EIS, Appendix G – Risk Register Social.

https://www.arultd.com/images/EIS/DOCUMENTS/Volume2/Nolans_EIS_Appendix_G_web.pdf

The EIS, Volume 6 also contain Appendix X_K: Social Impact Management Plan

https://www.arultd.com/images/EIS/DOCUMENTS/Volume6/Nolans_EIS_Appendix_X_K_web.pdf

2.2.1 Current Land Use

Traditional owners of the land on which Arafura will operate are Anmatjere people, with senior traditional owners living in the Alyuen, Ti Tree, Pmara Jutunta and Laramba communities and further afield in places such as Alice Springs. Aileron Pastoral Holdings Pty Ltd also hold background land tenure to the mine site, processing site, accommodation village and part of the borefield area under Aileron Perpetual Pastoral Lease (PPL 1097). The borefield also extends onto part of Napperby Station (PPL 1178). The predominant land use is cattle grazing.

2.2.2 Identified Stakeholders and Consultation

The EIS describes the consultation process and key themes raised during consultation in Chapter 6: Consultation

https://www.arultd.com/images/EIS/DOCUMENTS/Volume1/NolansEIS_Chapter6_LOWRES_web.pdf

Additional information is presented in EIS Volume 2 Appendix H: Community Consultation Report

https://www.arultd.com/images/EIS/DOCUMENTS/Volume2/Nolans_EIS_Appendix_H_web.pdf

Stakeholder consultation issues will be registered using the template provided in APPENDIX U. The template records the following key pieces of information:

- Name and title of persons consulted, and issues discussed. The register will also aim to record any specific concerns raised during consultation, actions taken to address them and the current status of these matters.

- An outline of the ongoing arrangements and consultation process undertaken with the underlying landowners and managers, and other interested stakeholders, to ensure they are informed and that their concerns are considered.
- Stakeholder consultation which occurs within the reportable period of the MMP will be provided as reference in APPENDIX U, which will act as evidence of two-way communication with other relevant stakeholders and any key details of the agreed arrangements for maintaining the communication process throughout the life of the MMP.

The following snapshot of the key parties which are associated with the proposed activity are outlined below, these stakeholders will be reviewed upon the next revision of the MMP:

Table 2-3 Key Parties Associated with Proposed Activities

Key Parties	Titles
Lease Owner/Manager:	Aileron Pastoral Holdings/Craig and Sarah Cook, Napperby Station/Boyd and Elle Easy Pine Hill Station/Greg Vickers
Land Owner:	NTG
Land claimants (Native Title)	Various prescribed body corporates (names can be provided.
Land Council representing the Traditional Owners for the country:	Central Land Council
Neighbours and communities	Alyuen, Aileron, Laramba, Ti Tree, Parma Jutunta
Tenement manager	AMETS
Government Departments	DITT, DEPWS, NT EPA, DTFH&C
Tourism and recreation stakeholders	NA
Shareholders.	TBC
Employees (internal)	TBC

2.2.3 Workforce Description and Demography

Arafura has completed a Territory Benefit Plan, APPENDIX W, which sets out how the project will meet the following objectives:

- Boosting local workforce development and employment opportunities.
- Facilitating regional and Indigenous economic and community development.
- Encouraging local business participation and small to medium enterprise capability development.
- Enabling economic, industry and social infrastructure investment.

The Project is expected to employ the equivalent of 650 full time employees over the twenty-six months of the primary construction period. During this time, it is expected that Northern Territory personnel will be employed directly by Arafura and its contractors where possible.

During steady state operations, the Project will employ an average of 280 full time equivalent workers in each year over the 38 years of operation.

Arafura has a specific Local and Indigenous Engagement Strategy (IES), which outlines the approach and strategic priorities around both local and indigenous engagement into the project. This strategy is provided as a reference in APPENDIX X.

3.0 STATUTORY AND NON-STATUTORY REQUIREMENTS

3.1 Statutory Requirements

The various components of the project and how they will be managed and operated in accordance with commonwealth and state based statutory requirements are outlined in Table 3-1 Statutory Requirements. Environmental management plans have been developed in accordance to the relevant statutory requirements outlined in Table 3-1.

Table 3-1 Statutory Requirements

Legislation	Agency	EMP Reference	Comments
Commonwealth			
Aboriginal & Torres Strait Islander Heritage Protection Act 1986	Attorney-General's; Prime Minister and Cabinet	Cultural Heritage	Protects natural, historic and Indigenous heritage places that are of outstanding universal value, outstanding significance to the nation; or that are owned or controlled by the Australian Government. No sites or places within the Project area are currently listed on the registers of: World Heritage List; National Heritage List; and Commonwealth Heritage List.
Aboriginal Land Rights (Northern Territory) Act 1976	Attorney-General's; Prime Minister and Cabinet	Cultural Heritage	Governs the grant and administration of Aboriginal land in the Northern Territory. The Land Rights Act empowers Land Councils to administer Aboriginal Land Trusts and provides that Land Councils are to consult traditional Aboriginal owners in relation to proposals that affect Aboriginal land. The Land Rights Act also mandates the protection of sacred sites. The Project area is within the administrative boundary of the Central Land Council (CLC). However, the Project area is not located on Aboriginal land. The CLC has recorded sacred sites in the Project area. Native Title Agreement signed and in place and is currently being registered with Native title Tribunal.
Environment Protection and Biodiversity Conservation Act 1999	Environment and Department of Energy	Biodiversity Weed	Requires a person not to take an action that has or will have a significant impact on a Matter of National Environmental Significance (MNES) unless that action is approved. The Project was referred to the Commonwealth Department of the Environment and was determined that the action was a "controlled action" and required formal assessment and approval under the EPBC Act. Reasons included: ▪ the proposed action may affect listed threatened species and communities including the listed vulnerable Black-Footed Rock-Wallaby – MacDonnell Ranges Population, Greater Bilby and Great Desert Skink; and ▪ the proposed action is a nuclear action due to the presence of certain minerals. ▪ Management strategies must be implemented by the Proponent and oversighted and enforced by the relevant regulator throughout the life of the Project to deliver acceptable environmental outcomes.
Native Title Act 1993	Attorney-General's; Prime Minister and Cabinet	Cultural Heritage	Provides for the recognition and protection of native title. Establishes the National Native Title Tribunal, which administers rights and interests over lands and waters by Aboriginal people. In the Act, the grant of a mineral lease on an area where native title has been determined to exist (or is subject to a registered native title claim) is a future act and will trigger the 'right to negotiate' process. The granting of the Nolans MLs occurred in July 2020 and February 2021. The right to negotiate process requires good faith negotiations between the proponent, government party and native title party with a view to obtaining the agreement of the native party to the doing of the future act subject to conditions. In some circumstances, there may be more than one native title party. If agreement is reached, the negotiation parties will execute an agreement in accordance with the native title agreement (NTA) and the future act will be valid for the purposes of the NTA. A copy of such agreement is to be provided to the National Native Title Tribunal. The Nolans NTA was executed by the project's native title holders (through their prescribed body corporates), the Central Land Council (CLC) and Arafura in June 2020. The NTA also mandates certain processes of notification, consultation and or consideration of comments in relation to other types of future acts. Notification is likely to be relevant to the Project in respect of infrastructure related mineral leases and access authorities. The act also provides for Indigenous Land Use Agreements (ILUA) which are voluntary agreements between a native title group and others about the use of land and waters. These agreements allow people to negotiate flexible, pragmatic agreements to suit their particular circumstances. When registered, ILUAs bind all parties and all native title

Legislation	Agency	EMP Reference	Comments
			holders to the terms of the agreement. There are three native title determinations covering the Project area (DCD2013/001 – Napperby Perpetual Pastoral Lease - Alherramp Ilewerr Mamp Arrangkey Tywerl (AIMAT) Native Title Party), (DC2014/002 – Aileron Pastoral Lease - IPY Native Title Party; DC2007/002 – Aileron - Kwaty Native Title Party).
National Environment Protection (Air Toxics) Measure	Department of Environment and Energy	Air	To facilitate management of air toxics in ambient air that will allow for the equivalent protection of human health and wellbeing by: ▪ Providing for the generation of comparable, reliable information on the levels of toxic air pollutants at sites where significant elevated concentration of one or more of these air toxics are likely to occur ▪ Establishing a consistent approach to the identification of such sites for use by jurisdictions. ▪ Establishing a consistent frame of reference ('monitoring investigation levels'-MILs) for use by jurisdictions in assessing the likely significance of levels of air toxics ▪ Adopting a nationally consistent approach to monitoring air toxics at a range of locations
National Environment Protection (Ambient Air Quality) Measure	Department of Environment and Energy	Air	Establishes national ambient air quality standards and a national framework for the monitoring and reporting of six common air pollutants, including ozone (O_3),carbon monoxide (CO). nitrogen dioxide (NO_2) and sulfur dioxide (SO_2).
National Greenhouse and Energy Reporting Act 2007	Department of Environment and Energy	Air	Corporate entities, corporate groups or entities that have operational control of facilities are required to be registered and report emissions and energy use if such emissions or use exceeds statutory thresholds contained in the Act.
	National Environment Protection Council	Air	The purpose of NEPC is to ensure that: ▪ Australians enjoy the benefit of equivalent protection from air, water or soil pollution and from noise wherever they live; and ▪ Business decisions are not distorted, and markets are not fragmented by variations in major environment protection initiatives between member governments. NEPC creates National Environment Protection Measures (NEPMs) on: ▪ Ambient air quality; ▪ Ambient marine, estuarine and freshwater quality; ▪ The protection of amenity in relation to noise; ▪ General guidelines for the assessment of site contamination; ▪ Environmental impacts associated with hazardous wastes; ▪ The re-use and recycling of used materials; and ▪ Motor vehicle noise and emissions. The Air NEPM sets air quality standards that are legally binding on each level of government. Jurisdictions put strategies in place to reduce emissions and to achieve the standards set out. The standards relate to six criteria air pollutants: carbon monoxide, nitrogen dioxide, photochemical oxidants, sulfur dioxide, lead and particles. Ambient Air Quality NEPM standards have been adopted for the Project.
Northern Territory Specific			
Bushfires Management Act 2016	Department of Environment and Natural Resources	Biodiversity	Relates to the prevention and suppression of bushfires. The fundamental principle established by the Act is that the responsibility for bushfire management rests with the landholder. In the event the Project requires controlled burning the company shall seek a permit through Bushfires NT. If site is situated outside the emergency response area, fire management is required to prevent impacts on property, industry and environment.
Environmental Offences and Penalties Act 1998	Environmental Protection Agency	Biodiversity Diversion	Establishes penalties for certain offences under prescribed Acts, and for related purposes. Applies to both individuals and corporate entities. If found in breach of any relevant act – penalties will apply.

Legislation	Agency	EMP Reference	Comments
Fire and Emergency Act 1996	Northern Territory Fire and Rescue Service (NTFRS)	Fire	Provides for the requirement to cooperate with NT Fire and Rescue Services in responses to fires and other emergencies and investigations within designated emergency response areas. Also requires compliance with a law for the prevention of fire or the protection of the public from danger arising from fire.
Fire and Emergency Regulations 1996	Northern Territory Fire and Rescue Service (NTFRS)	Fire	Regulations under the Fire and Emergency Act 1996 for firebreaks; accumulation of combustible material; stacked materials; flues; cutting, heating and welding equipment; oily waste, emergency and evacuation planning, accommodation parks and smoke alarms.
Dangerous Goods Act 1998	Attorney-General and Justice	Hazardous Substances	Applies to the movement and handling of explosives, fuel and gas. Arafura will obtain licences for storage or transportation of any dangerous goods,
Heritage Act 2011	Department of Tourism, Sport and Culture	Cultural Heritage	Provides a system for the identification, assessment, protection and conservation of the Northern Territory's natural and cultural heritage. If any archaeological places or objects are to be disturbed, work must cease until permission is sought to carry out work on the heritage place or object. An application must be made with the consent of the owner of the place or object. Includes blanket protection for Aboriginal and Macassan archaeological places and objects across the NT, and other places, classes of places, or objects which the Heritage Council considers to be of heritage significance, which are then listed in the Northern Territory Heritage Register and Archaeological Site Register There are three declared heritage places in the vicinity of the subject area. There are also a number of sites containing artifacts which may be impacted by planned project activities which will require approval under the Heritage Act.
Mining Management Act 2001	Department of Industry, Tourism and Trade - Mines Division	Hazardous Substances Biodiversity Weed	Regulates mining activities and the management of mining sites. The legislation is administered by the DITT. An operator of a mining site requires an authorisation under the Act. An application for an authorisation must include a Mining Management Plan (MMP). The MMP must describe the mining activities proposed and management systems to protect the environment, health and safety, details of ownership, plans for the mine workings and infrastructure, and a plan and costing of closure activities. An operator who carries out mining activities under an authorisation must provide a security to the Minister to secure compliance with the Act and cover the costs and expenses of preventing, minimising or rectifying environmental harm caused by mining activities.
Northern Territory Aboriginal Sacred Sites Act 1989	Aboriginal Areas Protection Agency (AAPA)	Cultural Heritage	Protects sacred sites by establishing a procedure for the registration of sacred sites and establishing a procedure for the avoidance and/or protection of sacred sites in the development and use of land. Under the Act, an Authority Certificate can be issued by the Aboriginal Areas Protection Authority (AAPA) that provides legal indemnity against possible prosecution in relation to damage to sacred sites resulting from the works or uses covered by the certificate, so long as any conditions imposed are followed. AAPA administers authority certificates in consultation with the relevant custodians under the Act.
Environment Protection Act 2019	Department of Environment, Parks and Water Security	Biodiversity Groundwater Surface Water Diversion	Establishes the Northern Territory Environment Protection Authority (NTEPA) as an independent regulatory authority with duties and functions under the Waste Management and Pollution Control Act and the Environmental Assessment Act.
Planning Act 1999	Department of Infrastructure, Planning and Logistics	Diversion	Establishes a system to facilitate planning for the orderly use and development of land.
Soil Conservation and Land Utilisation Act 1969	Department of Environment, Parks and Water Security	Biodiversity Air Diversion	Erosion & Sediment Control Plan and Mine Closure Plan to meet objectives of this Act. Prevent soil erosion and conserve and reclaim the soil.

Legislation	Agency	EMP Reference	Comments
Territory Parks and Wildlife Conservation Act 1976	Department of Environment and Natural Resources	Biodiversity Weed	Protects Territory parks and reserves, animals and plants (including wildlife and protected wildlife). The Act prohibits the intentional killing of any terrestrial or marine vertebrate or the taking of and interference with protected species of wildlife (with the exception of fish). All threatened species are classed as protected wildlife. It includes "Principles of Management" which requires that a threatened species be managed in a manner that "maintains or increases their population or the extent of their distribution at or to a sustainable level". Threatened species are defined under the regulations as being species that are 'extinct", "critically endangered", "endangered" and "vulnerable". It also lists those species of plants and animals that are protected within the Northern Territory. Under the Act, permits will be required to take or interfere with protected plants or animals. This may apply if protected plants or animals are encountered during the Project's life.
Ti-Tree Water Allocation Plan 2019-2020 (Draft)	Department of Environment, Parks and Water Security	Diversion	The water allocation plan which applies to all surface water and groundwater within the Ti-Tree Water Control District (TTWCD). It establishes an adaptive management framework for the allocation of water resources and the regulation of licensed water use. Its purpose is to ensure water resources are managed in a way that recognises and maintains environmental and cultural values while allowing water to be sustainably used for productive consumptive beneficial uses
Transport of Dangerous Goods by Road and Rail (National Uniform Legislation) Act 2010	Attorney-General and Justice	Hazardous Substances	Regulates the transport of dangerous goods on land in order to promote public safety and protect property and the environment. The movement and handling of chemicals outside of workplaces is governed by the Act The Act creates certain offences in relation to the movement of dangerous goods including: ▪ Failure to hold a dangerous goods driver's licence; ▪ Transporting goods too dangerous to be transported; and ▪ Failure to transport dangerous goods in a safe way. ▪ The Regulations also creates a number of specific offences, including: ▪ The sale or supply of dangerous goods in non-compliant packaging: ▪ Labelling dangerous goods incorrectly; and ▪ Failure to segregate dangerous goods from food or food packaging. This legislation applies to the Project as dangerous goods will be handled and transported during construction and operation of the Project.
Water Act 1992	Department of Environment, Parks and Water Security	Diversion	Establishes the process for the investigation, allocation, use, control, protection, management, and administration of water resources.
Waste Management and Pollution Control Act 1998	Department of Environment, Parks and Water Security	Hazardous Substances	Primary piece of environmental protection legislation in the Northern Territory. The Act: ▪ imposes general environmental duties; ▪ requires the licensing of certain activities; ▪ establishes offences relating to the environment and ▪ contains material enforcement, penalty and extension of liability provisions. The Act does not apply to a contaminant or waste resulting from a mining activity (as that term is defined in the *Mining Management Act 2001*) that is confined within the land on which the mining activity is being carried out.

Legislation	Agency	EMP Reference	Comments
Weeds Management Act 2001	Department of Environment and Natural Resources	Biodiversity Weed	Aims to prevent the spread of weeds and to ensure that the management of weeds is an integral component of land management. The legislation requires that reasonable attempts be made to control or eradicate declared noxious weeds. Categories of noxious weeds include the following: Schedule Class A/C Weeds:- These plants do not occur in the NT but pose a significant threat if they invade or if present, pose a serious threat. Reasonable effort must be made to eradicate these weeds; Schedule Class B/C Weeds: -These weeds often occur widely in the NT. They are capable of spreading further and should be prevented from doing so. Continuing control measures are required to prevent their spread. Reasonable attempts must be made to contain the growth and prevent the movement of these plants; and Schedule Class C Weeds: -This category includes plants that pose an unacceptable risk of spreading in the Territory or to other parts of Australia if they were to be sold or traded in the NT and are a serious threat to another State or Territory of Australia. All schedule Class A and B weeds are considered to be Class C weeds. The manager of the Project site will be responsible for the management of weeds in accordance with the Act.
Work Health and Safety (National Uniform Legislation) Act 2011	Attorney-General and Justice	Hazardous Substances Fire Air	Regulates health and safety in the workplace. The Act requires the submission of a Risk Management Plan to NT WorkSafe covering the occupational health and safety aspects of the operation. The Act also requires incident notification and compliance with health and safety duties. Activities on the Project site will be completed in accordance with a Risk Management Plan approved and certified in accordance with the WHS Regulations. If any facilities proposed as part of the Project use above certain minimum quantities of specified chemicals the Project may be considered to be a Major Hazard Facility and require licensing. The WHS Regulations apply to the use, handling and storage of hazardous chemicals at a workplace.

3.1.1 NTEPA Assessment

The NTEPA completed its environmental impact assessment of the Project in December 2017. Its findings are contained in an Assessment Report (that includes recommendations) as advice to the Northern Territory Ministers for Environment and Natural Resources, and Primary Industry and Resources, for consideration in environmental approval decisions to be made by the NTG.

The NTEPA's report was provided to the Australian Government's Department of the Environment and Energy (DoEE) to inform its assessment and approvals process under the Environment Protection and Biodiversity Conservation (EPBC) Act. The DoEE completed its assessment and granted an approval to Arafura in May 2018 subject to 14 conditions.

Subsequent changes to the planned configuration of the Project required the completion of a Section 14A variation under the Northern Territory's Environmental Assessment Administrative Procedures. This was submitted to the NTEPA in June and August 2019. The NTEPA assessed the variation and in a Statement of Reasons document released in September 2019 determined that no further action is required.

In addition, a summary of the licence, approvals and / or permits that have been granted as per the requirements of the statutory legislation is outlined in Table 3-2. Granted Mining Leases (MLs) are listed in Table 1-1.

Table 3-2 Project Licence / Approval / Permits

Legislation	Licence / Approval / Permit Reference
Native Title Act 1993	There are three native title determinations covering the Project area: **DCD2013/001** - Napperby Perpetual Pastoral Lease - Alherramp Ilewerr Mamp Arrangkey Tywerl (AIMAT) Aboriginal Corporation **DCD2017/001** - Aileron Pastoral Lease - Irretyepwenty Ywentent Pwert (IPY) Aboriginal Corporation **DCD2017/002** - Aileron (Nolan's Bore) - Kwaty Aboriginal Corporation
Northern Territory Aboriginal Sacred Sites Act 1989	AAPA Certificates issued in 2008 (C2008/205) and 2013 (C2013/205) have expired and a new overarching certificate covering the entirety of the project will be applied for prior to commencement of site activities.
Mining Management Act (MM Act)	Mining Authority pending approval

3.2 Non-Statutory Obligations

The management of the operations of the project have been developed with general consultation of the non-statutory obligations and guidelines outlined in Section 9.2.

3.3 Sacred, Archaeological and Heritage Sites

The Project area is within the administrative boundary of the Central Land Council (CLC). The CLC and the Aboriginal Areas Protection Authority have recorded sacred sites in the Project area, however the Project area is not located on Aboriginal land (Figure 1-10).

There are three native title determinations covering the parts of Project area which have all been determined:

- DCD2013/001 - Napperby Perpetual Pastoral Lease - Alherramp Ilewerr Mamp Arrangkey Tywerl (AIMAT) Aboriginal Corporation.
- DCD2017/001 - Aileron Pastoral Lease - Irretyepwenty Ywentent Pwert (IPY) Aboriginal Corporation.
- DCD2017/002 - Aileron (Nolan's Bore) - Kwaty Aboriginal Corporation.

A Sacred Site Clearance Certificate 2019-105 was sought and has been issued by the Central Land Council which covers the entire project site.

3.3.1 Sacred Sites

[redacted]

- [redacted]
- [redacted]

Authority Certificates were issued by the Aboriginal Areas Protection Authority (AAPA) in 2008 and 2013, identifying conditions covering all works associated with mining and access to the mine site (C2008/205), and mineral exploration activities inclusive of water drilling, reconnaissance visits in 4WD vehicles, access with drilling rig and support vehicles and minor vegetation clearing at discrete locations (C2013/205). The conditions in C2013/205 specify that no work shall take place, [redacted]

In addition, the CLC have provided the scared site clearance certificate n. 2019-105 covering the project area.

A new Authority Certificate from the APAA will be obtained prior to commencement of the construction phase of the Project. Any conditions in future certificates relating to Restricted Works Areas are to be incorporated into the Cultural Heritage Management Plan (CHMP).

3.3.2 Heritage and Archaeological Sites

From the AAPA records, there are three declared heritage places in the vicinity of the subject area but none of these will be impacted by the project.

4.0 OPERATIONAL ACTIVITIES

This MMP is seeking an initial MMP authorisation for six years - the construction phase of the project, which is anticipated to be 26-months, a two-year commissioning phase and a further two years of steady-state operations.

Operational activities will be carried out in two phases, the construction phase and the operational phase. Prior to the construction phase, engineering design and contract tendering will be undertaken in a front-end engineering and design (FEED) phase.

Current planned timing of these phases are as follows:

- FEED phase – August 2021 to July 2022.
- Construction Phase – August 2022 to September 2024.
- Operations Phase – October 2024 to LOM.

An indicative timeline is included in Figure 4-1, however, final timing of the Project execution is dependent on financing activities.

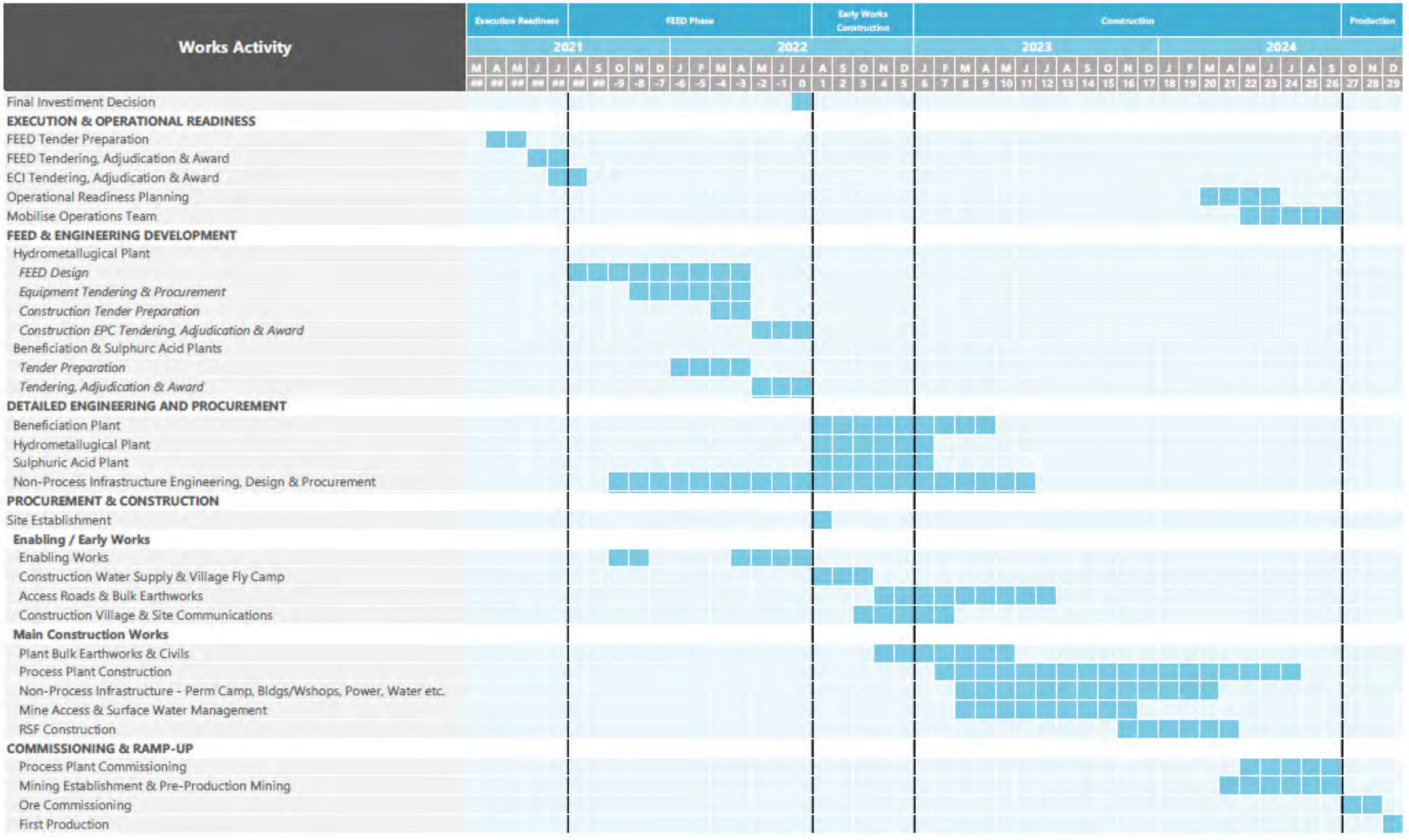

Figure 4-1 Nolans Implementation Schedule

4.1 Construction Phase Activities

Construction will be undertaken in a number of stages, including:

- Enabling works, carried out in parallel with the FEED phase, which will prepare the site for construction with some minor works.
- Early works, which will construct the first part of the infrastructure for the project such that it is ready for the main construction works.
- Construction, where the majority of the facilities are constructed.
- Commissioning, where the various systems and equipment are tested and readied for operation.

4.1.1 Enabling Works

The enabling works will focus these primary areas, as outlined below:

- In order to progress the necessary hydrogeological studies (phase two groundwater modelling in accordance with the WAMP) and bore construction designs for the groundwater production bores and overall borefield development, diamond-core drilling up to five (5) 'stratigraphic bores' will occur at each borefield location early during the enabling works program. This drilling program will provide hydrogeological data on the borefield stratigraphy to enable detailed production bore designs.
- Rehabilitation of the access track between the Stuart Highway, the process plant site and the village site utilising the existing station tracks alignment wherever possible. This access shall provide access for all plant and equipment proposed under the early works development phase and removes any need for the Project to consider utilising other primary station/bore access tracks. Minor upgrading, if required, may also be undertaken to the Nolans track, which runs from Aileron to the Nolans Bore, and to the track from Nolans Bore to the process plant site.
- Coupled with the above rehabilitation works, access to water is a strict requirement to support any construction scheduled under the enabling and early works programmes. This requires the upgrading of the existing Nolans Dewatering Test Bore (located in the proposed pit outline) and potentially the drilling of an additional bore(s) (within the pit area) to provide capacity to sustain the proposed activities until the main water supply is developed.
- Installation of a water system from the Nolans Bore(s) which will consist of a dam near the bores, pumping system and pipeline to deliver water to a dam near the village location. The water pipeline will largely follow the existing station track between the Nolans Bore area and the village area.

It is anticipated that the stratigraphic drilling will be undertaken early in the FEED phase in the fourth quarter of 2021 with the remainder of the enabling works carried out in the second quarter of 2022.

4.1.2 Early Works Construction

Early works for the Project are those site construction activities that facilitate the execution of other, more intensive work scopes, thus giving the best opportunity for the project to meet the scheduled milestones.

Proposed works include:

- Borefield D (i.e. the first borefield west of the gas pipeline) development: increase site water supply to meet more demanding civil works and support construction personnel's daily water usage. This development involves drilling of two (2) additional production bores to supplement the existing bores, respective observation bores and other monitoring bores as outlined in the water management plan.
- Water pumping infrastructure at borefield D development: headworks for all three (3) productions bores at borefield D, centrally located collection tank and transfer pumps, large bore buried pipeline between borefield D and the process plant site temporary turkey's nest and a centrally located control and monitoring system, diesel generating set and diesel storage tank.
- Accommodation village bulk earthworks to ensure the pad construction is sequenced ready to receive accommodation units and central facilities.
- Establishment of a 'fly-camp' in-situ at the village location to supplement available beds at Aileron Roadhouse and allow for increased manning to accelerate the overall bulk earthworks campaign. The balance of the camp development shall follow with a sequenced, gradual handover of rooms to allow occupation and increased manning.
- Establishment of the quarry and borrow pits, at locations to be finalised with applications to be made for extractive mineral permits or extractive mineral leases and a separate MMP for these quarrying and borrow operations.
- Site Access Road (SAR) bulk earthworks will commence once the main water supply and fly-camp are established with the SAR prepared to an appropriate engineered standard to allow the safe delivery of plant, equipment and other materials (i.e. accommodation units, temporary offices, etc.) to site to suit the needs of Contractors mobilising early under the main construction programme.
- Plant pad bulk earthworks will commence in parallel with the development of the SAR.
- Installation of the microwave communications system to from Aileron to the Village which involved installation of towers and communications infrastructure at Aileron Roadhouse and on a hill close to the village. This will allow communications, including two-way radios, consistently across the site. The microwave communications network will later be expanded to the plant area, mine area, and borefields.

4.1.3 Construction

The work carried out under the main construction programme will include the following:

4.1.3.1 Civil Works

Bulk earthworks continues from the early works phase, with the finalisation of the process plant pad complete with raw water storage pond and power station hardstand. Civil construction then moves to the MAR, mine infrastructure area and explosive storage area followed by the mine area surface water management, all being completed ahead of mobilisation of the mining contractor and ancillary facilities.

The Mine area surface water management consists of:

- Stage 1 Kerosene Camp Creek diversion for mine site development.
- Flood protection bunds to prevent water flow into the mine area.
- Mine area water collection ponds and other surface water management structures.

The final civil construction works will include the Residue/Tailings Storage Facilities.

4.1.3.2 Process Plant Construction

The process plant will be packaged under multiple turnkey (design and construct) contracts, with each taking care and custody of their respective area of the plant pad upon site mobilisation.

The process plant construction contracts will include:

- Beneficiation plant.
- Hydrometallurgical plant, which includes the majority of the shared infrastructure and services.
- Sulphuric acid plant.

4.1.3.3 Power Station

The power station will be let under a build, own and operate (BOO) style contract with the contractor responsible for the construction of the facilities. The power station will consist of a number of natural gas fired turbines, each equipped with duct firing and a heat recovery boiler as well as back-up gas and/or diesel fired reciprocating engine generating sets. Natural gas will be sourced from a newly constructed letdown station connected to the Amadeus Gas Pipeline (AGP). The power station will supply all of the electrical power required to operate the process plant and non-process infrastructure and will supplement the steam produced by the sulphuric acid plant.

4.1.3.4 Borefield Development

The remaining four borefields (A, B, C & E) including headworks, collecting tanks and pumps, inter-connecting pipelines, control and diesel fired power supplies will be constructed and commissioned prior to the commencement of process commissioning.

4.1.3.5 Non-process Infrastructure

As described under the preceding section, non-process infrastructure (NPI) as it relates to the process plant is focused primarily on the operations administration complex, maintenance facilities, and other

general services (wastewater treatment, overhead powerline, water and power reticulation and communications/other operational technology systems). The construction of these facilities and services will be executed in parallel to the process construction and are expected to be complete in a timely manner, ahead of mobilisation of operations personnel.

The NPI works will be contracted to specialist contractors for the various design, supply and construction contracts who will be directly managed by Arafura's integrated project management team (IPMT).

4.1.4 Commissioning

Commissioning will involve testing and commissioning of equipment and systems in preparation for operations.

Non-process infrastructure, namely buildings, wastewater treatment plant, and other equipment, will be commissioned in a fashion in line with typical commercial-, or industrial-style applications.

Later stages of commissioning is generally carried out using air and/or water. Once commissioning is complete, start-up commissioning takes place with ore, reagents and other process materials. When the pre-determined levels of output and quality are achieved, the plant will be handed over to operations personnel for optimisation and routine operation.

4.2 Mining Activities

Mining will use conventional open-pit mining methods including drill and blast, waste and ore mining with hydraulic excavators and rear dump trucks and run-of mine (ROM) haulage activities to transport ore to the process plant approximately 8.5 km to the south. The mine is expected to have a life of 28 years with processing of ROM stockpiles to continue until fully depleted for a further 10 years. Other ancillary mining activities include:

- Vegetation clear and grub
- Topsoil removal and stockpiling (**APPENDIX AA,** Topsoil Management Procedure)
- Pit dewatering
- Surface water management for mining activities
- Dust suppression
- Road Maintenance
- Long-term stockpile management
- Mine landform and disturbance rehabilitation

4.2.1 Geology, Resources and Reserves

4.2.1.1 Geology and Mineral Resources

The Nolans rare earths-phosphate-uranium-thorium (REE-P-U-Th) deposit is one of the largest and most intensively explored deposits of its kind in the world.

A detailed discussion of the regional and deposit geology, along with mineralisation, are discussed in Section 2 of the Definitive Feasibility Study (DFS).

https://www.arultd.com/images/Nolans_DFS_Summary_Report_-_Final_for_website.pdf

The deposit contains a JORC 2012-compliant Mineral Resources of 56 million tonnes at an average grade of 2.6% total rare earth oxides (TREO) and 11% phosphate (P_2O_5) that extends beyond 215 metres below the surface. Two-thirds of the contained rare earths are in high confidence Measured and Indicated resources.

Table 4-1 Mineral Resources for the Nolans Deposit as at 7 June 2017 (1% TREO Cut Off)

Resources	Tonnes (Million)	Rare Earths TREO %	Phosphate P_2O_2 %	NdPr Enrichment %
Measured	4.9	3.2	13	26.1
Indicated	30	2.7	12	26.4
Inferred	21	2.3	10	26.5
TOTAL	**56**	**2.6**	**11**	**26.4**

Note: Numbers may not compute due to rounding. "NdPr enrichment" is the proportion of TREO comprising Nd_2O_3 and Pr_6O_{11}.

The most abundant rare earth-bearing minerals at Nolans are apatite, monazite (both phosphate minerals) and allanite (a silicate mineral). These mineral species present a highly desirable rare earth mix at Nolans, with 26.4% of the mix represented by NdPr oxides. The mineralised material also contains radioactive minerals of uranium and thorium, along with their decay chain daughters in equilibrium and is considered a naturally occurring radioactive material (NORM).

The host rocks are predominantly a mixture of gneisses and granites with the mineralogy of these rock units is typically dominated by quartz, feldspar and biotite. A portion of the host rocks are also NORM.

Both ore and host rocks are extremely low in sulphides. Waste rock characterisation is addressed in the EIS, Volume 2 Appendix L: Acid, Metalliferous Drainage Report.

https://www.arultd.com/images/EIS/DOCUMENTS/Volume2/Nolans_EIS_Appendix_L_web.pdf

4.2.1.2 Ore Reserves

Ore reserves have been estimated for the Project compliant with the requirements of JORC 2012. The ore reserves are based on the preliminary mine designs along with anticipated mining, process and other costs, forecast metallurgical performance and product revenue.

In addition to the ore reserves, the proposed pit design also includes a portion of Inferred Mineral Resources which is included in the mining inventory in the LOM mining schedule.

Table 4-2 provides the current ore reserves estimate and the mining inventory for the Project.

Table 4-2: Ore Reserves (As at 16 March 2020) and Mining Inventory

Material	Mt	P_2O_5	TREO	NdPr in TREO
		(%)	(%)	(%)
Proved	5.0	12.7	3.0	26.2
Probable	24.6	12.3	2.7	26.5
Total Ore Reserve	**29.5**	**12.4**	**2.8**	**26.5**
Inferred	9.5	11.4	2.5	26.6
Total Mineral Inventory	**39.0**	**12.1**	**2.7**	**26.5**

Note: Numbers may not compute due to rounding. "NdPr enrichment" is the proportion of TREO comprising Nd_2O_3 and Pr_6O_{11}.

4.2.2 Mine Scheduling

The open pit will be mined in seven stages as either discrete pits or as pit wall cutbacks over the LOM plan with an average strip ratio of 4.5 (t:t). The mining sequence is determined by the production schedule to maintain adequate ROM stocks and achieve a target rare earth feed concentrate production of 340,000 tpa. This allows for mining for the first seven years to be achieved on a campaign basis before becoming a continuous operation. The current planned campaigns can be broken down as:

- Mining Campaign 1:
  - Pre-strip activities for 4 months before process plant ore commissioning
  - 12-months of production mining.
  - 12-month break from mining activities (during Year 2).
- Mining Campaign 2:
  - Mining activities re-commence in Year 3 for approximately 48 months.
  - 3-year break from mining activities (during Years 7, 8 and 9).
  - Mining then recommences on a continuous basis for the remainder of the mine life.

During both mining campaign breaks, ROM haulage of ore to the process plant will continue reclaiming ore from the ROM stockpiles built up during the mining campaigns. Supporting mine ancillary activities will also continue through the mining breaks.

Mining takes place in Pit stage 1 during campaign 1 (Figure 4-3), and Pit stages 1, 2 and 3 during campaign 2 (Figure 4-4) which significantly minimises the total mining disturbance footprint during these initial years of operation.

Changes to the current mining campaign timeframes are possible and could be influenced by the following factors:

- Increases or decreases in the process plant commissioning ramp-up period.
- Process plant performance:
- Mining performance to plan during the campaign periods including grade performance.

Either of these factors could result in a delay to the mining breaks commencing, and extension of the mining breaks or even cancellation of the mining breaks to maintain the continued supply of ore to the ROM.

The estimated mine movements during mining campaigns 1 and 2 are shown in Table 4-3.

Table 4-3 Mining Campaign 1 and 2 Mining Quantities by Pit

Pit	Material	Pre-Production	Yr1	Yr2	Yr3	Yr4	Yr5	Yr6	Yr7	Total
Pit 1	Ore (Mt)	0.1	1.5	-	1.8	1.1	-	-	-	**4.5**
	Waste (Mt)	1.4	3.7	-	4.0	1.0	-	-	-	**10.1**
	LT Stockpile (Mt)	0.0	0.2	-	-	-	-	-	-	**0.2**
Pit 2	Ore (Mt)	-	-	-	-	0.4	0.8	0.8	0.2	**2.2**
	Waste (Mt)	-	-	-	-	1.4	2.1	2.0	0.2	**5.7**
	LT Stockpile (Mt)	-	-	-	-	-	-	-	-	**-**
Pit 3	Ore (Mt)	-	-	-	-	0.1	0.4	0.6	-	**1.1**
	Waste (Mt)	-	-	-	-	1.8	2.4	2.2	-	**6.4**
	LT Stockpile (Mt)	-	-	-	-	-	-	-	-	**-**
Total	Ore (Mt)	**0.1**	**1.5**	**-**	**1.8**	**1.6**	**1.2**	**1.4**	**0.2**	**7.8**
	Waste (Mt)	1.4	3.7	-	4.0	4.2	4.5	4.2	0.2	22.2
	LT Stockpile (Mt)	-	0.2	-	-	-	-	-	-	0.2
	ROM Haulage (Mt)	-	0.6	0.8	0.7	0.8	0.8	0.9	0.9	5.5

4.2.3 Mine Design

Ore will be selectively mined on bench heights to be no greater than 5 metres with mining being undertaken on three, 2 metre flitches when heave is included. All ore mined will be stockpiled on the ROM pad in fingers for blending with no direct feed of the process plant occurring. ROM ore will be loaded onto road trains by front end loader and delivered to the process plant.

Waste from the mine will be stockpiled in two waste rock dumps (WRDs), one to the east and one to the west of the pit.

Mineralised material not presently classified as suitable ore types for processing (referred to internally as "non-preferred" ore types) will be stockpiled in the designated long-term "stockpiles" area. These stockpile areas will contain low-grade ore that may or may not be processed throughout the LOM. For material types that do not end up being processed, these long-term stockpile areas will buttress the eastern waste rock dump to facilitate eventual shaping and capping by benign waste material and eventual rehabilitation and merging into the eastern WRD.

Figure 4-2 shows the overall mine layout at the end of mine life with Figure 4-3 and Figure 4-4 showing the mine layout at the end of campaigns 1 and 2, respectively.

316,000 317,000 318,000 319,000 320,000 321,000

7,503,000 7,502,000 7,501,000 7,500,000

Nth Dump 3

Pit 5

Pit 6

Pit 7

Sth Dump 4/5

RoM Pad

Mine Offices

LTS - NP1 stockpile

LTS - NP2 stockpile

LTS - Inf stockpile

1:15,000 @A3

0 200 400 600

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 53

N

Legend

- Topsoil Stockpile
- Project Areas
- Pit Contours
- Approximate ultimate pit outline
- General Mine Features

Arafura Resources Limited
Mine Management Plan

Job Number	12515982
Revision	B
Date	21 Jul 2021

Mine Layout at Life of Mine

Figure 18

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Data source: Data Custodian, Data Set Name/Title, Version/Date. Created by:fjohnson

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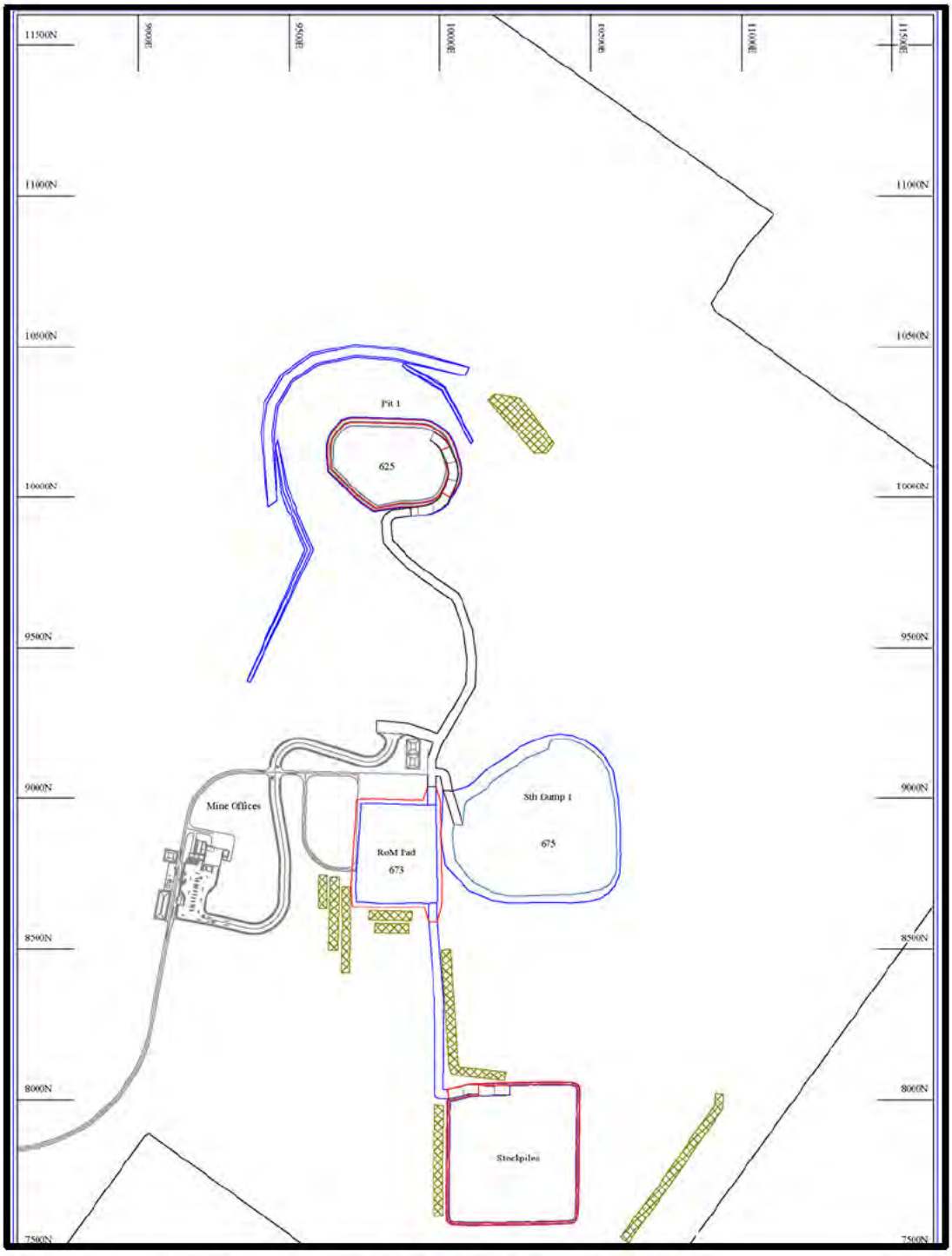

Figure 4-3 Mine Layout at end of Campaign 1 (end of Year 1)

Figure 4-4 Mine Layout at end of Campaign 2 (start of Year 7)

4.2.3.1 Pit Design

The open pit mine design is shown in Figure 4-5. The LOM open pit is currently planned to reach a depth of about 220 m with a surface area of approximately 100 ha. The final pit dimensions are 1.6 km long, 1 km wide at its widest point and extending to a depth of approximately 220 m. The final pit is the results of merging individual pit stages and final pit wall cutbacks.

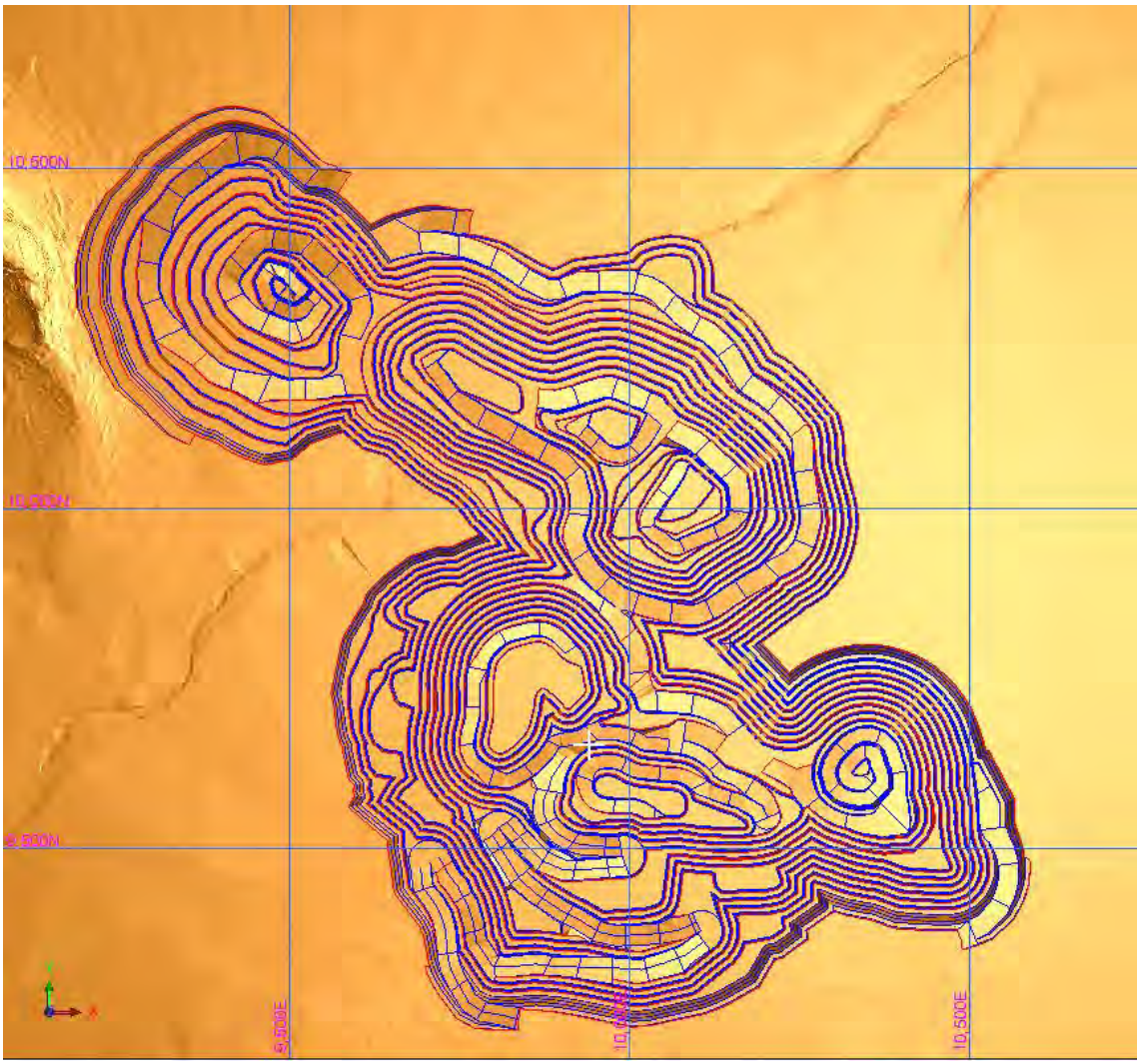

Figure 4-5 Final Pit Design

The first three Pit stages are independent of each other with the Pit stage 1 being in the western portion of the deposit and centred on the measured mineral resources. Pit stages 2 and 3 are in the eastern region of the deposit.

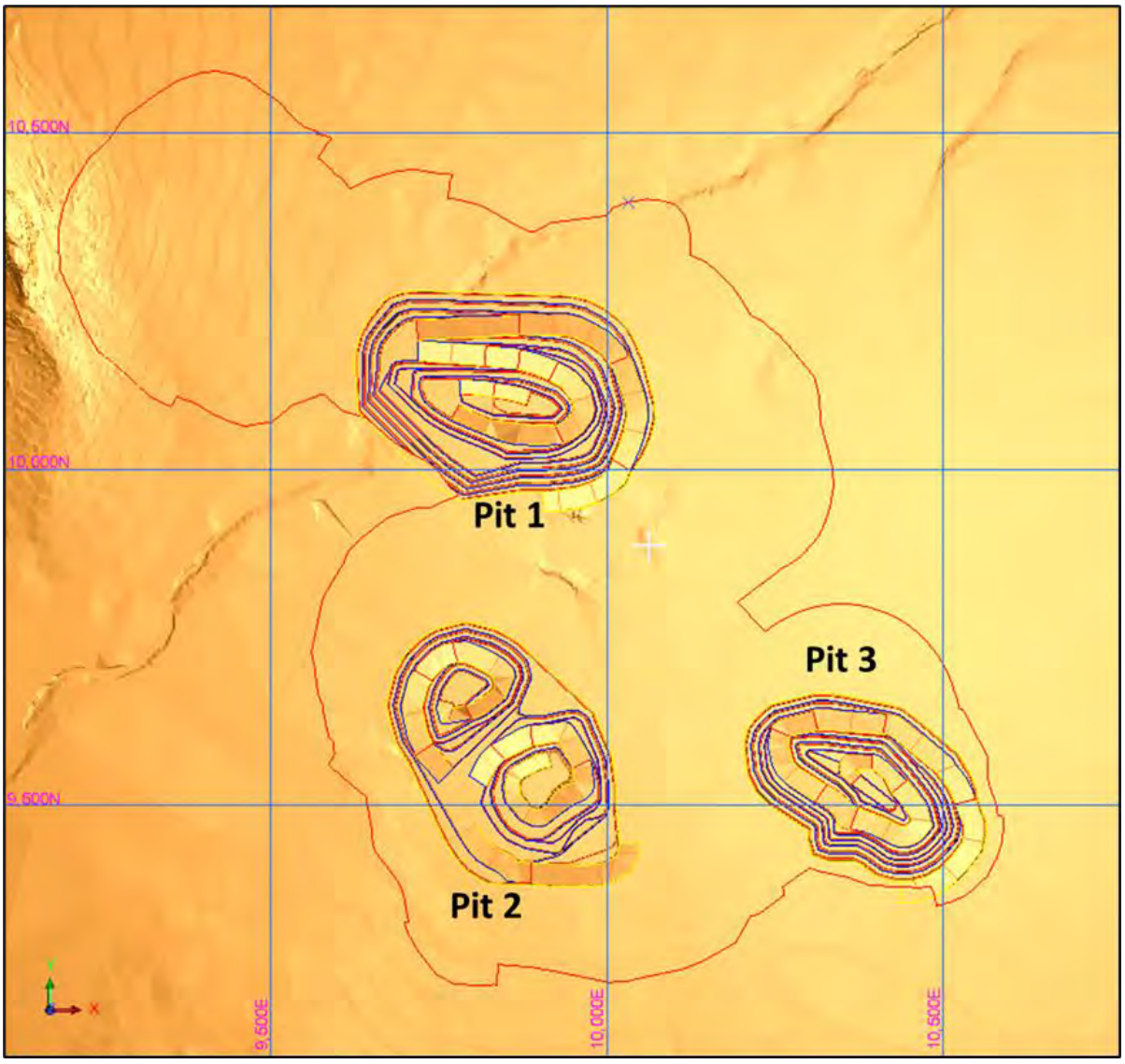

Figure 4-6 Pit Stages 1, 2 and 3 Design to the End of Mining Campaign 2

Pit stage 1 is 400 m by 250 m in size and will get to a depth of 35 m by the end of mining campaign 1. It is completely mined out during mining campaign 2 to a depth of 120 m.

Both pit stages 2 and 3 are mined during mining campaign 2 and are similar dimensions as pit stage 1. Stage 2 reaches a maximum depth of 70 m with stage 3 reaching 90 m depth upon completion.

Total scheduled quantities for the three pit stages are shown in Table 4-3.

4.2.3.2 Ore and Mineralised Stockpiles

The active ROM stockpile area is where road train loading and haulage activities occur and will cater for the target ore types and blending as determined by grade control processes and detailed mine scheduling. The active ROM area is approx. 300 by 250 m in size. Lower grade ore types will be stockpiled in the long-term stockpiles (LTS) area until later in the mine life when reclamation is required to feed the process plant. The maximum ROM stockpile size will reach 14 Mt (in size) in Year 27 of operations and will be constructed with ten metre lifts. The two stockpile areas (the ROM and stockpiles area) combined are sufficient in size to stockpile all required quantities for processing, including the 1.0 Mt of non-preferred ore types that will remain at the end of the mine life, which will be merged with the eastern WRD and encapsulated at that time if not processed.

Stockpile sizes during the first two mining campaigns are planned to accommodate the following mine schedule requirements:

- Mining Campaign 1:
  - ROM ore, 1.0 Mt.
  - Non-preferred ore, 0.2 Mt.
- Mining Campaign 2:
  - ROM ore, 3.2 Mt
  - Non-preferred ore, 0.3 Mt

Both active ROM and long-term stockpiles will be built in 10 m lifts with multiple lifts planned to accommodate the quantity of materials expected through the mine life.

The stockpile locations have been incorporated into the surface water management plan and associated infrastructure to control seepage and drainage from the stockpile areas.

4.2.3.3 Pit Dewatering

The aquifer at the Nolans open pit is localised and contained within the ore body with the surrounding rocks (gneiss, granites and schists) having a significantly lower permeability. Dewatering of the ore body will be achieved with screened bores placed within the orebody between longer-term pit stages in conjunction with in-pit sumps and surface pumps to achieve dewatering requirements outside of the surface bore zones of influence.

The pit water balance including groundwater inflows and rainfall estimates that a maximum long-term extraction rate of 0.32 GL/annum (10 L/s) may be required to be pumped, however, lower rates should be expected. Higher pumping rates will be achieved using the in-pit sump pumps to decrease dewatering times and manage the main risks of recharge which come from precipitation and run-off.

Water from pit-dewatering will be pumped to a central de-silting pond, which will overflow to the dust suppression water pond.

4.2.3.4 Haul Road Design

Mine haul roads and pit ramps are designed to accommodate 150 t payload class dump trucks. Table 4-4 shows the haul road design parameters and Figure 4-7 the pit ramp dimensions.

Table 4-4 Haul Road and Ramp Design Criteria

Road & Ramp Design Parameters	Quantity	Unit
Dual Lane Surface Haul Road width (Minimum running pavement)	35 (21)	Metres
Dual Lane Ramp width (Minimum running pavement)	28 (21)	Metres
Single Lane Ramp width (Minimum running pavement)	21 (14)	Metres
Maximum length of single lane ramp	100	Metres
Maximum haul road /ramp gradient	10	Percent
Maximum downhill gradient leading into intersections	3	Percent
Minimum length of intersection (3% gradient section)[1]	85	Metres
Minimum Stand off from pit crest	8	Metres

1. Based on loaded dump truck at 30 km/h using MSHA Haul Road Inspection Handbook with a 1.5 times FOS

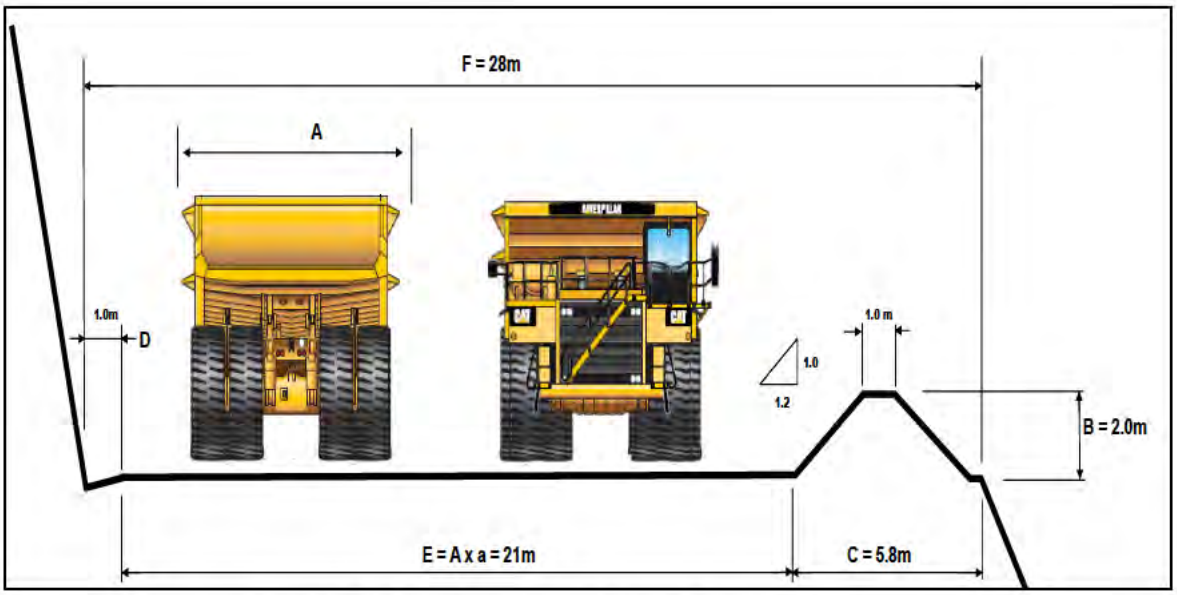

Figure 4-7 Pit Ramp Cross Section Schematic for Cat 785D

4.2.3.5 Dust Management

Dust management in the mine will use the following strategies to minimise dust:

- Water cart(s) will use water sprays and a water cannon to suppress dust in the following areas:
  - Active pit work areas.
  - Mine roads.
  - Active stockpiles.
  - Active WRD tip or other work locations.
  - Mine access road.
- Fixed water sprays on the ROM stockpiles.
- Timing of blasting to be risk assessed based on weather conditions with blasting timed for periods of low wind.
- Washdown of all vehicles leaving the mine area and travelling to the process plant on the mine access road.

Water for dust suppression will be sourced from the dust suppression water pond. Water for this pond will be supplied from the following sources, in order of preference:

- Pit dewatering water.
- Water reclaimed from mine area storm water management.
- Brine from the process plant reverse osmosis (RO) plants.
- Raw water.

4.2.4 Waste Rock Dumps

Overburden and waste rock will be deposited in two purpose constructed WRDs over the LOM, with a final waste rock quantity of 304 Mt. The two WRDs will hold waste volumes built to a relative level (RL) 320 m, with a height of 60 m above natural surface and consistent with local topography. The waste rock dumps have a combined footprint of approx. 220 ha which is adequate for 35 years of storage. The design concept is concave slope with no berms. The initial waste rock dump designs are shown in Figure 4-8 and Figure 4-9.

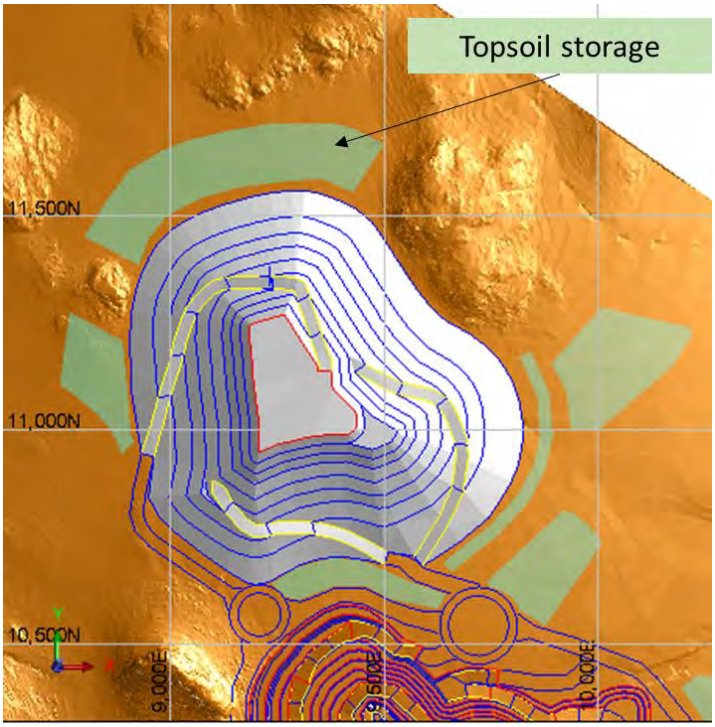

Figure 4-8 Western Waste Dump

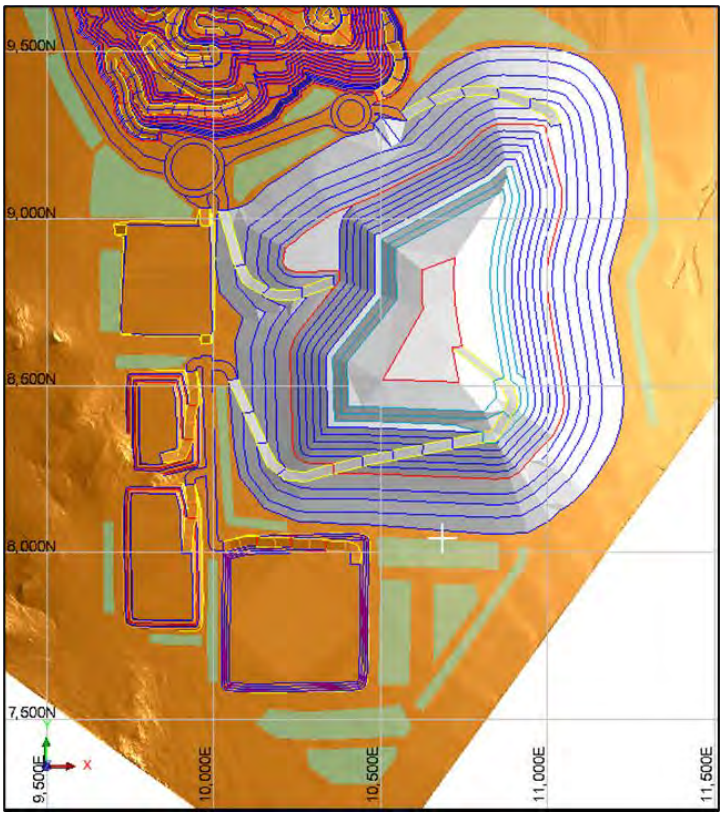

Figure 4-9 Eastern Waste Dump and long term stockpile areas

Each of the two WRD locations have been divided into several discrete dump stages to allow staged encapsulation and progressive rehabilitation.

The Eastern WRD is the largest WRD (approx. 1 km by 1.25 km) split up into five stages with a total capacity of 69.2 M cubic metres. The final stage contains the majority of the volume capacity (63%) consisting of entirely benign waste to encapsulate the previous four stages. The Western WRD is smaller (approx. 1 km by 750 m) and split up into three stages with a total capacity of 22.2 M cubic metres.

The maximum height for all WRD and stockpiles is the 720 m level, approximately 50 to 60 metres above the 660 m existing ground level. The WRD construction design criteria for the project is;

- 10 m lift construction
- 5 m berms for each lift
- 37 degrees angle of repose
- Maximum height 720 m RL (approx. 50 – 60 m above natural topography)

Rehabilitation of the constructed WRDs will likely entail pushing the berms down into a concave slope with an average overall slope angle of 16 degrees (Landloch 2021b).

The proposed WRD construction cross-sectional profile is illustrated in Figure 4-10. Recent work by Landloch (2021b) also provides guidance on the suitability of these landforms APPENDIX Z in the long term.

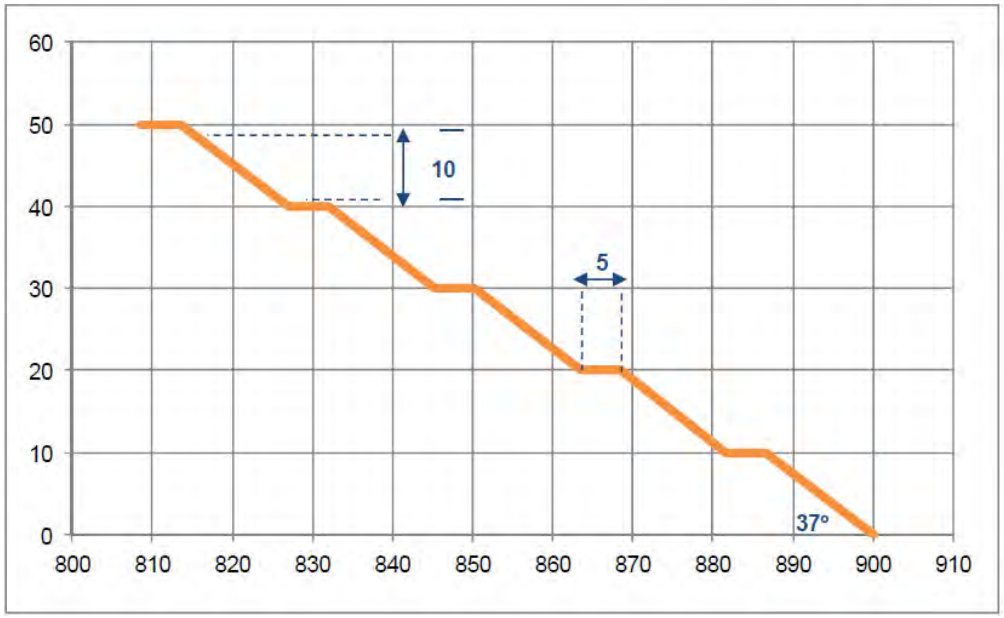

Figure 4-10 Proposed WRD profile during construction

During the initial project development, the mining infrastructure and WRDs will only be located to the east of the pit, towards Nolans Creek. Development of the WRD to the west of the pit will not occur until year 12 of operations.

The WRDs are divided into discrete zones and scheduled on a 10 m lift-by-lift basis to ensure encapsulation of the naturally occurring radioactive material (NORM) waste is achieved using benign waste material mined during the life of the project. NORM material is centrally located within each dump stage and lift with benign waste used at the waste dump extremities to provide encapsulation requirements. Waste rock dumps designs will be informed by strategic guidance for rehabilitated waste landforms. (Landloch, 2021b) which is provided as APPENDIX Z.

Table 4-5 quantifies the estimated benign and NORM waste volumes expected for the first two mining campaigns.

Table 4-5 Waste Quantities for Mining Campaign 1 and 2

Waste Material	Unit	Pre-production	Yr1	Yr2	Yr3	Yr4	Yr5	Yr6	Yr7
Benign	M BCM	0.5	0.9	0.0	1.0	1.0	1.0	0.8	0.0
NORM	M BCM	0.2	0.7	0.0	0.7	0.8	0.9	1.0	0.1

Acid and metalliferous drainage (AMD) assessment has revealed very low sulphur content and significant apparent neutralising capacity in most lithologies and waste streams. The static and kinetic AMD and geochemical testing indicates that the proposed waste rock, ore and pit wall material has a very low risk of generating acidic, metalliferous or saline leachate (EIS Chapter 8 and Appendix L). https://www.arultd.com/images/EIS/DOCUMENTS/Volume1/Nolans_EIS_Chapter8_LOWRES_web.pdf

https://www.arultd.com/images/EIS/DOCUMENTS/Volume2/Nolans_EIS_Appendix_L_web.pdf

Conceptually, potential acid forming (PAF) material if found will be contained and encapsulated within benign waste in designated areas of the WRD along with NORM classified waste material. Based on the waste rock characterisation assessment completed for the project there is a low risk of acid metalliferous drainage resulting from the waste rock associated with the project.

Progressive rehabilitation of the WRD's is planned to occur when sections of the WRD's can be re-sloped without impacting ongoing WRD development and NORM waste encapsulation processes. Currently, only one section of the Eastern WRD is planned to be rehabilitated during the first two mining campaigns equalling a total of 16.4 ha in year 4 of mining operations. Progressive rehabilitation is limited during the campaign mining periods due to the overall limited disturbance and mined volumes.

4.2.5 Mine Area Surface Water Management

The surface water management should be read in conjunction with Knight Piesold, Nolans – Mining Area Surface Water Management – Design Summary, prepared for Arafura Resources Pty Ltd, November 2018, Document Reference PE801-00140/07 that was undertaken for the DFS, as attached in APPENDIX BB at the end of this document.

Surface water management will be characterised into clean water systems, dirty water systems and ore contact water. Figure 4-11 shows the general mining surface water management systems for the final mine design.

LEASE BOUNDARY
SPILLWAY
SPILLWAY
EASTERN SEDIMENT CONTROL DAMS
POLISHING POND
SPILLWAY
WESTERN SEDIMENT CONTROL DAM
SI-26
SI-27
SI-28
SPILLWAY
NOLANS CREEK
WASTE DUMP
OUTFLOW CONTROL BUND
PIT
PIT DIVERSION CHANNEL
SI-29
SI-30
PIT INFLOW CONTROL BUND
ROM PAD
SEDIMENT CONTROL DAM
SPILLWAY
MINE FACILITIES
STOCKPILE
WASTE DUMP
WATER FLOW DIRECTION
317000mE
318000mE
319000mE
320000mE
321000mE
7503000mN
7502000mN
7501000mN

LEGEND:

- EXISTING WATER COURSE
- EXCLUSION ZONE - LIMITED WORK
- POND EXTENTS
- TOPSOIL STOCKPILE
- LEASE BOUNDARY
- FLOOD PROTECTION BUND
- DIVERSION DRAIN
- PIEZOMETER AND SETTLEMENT PIN LOCATION

NOTES:

1. 1m CONTOUR NTERVALS SHOWN. TOPOGRAPHY PROVIDED BY ARAFURA, JUNE 2018.
2. YEAR 24 PIT LAYOUT SHOWN.

SETTLEMENT PIN AND PIEZOMETER LOCATIONS

POINT	EASTING	NORTHING
SI-26	318732	7502884
SI-27	318776	7502736
SI-28	318850	7502604
SI-29	318336	7501531
SI-30	318458	7501372

Figure 4-11 Mining Area Surface Water Management

250 150 50 0 250 500 750
SCALE (METRES) 1:15,000 (A3)

ORIGINAL STAMPED IN RED

	DATE	DESIGNED	CHECKED	APPROVED	CLIENT APP'D

Knight Piésold CONSULTING

CONSULT AUSTRALIA Member Firm

SHEET SIZE A3
REFERENCES

DRAWING No.	DRAWING TITLE
801-140-A5001-910	MONITORING INSTRUMENTATION DETAILS

REVISIONS

REV	DATE	DESCRIPTION	DRN	DESIGN	CKD	APP	CLIENT APP
A	30/11/2018	ISSUED FOR REVIEW	PRK	AM	AM	BAS	

ARAFURA RESOURCES
NOLANS PROJECT
MINING AREA SURFACE WATER MANAGEMENT
MONITORING INSTRUMENTATION LAYOUT - STAGE 2

SCALE 1:15,000
STATUS: IFR
DRAWING NUMBER **801-140-A5001-902**
REV **A**

287 410

4.2.5.1 Clean Water Systems

Catchments for clean water systems include natural watercourses and drainage lines outside of the operational mining areas, with provision of infrastructure for flood protection levees, clean water diversions, and open drain systems.

Flow and stormwater diversion banks will be installed across the mine site to divert clean water away from the disturbed areas and around infrastructure. The major management structures include:

- Diversion channel, cut off bund and paleochannel cut off of the Kerosene Creek alignment to divert flow around the mining area including the open pit.
- Flood protection bund to the eastern side of the mine area which mitigates risks associated with the Nolan's Creek flood plain impacting mine infrastructure, eastern waste rock dump.
- Downstream erosion and sediment control devices to manage and direct (disperse) new potentially focussed flow paths.

4.2.5.2 Dirty Water System

Sediment water catchments include areas disturbed by mining activities (i.e. haul roads, waste rock dump(s), etc.). Surface water drainage systems will be employed to intercept and direct sediment-laden water to sediment management structures which will be constructed downstream of any disturbed mining or infrastructure areas (typically from haul roads, waste dumps, stockpiles and other exposed pavements).

Infrastructure consists of overland open channel drains/catch drains, sediment basins and erosion and sediment control structures (upstream and downstream). The overland flow catch drains will direct stormwater to sediment settlement ponds.

Stormwater retention ponds (or sediment basins) will contain stormwater runoff from any respective catchments reporting to them in accordance with a retention capacity of 100-years ARI (equivalent to the 1% AEP) 72-hour design storm event, while maintaining a minimum freeboard of 500mm to the embankment crest.

4.2.5.3 Ore Contact Water

The ore contact water system manages runoff water generated within the open pit, and stockpile (ROM pad). As a result, ore contact water typically includes elevated pollutant levels that should not be discharged into the downstream environment without suitable treatment.

Within the open pit, pit sumps will be used to manage most runoff generated within the pit area and inflows from the stockpile erosion and sediment control drainage. During periods of extended or extreme rainfall, it is expected that the pit sumps will be overtopped, flooding the pit floor and potentially some lower benches. During these periods, mining operations will be moved to upper benches (if safe to do so) or suspended whilst the pit is dewatered.

The pit will be dewatered into water storage ponds (turkeys nests) for use in dust suppression or will be directed into the process water dam for use in the processing plant.

4.2.6 Mining Performance Against Previous Mine Management Plan

No mining activities have been undertaken at the Project. In subsequent MMPs this section will summarise the performance of the mining operational activities in accordance with the authorised MMP from the previous reporting period and identify any non-compliance or emerging issues that may have arisen.

4.3 Processing Activities

The ore from the mine is processed over a 38-year life to produce rare earth products and a merchant grade phosphoric acid by-product. The flowsheet for the process is shown in Figure 4-12. The process plant is initially designed to process up to 1 Mtpa of ore to produce a maximum of 340,000 tpa of high-phosphate rare earth bearing feed concentrate. Average production over the LOM includes 4,440 tpa of NdPr oxide, 474 tpa of Samarium, Europium, Gadolinium/Heavy Rare Earths (SEG/HRE) oxide and 144,000 tpa of 54% P_2O_5 merchant grade phosphoric acid. The production of a cerium rare earth product has been deferred until after commissioning and ramp up of the processing plant.

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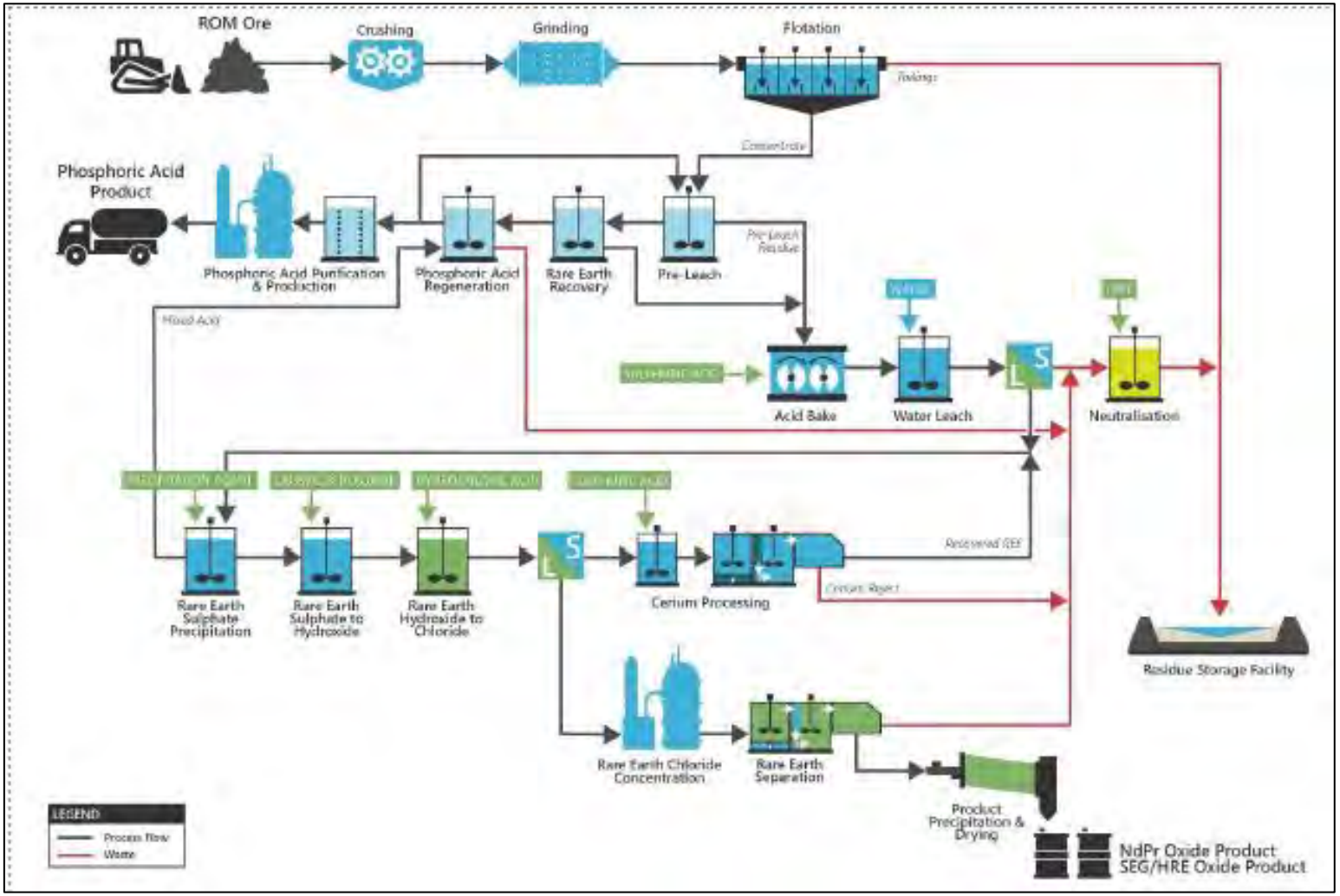


Figure 4-12 Metallurgical Process Flowsheet

At a high level, the process consists of the following production steps:

- Beneficiation
- Phosphate extraction – which consists of:
  - Pre-leaching the high phosphate concentrate in phosphoric acid.
  - Heating of the weak phosphoric acid to precipitate minor dissolved rare earths.
  - Separation of the leach residue and precipitated rare earths for further processing in rare earth extraction.
  - Regeneration of the weak phosphoric acid with sulphuric acid, which is recycled from the rare earth extraction, to produce a gypsum waste and a strong phosphoric acid.
  - Purification of the excess phosphoric acid to produce a merchant grade phosphoric acid for sale.
- Rare earth extraction which processes the rare earth rich residue from the phosphate extraction as follows:
  - Acid baking in conventional paddle dryers with sulphuric acid at 250ºC followed by water leaching of the discharge.
  - Precipitation of a clean rare earth sulphate from the water leach liquor to produce a mixed acid which is recycled to phosphoric acid regeneration.
- Rare earth processing where the rare earth sulphate is dissolved in water before precipitation of the rare earths as a hydroxide using caustic soda before selective leaching of non-cerium rare earths with hydrochloric acid to produce a cerium free rare earth chloride solution and a low-grade cerium product.
- Cerium processing where the low-grade cerium is dissolved in sulphuric acid before processing in a simple solvent extraction circuit to produce a high-grade cerium liquor, which will initially be sent to waste, and a recycle stream with the remaining rare earths.
- Separation which consists of two sequential rare earth solvent extraction circuits for the production of a SEG/HRE rare earth product and an NdPr product which are both precipitated using oxalic acid prior to calcining.

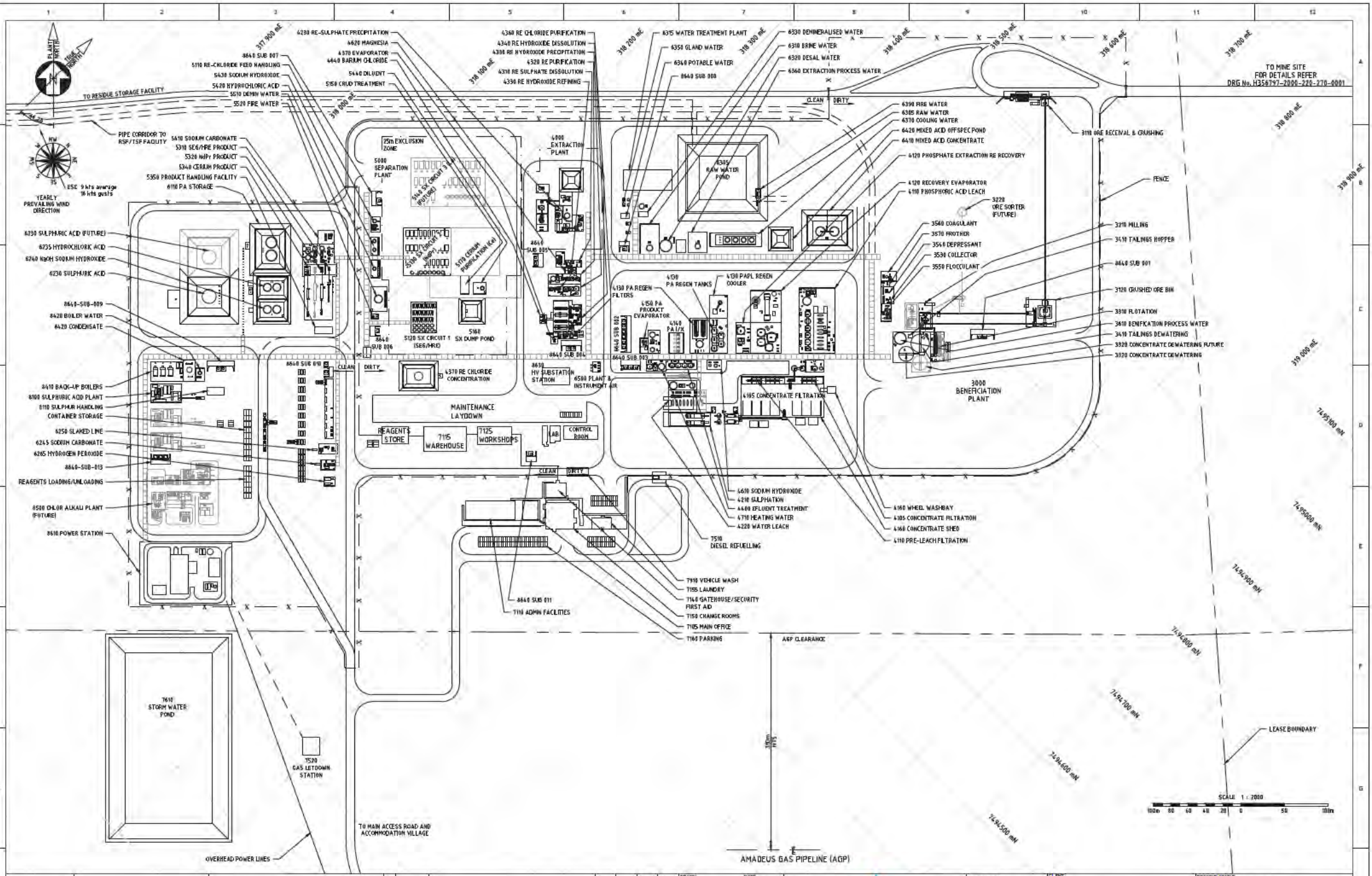
The forecast production over the 38-year LOM is given in Table 4-6 Forecast Production by Operating Year and the plant layout is shown

Figure 4-13. Further details on the processing are included below.

Table 4-6 Forecast Production by Operating Year

Year	yr.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Ore Processed	kt	590	814	699	765	814	919	853	853	854	1,098	980	740	947	1,020	999	1,384	1,296	998	771	835
Head Grade																					
P_2O_5	%	13.0	12.6	14.2	14.8	14.9	14.5	15.0	14.9	14.9	11.9	12.5	15.8	13.2	13.7	14.7	11.0	11.0	13.0	15 2	14.8
TREO	%	3.3	3.2	3.4	3.3	3.3	3.2	3.3	3.3	3.3	2.7	2.7	3.3	2.8	3.0	3.2	2.6	2.6	2.8	3.2	3.1
Beneficiation																					
P2O5 Recovery	%	68.8	78.7	85.7	84.1	80.9	75.6	77.0	77.0	77.0	76.1	83.2	87.7	80.3	68.6	67.3	61 9	67.6	78.9	86.4	80.8
TREO Recovery	%	66.5	75.8	83.5	79.0	74.9	67.0	70.2	70.3	70.3	67.2	74.9	82.6	72.4	59.0	59.4	49.8	57.9	71.4	81 2	75.5
Concentrate	kt	198	278	280	314	326	341	333	333	333	341	340	334	334	334	340	340	340	342	334	333
Final Production																					
NdPr Oxide	t	2,529	4,485	4,621	4,661	4,706	4,677	4,710	4,709	4,708	4,533	4,472	4,648	4,374	4,270	4,505	4,123	4,531	4,620	4,639	4,679
SEG/HRE Oxide	t	374	595	610	611	606	596	601	601	601	589	579	602	567	544	572	539	602	612	607	606
P_2O_5	kt	47	66	68	76	79	81	79	78	78	79	82	82	80	77	79	76	77	81	81	80
MGA Phos Acid	kt	88	123	126	141	145	149	146	145	145	147	151	152	147	142	146	140	143	150	150	148

Year	yr.	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	TOTAL
Ore Processed	kt	1,116	1,101	1,232	1,111	879	864	901	940	940	1,125	1,351	1,351	1,351	1,511	1,506	1,506	1,506	1,423	**39,940**
Head Grade																				
P_2O_5	%	12.1	11.5	11.2	12.4	15.5	16.0	15.8	15.3	15.3	13.3	11.6	11.6	11.6	8.6	8.1	8.1	8.1	8.1	**490**
TREO	%	2.7	2.7	2.5	2.7	3.4	3.4	3.4	3.3	3.3	2.9	2.6	2.6	2.6	2.1	2.0	2.0	2.0	2.0	**110**
Beneficiation																				
P2O5 Recovery	%	73.4	74.8	69.9	70.6	72.4	72	69.1	68.7	68.7	64.6	59.5	59.5	59.5	57.9	57.5	57.5	57.5	57.5	**2,714**
TREO Recovery	%	65.3	66.9	56.9	58.3	65.3	65.0	61.1	59.8	59.8	53.1	44.9	44.9	44.9	39.0	37.8	37.8	37.8	37.8	**2,345**
Concentrate	kt	341	325	340	340	340	341	340	340	340	341	340	340	340	276	258	258	258	243	**12,147**
Final Production																				
NdPr Oxide	t	4,662	4,578	4,133	4,144	4,585	4,590	4,498	4,448	4,448	4,128	3,701	3,701	3,701	2,841	2,610	2,610	2,610	2,754	**157,946**
SEG/HRE Oxide	t	610	604	540	533	584	587	575	570	570	530	477	477	477	373	345	345	345	326	**20,480**
P_2O_5	kt	79	75	77	78	79	80	79	79	79	77	75	75	75	60	56	56	56	53	**2,813**
MGA Phos Acid	kt	146	139	143	144	146	147	146	146	146	143	138	138	138	112	104	104	104	98	**5,209**



REV	DATE	REVISION DESCRIPTION	DRAWN	CHECKED	ENGINEER	APPROVED
B	07 05 2020	ISSUED FOR USE	GWB			
A	13 03 2020	ISSUED FOR INTERNAL REVIEW	GWB			

IN THE ABSENCE OF THE APPROVED SIGNATURE THIS DRAWING SHALL BE TREATED AS PRELIMINARY

		DATE
DRAWN	G BLOEM	13 03 2020
DESIGNED		
CHECKED		
ENGINEER		
APPROVED		

ARAFURA RESOURCES LIMITED

CLIENT:

PROJECT: NOLANS RARE EARTH PROJCT DEFINITIVE FEASIBILITY STUDY

TITLE: Figure 4-13 PROCESS PLANT SITE LAYOUT

DRAWING STATUS: ISSUED FOR REVIEW

CL ENT DWG NO:

SCALE	GRID	DATUM	SIZE
1 2000	UTM 53R		A1

DWG NO: NRE-0000-E-DWG-G-0001 REV: B

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4.3.1 Beneficiation

Ore from the mine will be transported to the processing plant by road trains and directly tipped into a ROM bin within a shed with a negative pressure system to limit dust emissions. The ROM bin will then feed a single stage roll crusher to crush the ore which is also covered by a combination of a negative pressure system and water sprays to again limit potential dust emission. After crushing the ore material is conveyed to a coarse ore bin. Ore from the coarse ore bin is then fed into a single stage semi-autogenous (SAG) grinding mill in closed circuit with hydro-cyclones for grinding the ore to 80% passing 150 micron.

Dust will be managed in the crushing circuit through dust collected system installed on the ROM bin, crusher, coarse ore bin and conveyor transfer points. Water sprays and conveyor covers will also be employed to further mitigate and limit the possibility of dust emissions.

Ground ore from the SAG mill circuit will be heated using hot water from the extraction plant before flotation of a high phosphate concentrate in a rougher flotation circuit. Concentrate and tailings from the flotation circuit will be thickened in traditional hi-rate thickeners with the thickened concentrate reporting to the extraction plant for filtration and the thickened tailings being pumped to the residue storage facility (RSF). Overflow water from the thickeners, and returned filtration from the concentrate filter, will be recycled through the process water pond for re-use in the flotation circuit.

The beneficiation circuit above will use the following reagents:

- Oleic acid (collector).
- Sodium silicate (depressant).
- Flocculant.
- Coagulant.

4.3.2 Phosphate Extraction and Phosphoric Acid Production

The phosphate extraction section of the processing plant consists of five sub-sections that together separate the phosphate from the rare-earths, and in doing so, produce a phosphoric acid by-product.

The sub-sections include:

- Phosphoric acid pre-leach.
- Rare earth recovery.
- Phosphoric acid regeneration.
- Phosphoric acid purification.
- Phosphoric acid concentration.

4.3.2.1 Phosphoric Acid Pre-Leach

Concentrate from the beneficiation plant is filtered to produce a moist filter cake that is collected by front-end loader and stored in a concentrate shed. The shed is sealed and operated under negative pressure to ensure dust does not leave the shed and enter the outside environment.

Concentrate is reclaimed and fed into the pre-leach circuit by front-end loader in the concentrate shed. The pre-leach consists of a two-stage counter-current leach with phosphoric acid and solid-liquid separation with centrifuges after both stages.

The solids from the second stage centrifuges are filtered and stored in the concentrate shed for processing in the rare earth extraction. The liquor from the first stage centrifuges, which has some of the rare earths in solution, is processed in the rare earth recovery.

4.3.2.2 Rare Earth Recovery

The small amounts of rare earths that are dissolved in the pre-leach are precipitated in the rare earth recovery and then recovered by filtration before mixing with the pre-leach solid residue for feeding to rare earth recovery.

The dissolved rare earths are precipitated by heating with steam to the boiling point of 107ºC, which, in the presence of calcium in solution, destabilises the rare earth chemicals causing the precipitation. Following precipitation, the liquor is filtered for recovery of the rare earths prior to cooling and feeding to the phosphoric acid regeneration.

4.3.2.3 Phosphoric Acid Regeneration

In the phosphoric acid regeneration, liquor from the rare earth recovery will be treated to regenerate the phosphoric acid for use in the pre-leach and to precipitate gypsum waste. This regeneration is achieved through the addition of sulphuric acid, contained in recycle streams from other parts of the circuit, or as concentrated sulphuric acid. Cooling of the regeneration reactors is required to ensure efficient operation.

The regeneration precipitates the calcium leached from the concentrate as gypsum, which is filtered from the phosphoric acid. The gypsum filter cake is re-pulped with extraction process water before being neutralised with lime and pumped as a slurry to the beneficiation/gypsum (BF/GYP) cell in the RSF.

The regenerated phosphoric acid is recycled to the pre-leach with the excess phosphoric acid, produced from leaching of the phosphates in the concentrate, feeding to phosphoric acid purification.

4.3.2.4 Phosphoric Acid Purification

Phosphoric acid purification is designed to remove the uranium and thorium, and other minor impurities, from the phosphoric acid to meet the required specification. The removal of uranium and thorium from the phosphoric acid is achieved by nano-filtration, which is similar in nature to reverse osmosis used in water treatment.

The nano-filtration operates over a number of stages with the addition of recycled acid liquor to adjust the chemistry and achieve the desired recovery and rejection rates. The nano filtration produces three products:

- Clean phosphoric acid, which is sent to phosphoric acid concentration.

- Low grade mixed phosphoric and sulphuric acid, which is used in phosphoric acid regeneration.
- Reject liquor, which contains the majority of the uranium and thorium, which is sent to water leach residue neutralisation for neutralisation with lime prior to disposal in the water leach (WL) cell in the RSF.

4.3.2.5 Phosphoric Acid Concentration

In the phosphoric acid concentration, excess water is removed by evaporation to obtain the required P_2O_5 concentration of 54%, meeting the specification for MGA phosphoric acid. The evaporated water is condensed and recycled into the hot water circuit.

The concentrated phosphoric acid is stored as a merchant grade phosphoric acid product for shipment.

The only major reagent used in the phosphate extraction circuit is quicklime for neutralisation, with most of the other reagents recycled in process streams from other parts of the process. Flocculant and coagulant are used to improve performance of the solid/liquid separation.

Therefore, the reagents used in the phosphoric acid extraction include:

- Phosphoric acid (a very small amount used for the first fill of the tanks only).
- Sulphuric acid (only a minor make-up, with the main source being mixed acid recycled from other parts of the process plant).
- Flocculant and coagulant.
- Quicklime (used in the residue neutralisation prior to being discharged into the RSF).

The reagents used in the phosphoric acid production include:

- Sulphuric acid (only a minor make up).

4.3.3 Rare Earth Extraction

The rare earth extraction section of the process plant consists of three subsections, which together, separate the rare earths from the gangue minerals, and in doing so, recover the excess acid for re-use in the phosphate extraction area. The sub-sections include:

- Sulphation.
- Water Leach.
- Rare Earth Sulphate Precipitation.

4.3.3.1 Sulphation

In sulphation, rare earth minerals are converted from their phosphate and silicate forms to a sulphate form using sulphuric acid at elevated temperature making them amenable to recovery and separation from impurities.

Wet pre-leach residue (PLR) will be recovered from the PLR stockpiles by a front end loader and conveyed to two trains of sulphation equipment operating in parallel. Each train will consist of a sulphation dryer, acid mixer, acid bake and sulphation cooler units.

The dryers will dry the PLR at 120°C to remove moisture before it is mixed with concentrated sulphuric acid for feeding into the acid bake. The acid bake, which is carried out in indirect, oil heated, paddle type heaters, bakes the mixture at up to 250°C to drive the sulphation of the rare earths. The product from the acid bake will discharge directly into the sulphation coolers where it is cooled to 50°C before discharging directly into the water leach circuit.

The acid mixer, acid bake and sulphation cooler units will generate gases, which will be extracted to a local wet scrubber.

4.3.3.2 Water Leach

During water leach, the rare earth sulphate and acid (sulphuric and phosphoric) contained in the sulphated paste are separated from the gangue through leaching in cold water which dissolves the soluble rare earth sulphates and acids (sulphuric and phosphoric) present in the sulphated material and separates them from insoluble gangue material.

Following water leach the solids and liquor are separated using counter current centrifuges. The final washed solids are repulped in waste process liquor prior to neutralisation with lime in the water leach neutralisation circuit and pumping to the RSF for disposal.

The rare earth sulphate containing liquor is forwarded to the rare earth sulphate precipitation area.

4.3.3.3 Rare Earth Sulphate Precipitation

During the rare earth sulphate precipitation, rare earth elements are separated from sulphuric acid and phosphoric acid, along with most of the contained impurities in the water leach liquor. The selective precipitation is achieved through the addition of methanol which selectively depresses the solubility of rare earth sulphates over most other components of the water leach liquor, and results in the formation of a rare earth sulphate precipitate.

Thorium will also co-precipitate with the rare earth sulphates.

The precipitated rare earth sulphates are separated from the methanol and mixed acid solution by filtration with the filter cake being washed with methanol before being dried and stored for further processing in the rare earth processing area.

The filtrate containing the methanol and mixed acid is forwarded on to a methanol strip where methanol and mixed acid are separated by distillation for re-use (recycle) with the recovered methanol being recycled for re-use in the rare earth sulphate precipitation. The mixed acid is used in the phosphate extraction area (predominately to drive the regeneration of the phosphoric acid) with two ponds, on-spec and off-spec, included for storage of the mixed acid to decouple the sections of the process.

This area of the plant contains a significant inventory of flammable organic liquor and is designed to fully drain by gravity to a dump pond in case of emergency.

The reagents used in rare earth extraction above include:

- Concentrated sulphuric acid.
- Methanol.
- Quicklime.
- Flocculant.

4.3.4 Rare Earth Processing

The rare earth processing section of the process plant consists of four subsections which together separate rare earths from impurities and produce a purified cerium free rare earth chloride liquor to feed separation. The sub-sections include:

- Rare earth sulphate dissolution and purification.
- Rare earth hydroxide precipitation.
- Rare earth hydroxide dissolution.
- Rare earth chloride concentration

4.3.4.1 Rare Earth Sulphate Dissolution and Purification

The rare earth sulphate precipitate from rare earth extraction is leached in desalinated water to dissolve the soluble rare earth sulphate while leaving most impurities behind as insoluble phosphates (such as thorium). Following dissolution over two stages, the rare earth sulphate liquor is filtered with the solids before being fed to the water leach residue neutralisation for neutralisation with lime and disposal to the RL cell in the RSF.

The clarified rare earth sulphate liquor still contains impurity elements such as aluminium, iron, uranium, and residual thorium. These impurities are precipitated using pH adjustment with magnesia which drives the precipitation of impurities such as phosphates and hydroxides.

The discharge of the purification stage is filtered with clear purified liquor, which is forwarded on to rare earth hydroxide precipitation. The solids from the filter are recycled to the pre-leach filter feed tank in the phosphate extraction for recovery of mis-reporting rare earths.

4.3.4.2 Rare Earth Hydroxide Precipitation

Rare earth hydroxide precipitation is the first part in a two-part process to separate cerium from the other rare earth elements. In the rare earth hydroxide precipitation, sodium hydroxide is added to drive the precipitation of the rare earths contained in the purified rare earth sulphate liquor as hydroxides, with hydrogen peroxide addition to oxidise the cerium.

The final rare earth barren sodium sulphate liquor is recycled for water recovery, while the washed refined rare earth hydroxide cake is repulped and fed to the rare earth hydroxide dissolution.

4.3.4.3 Rare Earth Hydroxide Dissolution

Rare earth hydroxide dissolution separates cerium from the other rare earth elements through selective leaching of the non-cerium rare earths from the rare earth hydroxide precipitate using hydrochloric acid.

Rare earth hydroxide dissolution is configured in a multi-stage counter current configuration, with dosing of hydrochloric acid over multiple tanks in each stage, with filtration between each stage. This configuration is designed to separate the cerium from the other rare earths while minimising the losses of NdPr to the cerium product.

The final rare cerium free earth chloride liquor is forwarded on to rare earth chloride concentration, while the low-grade cerium hydroxide is further processed in cerium processing.

4.3.4.4 Rare Earth Chloride Concentration

The rare earth chloride solution is concentrated in the rare earth chloride evaporator then stored for further processing in the rare earth separation. Evaporated water is condensed and recycled in the hot water circuit.

Reagents used in rare earth processing above include:

- Magnesia, as a milk of magnesia slurry.
- Sodium hydroxide (caustic soda).
- Hydrogen peroxide.
- Hydrochloric acid.

4.3.5 Rare Earth Separation

The rare earth separation section of the process plant consists of three subsections which separate the various rare earths products, recover valuable rare earths from the low-grade cerium hydroxide and precipitate, calcine and package the final products for sale. The sub-sections include:

- Rare earth chloride solvent extraction.
- Cerium processing.
- Product handling.

4.3.5.1 Rare Earth Chloride Solvent Extraction

There are two solvent extraction circuits which process the rare earth chloride liquor from rare earth processing in series. The first circuit separates the middle and heavy rare earths (SEG/HRE) and the second separates the NdPr, leaving the lanthanum in the final raffinate. The lanthanum could be recovered at a later stage should price warrant the cost of processing through the addition of a third circuit.

Each circuit consists of a series of mixer settlers which extract the desired rare earths onto an organic extractant in the first group of mixer settlers, scrub unwanted rare earths from the organic extractant

in the second group and then strip the separated rare earths from the organic extractant to produce a concentrated strip liquor in the final group. The chemistry of the rare earth movement between the aqueous and organic phases is controlled through careful control of pH through the addition of hydrochloric acid and sodium hydroxide.

This area of the plant contains a significant inventory of flammable organic liquor and designed to fully drain by gravity to a dump pond in case of emergency preventing an uncontrolled release or total loss of the facilities.

The SEG/HRE and NdPr strip liquors are forwarded to separate precipitation circuits while the raffinate (tail) is neutralised in the gypsum neutralisation circuit for disposal to the RSF.

4.3.5.2 Cerium Processing

The low-grade cerium hydroxide, which contains significant NdPr, from rare earth processing, is dissolved using sulphuric acid, then purified using solvent extraction where the cerium is readily separated from the other rare earth elements, to produce:

- Purified cerium strip liquor.
- Rare earth sulphate raffinate.

The cerium strip liquor will initially be sent to neutralisation for precipitation with lime and disposal to the RSF, however, the production of a high-purity cerium product may be installed later should cerium price warrant its production.

The rare earth sulphate raffinate is recycled to water leach in the rare earth extraction process to recover the contained rare earths.

This area of the plant contains a significant inventory of flammable organic liquor and is designed to fully drain by gravity to a dump pond in case of emergency preventing an uncontrolled release or total loss of the facilities.

4.3.5.3 Product Handling

The purified liquors from the rare earth chloride solvent extraction, and the cerium processing if a cerium product is produced at a later time, are processed in separate, but similar, precipitation and calcining circuits before feeding to a packaging plant.

Each circuit consists of precipitation using oxalic acid to produce a rare earth oxalate, which is then filtered and washed prior to feeding into a calciner where the rare earth oxalates are converted at high temperature to rare earth oxides. The calcined product from each circuit is cooled, then stored for packaging where product from all circuits is processed through a single common product weigh and wrapping facility.

Barren liquors from each precipitation circuit are combined and recycled for water recovery.

Reagents used in rare earth separation include:

- Sodium hydroxide (caustic soda).

- Hydrochloric acid.
- Sulphuric acid.
- Hydrogen peroxide.
- Oxalic acid.

4.3.6 Sulphuric Acid Plant

The sulphuric acid plant (SAP) will produce concentrated sulphuric acid by melting, with minor amounts of lime and surfactant to aid melting sulphur, and then burning elemental sulphur and then converting the sulphur dioxide through multi-pass catalytic conversion and contact to sulphuric acid. Residual sulphur dioxide will be exhausted from the SAP through a stack.

The SAP will produce approximately 1,000 tpd of sulphuric acid which will be pumped to storage on site. The SAP will also produce steam for use in the process for heating and other duties.

4.3.7 Reagents

The reagents used in the process, average consumption, storage and form of transport are summarised in Table 4-7

Table 4-7 Reagent Consumptions Storage and Transport

Reagent	Consumption Rate (t/y)	Storage (t / days)	Transport Type	Storage Type
Sulphuric Acid	287,410	4,000 t / 5 d	Produced from SAP	Tank
Sulphur (used in SAP)	93,016	1,800 t / 7 d 66 containers	20' shipping container, end-tip	Containers
Hydrochloric Acid (32%)	40,273	770 t / 7 d	Isotainer 20ft	Tank
Caustic Soda (50%)	49,175	940 t / 7 d	Isotainer 20ft	Tank
Quicklime	25,462	120 t / 1.7 d	Isotainer 20ft with onboard blower	Silo
Methanol	2,625	19 t / 2.6 d	Isotainer	Tank
Hydrogen Peroxide (70%)	2,821	54 t / 7 d	Isotainer	Tank
Oxalic Acid	6,034	120 t / 7 d	1 m^3 Bulk Bag	Reagent Shed
Sodium Silicate	1,319	44 t / 12 d	Isotainer	Tank
Oleic Acid	493	16 t / 12 d	Isotainer	Tank
Flocculant	255	15 t / 21 d	1 m^3 Bulk Bag	Reagent shed

Coagulant	349	17 t / 16 d	Isotainer	Tank
Magnesia	356	20 t / 20 d	1 m^3 Bulk Bag	Reagent shed
Diluent Shellsol D70	75	40 t	Isotainer	Tank
Extractant P507	11	1 t	1 m^3 IBC	Reagent Shed
Extractant DEPHA	3	1 t	1 m^3 IBC	Reagent Shed
Extractant TOPO	1	1 t	1 m^3 IBC	Reagent Shed

Note: Average consumption is calculated as the average following ramp up for the first seven years of production.

Reagents will be delivered to site from the Alice Springs rail terminal by road train. Once at site the reagents will be unloaded from the trailers with empty containers or outgoing product containers backloaded on the trucks. Unloading of the containers will be as follows:

- Sulphur will be stored in the purpose-built containers in a stack and then unloaded using a tipping frame directly into the SAP.
- Bulk liquid reagents in isotainers will be unloaded into storage tanks in an isotainer unloading facility.
- Lime will be pneumatically unloaded into a silo.
- Bagged and liquid reagents in intermediate bulk containers (IBCs) will be destuffed from the shipping containers and stored in the reagents shed(s).
- Flammable reagents, methanol and diluent, will be unloaded into tanks within the plant to contain all flammable reagents in close proximity.

In addition, for start-up, minor quantities of concentrated sulphuric acid and phosphoric acid will likely be imported and loaded into the storage tanks.

Evaluation of the nature and storage volumes is currently underway to determine if the facility needs certification as a major hazard facility.

4.3.8 Product Storage and Shipping

Rare earth products, once bagged, will be loaded into containers adjacent to the road train unloading area ready for back loading and transport to customers.

Bulk phosphoric acid product will be stored in a 2,700-t tank, which is equivalent to 7 days storage. Phosphoric acid will be loaded into isotainers in a section of the isotainer unloading area before being backloaded onto road trains for transport to customers.

4.3.9 Services

The services for the plant area will include raw water, fire water, potable water, desalinated water, recycled water, hot water, steam and compressed air.

Raw water is stored in a lined pond at the process plant and distributed to the beneficiation plant, hydrometallurgical plant and other users. The raw water pond will also serve as the source of fire water which will feed from dedicated pumping systems into a ring main around the facilities.

Raw water will be processed on site in RO plants to produce desalinated water, for use in the process, and potable water for domestic consumption. In addition, a separate RO plant will process waste liquors from rare earth process and rare earth separation for recovery of water to produce desalinated water and RO reject water for the repulping of tailings streams.

Hot water from around the plant, primarily from evaporators, will be collected and then cooled in evaporative cooling towers to allow it to be re-used in the process.

Steam, which is generated from desalinated water in the SAP and power station, and dry compressed air are reticulated to users throughout the process plant.

4.3.10 Ponds and Processing Area Water Management

4.3.10.1 Ponds

The ponds located in the process plant, their volumes and construction include:

- Beneficiation process water pond – 5,000 m^3 pond, equating to an 11-hour full flow operation, lined with a single 1.5mm thick high density polyethylene (HDPE) geomembrane.
- Mixed acid storage ponds – two of, 10,000 m^3 ponds, double lined with 1.5mm thick HDPE geomembrane, separated by a sandy layer containing a geopipe network draining to a sump for the early detection of leaks in the top membrane.
- Cerium raffinate pond – 7,500 m^3 pond, double lined with 1.5mm thick HDPE geomembrane, separated by a sandy layer containing a geopipe network draining to a sump for the early detection of leaks in the top membrane.
- Methanol dump pond – Methanol is flammable unless diluted with water below the flammable limit. The methanol dump pond will be designed to accommodate 120% of the process methanol volume including the required dilution and allowance for storm events. The pond will be double lined with 1.5mm thick HDPE geomembrane, separated by a sandy layer containing a geopipe network draining to a sump for the early detection of leaks in the top membrane.
- SX dump pond(s) – designed to accommodate 120% of the process organic volumes in the solvent extraction circuits including an allowance for storm events. The pond(s) will be double lined with 1.5mm thick HDPE geomembrane, separated by a sandy layer containing a geopipe network draining to a sump for the early detection of leaks in the top membrane.

Consideration will be given to floating covers on the permanent storage ponds to reduce evaporation or prevent interaction of fauna with the pond contents.

4.3.10.2 Surface Water Management

Surface water management will be characterised into process systems, dirty water systems and clean water systems.

Process Systems

All process equipment will be bunded in concrete or other bunds designed to meet Australian standard for size and storage volumes, with lining for chemical compatibility with the process chemicals. Spillages and any collected water in the process bunds will be returned into the process or pumped to the RSF.

Overflows from the process bunds will report into the dirty water systems.

Dirty Water Systems

Stormwater within the process plant disturbed area and any spillage from process bunds will be collected from hardstands and other areas through drainage structures and directed to stormwater pond(s). The stormwater pond(s) will be sized with a retention capacity of 100-year ARI (equivalent to the 1% AEP) 72-hour design storm event while maintaining a minimum freeboard of 500mm below the embankment crest. Stormwater pond(s) will be sized with a suitable spillway for the check storm event.

Stormwater ponds will be clay lined in the batters and floors. The final number of stormwater ponds will be dictated by catchment areas, earthworks and drainage design and constructability concerns.

Clean Water Systems

Catchments include natural watercourses and drainage lines outside of the operational process areas, with provision of infrastructure for flood protection levees, clean water diversions, and open drain systems.

Flow and stormwater diversion banks and cut off drains will be installed across the broader process plant site to divert clean water away from the disturbed areas and around infrastructure. This water flow, once directed around the disturbed area will be fed to downstream erosion and sediment control devices to manage and direct (disperse) new potentially focussed flow paths.

4.3.11 Processing Performance Against Previous Mine Management Plan

No processing activities have been undertaken at the Project. In subsequent MMPs this section will provide an assessment of processing performance, including such factors as:

- Mineral treatment (ore treated, feed grade, recovery, process plant performance).
- Product, volumes and quality.
- Processing circuit efficiency (water use).
- Energy requirements (power use).
- Production and major reagents or chemicals consumption.

- Engineering upgrades and modifications.
- Detail any new processing initiatives, developments or changes proposed for the oncoming reporting period.

4.4 Residue Storage Facility

The residue storage facility is discussed in Section 6 of the Definitive Feasibility Study (DFS) and the Section 14A Report.

https://www.arultd.com/images/Nolans_DFS_Summary_Report_-_Final_for_website.pdf

https://www.arultd.com/images/EIS/Supplement/Notice_alteration_project14A_nolans_june2019.pdf

4.4.1 Residue Characterisation

Waste characterisation studies have been completed by Knight Piesold to determine the physical behaviours and chemical properties of the anticipated residue streams. The detailed testing procedures and results of the assessment are discussed in the individual residue testing reports.

- Knight Piesold, Tailings Testing Report – Water Leach Residue, prepared for Arafura Resources Pty Ltd, March 2019, Document Reference PE801-00140/16.
- Knight Piesold, Tailings Testing Report – Blend Tailings, prepared for Arafura Resources Pty Ltd, March 2019, Document Reference PE801-00140/17.

Key characteristics of the residue slurries reporting to the RSF have been included in Table 4-8.

Table 4-8 Key Characteristics of Residue Slurries

Parameter	Beneficiation and Gypsum Residue	Water Leach Residue
Solids Specific Gravity	2.5	2.3
Liquid Specific Gravity	1.0	1.0
Solids by weight	32.5%	35.0%
Density	0.8 – 1.2t/m3	06 – 0.9tm3
Supernatant Release	24-35%	0 – 23%
Underdrainage Release	32%	32%
Radioactivity (max head-of-chain)	Solids = 5 9 Bq/g Liquids = <1.0 Bq/g	Solids = 1.2 +/- 0.1 Bq/g Liquids = <0.12 Bq/L

4.4.1.1 Waste Radiation Classification

Based on the waste characterisation testing completed by Knight Piesold (2019b, 2019c), the RSF is classed as a nuclear waste disposal facility in accordance with Australian Radiation Protection and Nuclear Safety Agency regulations (Australian Government 2005; Australian Government 2017) for "Very Low-Level Waste" with the radioactivity of the head-of-decay chain elements within the residue

and the liquor in both BF/GYP and WL Facilities in the range of 1 to 10 Bq/g or 1 to 10 Bq/L. The RSF designs accounts for these elevated radiation levels, specifically relating to seepage, dust control and capping requirements. The management of radiation and limiting exposure will be discussed in the Appendix K, Radiation Management Plan.

4.4.1.2 Acid Potential

Acid base accounting completed during the waste characterisation testing indicated that both BF/GYP Residue and WL Residue are likely Non-Acid Forming and therefore very low risks of acid generation are calculated within the Facilities.

4.4.2 Overarching Residue Storage Facility Design Parameters

The RSF has been designed to meet the following standards:

- Australian National Committee on Large Dams: "Guidelines on the Consequence Categories for Dams".
- Australian National Committee on Large Dams: "Guidelines on Tailings Dams, Planning, Design, Construction, Operation and Closure".
- Northern Territory Environmental Protection Authority: "Guidelines for the Siting, Design and Management of Solid Waste Disposal Sites in the Northern Territory".
- Department of Mines, Industry Regulation and Safety's Code of Practice "Tailing's storage facilities in Western Australia".
- Department of Mines, Industry Regulation and Safety "Guide to the preparation of a design report for tailings storage facilities (RSFs)".

4.4.2.1 Minimum Design Parameters

A failure consequence assessment and determination of the hazard categories for the RSF has been completed in accordance with Department of Mines, Industry Regulation and Safety's (DMIRS) Code of Practice for "Tailings Storage Facilities in Western Australia" and the ANCOLD "Guidelines on the Consequence Categories for Dams".

Minimum design requirements for the RSF were determined by applying the ANCOLD minimum design parameters from the ANCOLD "Guidelines on Tailings Dams" associated with the determined ANCOLD hazard category. This in conjunction with the site conditions were used to develop the minimum design parameters. The adopted values for the design of each RSF are summarised in Table 4-9.

Table 4-9 Minimum Design Parameters for the RSF

Criteria	Minimum Design
Design Climatic Conditions	Design Storm Depth: ▪ 1 in 100 yr AEP 24-hour storm: 196 mm ▪ 1 in 100 yr AEP 72-hour storm: 298 mm ▪ PMP 24-hour storm: 670 mm ▪ PMP 72-hour storm: 1,090 mm
Embankment Freeboard	The critical elevation out of: ▪ Minimum of 0.5 m to maximum residue ▪ Minimum of 1.0 m to maximum design pond. ▪ Minimum of 0.1 m for maximum emergency spillway flow (PMP)
Spillway Capacity	Sized to safely discharge any excess water due to a PMP rainfall event after attenuation in the facility.
Design Earthquake Loading	OBE - 1 in 1,000 year: 0.024g MDE - 1 in 10,000 year: 0.045g Post Closure - MCE: 0.053g
Minimum Factor of Stability	Long term drained 1.5 Short term undrained. Potential loss of containment 1.5 No potential loss of containment 1.3 Post seismic: 1.0 to 1.2

4.4.2.2 RSF Design Strategy

Detailed description of the design and operational requirements, including monitoring, are provided within the Design Report and RSF Operating Strategy compiled by Knight Piesold:

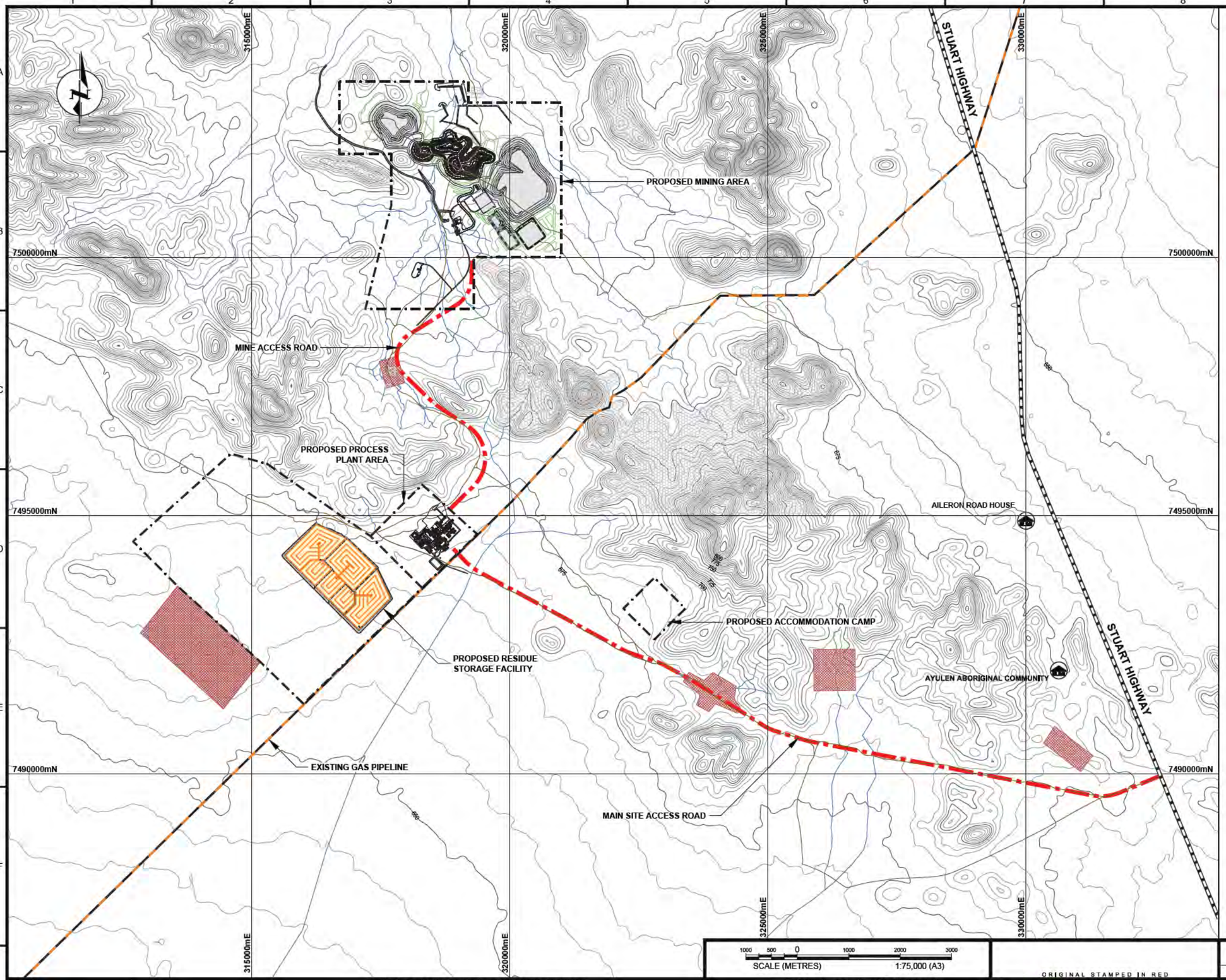
- Knight Piesold, Residue Storage Facility, Definitive Feasibility Study – Design Report, prepared for Arafura Resources Pty Ltd, March 2019, Document Reference PE801-00140/12.
- Knight Piesold, Residue Storage Facility Operating and Monitoring Manual, prepared for Arafura Resources Pty Ltd, November 2018, Document Reference PE801-00140/8.

The Project will produce three residue wastes delivered to the RSF as two different streams: a combined beneficiation tailings stream (BF) and gypsum (GYP) residue stream and a water leach (WL) residue stream. The wastes will be transferred in a bunded corridor from the nearby processing facilities to the RSF and deposited into their respective storages as shown in Figure 4-14. The RSF is designed to operate the two residue facilities (RF) concurrently, one to receive BF and GYP residue and the other to receive WL residue. The two RFs will share an adjoining embankment and are considered one cell.

To limit the operational area, as well as the final height, a total of three cells (Phase 1) will be constructed sequentially during the first 20 years of the Project life. A further three cells (Phase 2) will

be constructed for the remainder of the 38-year LOM, with the facility being mirrored to the south once the Phase 1 cells are completely filled.

Each BF/GYP RSF cell will be approximately 50 ha whilst each WL RF cell will be approximately 16 ha each. The entire construction footprint of the first RSF (3 x BF/GYP and 3 x WL) will be approximately 240 ha allowing for vehicle access and a reduced embankment profile at closure. The final configuration of this RSF is illustrated in Figure 4-15 .



LEGEND:

- L MITED WORK EXCLUSION ZONE
- OFF LIMITS EXCLUSION ZONE
- TOPSO L STOCKP LE
- EXIST NG DRAINAGE COURSE
- EXIST NG GAS PIPEL NE
- EXIST NG HIGHWAY
- EXIST NG ROAD (SEALED)
- EXIST NG ROAD (UNSEALED)
- LEASE BOUNDARY
- SITE ROAD ALIGNMENT

NOTES:

1. 5m CONTOUR INTERVALS SHOWN.TOPOGRAPHIC NFORMATION DERIVED FROM 1 SECOND SRTM DATA, OBTAINED FROM GEOSC ENCE AUSTRALIA, (2011).
2. YEAR 24 PIT LAYOUT SHOWN.
3. STAGE 2 SURFACE WATER MANAGEMENT STRUCTURES SHOWN.

Figure 4-14 Location of the RSF in Relation to Site Infrastructure

SCALE (METRES) 1000 500 0 1000 2000 3000 — 1:75,000 (A3)

ORIGINAL STAMPED IN RED

	DATE	DESIGNED	CHECKED	APPROVED	CLIENT APP'D
A	30/11/2018	ISSUED FOR REVIEW	PRK	AM	AM	BAS	

SHEET SIZE A3

REFERENCES

DRAWING No.	DRAWING TITLE

REVISIONS

REV	DATE	DESCRIPTION	DRN	DESIGN	CKD	APP	CLIENT APP

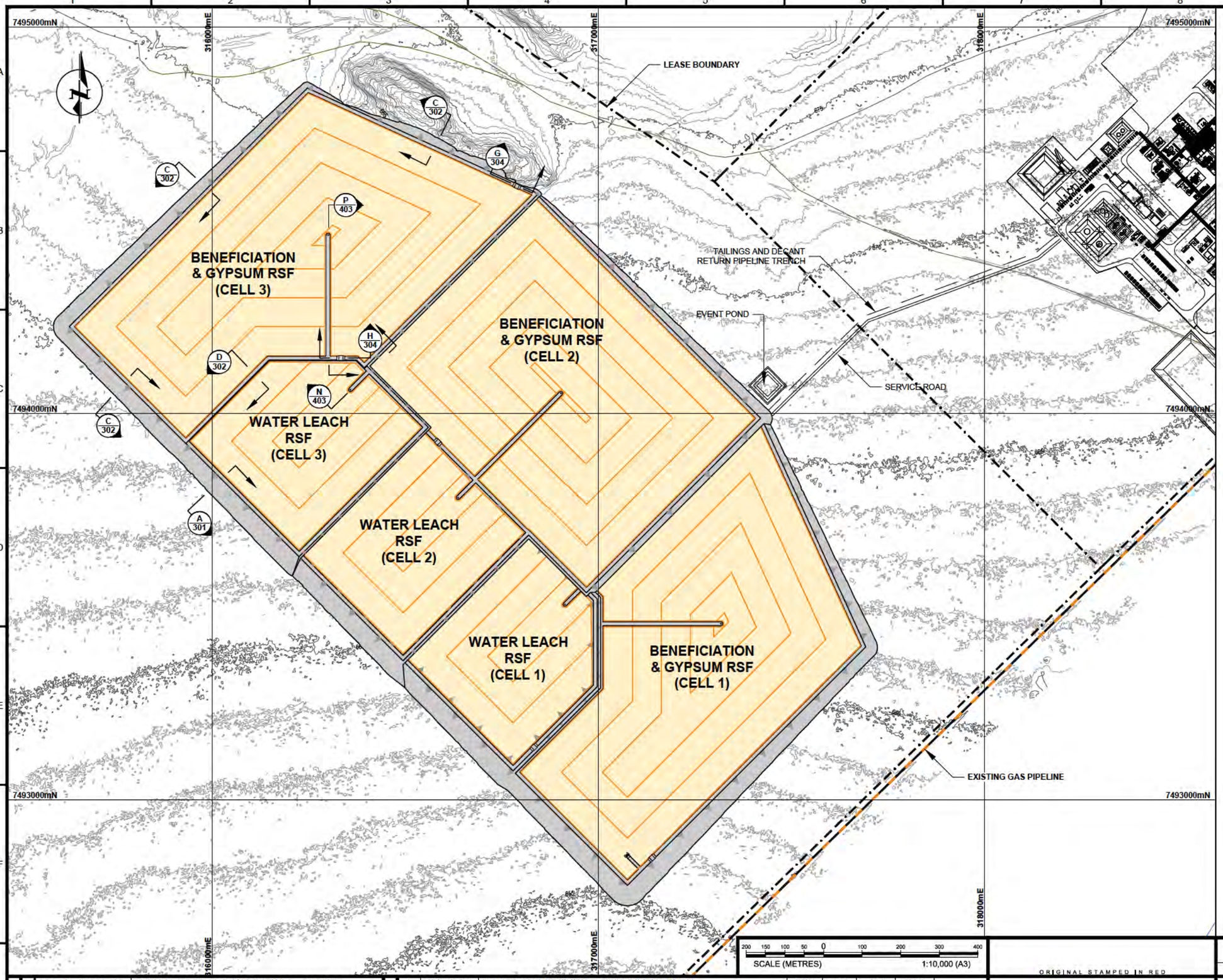
Knight Piésold CONSULTING

CONSULT AUSTRALIA Member Firm

ARAFURA RESOURCES
NOLANS PROJECT
MINING AREA SURFACE WATER MANAGEMENT
SITE GENERAL ARRANGEMENT

SCALE 1:75,000
STATUS: IFR
DRAWING NUMBER **801-140-A5001-050**
REV **A**

287



LEGEND:

- EXIST NG DRAINAGE COURSE
- EXIST NG GAS PIPEL NE
- EXIST NG ROAD (UNSEALED)

NOTES:

1. 1m CONTOUR NTERVALS SHOWN. TOPOGRAPHY PROV DED BY ARAFURA, JUNE 2018.

Figure 4-15 RSF Final Layout

SHEET SIZE A3	DRAWING No.	DRAWING TITLE
REFERENCES	801-140-A3001-301	TYPICAL SECTIONS AND DETAILS - SHEET 1
	801-140-A3001-302	TYPICAL SECTIONS AND DETAILS - SHEET 2
	801-140-A3001-303	TYPICAL SECTIONS AND DETAILS - SHEET 3
	801-140-A3001-403	DECANT SECTIONS AND DETAILS - SHEET 3

REVISIONS

REV	DATE	DESCRIPTION	DRN	DESIGN	CKD	APP	CLIENT APP
A	28/11/2018	ISSUED FOR DEFINITIVE FEASIBILITY STUDY	PRK	AM	AM	BAS	

ORIGINAL STAMPED IN RED

DATE	DESIGNED	CHECKED	APPROVED	CLIENT APP'D

Knight Piésold CONSULTING

CONSULT AUSTRALIA Member Firm

ARAFURA RESOURCES
NOLANS PROJECT
RESIDUE STORAGE FACILITY
PHASE 3 LAYOUT - STAGE FINAL

SCALE 1:10,000
STATUS: DFS
DRAWING NUMBER **801-140-A3001-170**
REV **A**

The two residue facility types (BF/GYP and WL) have been designed with consideration to the geochemical properties of the waste streams being deposited. To provide seepage control and to mitigate potential seepage losses, engineered basin liners and underdrainage features have been integrated.

The BF/GYP RF will incorporate a reworked soil lined basin with a full piped underdrainage network. The embankments will have a low permeability soil upstream fill zone and will be built using modified centre line construction techniques. A cut-off trench will be located beneath the entire length of the embankment and will be excavated into a competent foundation layer.

The WL RF will include additional seepage measures comprising of two basin liners, a primary HDPE geomembrane overlying a secondary engineered soil liner. The WL RF will incorporate an underdrain network above the HDPE liner with an additional leakage control and recovery system below the HDPE liner providing stringent seepage management. The embankments will have a low permeable upstream fill zone as well as a HDPE geomembrane liner and, like the BF/GYP RF, include a cut-off trench beneath the entire length of the embankment, excavated into a competent foundation layer. To allow for continuous lining of the embankments, embankment lifts will be constructed using downstream construction techniques.

Detailed designs of the embankments for both the BF/GYP RF and WL RF have been provided in Figure 4-16 and Figure 4-17.

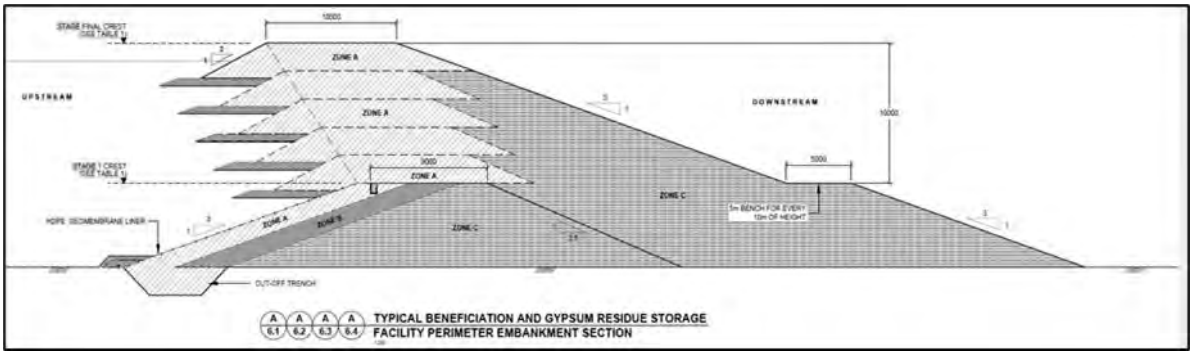


Figure 4-16 Typical Beneficiation and Gypsum Residue Storage Perimeter Embankment Section

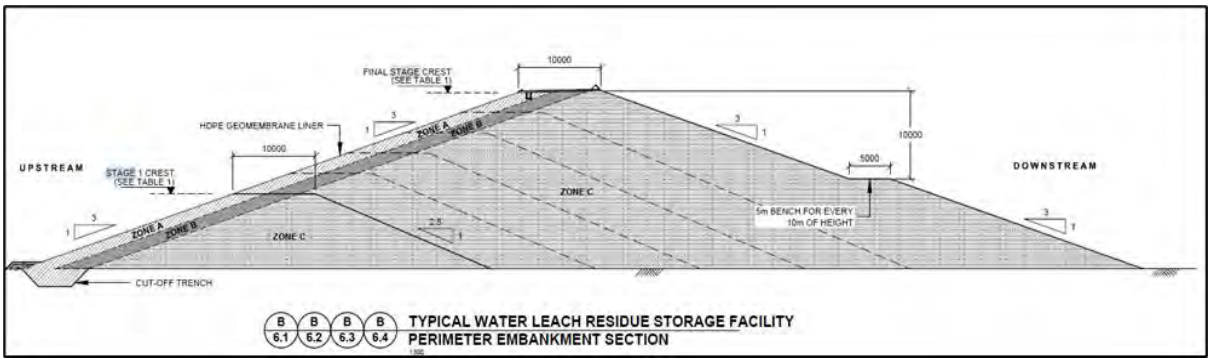


Figure 4-17 Typical Water Leach Residue Storage - Perimeter Embankment Section

4.4.3 Key Residue Storage Facility Features

The following key RSF features have been summarised from the KP (2019a) RSF Design Report. The report should be referenced for specific designs details.

4.4.3.1 Residue Deposition System

The deposition of the residue into both the BF/GYP RF and WL RF will be done sub-aerially from the perimeter embankments. Multiple spigots inserted along the residue distribution line will be used to control deposition. The spigots will be systematically relocated to control the location of the supernatant pond. A suitable cycle time will be confirmed after the initial establishment of the residual beaches to ensure even residue deposition, thereby maintaining the supernatant pool at a suitable location and maintaining the formation of the residue beach.

4.4.3.2 Seepage Control

Seepage control and underdrainage features have been incorporated into the RSF design to mitigate potential seepage losses and to increase settled densities of the residue streams.

4.4.3.3 Cut-off Trench

A cut-off trench will be installed along the entire length of the embankments to prevent near surface seepage. During Stage 1, construction of the cut-off trench will be excavated into foundation soils to competent foundation materials and backfilled with low permeability fill. The cut-off trench will vary in depth depending on the extent of the competent foundation material. The cut-off trench will be directly below the upstream Zone A (see Figure 4-16 and Figure 4-17 for embankment zones) of the embankment and will run the full length of the embankment.

4.4.3.4 Basin Area Lining

The basin areas will be lined to reduce seepage potential from the RSF. During the initial construction, the basin areas will be cleared and grubbed prior to excavation. The basin surface will be left with sufficient low permeability material which will be worked to create a compact soil liner. For the WL RF, an addition HDPE liner will be added to further reduce seepage losses.

4.4.3.5 Underdrainage System

A collector drain will be installed through the centre of the basin with connecting finger drains that will make up the underdrainage system. In addition, the underdrainage will connect into the toe drains with all drainage reporting to the underdrainage sump located at the RSF embankment. The benefits of the system include:

- Reduced seepage through the basin and under/through the embankment. This is beneficial to the environment and promotes increased embankment stability.
- Residue mass drainage, thus increasing the density of the residue and consequent facility efficiency in terms of constructed storage capacity.
- Increased strength of the residue mass immediately adjacent to the embankment.
- Reduced phreatic surface in the residue mass and RSF embankments.

4.4.3.6 Underdrainage Collection Tower

At the lowest point of the BF/GYP RF basin and adjacent to the embankment upstream toe, an underdrainage collection tower will be positioned. The underdrainage sump will collect solution from the underdrain system before being pumped to the residue surface via a submersible pump located beneath the underdrainage collection tower. Recovered solution will be pumped to the surface of the RSF where it will report to the supernatant pond and ultimately the decant tower.

4.4.3.7 Underdrainage Collection Sump and Riser Pipe

Like the underdrainage recovery tower associated with the BF/GYP RF, a sump will be excavated within the WL RF to collect solution from the lined HDPE basin. The sump will incorporate a submersible pump and riser pipe to remove excess solution. Ingress of residue will be avoided by backfilling with coarse drainage rock and appropriate filters.

4.4.3.8 Leak Collection and Recovery System

As a matter of contingency, a leakage collection and recovery system (LCRS) will be installed beneath the HDPE basin liner of the WL RF. A network of collector pipes will direct solution that has breached the HDPE liner to a collection sump. The sump will act as a monitoring point to detect leaks and, if required, as an abstraction point for solution.

4.4.3.9 Decant System

Each cell will have a decant tower during operation that will remove supernatant water via a submersible pump. The initial supernatant pond for Cell 1 will be located on the eastern edge of the RSF. Solution recovered from the decant system will be pumped back to the plant for re-use in the process circuit.

4.4.3.10 Spillways

Each cell of the RSF will be designed to contain the greater of a 1 in 100-year ARI and a 1% AEP 72 hour storm event in addition to the maximum supernatant pond under average rainfall conditions. Under normal operating conditions the stormwater capacity will be more than the event volumes and no discharge from the facility is expected.

To prevent uncontrolled overtopping of an embankment in an event that exceeds the design parameters, spill ways have been included in the design for each cell. The spillways allow for the safe management of stormwater in an emergency event up to the PMP event.

4.4.3.11 Delivery and Decant Return Pipeline Corridor

The residue delivery pipelines and decant return pipeline that run between the RSF and the processing plant will be installed within a HDPE lined bund. An event pond located at the toe of the RSF will be adequately sized to recover the entire content of the pipeline in the event of a failed pipe.

4.4.4 Design Storage

Per Table 4-10 below, tailings disposal into the RSF cell 1 is scheduled to occur through year eight of the disposal staging schedule, with tailings disposal occurring through the construction of four staged wall height increases (lifts) up to a maximum wall height of 15 metres in total prior to the construction of additional cells to the west side of the facility. The current RSF design works on a two-year construction cycle for each stage of embankment lifts. An estimated Phase 1 (20 years) construction/disposal schedule has been provided in Table 4-10 and Table 4-11. These are the design considerations and will be adjusted as required throughout the LOM.

As the RSF will begin construction during the second year of the construction programme, the six years covered by this MMP will cover the RSF construction (occurring during the second half of the two-year Nolans construction programme) plus an additional four years of operations (which includes the Nolans processing plant commissioning).

Table 4-10 Estimated Phase (20 years) Disposal Staging Schedule for Beneficiation/Gypsum Residues

Cell		Stage	Construction Year	Crest Elevation (mRL)	Storage Capacity		Cumulative storage (Mt)		Density	Cumulative Storage in Cell (Mm^3)
					(month)	(Mt)	in Cell	in Facility	(t/m^3)	
Beneficiation & Gypsum Residue Cells	1	1	-1	663.4	30	1.58	1.58	1.58	1.03	1.53
		2	3	666.0	30	2.22	3.80	3.80	1.18	3.22
		3	5	668.1	24	1.45	5.25	5.25	1.23	4.27
		4	7	670.4	24	1.60	6.85	6.85	1.29	5.31
	2	1	9	666.8	12	0.94	0.94	7.79	0.75	10.39
		2	10	669.9	24	1.99	2.93	9.78	1.06	9.23
		3	12	672.1	24	2.05	4.98	11.83	1.18	10.03
		4	14	674.2	24	1.92	6.89	13.75	1.24	11.09
	3	1	16	668.2	12	0.99	0.99	14.74	0.76	19.39
		2	17	671.6	24	2.06	3.05	16.80	1.08	15.56
		3	19	674.4	24	1.96	5.01	18.76	1.16	16.17
		4	21	676.4	24	1.05	6.06	19.81	1.23	16.11

Table 4-11 Estimated Phase 1 (20 Years) Disposable Staging Schedule for Water Leach Residues

Cell		Stage	Construction Year	Crest Elevation (mRL)	Storage Capacity		Cumulative storage (Mt)		Density	Cumulative Storage in Cell (Mm^3)
					(month)	(Mt)	in Cell	in Facility	(t/m^3)	
Water Leach Residue Cells	1	1	-1	662.9	36	0.30	0.30	0.30	0.89	0.35
		2	3	665.4	24	0.28	0.59	0.59	0.91	0.67
		3	5	667.6	24	0.28	0.87	0.87	0.92	0.99
		4	7	669.7	24	0.29	1.15	1.15	0.93	1.30
	2	1	9	663.5	12	0.15	0.15	1.30	0.66	0.23
		2	10	666.6	24	0.27	0.41	1.57	0.82	0.55
		3	12	669.0	24	0.29	0.70	1.86	0.87	0.86
		4	14	671.2	24	0.29	0.99	2.15	0.89	1.18
	3	1	16	665.2	12	0.14	0.14	2.29	0.66	0.23
		2	17	668.1	24	0.29	0.43	2.58	0.82	0.55
		3	19	670.4	24	0.29	0.73	2.87	0.87	0.85
		4	21	672.0	24	0.20	0.92	3.07	0.89	1.08

4.4.5 Construction

Construction will be completed during the dry season, on a two-yearly cycle. Embankments will be constructed with slopes of 3H:1V upstream and 2.5H:1V downstream during operation. These slopes will then be flattened to 3.5H:1V during the last construction stage to present a final closure profile.

For the initial Stage 1 embankment, the bulk construction materials will be sourced from the RSF footprint to reduce the total disturbed area impacted by the facility and to generate storage volume for future cells. Material not sourced from within the RSF footprint will be sourced from a rock outcrop on the northern extent of the RSF, from the mining operations waste stockpiles or local borrow sources. Details of the material availability will be provided in detail within the Project Borrow Management Plan which is in development.

A summary of the required construction material has been provided in Table 4-11 Estimated Phase 1 (20 Years) Disposable Staging Schedule for Water Leach Residues and typical cross sections of the RSF Embankments (including fill zones) are provided in Figure 4-16and Figure 4-17.

Table 4-12 Summary of Construction Materials Including Source and Zone Compaction Specifications

Zone Type	Zone Description	Zone Compaction Specifications	Marial Source
Zone A	Low permeability material.	98% SMDD, 0% < OMC < =3% 300mm layers	From local borrow.
Zone B	Transitional fill	95% SMDD, -3% < OMC < +3% 500mm layers	From local borrow.
Zone C	Structural fill	95% SMDD, -3% < OMC < +3% 500mm layers	From local borrow.
Zone E	Erosion protection	Uniform density free from cavities, 300mm layers	From local borrow or supply from mining operation.
Zone F	Drain filter material	Uniform density free from cavities, Moist	Imported from offsite or processed onsite and supplied to local stockpile.
Zone G	Coarse rockfill	Uniform density	Processed onsite or supplied from mining operations.

4.4.5.1 Sediment Control

Construction of the embankments will predominantly take place during the dry season to reduce sediment runoff.

4.4.6 Operation

The purpose of the RSF EMP, Appendix W, is to provide a framework that will assist with the identification and management of the key environmental risks associated with the RSF. The EMP provides guidance on the RSF environmental monitoring and reporting requirements and assigns actions when performance thresholds are exceeded. The objective of the Plan is to ensure that the RSF operates in a manner that causes no adverse impacts to people or the environment.

The RSF EMP should be read in conjunction with the RSF supporting documentation. This includes the RSF Design Report and the associated RSF Operating and Monitoring Manual.

- Knight Piesold, Residue Storage Facility, Definitive Feasibility Study – Design Report, prepared for Arafura Resources Pty Ltd, March 2019, Document Reference PE801-00140/12.
- Knight Piesold, Residue Storage Facility Operating and Monitoring Manual, prepared for Arafura Resources Pty Ltd, November 2018, Document Reference PE801-00140/8.

4.4.7 Closure

Each cell will operate for 7 to 9 years before deposition shifts to newly built cells. On decommissioning, each cell will be capped to isolate the deposited residue and reduce rainfall infiltration.

Long-term stable water management structures will be constructed across the facility and rockfill placed to control erosion in critical area. The facility will then be revegetated.

All closure activities, including progressive rehabilitation of the RSF, will be described further within the Mine Closure Plan.

4.4.8 Residue Storage Facility Surface Water Management

Surface water management will be characterised into dirty water systems and clean water systems.

Dirty Water Systems

Stormwater falling within the RSF area, including areas where any spillage may occur from piping and spigots, will drain into the RSF storage cells. Any stormwater collected in the piping corridor will be directed to lined sediment collection sumps for later clean-out or directed into the process plant dirty water system.

Clean Water Systems

Catchments include natural watercourses and drainage lines outside of the RSF and from the outside walls of the RSF with provision of infrastructure for flood protection levees, clean water diversions, and open drain systems.

Flow and stormwater diversion banks and cut off drains will be installed across the RSF area to divert clean water away from the disturbed areas and around infrastructure. This water flow, once directed around the disturbed area will be fed to downstream erosion and sediment control devices to manage and direct (disperse) new potentially focussed flow paths.

4.4.9 Residue Storage Performance Against Previous Mine Management Plan

No residue storage activities have been undertaken at the Project. In subsequent MMPs this section will provide an assessment of residue storage facility performance, including such factors as:

- Volumes of material in storage and updated planned volumes for the oncoming reporting period.
- Water recovery rates.
- Seepage recovery rates.

- Any leakage detected.
- Engineering upgrades and modifications to the design.

4.5 Operations Complex, Process Plant, Camp and other Facilities

An operations administration complex will be constructed centrally to the processing plant, complete with the following infrastructure to support the production activities, but not necessarily limited to:

- Security gatehouse, including emergency response and first aid with a carpark for the site ambulance, fire truck and emergency response trailer.
- Process plant administration building with office, meeting rooms, storerooms, kitchen and training facilities.
- Process plant control room.
- Changing rooms and associated laundry sized to suit the full workforce during operations allowing for a clean-in/clean-out operating philosophy to be adopted.
- Process plant laboratory including ventilation systems and specialised drainage systems.
- Process plant maintenance offices

All of these facilities will be of prefabricated modular construction. The following facilities will be structural steel fabricated buildings:

- Fixed plant maintenance workshop containing areas for the various trades and a washdown bay for decontamination of equipment prior to maintenance.
- Process plant warehouse for spares and consumables including an adjacent fenced laydown yard.
- Reagent stores to store bulk bags and IBCs of reagents with the store potentially broken into separate storage areas to facilitate safe storage and ventilation requirements.

The operations complex will also include two carparks, with one for vehicles confined to the controlled area and one for vehicles accessing only clean and public areas.

4.5.1 Mine Complex and Facilities

The mine infrastructure area (MIA) including the ammonia nitrate explosive storage area (ANESA) will be developed to support the operation of the mine and shall be located only a short distance from the open pit and ROM pad. The most efficient grouping of facilities and placement of buildings will be employed to minimise clearing and aid effective operation. Heavy vehicle parking (go-line /dead-line), turnarounds and mine laydown area will form part of the overall layout and function of the MIA/ANESA.

4.5.1.1 Buildings

The buildings at the MIA will include:

- Mine administration complex (provided by the mining contractor).
- Ablutions and crib facilities (provided by the mining contractor).

- Mine heavy and light vehicle workshop (provided by the mining contractor).
- Mine stores (provided by the mining contractor).
- Core storage shed to store the core and other exploration samples.

4.5.1.2 Other Facilities

The MIA will also include the following facilities not described elsewhere:

- Tyre change pad, fitting area and storage.
- Water storage tanks and ponds.
- Carpark.

4.5.1.3 Explosives Storage

The ANESA will be located off the mine access road at the distances from all infrastructure required under the relevant legislation.

The ANESA will consist of two areas, one for the storage and mixing of ammonium nitrate based bulk explosives and one for the storage of detonators and high explosives. The facilities will be provided either under the mining or explosives supply contract. The design will meet AS2187, Explosives Storage, Transport and Use.

The ANESA will be fenced with high security fencing, with lights for night-time operation and security monitoring.

4.5.2 Accommodation Village

The accommodation village will be located approximately 5 kilometres from the process plant, to be accessed along the main site access road. The accommodation village will be laid out to make use of the natural surface grade for drainage and earthworks and will be subject to a detailed site survey and geotechnical investigation.

For operations, the village will consist of 200 rooms operating (potentially) on a motelling arrangement. For construction, the camp will have a peak occupancy of 650 on a motelling arrangement.

Central facilities and permanent accommodation units will be purchased, while the additional accommodation units required during the construction phase will be leased and demobilised with the start-up of full-time plant and mining operation. The Village will be comprised predominantly of prefabricated transportable buildings (larger building being multi-modular style) for both the central facilities and the accommodation units. Site erected structural buildings for central facilities applications will only be used in the event prefabricated units are not practical.

An initial "fly-camp" will be developed using the first supply of leased construction camp rooms (approx. 50 beds) and be established to marry in with the overall village layout to avoid double handling. This fly-camp will be serviced by temporary utilities and services, including a mobile kitchen and wastewater collection/treatment system.

In addition to the accommodation provided at the village, approximately 50 accommodation units will be available at the nearby Aileron Roadhouse (approximately 15 kilometres from the Project village) to provide contingency peak accommodation and also act as a fly-camp to facilitate early works.

The buildings (central and accommodation) will use a range of noise and thermal insulation techniques to provide comfort and maximise energy efficiency. The central facility buildings will include the following:

- Kitchen dining building complete with freezer and cool room storages for food.
- Village administration building, office, medical and shop.
- Recreation building(s) that provide a range of functions including breakout rooms, training/inductions and gymnasiums.

4.5.3 Power Supply and Distribution

4.5.3.1 Power Station

The power station will consist of natural gas fired turbines, equipped with duct firing and a heat recovery boiler to support a load of approximately 34 MW. The power station will supply all of the electrical power required to operate the process plant and non-process infrastructure and will supplement the steam produced by the sulphuric acid plant.

The power station will also include standby natural gas fired or diesel fired generating sets to provide power when the load is significantly reduced and to provide black start capability. Diesel for diesel engines will be drawn from the main plant area diesel storage.

4.5.3.2 Village

An overhead power line will be installed between the power station and the accommodation village.

A local diesel generator will be included at the accommodation village substation to allow for emergency power to be provided to selected equipment during a power outage. This diesel generator will be directly connected to the substation low voltage motor control centre (LV MCC). Diesel for this generating set will be supplied from a local self-bunded tank.

During construction the village will be operated on local diesel fired generators.

4.5.3.3 Mine Area

Power for the mine area will be provided from a local diesel generating set feeding into an outdoor kiosk style LV MCC. Diesel for the mine area generating set will be drawn from the main mine diesel storage.

4.5.3.4 RSF Return Water

RSF return water pumps will operate from a local diesel generating set(s) located on the RSF. Fuel will be stored in “belly tanks” with refuelling by the service truck.

4.5.3.5 Borefields

Each borefield will have a dedicated diesel generating set and self-bunded fuel storage tanks. The generating set size and fuel storage will be sized for the anticipated power draw. Power will be distributed to the borefield equipment through an outdoor kiosk style LV MCC.

4.5.4 Water Supply and Distribution

4.5.4.1 Initial Construction Water Supply

An initial construction water supply will be developed from the Nolans Bore aquifer. This will consist of fitting out the current bore, with the potential to add a second bore if required. These bores will pump to a turkeys nest staging pond near Nolans bore, which will in turn pump to a turkeys nest storage pond at the village site.

4.5.4.2 Water Supply

Raw water to supply the Project will be pumped from the Southern Basins aquifers (Reaphook palaeovalley) located in the proposed borefield approximately 25 km to the southwest of the processing site.

The Project's projected water demand is a maximum of 4.8 GL per year. The Company's Groundwater Extraction License with DEPWS is currently being revised and submitted.

The borefields consist of at least five borefield cluster layout consisting of following infrastructure at each bore cluster:

- Three (3) production bores (nominally 100-200 metres apart) fitted with variable speed bore hole pumps (to allow operation at an average of 12 L/s), headworks and buried delivery pipelines.
- Three (3) observation bores for constant level monitoring.
- Collection tank for water from the three bores.
- Pumps to transfer the water from the collection tank to the central borefield collection tank (located at Borefield D) via buried delivery pipelines.
- Diesel fired generating set and diesel storage tank.
- Control system including instrumentation and microwave communications back to the process plant.
- Fenced compound.
- Minor service tracks.

The central borefield (Borefield D) will be fitted with a larger collection tank and will pump directly from the borefield area to the process plant via a buried pipeline installed predominately adjacent to the alignment of the AGP.

The borefield layout has been designed to concentrate the drawdown on the easternmost portion of the Reaphook palaeovalley and extract additional groundwater resource from the feeder palaeovalley

to the east. This design also allows extraction within a relatively close proximity to the Nolans site whilst minimising the impact on areas to the west and south thought to have the potential to contain groundwater dependent ecosystems (GDEs).

A significant groundwater monitoring program has been designed to provide ongoing information on aquifer properties, groundwater modelling validation and drawdown impact. New monitoring bores will be designed and installed throughout the reaches of the Reaphook palaeovalley aquifer systems and monitoring will continue for the life of mine.

4.5.4.3 Water Distribution

Raw, potable and desalinated water will be reticulated throughout the plant area for use in the process and for domestic users.

In addition, water will be pumped to the various consumers around site through a combination of overland and buried pipelines. This includes raw, potable water and brine water being pumped to the mine infrastructure area for use in the mine and raw water being pumped to the camp. Potable water will be produced via a reverse osmosis plant at the camp with brine pumped back to the process plant.

During construction temporary pipelines may be installed along the site access road and mine access road along with temporary storage for use in road construction and dust suppression for borrow and quarrying areas.

4.5.5 Wastewater Collection and Treatment

4.5.5.1 Construction

During construction temporary modular activated sludge wastewater treatment plants (WWTP) will be installed at the village with the Class C treated effluent being disposed of in a spray field close to the village or utilised for irrigation of landscaping within the village (using buried seepage irrigation or other appropriate methods in accordance with appropriate regulations). Sludge from the WWTPs will be removed by local contractors and disposed of off-site.

Temporary facilities at the worksites, such as crib rooms and ablutions, will have holding tanks to collect the wastewater which will be emptied by a local contractor and either discharged into the village WWTP system or disposed of off-site.

4.5.5.2 Permanent Facilities

Permanent wastewater facilities will have all wastewater collected in the process plant site and village pumped to a central activated sludge WWTP located close to the process plant. Class C effluent from this WWTP will be recycled to the process plant for re-use as process water. Sludge will be removed by a local contractor and either disposed of off-site or disposed on-site in the tip waste facility.

The permanent camp may also include a grey water collection system which will collect wastewater from suitable sources for direct irrigation of landscaping.

Wastewater at the mine infrastructure area will be pumped to a central holding tank which will be pumped out by a local contractor on a regular basis and discharged into the central WWTP of taken for disposal off-site.

4.5.6 Waste Management

4.5.6.1 Construction

All waste materials generated during the construction period from construction activities, or the village, will be sorted and collected in a central waste disposal facility. Waste in this facility will be collected by a local contractor for disposal and recycling off-site.

4.5.6.2 Operations

Waste generated during operations will be disposed of as follows:

- Waste from the village and the office sorted into the central waste disposal facility and then collected by a local contractor for disposal and recycling off-site.
- Putrescible waste will be dehydrated at site and then re-used for fertiliser in landscaping or other places.
- Waste hydrocarbons will be collected in storage tanks located at the mine workshop and fixed plant workshop and will be collected by a local contractor for recycling or disposal off site.
- Contaminated soils will be either disposed of in the RSF where the contamination is with process chemical or remediated in a facility at the site waste disposal facility before being disposed of in the WRDs.
- Potentially contaminated waste (chemicals or NORM) will either be:
  - Decontaminated in the site washdown facilities before being sorted at the site waste disposal facility and collected by a local contractor for recycling or disposal off site; or
  - Disposed of in a compliant on-site landfill if appropriate guidelines and regulations allow.

4.5.7 Fuel Storage and Distribution

Diesel fuel will be required on site to service mining operations (both fleet and support vehicles), non-mining fleets (light vehicles, buses, emergency gensets, etc.), borefield power generation and the power station.

Diesel fuel storage will be installed at the mine area, process plant, each of the borefields and the village with supply of diesel by road tanker from Alice Springs. Fuel storage tanks will be double skinned, self-bunded fuel tanks with loading/unloading slabs constructed to contain spills and 10-year ARI 24-hour design storm events.

A refuelling facility will be installed at the mine infrastructure area, complete with a light vehicle bay (provision for B-triples) and a heavy vehicle (haul truck) bay, and at the process plant area, with refuelling only for light vehicles.

Permanent fuel dispensing forecourts shall provide a reinforced concrete slab containment area, with both spill and runoff areas to be drained to a collection sump for pumping and processing in a hydrocarbon oily-water separator installed as part of the vehicle washdown systems.

Smaller remote generating sets at the RSF, explosives magazine and for diesel driven pumps around the site will run from internal belly tanks filled from the service truck.

Fuel storage volumes will be:

- Mine area – 2 x 110,000 L tanks, high flow and low flow dispensing and fuel supply to mine area generating sets.
- Process plant area – 1 x 110,000 L tank, low flow dispensing and fuel supply to the power station.
- Village – 1 x 50,000 L tank with temporary integrated low flow dispensing to provide fuel supply to the generating sets at the village.
- Borefields – 1 x 30,000 L tank at Borefield D and 4 x 10,000 L tanks at the other borefields, providing fuel supply to the generating sets at each borefield.

4.5.8 Access Roads and Tracks

Proposed road corridors have been selected to avoid sensitive vegetation and heritage sites. Roads will be designed and constructed using conventional techniques with due consideration for minimising changes to surface water flows, through construction of floodways and/or culverts and/or installation of side drains where necessary. Baseline biodiversity data and hydrology studies will be used during the road design to avoid impact to sensitive areas. Roads will be built to relevant Austroads guidelines, Australian Road Research Board (ARRB) Unsealed Roads Manual and NTG design standards.

4.5.8.1 Site Access Road and Village Road

The main site access road from the Stuart Highway to the processing site also typically follows the alignment of the existing station tracks and will be constructed to a public road standard with a pavement width suitable for the safe passing and overtaking of heavy vehicles (i.e. road trains). The road has been designed as an all-weather road and will have a two-coat bitumen sprayed seal surfacing for its entire length, with signage, road markings, etc. Along this planned alignment there are a number of archaeological sites that have been identified and work is underway or planned to avoid or record these sites prior to construction.

The 16km site access road intersects with the Stuart Highway approximately 5 km south of the Aileron Roadhouse. This main intersection will conform with the NT Government (NTG) requirements for intersections, including spacings and surface treatments, and design shall include provisions of auxiliary lanes to accommodate accelerating and decelerating truck traffic travelling on the Stuart Highway.

4.5.8.2 Mine Access Road

The mine access road between the processing site and the mine site will provide general access for personnel and serve as the haul road for trucking ore to the process plant. Traffic volumes will be

relatively low, which, coupled with an adequate design speed, will accommodate an unsealed road for this approximate 8.5-kilometre alignment.

This road has been positioned to avoid the registered sacred site [redacted]

Increased dust suppression efforts and regular maintenance will be employed to ensure the mine access road always remains serviceable.

4.5.8.3 Process Plant Internal Roads

Internal roads throughout the process plant will be constructed to an appropriated engineered standard providing a narrow unsealed dual carriageway arrangement as compared to the main access roads. Traffic volumes will be limited; however, these roads will receive regular watering for dust suppression.

4.5.8.4 Other Project Accesses

Other project roads, more prudently coined 'Access Tracks', including those to, and within the, borefield, will likely be of a lesser quality but all will be constructed to ensure user safety as a guiding principle, with natural drainage maintained where possible. All access tracks will be appropriately signed.

4.6 Vehicle Washdown

Vehicle washdowns located at key locations around the site will provide for the effective removal of mud and dust and ensure vehicle cleanliness for maintenance, but also aid in site radiation management. Vehicle washdowns will be incorporated at the process plant main gate and mine infrastructure area. The mine area washdown will incorporate washdowns for light vehicles and road trains and heavy vehicles in separate washdown areas.

Washdown areas will utilise a combination of automatic sprays, manual cannons and manual hose reels and will be constructed over a containment slab which will drain to a sump systems / sediment trap, complete with bobcat/front end loader accessibility for removal of heavy sediments, before collected water is directed through an oily-water separator for treatment to remove hydrocarbons and sediments. Clean water will be directed to either the mine dust control water system or the beneficiation process water pond. Hydrocarbon impacted sediments will be removed by a bobcat and remediated at the site hydrocarbon bioremediation facility. Hydrocarbons will be collected in a waste oil tank and removed from site by a specialist contractor.

4.7 Communications

Communications for the site will be via a microwave link that connects into the existing optical fibre backbone that runs adjacent to the Stuart Highway or the Alice Springs to Darwin rail line. The microwave link will consist of:

- A communications tower near Aileron roadhouse or along the Alice Springs to Darwin rail line with a connection to the optical fibre. This will connect the main communications tower to the external communications infrastructure.

- A main communications tower on the hill behind the accommodation village with access via a track from the accommodation village.
- Communications towers at the accommodation village, process plant operations complex and mine infrastructure area that connects to the main communications tower and this local communications infrastructure.
- A communications towers at each borefield to connect the borefield control system to the main communications tower and from there the plant control system.

All of the remote communications equipment will be run from solar power and all systems will be backed up with batteries to ensure constant communications availability.

The main communications tower will also provide a digital two-way radio repeater system for communication around the site.

No mobile phone tower is currently planned to be installed with mobile phones able to operate through connection to the Wi-Fi networks that will be established in the village and work areas.

4.8 Infrastructure Area Performance Against Previous Mine Management Plan

No infrastructure activities have been undertaken at the Project. In subsequent MMPs this section will provide an assessment of infrastructure performance, including such factors as:

- Water usage, by type (i.e., raw water, desalinated water, potable water).
- Energy Usage (power and natural gas).
- Engineering upgrades and modifications.
- Detail any new infrastructure initiatives, developments or changes proposed for the oncoming reporting period.

4.9 Exploration

No exploration activities are planned on the granted Mineral Leases at this time.

5.0 ENVIRONMENTAL MANAGEMENT

5.1 Environmental Management Structure

The environmental management structure is presented in Figure 1-3

5.2 Environmental Policy

One of Arafura's key objectives is to minimise impact on the environment.

As an organisation, Arafura will:

- Integrate the principles of sustainable development into everyday operations.
- Comply with all legislative requirements for the environment.
- Work collaboratively with the community and governing bodies to ensure that a best practice approach is taken to environmental management.
- Encourage employees to value the environment in which Arafura operates.
- Sustainably manage the use of valuable natural resources, like groundwater, and actively look for project efficiencies to minimise impacts.
- Protect the biodiversity of the area.
- Actively reduce, re-use and recycle materials and consumables.
- Maintain an open consultation process with regulators and the community.
- Ensure the rehabilitation of disturbed areas.

5.3 Environmental Commitments

5.3.1 Commitments Contained in the MMP

A summary of project commitments is presented in Table 5-1- Table 5-15 for the following groups:

- Residue Storage Facility
- Processing Plant
- Waste Rock Dump
- Water Management
- Community
- Traditional Owners
- Air Quality
- Heritage
- Radiation
- Transport
- Waste
- Human Health
- Hazardous Substances
- Emergency Management

Table 5-1 Residue Storage facility commitments summary

Mining Area	Commitment	Complete / Date	MMP Reference / Comment	Performance
Residue Storage Facilities	Final RSF design to be included in the Mine Management Plan. ▪ All storage structures will be built to ANCOLD guidelines ▪ RSF will have a design storage capacity to contain a 1 in 100-year ARI average annual rainfall whilst retaining sufficient additional freeboard to accommodate a probable maximum precipitation (PMP 72-hour storm rainfall event. ▪ RSF design will include a low permeability liner system to reduce potential seepage vertically and laterally. ▪ The liner system will achieve a minimum 1 x 10-8 m/s permeability when placed. If clay liners are used it will be placed in layers and compacted and tested.	Not yet complete to final design level / 2021/2022	KP, DFS RSF Design Report Rev 0 During FEED Arafura will do the final design	80% Complete
	All RSF construction will be supervised by qualified engineering personnel. A construction quality assurance plan be implemented to ensure constructed dams meet design criteria. The plan will include quality control measures during the construction of the storage facilities, including records of the construction process and quality control results.	Post Approval	The RSF complex has been designed by competent engineers to the appropriate standards. It will be constructed under engineering supervision with testing to confirm design and construction criteria are being met.	Not yet complete
	Undertake further site investigations to identify suitable borrow areas on site and nearby. Alternative borrow areas subject to additional regulatory approval prior to commencing with construction works.	2021	Geotechnical investigation are being undertaken to identify the suitable sources of construction materials.	Not yet complete
	Management plans will be developed and implemented to ensure that the dams are operated and managed in accordance with the design intent and will require that relevant records are kept. Monitoring Plan for the RSF to include: ▪ Embankment piezometers to monitor the phreatic surface within the RFS embankment. ▪ Install shallow seepage detection bores outside but near the toe of embankments. ▪ Daily inspections to identify evidence of seepage.		This is included in the current concept design for the RSF and will be included in the final design report and installed in construction. See separate management plan.	To be completed after FID
	Annual dam safety audit will be completed by a suitably qualified person to inspect all the aspects of the dam, which includes the geotechnical stability of the dam and seepage.		This is a detailed in the RSF management plan.	
	Develop a Water Management Plan which incorporates an Emergency Response Plan including with specific actions to be implemented proactively to reduce the potential of an uncontrolled release or dam failure.	Yes / 2021	Section 5: Water Management Plan (WMP) and Environmental Emergency Management Plan (EMMP)	100% Complete

Table 5-2 Process plant commitments summary

Mining Area	Commitment	Complete / Date	MMP Reference / Comment	Performance
Processing plant	Final process plant design to be included in the Mining Management Plan, with a statement that the processing area will be inspected, and action taken to clean spills and maintain sumps and sump pumps.	Yes	EMP: Hazardous substance management	100% Complete
	Processing area will be lined and drained to sumps for pumping back into the process or discharge to the tailings and residue storages.	Post approval	EPA 14 A notification - KP Design Docs	100% until approval

Table 5-3 Waste Rock dump commitments summary

Mining Area	Commitment	Complete / Date	MMP Reference / Comment	Performance
Waste Rock Dump	Final WRD design to be detailed in the Mining Management Plan when 'representative' waste rock is available from the mining process for further test work.	Post approval	Statement in MMP.	100% until approval
	Studies to be completed during operations utilising local material, to validate information on the degradation of engineered barriers and capping over time.	Post approval	Statement in MMP.	100% until approval
	WRD design to manage potential seepage into groundwater or surface water drainage lines.	Yes / 2020	EPA 14 A notification - KP Design Docs	100% Complete
	Undertake further testing the proposed thickness of covering for radioactive materials in WRDs.	2021	Section 5: Radiation Management Plan (Arafura / Jim H)	100% complete

Table 5-4 Water management commitments summary

Mining Area	Commitment	Complete / Date	MMP Reference / Comment	Performance
Turkeys nest	Turkey's nest dams are to be located outside of flood affected areas.			
Slurry pipeline	Telemetry systems to be used to monitor the pipeline for leaks, which will automatically stop pumping and alert maintenance staff. Provide minimum 400m^3 storage in the event ponds, and bunding of the pipe corridor.	**N/A**	N/A - 14A notification outlines the design change to the process which removes the need for a Slurry pipeline.	**N/A**
Water Balance	The water balance model will be updated when final detailed design is completed.	Yes	Plant and RSF water balance updated and presented in 14A notification document.	100% Complete
	The water balance will be updated when operational to assess the performance of the proposed water management system.	Yes	Commitment in the water management section	100% / ongoing assessment

Table 5-5 Community commitments summary

Mining Area	Commitment	Complete / Date	MMP Reference / Comment	Performance
Community	Develop and implement a Social Impact Management Plan including: ▪ Establish a community reference group if requested by stakeholders. ▪ Appoint a community liaison person. ▪ Establish a presence in Alice Springs office. ▪ Develop protocols to manage all community related matters including a register to record, resolve and report on issues raised.	Post approval	Social - economic management plan Section 2.2. outlines the statement of actions to be undertaken post approval	Partially complete and some aspects won't be in place until after FID commitment or when requested by stakeholders
	Produce the following management plans and make them available on company website: ▪ Environmental, health and safety plan ▪ Community engagement plan ▪ Workplace and employment plan ▪ Traffic Management Plan ▪ Waste Management Plan, and ▪ Local Industry Participation Plan (to be developed after project approval).	Partial / TBC after approval	Section 5:	Plans Complete
	Establish an annual budget for continued communication on the project.		Will be implemented after FID	
	Establish an annual budget for sponsorship of projects within its area of operations.		Will be implemented after FID	
	All staff and contractors to complete cultural awareness training.		Will be implemented after FID	
	Develop, in consultation with community reference group, key indicators to be monitored and reported on annually.		Part of Native Title Agreement	

Table 5-6 Traditional owners commitments summary

Mining Area	Commitment	Complete / Date	MMP Reference / Comment	Performance
Traditional Owners	Finalise the mining agreement/ILUA with the CLC and Traditional Owners including: ▪ Access to land ▪ Annual visits to the mine site (if requested) ▪ Ongoing engagement commitments ▪ Protection and management of cultural sites and objects ▪ Environmental commitments ▪ Community benefits package and ▪ Employment and business development. ▪ Onsite meetings with Traditional Owners to discuss the management of archaeological sites and/or sacred sites prior to any works being undertaken and the likelihood of bush tucker consumption from the mine area.	Executed in June 2020	A Native title Agreement has been signed with the registered body corporates that represent the Native title Holders. The agreement outlines a number of commitments that mee t these requirements. In addition, a stakeholder engagement strategy has been written in collaboration with a wide range of project stakeholders. A Community Benefits Agreement has been written and approved by NTG and Federal governments. Documentation is being prepared to ensure local participation in the project.	Completed and being registered with National Native Title Tribunal

Table 5-7 Air Quality commitments summary

Mining Area	Commitment	Complete/ Date	MMP Reference / Comment	Performance
Air Quality	Develop and implement an Air and Dust Management Plan to mitigation dust impacts, including: ▪ Chemical treatment or water spraying to treat roads ▪ Implement road speed limits ▪ Seal access road from Highway to Mine ▪ Minimise open areas exposed to wind erosion ▪ Topsoil striping to occur only during suitable wind and weather conditions ▪ Ore to be sprayed with water prior to entering crushing circuit ▪ Float cells will be installed on the windward side of the crushing circuit and a dust suppression system over the jaw crusher and ▪ Continuous dust monitoring as required during preproduction and construction at site boundary and sensitive receptors Develop and implement Erosion and Sediment Control Plan. ▪ Design of all aspects of the rare earths plant to include emission controls (scrubbers) to minimise dispersion of emissions. ▪ Power Station stack height to be a minimum of 12.5 m and have an internal diameter of 0.6 m. ▪ Acid Plant stack height to be a minimum of 20 m and have an internal diameter of 1.36 m.	Yes / Draft 2020	All roads are being designed and will be managed to minimise dust emission. Main access road will be bitumen sealed. Where required speed limits will be mandated. Section 5: Air and Dust Management Plan (Appendix 3) Section 5: Erosion and Sediment Control Plan (Appendix 6) Crushing circuit is fully enclosed. Plant is being designed to meet all appropriate Australian emissions control standards. Dust monitoring has been in place at site for in excess of 10 years and will continue.	Plan Complete

Table 5-8 Heritage commitments summary

Mining Area	Commitment	Complete / Date	MMP Reference / Comment	Performance
Heritage	Liaise with Traditional Owners and custodians, via onsite meetings, regarding cultural heritage management and specifically including the management of [redacted] ▪ Gain AAPA clearance certificate and CLC clearance certificates prior to construction commencing. ▪ Gain regulatory approval if removal of cultural sites is required. ▪ Undertake archaeological survey to identify sites of heritage value. Development and implement a Cultural Heritage Management Plan, including: ▪ Buffer distances or fencing surrounding identified and agreed archaeological sites and/or sacred sites ▪ Pre-clearing / disturbance visual investigations ▪ Research plan for an appropriate recording and salvage program (if requested) ▪ Procedure for managing unexpected finds and unintentional disturbance ▪ Mine site induction to all employees/visitors to include the identification and management of artefacts and cultural sites. Investigate options to realign access road to avoid [redacted] Continue to liaise with Traditional Owners regarding the management of [redacted] Finalise Mining Agreement including provisions for: ▪ Access to land and ▪ Visits to the mine (if requested).	Ongoing	Cultural Heritage and Soc-economic Management Plan	Plan written and CLC Sacred site clearance in place for entire project area [redacted] has been avoided with realignment of haul/mine access road New AAPA certificate will be applied for prior to construction commencement

Table 5-9 Radiation commitments summary

Mining Area	Commitment	Complete / Date	MMP Reference / Comment	Performance
Radiation	Develop and implement a Radiation Management Plan (including Regulator approval), referencing appropriate ARPANSA Codes of Practice including: ▪ Determine baseline radiation levels, with ongoing monitoring of radiation levels at the processing site and accommodation ▪ A baseline dataset of uranium levels in groundwater to be obtained prior to development works on site. ▪ Water to be used for dust suppression will need to comply with certain criteria before being used. The final criteria will be part of the approved Air Quality and Dust Management Plan (part of the Mine Management Plan). ▪ Radiation action levels, for both workers and the public that trigger internal investigations or other controls ▪ Identification of Controlled Areas ▪ Undertake regular testing of radiation levels and implement occupational health and hygiene practices for staff. Radiation doses will be incorporated into the ARPANSA ANRDR. and ▪ Radiation Safe Work Permits for work within a Controlled Area. ▪ All materials leaving site will be transported in accordance with the relevant transportation codes. A grade control management system to be implemented with trucked wasterock to pass through two radiometric analysers when exiting the pit Equipment exiting the Controlled Areas will first require formal decontamination clearance. Equipment and vehicles exiting will be required to pass through the Clean/Dirty boundary with wash down bay and facilities provided.		All of these matters are addressed in the EIS and the project radiation management plan.	Plan complete

Table 5-10 Transport commitments summary

Mining Area	Commitment	Complete / Date	MMP Reference / Comment	Performance
Transport	Develop and implement a Traffic Management Plan, including: ▪ Journey Management Plans ▪ Channelisation of Stuart Highway ▪ Site speed restrictions ▪ Tyres and rims management plan and ▪ Compliance with AS1742.3.		Traffic Management Plan TBC after FID commitment	
	Consultation with NT Department of Infrastructure, Planning and Logistics regarding Stuart Highway intersection.		Consultation has taken place and a draft concept intersection plan provided for comment/approval,	

Table 5-11 Waste commitments summary

Mining Area	Commitment	Complete / Date	MMP Reference / Comment	Performance
Waste	Develop and implement a Waste Management Plan including compliance with: ▪ Central Australian Remote Landfill Operating Manual ▪ Waste Management Guidelines for Small Communities in the Northern Territory ▪ Guidelines for the Siting, Design and Management of Solid Waste Disposal Sites In the Northern Territory ▪ Cover landfill rather than burn it.	Yes / 2021	EMP (Waste Management Plan)	Plan Complete

Table 5-12 Human health and safety commitments summary

Mining Area	Commitment	Complete / Date	MMP Reference / Comment	Performance
Human health and safety	Develop and implement a Health and Safety Management Plan to mitigate the risk to human health and safety. The Management Plan will include emergency response procedures in the event of an emergency or accident, with the consideration of Environmental Health Fact Sheet (No. 700) as a Requirement for Mining and Construction Project /DoH requirements for mining camps and construction camps in the NT (https://nt.gov.au/property/building-and-development/health-requirements-mining-construction-projects).		TBC by Arafura – Construction specific, which will then be modified and transitioned into an operational plan.	

Table 5-13 Hazardous substances commitments summary

Mining Area	Commitment	Complete / Date	MMP Reference / Comment	Performance
Hazardous Substances	Develop and implement a Hazardous Substances Management Plan including: Ensure handling and storage of hazardous substances are in accordance with relevant Australian standards Detail hazardous substances inventory requirements and Detail fuel inventory and investigation requirements. Detail fuel inventory and investigation requirements. Provide spill response procedures and subsequent investigation requirements. Finalise onsite chemical inventory and update risk assessment.	Yes / 2021	EMP (Hazardous Management Plan)	Plan Complete

Table 5-14 Emergency management commitments summary

Mining Area	Commitment	Complete / Date	MMP Reference / Comment	Performance
Emergency management	Liaise with the Local Emergency Coordinators regarding potential off-site emergencies.		TBC after approval.	
	Guidance, advice and assistance to be provided as requested by the Local Controller.		TBC after approval.	
	Finalise onsite chemical inventory and register (and update risk assessment).		TBC after approval	
	Provide the Local Controller a copy of all MSD Registers.	Ongoing	Ongoing update of the Hazardous Management Plan	
	Develop and implement an Emergency Response Management Plan including: ▪ Emergency Response Team will undergo regular training and participate in regular mock and desktop exercises regulatory reporting requirements ▪ Emergency Response Plans for potential incidents and ▪ Trained emergency response personnel will also be available to assist in emergency management as required by the Local Controller upon request.	Yes / 2021	EMP (Emergency Response Plan)	

5.3.2 Recommendations Resulting from Formal Environmental Assessment

The project was assessed by the NT EPA, with assessment provided in the form of a formal report: NT EPA, Environmental Assessment Report 84, Nolans Project Arafura Resources Ltd December 2017.

A set of sixteen recommendations were presented as part of the NT EPA assessment of the EIS, as documented in the NT EPA, Environmental Assessment Report 84, Nolans Project Arafura Resources Ltd December 2017. A summary of the recommendations and reference to where they have been addressed is presented in Table 5-15.

Table 5-15 Environment impact assessment recommendations and issues

Recommendation	Reference Sections	Performance against Commitment
The Proponent or Operator shall ensure that the Nolans Project is implemented in accordance with all environmental commitments and safeguards outlined in the final Environmental Impact Statement for the Nolans Project (draft Environmental Impact Statement and Supplement) recommendations from the Assessment Report 84.	Section 5.3 Environmental Commitments	**Complete:** Recommendation has been met through the development of the MMP and associated water, borefield, closure and general environmental management plans.
The Proponent or Operator shall provide written notice to the Northern Territory Environment Protection Authority and the responsible Minister if it alters the Nolans Project and/or commitments in such a manner that the environmental significance of the action may change, in accordance with clause 14A of the Environmental Assessment Administrative Procedures.	Commitment statement to be added to MMP, so that any changes to construction / operational project plans are communicated to the NT EPA.	**Complete / Ongoing:** Recommendation already meet through the GHD report, *Arafura Resources Ltd – Nolans Project Section 14A notification*, May 2019 Ref: 4322795 .
Before approvals or decisions are given or made for the Project, the Proponent or Operator shall provide to the relevant regulator a Water Abstraction Management Plan for the Nolans Project.	Section 6.0 WATER MANAGEMENT PLAN, Section and **APPENDIX R** ARMS-0000-H-PLN-N-0011 WATER ABSTRACTION MANAGEMENT PLAN**:** GHD, 2021, Arafura Resources Ltd, *Water Abstraction Management Plan*, Rev1	**Complete:** Recommendation has been met through the WAMP document and associated studies which have been used to inform its development.
The Water Abstraction Management Plan established in recommendation 3 must include assessment and management of any stock or drinking water bores that could be impacted by the Project, in agreement with the owners and/or operators of those bores.	Section 6.0 WATER MANAGEMENT PLAN and **Appendix A:** GHD, 2021, Arafura Resources Ltd, *Water Abstraction Management Plan*, Rev1	**Complete:** Recommendation has been met through the WAMP document and development of a Hydro Census data template for the assessment and management of identified stock or drinking bores.
The Water Abstraction Management Plan established in recommendation 3 must incorporate an assessment of groundwater dependent ecosystems.	Section 6.0 WATER MANAGEMENT PLAN and **Appendix A:** GHD, 2021, Arafura Resources Ltd, *Water Abstraction Management Plan*, Rev1	**Complete:** Recommendation has been met through the WAMP document and associated studies which have been used to inform its development.
Mining approvals in relation to groundwater abstraction should include conditions that require the Proponent or Operator to: ▪ Allocate clear responsibilities and accountabilities for water use and management ▪ Provide, in the Water Management Plan, regular updates of the projected water balance for the Project, including detailed estimates for the various phases of the Project and specifying the source and quantity of the water to be used ▪ Demonstrate how water considerations are integrated in Project planning including final Project design and technologies ▪ Report on continual improvement initiatives in water use and efficiencies including the provision of relevant water use targets ▪ Provide details on how water would be effectively managed during Project operations, including minimising water consumption, maximising water reuse and preventing water waste including unnecessary or excessive flow or flood of water ▪ Abstract water from bores only when equipped with operating flow meters ▪ Record the volume of water abstracted from the borefield and the mine site as reported in the Water Abstraction Management Plan (recommendation 3) ▪ Provide an annual Water Management Report to stakeholders. This is to include water use performance, performance in relation to triggers and any changes in triggers	Section 6.0 WATER MANAGEMENT PLAN and **Appendix A:** GHD, 2021, Arafura Resources Ltd, *Water Abstraction Management Plan*, Rev1: Section 3, 6 and 9.	**Complete:** Recommendation has been met through the WAMP document and development templates and forms to monitor / manage groundwater abstraction.
Before approvals or decisions are given or made for the Project, the Proponent or Operator shall provide to the relevant regulator an updated Kerosene Camp Creek diversion design and modelling that demonstrate how the diversion would:	Section 6.0 WATER MANAGEMENT PLAN and APPENDIX P Diversion Management Plan and GHD, 2019 *Arafura Resources LTD - Nolans Project Section 14A Notification: Section 4.2* - Kerosene Camp Creek - Stage 1 interim diversion	**Complete:** Recommendation has been met through the Kerosene Camp Creek diversion management plan.

Recommendation	Reference Sections	Performance against Commitment
Before approvals or decisions are given or made for the Project, the Proponent or Operator shall provide to the relevant regulator an updated Acid and Metalliferous Drainage (AMD) Management Plan for the Nolans Project. The AMD Management Plan must, at a minimum, provide:	**Section 5.6.3** – Environmental Management Plans	
Before approvals or decisions are given or made for the Project, the Proponent or Operator shall engage an appropriately qualified and experienced Independent Certifying Engineer (ICE) to oversee the design and any works undertaken at the waste storages (Tailings Storage Facility, Residue Storage Facility and Waste Rock Dumps). The ICE is to provide:	**TBC after approval**	**20% Complete:** Mine closure plan has been developed which indicates a cost and preparation for the decommissioning and final rehabilitation of the RSF.
Before approvals or decisions are given or made for the Project, the Proponent or Operator shall provide to the relevant regulator an updated erosion and sediment control plan for the Project. The plan should outline all permanent and temporary erosion and sediment control measures proposed to be installed for the Project. The updated plan should be prepared by a suitably qualified person and in accordance with the international standards for erosion and sediment control (as amended from time to time) or higher standard. An independent, suitably qualified and experienced auditor should be engaged to review and approve the plan, and to inspect and approve work is undertaken according to the plan.	**Section 5.6.3** – Environmental Management Plans Erosion Sediment Control Management Plan Sediment sampling procedure 14A Notification, which outlines the final mine site design and water control structures.	**95% Complete:** Recommendation has been met with the exception that the management plans and design is awaiting peer review.
Before approvals or decisions are given or made for the Project, the Proponent or operator shall provide to the relevant regulator a Biodiversity Management Plan for the Project. The Biodiversity Management Plan must, at a minimum, contain: ▪ an identification of potential project impacts and risks, mitigation measures and preventative actions for the protection of biodiversity values and habitat for threatened species ▪ a procedure for pre-clearance surveys for threatened species, including the great desert skink ▪ the final alignment of the borefield access track, incorporating a buffer of at least 200 m around the known warren of the great desert skink ▪ the scope, standards and timeframes for a flora and fauna monitoring program ▪ procedures for managing fire risk from the Project on habitat for threatened species ▪ weed hygiene and control procedures for avoiding the introduction and/or spread of weeds into habitat for threatened species ▪ procedures for avoiding and/or managing the risk of introduced fauna on threatened species ▪ goals, measures and criteria for the rehabilitation of habitat for threatened species following the closure and decommissioning of the Project.	**Section 5.6.3** – Environmental Management Plans Biodiversity Management Plan	**Complete:** The recommendation has been completed through the development of the Biodiversity management plan, attached to this MMP in Appendix A.
The Proponent shall establish the Community Reference Group as a forum to consult with stakeholders on agreed post mining land uses and engage on the broader environmental management and performance of the Project's operations including water use, monitoring results, and mine closure and rehabilitation.	**Section 2.2.4** – Community Affairs	**0% Complete:** TBC post approval, statement outlined in this MMP. This is a requirement of our commitment in our social Impact Assessment and is included in our signed Native Title Agreement. To be completed after FID.
Prior to the commencement of any construction, the Proponent or Operator must obtain relevant authorities and consents to disturb any/all sites of historical and cultural significance that may be disturbed by the Project.	**Section 3.3 –** Sacred, Archaeological and Heritage sites	**Complete:** CLC Sacred Site Clearance Certificate
The Proponent or Operator shall engage an independent process safety expert, endorsed by the relevant regulator to: Develop a process safety plan that details how process safety systems would be implemented to prevent the occurrence of a major process safety incident		Process Safety Plan to be completed prior to the process plant commissioning.

Recommendation	Reference Sections	Performance against Commitment
Approvals and decisions for the Project shall have conditions that require the Mine Closure Plan to progressively include: ▪ Alternative risk based rehabilitation options that identify a range of closure scenarios and strategies for the Waste Rock Dumps, Residue Storage Facility and the pit and provide justification that the preferred closure option minimises environmental risks ▪ Identification and management of knowledge gaps relating to closure- specific technical information; including environmental baseline data, waste characterisation, pit lake characterisation, and review of monitoring data; to inform sustainable mine closure ▪ Details of pre-closure research trials, investigations and modelling aimed at closing knowledge gaps to inform detailed rehabilitation design. These are to include, but not be limited to, revegetation trials, final cover materials, capping design and groundwater studies particularly in respect of drawdown in the vicinity of the mine pit. ▪ The Mine Closure Plan is to be peer reviewed by an appropriately qualified independent professional prior to submission to the relevant regulator.	**Section 8 – Closure Planning**	Statements to be included in the Mine Closure Plan, which provides updates relating to the ongoing works associated with closure planning. Section on the reporting of trails / research / works completed through the mine operation phase – (potentially a statement could be added to the **Key Environmental Activities**
Before approvals or decisions are given or made for the Project, the Proponent or Operator shall provide to the relevant regulator a conceptual Mine Closure Plan that must be reviewed and updated every three to five years. Details of what should be included in the plan is outlined in the EPA recommendations report.	**Section 8 – Closure Planning**	**95% Complete:** Recommendation has been met with the exception that the management plans and design is awaiting peer review.

5.4 Environmental Training and Education

All employees and contractors will receive a site induction that will include:

- A project overview.
- Site policies.
- Pertinent legislation and operating licenses covering the project.
- Roles and responsibilities of the employees and management.
- Incident reporting guidelines.
- Job risk assessments.

In addition, the environmental portion of the induction will cover:

- Environmental department roles and responsibilities.
- Cultural heritage.
- Land clearing commitments and the site ground disturbance permit process.
- Weed management.
- Surface water management.
- Dust management.
- Chemical spills and hydrocarbon management.
- Flora and fauna highlights, issues and management.
- Environmental legislative and license commitments that must be followed.
- How the various jobs could affect any of the above.

In addition, all full-time employees and contractors will undertake a cross-cultural training programme.

5.5 Environmental Emergency Preparedness and Response

Environmental emergency preparedness and response is detailed in the EMP Emergency Response Management Plan in APPENDIX I.

Arafura will establish and maintain an Emergency Response Group (ERG) for the project to provide emergency services for the construction and operations when required.

Training and response skills for the ERG will include:

- Working at heights rescue.
- Confined space rescue.
- Medical evacuation.
- Fire (building, chemical and equipment) and bushfire management.
- Emergency evacuation.

- Critical incident management.
- Plant accident.
- Chemical spills and hazard containment.
- Management of the project during a heavy rainfall event.

5.6 Implementation, Monitoring and Review

5.6.1 Identification of Environmental Aspects and Impacts

An assessment of the activities associated with the project, including those carried out by contractors and suppliers, was completed. As per the MMP outline, the following environmental aspects have been considered:

- Emission to air.
- Releases to surface water or groundwater.
- Releases to land and or impacts to flora or fauna.
- Use of raw materials and natural resources.
- Use of energy.
- Energy emitted such as radiation, vibration, noise.
- Waste.
- Land management / soil.

Potential impacts may include, but are not limited to:

- Disturbance to heritage or cultural sites.
- Disturbance to communities.
- Erosion of land.
- Harm to threatened species.
- Pollution/contamination to air, water or land.
- Introduction and spread of non-native species.

5.6.2 Risk Assessment

The assessment of the environmental risks to the project was initially completed as part of the EIS assessment of the project. This assessment, combined with the other technical assessment has been used to develop a risk register, which summarises the potential for environmental risks arising from project activity / events as part of the construction and operation of the project.

A summary of the current project risk register is provided in APPENDIX V. In addition, an outline of how the environmental risks were assessed is also summarised, highlighting different areas of environmental concern and how the likelihood and consequence is assessed and will be assessed as the project progresses

In the risk register, for each potential consequence, a set of activities, controls or monitoring is proposed to prevent the risk to the environment. The residual risk has then been assessed and assigned a rating of low, medium or high. The applicable document which corresponds to the details on how the environmental risk will be managed is then referenced.

The risk register will be reviewed at the end of each reportable period to ensure that the activities and risk register stays relevant to the current stage of the project. The risk register has been used to design the environmental management activities, controls and monitoring to prevent or minimise those environmental impacts.

The management of the environmental risks will be completed through a series of project specific environmental management plans, which provide the following information around the management of the risk:

- Standards and procedures.
- Hazard identification.
- Risk assessment.
- Risk control.
- Frequency of assessment.

5.6.3 Environmental Management Plans (EMP)

A set of EMPs have been written to describe how Arafura will prevent, minimise or mitigate the environmental impacts identified from the risk assessment process, and to meet the environmental commitments and recommendations outlined in Section 5.3. They are provided in APPENDIX A - APPENDIX R and cover:

- Water Management Plan (Section 6.0)
- ARMS-0000-H-PRO-N-0001 GROUNDWATER SAMPLING PROCEDURE
  - Groundwater Sampling Form
  - Example COC
- ARMS-0000-H-PRO-N-0002 SURFACE WATER SAMPLING PROCEDURE
  - Surface Water Sampling Form
  - Example COC
- ARMS-0000-H-PRO-N-0003 SEDIMENT SAMPLING PROCEDURE
  - Sediment Sampling Form
  - Example COC
- ARMS-0000-H-PLN-N-0003 DIVERSION MANAGEMENT PLAN
  - Water quality TARP
  - Geomorphology TARP – Inspection checklist
- ARMS-0000-H-PLN-N-0011 WATER ABSTRACTION MANAGEMENT PLAN

- Hydro census data template
- Bore construction template
- Flow meter recording template
- Bore trigger and SWL monitoring sheet
- Annual water abstraction management report template
- Vegetation survey form

- ARMS-0000-H-PLN-N-0002 BIODIVERSITY MANAGEMENT PLAN
  - Fauna sighting and fatality register
  - Ground disturbance permit
- ARMS-0000-H-PLN-N-0009 WEED MANAGEMENT PLAN
  - Weed monitoring / control form
  - Weed register
- ARMS-0000-H-PLN-N-0001 AIR QUALITY AND DUST MANAGEMENT
  - Monthly dust reporting from dust deposition gauge
- ARMS-0000-H-PLN-H-0003 NOISE, VIBRATION AND LIGHT MANAGEMENT PLAN
- ARMS-0000-H-PLN-N-0007 WASTE MANAGEMENT PLAN
- ARMS-0000-H-PLN-N-0006 RESIDUAL STORAGE FACILITY MANAGEMENT PLAN
- ARMS-0000-H-PLN-H-0002 HAZARDOUS SUBSTANCES MANAGEMENT PLAN
  - Fuel inventory
  - MSDS register
  - Hazardous substance register
- ARMS-0000-H-PLN-N-0008 WASTE ROCK MANAGEMENT PLAN
- ARMS-0000-H-PLN-H-0012 EROSION AND SEDIMENT CONTROL MANAGEMENT PLAN
- ARMS-0000-H-PLN-I-0001 CULTURAL HERITAGE MANAGEMENT PLAN
  - Heritage inspection checklist
  - Unexpected finds procedure – historical cultural and heritage items
  - Unexpected finds procedure – suspected human remains
- ARMS-0000-H-PLN-W-0001 SOCIAL IMPACT MANAGEMENT PLAN
  - Complaints Register
- ARMS-0000-H-PLN-W-0001 SOCIAL IMPACT MANAGEMENT PLAN

5.6.3.1 Objectives and Targets

The objectives and targets for each EMP have been developed following the SMART principles outlined in the MMP guidance document:

- **S**pecific and unambiguous, with explicit targets.
- **M**easurable, so that performance can be measured against targets.
- **A**chievable. Does the company have the resources or the capability to meet targets?
- **R**ealistic, so not trying to achieve the impossible.
- **T**ime-based, so targets can be met within a certain time frame.

The objectives and targets have also been established to be consistent and measurable against the environmental policy and meet the relevant national and state statutory requirements, as referenced in Section 3.0.

5.6.3.2 Management and Mitigation Strategies

Detailed management and mitigation measures have been identified from the risk assessment and included where relevant, with timeframes for implementation of the controls.

5.6.3.3 Monitoring and Measurement

Detailed monitoring programs have been developed in the EMPs which can be used for the construction and operational phases of the project. These include:

- Measuring performance against standards and targets.
- Sampling procedures and frequency.
- Recording of results.
- Required instruments and calibration.
- Sample preservation.

5.6.4 Review Effectiveness of Management and Mitigation Strategies

Per each EMP, regular reporting will be used to assess the results against trends, trigger levels and/or benchmarks to determine the effectiveness of control strategies and whether the targets are being met.

5.6.4.1 Non-Conformance and Corrective Action

Non-conformances and corrective actions are presented in the trigger, action and response plan (TARP) within each EMP. In addition, the incident reporting template used for the project is provided in APPENDIX T.

All non-conformances and corrective actions taken during the previous reporting period will be reported at the end of each reporting period.

5.7 Key Environmental Activities for the Oncoming Period

All new environmental initiatives, developments, capital projects or changes proposed for the oncoming reportable period will be outlined in this section.

6.0 WATER MANAGEMENT PLAN

This section covers surface and groundwater located both on the mine lease and in the receiving environment both up and down gradient of the lease. In addition, it covers interactions of those waters with activities related to the operation of the mine and its infrastructure and how those interactions influence water quality and quantity and timing.

The EIS Appendix X_L: Water Management Plan

https://www.arultd.com/images/EIS/DOCUMENTS/Volume6/Nolans_EIS_Appendix_X_L_web.pdf

and the EIS Supplement Appendix 4: Water Management Plan Framework (GHD, 2017) provide the original water management plans (WMP)

https://www.arultd.com/images/EIS/Supplement/Appendix-04_Water-Management-Plan-Framework_WEB.pdf.

This MMP chapter, the cross referenced EMP's and Water Abstraction Management Plan, the WAMP (APPENDIX R ARMS-0000-H-PLN-N-0011 WATER ABSTRACTION MANAGEMENT PLAN) supersede these original WMP documents.

The WMP is summarised graphically in Figure 6-1, demonstrating the components it relies on including procedures, plans and monitoring programs.

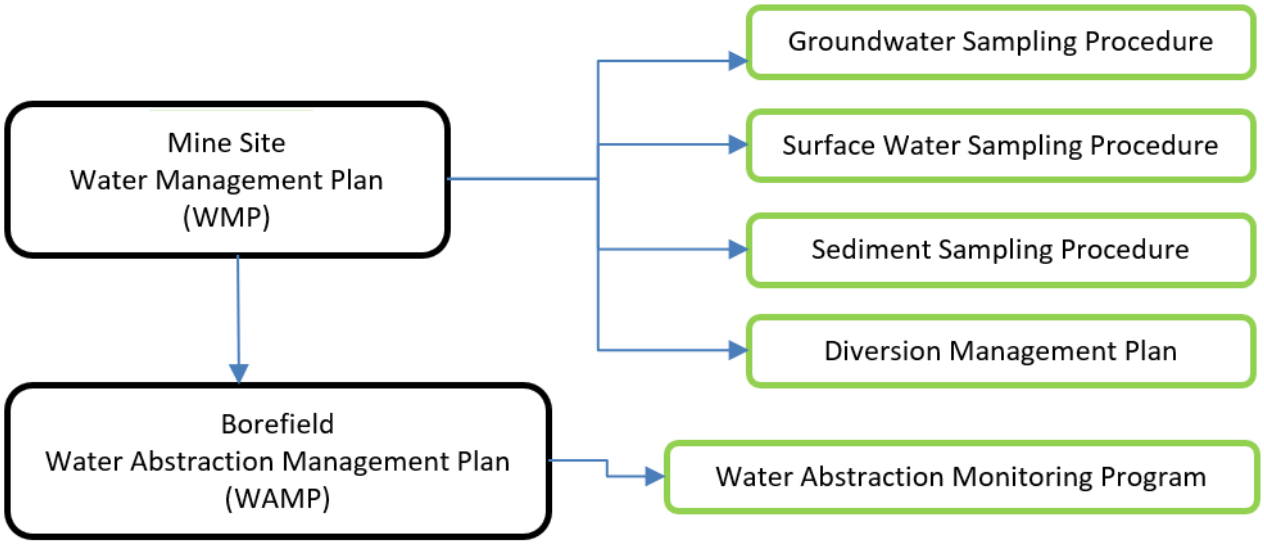


Figure 6-1 Water Management Plan Flow Diagram

6.1 Current Conditions

6.1.1 Surface water

The EIS Chapter 7: Surface Water and provides the original study for the site.

https://www.arultd.com/images/EIS/DOCUMENTS/Volume1/NolansEIS_Chapter7_LOW_RES_web.pdf

Typically, there is limited surface water flows in the few creeks that cross the site. In 2020 it is likely that surface flows associated with rainfall events in the first three months and last month of the year occurred. In December 2020, three events exceeded 50mm/day and a Feb event was just under 80mm/day. January, March and October had events registering good falls over the month nearing 50 mm (based on weather station recordings at Nolans. The December and February events resulted in widespread and extensive surface water flows with the December monthly total exceeding 308mm for the month.

Surface water management is addressed in the following EMP's:

- ARMS-0000-H-PRO-N-0002 SURFACE WATER SAMPLING PROCEDURE (APPENDIX N)
- ARMS-0000-H-PRO-N-0003 SEDIMENT SAMPLING PROCEDURE (APPENDIX O)
- ARMS-0000-H-PLN-N-0003 DIVERSION MANAGEMENT PLAN (APPENDIX P)

6.1.2 Groundwater

The EIS Chapter 8: Groundwater, Appendix K: Groundwater Report, Groundwater Models and Appendix 10: Groundwater Models provides the original study for the site and borefield.

https://www.arultd.com/images/EIS/DOCUMENTS/Volume1/NolansEIS_Chapter8_LOW_RES_web.pdf

https://www.arultd.com/images/EIS/DOCUMENTS/Volume2/Nolans_EIS_Appendix_K_web.pdf

https://www.arultd.com/images/EIS/Supplement/Appendix-10_Groundwater-Models-139-307-400-v2_WEB.pdf

In addition the Definitive Feasibility Study (DFS) also provides additional groundwater studies for the borefield.

https://www.arultd.com/images/Nolans_DFS_Summary_Report_-_Final_for_website.pdf

The WAMP (APPENDIX R) supersedes these EIS and DFS documents.

Groundwater management is addressed in the following EMP as well as the WAMP:

- ARMS-0000-H-PRO-N-0001 GROUNDWATER SAMPLING PROCEDURE (APPENDIX M), for the site;
- GHD, 2021 Arafura Resources Ltd Water Abstraction Management Plan (WAMP) Rev1 (APPENDIX R), for the borefield.

6.2 Information/Knowledge Gaps

6.2.1 Identification of Information/knowledge gaps

The WAMP describes the knowledge gaps associated with a greenfields borefield. Likewise, background information at the mine site is sparse, only beginning in 2006.

6.2.2 Filling Information/Knowledge Gaps

The WAMP provides the Water Abstraction Monitoring Program to continue to provide background groundwater data for the project.

6.2.3 Water Account

No water usage occurred in the previous reporting period.

A water account based on the Minerals Council of Australia Water Accounting Framework will be provided for subsequent reporting periods.

6.3 Risk Management

6.3.1 Identify Hazards and Rank Risks

The WMP and WAMP and associated EMP's identify hazards that could result from activities related to the operation and rank the associated risks of impacts to both surface and groundwater.

The EIS, Volume 2 presents Appendix F: Risk Register (Environmental)

https://www.arultd.com/images/EIS/DOCUMENTS/Volume2/Nolans_EIS_Appendix_F_web.pdf

In addition, focussed groundwater risks are addressed in the EIS Supplement Appendix 11: Risk Assessment: Impact of Groundwater Changes

https://www.arultd.com/images/EIS/Supplement/Appendix-11_Risk-assessment--potential-impacts-of-groundwater-changes-to-GDEs_WEB.pdf

And the EIS Supplement Appendix 12: Peer Review of GDE Risk Assessment

https://www.arultd.com/images/EIS/Supplement/Appendix-12_Peer-Review--risk-assessment-groundwater-drawdown-GDEs_WEB.pdf

6.3.2 Actions and Strategies in Response to Identified Risks

The WMP and WAMP and associated EMP's include strategies and actions that will be implemented to manage any risks identified in the risk assessment process.

6.4 Monitoring

6.4.1 Monitoring Program

The WMP and WAMP monitoring programs are outlined in the:

- Groundwater Sampling Procedure (APPENDIX M);
- Surface Water Sampling Procedure (APPENDIX N);
- Sediment Sampling Procedure (APPENDIX O);
- Diversion Management Plan (APPENDIX P); and
- Water Abstraction Monitoring Program within the WAMP (APPENDIX R).

6.4.2 Data Review and Interpretation.

The WMP and WAMP provided data review and interpretation requirements in the:

- Groundwater Sampling Procedure (APPENDIX M);
- Surface Water Sampling Procedure (APPENDIX N);
- Sediment Sampling Procedure (APPENDIX O);
- Diversion Management Plan (APPENDIX P); and
- Water Abstraction Monitoring Program within the WAMP (APPENDIX R).

6.5 Management

6.5.1 Remedial or Corrective Management Actions

Not applicable to this reporting period.

6.5.2 Actions Proposed Over the Reporting Period and their Potential to Impact on Water Quality

No actions (other than those associated with background monitoring) are proposed over this reporting period.

7.0 INCIDENT REPORTING

Subsequent MMPs will provide details of incidents reported or included on a Arafura's register during the previous reporting period. The incident report will include details about the incident, how it occurred, where and when it occurred, physical actions taken to rectify, remediate or rehabilitate, and operational actions to address the future management of incidents of this type.

The incident reporting will include the following key aspects:

- Reporting of identified hazards
- Reporting of accidents/incidents and system failures
- Determining the true cause
- Checklists for investigations
- Corrective actions taken.
- Preventative actions implemented.
- Review of corrective and preventative actions
- Reporting to statutory authorities
- Management of complaints.

8.0 CLOSURE PLANNING

The Mine Closure Plan (MCP) is documented in the EIS Chapter 18: Rehabilitation, Decommissioning and Closure

https://www.arultd.com/images/EIS/DOCUMENTS/Volume1/NolansEIS_Chapter18_LOWRES_web.pdf

and EIS Appendix W: Rehabilitation, Decommissioning and Closure Report, Mine Closure Plan (MCP)

https://www.arultd.com/images/EIS/DOCUMENTS/Volume4/Nolans_EIS_Appendix_W_web.pdf.

The Section 14A Report also contains further closure considerations.

https://www.arultd.com/images/EIS/Supplement/Notice_alteration_project14A_nolans_june2019.pdf

Additional design, construction and operation, monitoring and closure information relating to the Revised Project RSF is available in Knight Piésold 2019 which is appended at Appendix D of the Section 14A Report.

In lieu of NT specific closure guidelines, the Western Australia "Mine Closure Plan Guidance Version 3.0 March 2020" provide the framework for this section. The WA MCP checklist is provided below (Table 8-1 Western Australia Mine Closure Plan Guidance Checklist).

Table 8-1 Western Australia Mine Closure Plan Guidance Checklist

Q No	Mine Closure Plan (MCP) checklist	Y/N/NA	Page No.	Comments	Changes from previous version (Y/N)	Page No.	Summary
1	Has the Checklist been endorsed by a senior representative within the tenement holder/operating company? (See bottom of checklist.)	Y per the MMP signature					
Public Availability							
2	Are you aware that all approved MCPs will be made publicly available?	N/A					
3	Is there any information in this MCP that should not be publicly available?	N					
4	If "Yes" to Q3, has confidential information been submitted in a separate document/section?	N					
Cover Page, Table of Contents							
5	Does the MCP cover page include: Project title Company name Contact details (including telephone numbers and email addresses) Document ID and version number Date of submission (needs to match the date of this checklist)	Y					*Refer to MMP Cover Page*
Scope and Purpose							

Q No	Mine Closure Plan (MCP) checklist	Y/N/NA	Page No.	Comments	Changes from previous version (Y/N)	Page No.	Summary
6	State why the MCP is submitted (e.g. as part of a mining proposal, a reviewed MCP or to fulfil other legal requirements)	N/A					*As part of EIS and MMP*
Project Overview							
7	Does the project summary include: ▪ Land ownership details (include any land management agency responsible for the land / reserve and the purpose for which the land / reserve [including surrounding land] is being managed). ▪ Location of the project. ▪ Comprehensive site plan(s). ▪ Background information on the history and status of the project.	Y					Refer to MMP Sections 2.2.1 and 1.3
Legal Obligations and Commitments							
8	Does the MCP include a consolidated summary or register of closure obligations and	Y					EIS Appendix W Section 4 Also refer to MMP, 5.3 Environmental Commitments

Q No	Mine Closure Plan (MCP) checklist	Y/N/NA	Page No.	Comments	Changes from previous version (Y/N)	Page No.	Summary
	commitments?						
Stakeholder Engagement							
9	Have all stakeholders involved in closure been identified?	Y					*Refer to EIS,* Appendix W Section 5.1
10	Does the MCP include a summary or register of historic stakeholder engagement with details on who has been consulted and the outcomes?	Y					*Refer to MMP APPENDIX U* STAKEHOLDER CONSULTATION AND ISSUES
11	Does the MCP include a stakeholder consultation strategy to be implemented in the future?	Y					*Refer to EIS,* social impact assessment (in Appendix S) and the social impact management sub plan (SIMP) in Appendix X
Post-mining land use(s) and Closure outcomes							
12	Does the MCP include agreed post-mining land use(s), closure outcomes and conceptual landform design diagram?	Y					*Refer to EIS Appendix W MCP Section 6, and conceptual* landform design *diagram in* Figure 4-2.
13	Does the MCP identify all potential (or pre-existing) environmental legacies, which may restrict the post mining land use (including contaminated sites)?	N/A					The predominant land use is cattle grazing.

Q No	Mine Closure Plan (MCP) checklist	Y/N/NA	Page No.	Comments	Changes from previous version (Y/N)	Page No.	Summary
14	Has any soil or groundwater contamination that occurred, or is suspected to have occurred, during the operation of the mine, been reported to regulators?	N					
Development of Completion Criteria							
15	Does the MCP include an appropriate set of specific completion criteria and closure performance indicators?	Y					EIS Appendix W MCP Section 6.3 and 6.4
Collection and Analysis of Closure Data							
16	Does the MCP include baseline data (including pre-mining studies and environmental data)?	Y					Refer to EIS
17	Has materials characterisation been carried out consistent with applicable standards and guidelines (e.g. GARD Guide)?	Y					EIS Appendix L AMD Report
18	Does the MCP identify applicable closure learnings from benchmarking against other comparable mine sites?	N					To be completed in next MCP
19	Does the MCP identify all key issues impacting mine	Y					EIS Appendix W MCP Section 7

Q No	Mine Closure Plan (MCP) checklist	Y/N/NA	Page No.	Comments	Changes from previous version (Y/N)	Page No.	Summary
	closure outcomes and outcomes (including potential contamination impacts)?						
20	Does the MCP include information relevant to mine closure for each domain or feature?	Y					EIS Appendix W MCP Section 2
Identification and Management of Closure Issues							
21	Does the MCP include a gap analysis/risk assessment to determine if further information is required in relation to closure of each domain or feature?	Y					EIS Appendix W MCP Section 7
22	Does the MCP include the process, methodology, and has the rationale been provided to justify identification and management of the issues?	Y					EIS Appendix W MCP Section 7
Closure Implementation							
23	Does the MCP include a summary of closure implementation strategies and activities for the proposed operations or for the whole site?	Y					EIS Appendix W MCP Section 8 Refer MMP APPENDIX S INITIAL STAGE CLOSURE SUMMARY
24	Does the MCP include a closure work program for	Y					EIS Appendix W MCP Section 8 Refer MMP

Q No	Mine Closure Plan (MCP) checklist	Y/N/NA	Page No.	Comments	Changes from previous version (Y/N)	Page No.	Summary
	each domain or feature?						APPENDIX S INITIAL STAGE CLOSURE SUMMARY
25	Does the MCP contain site layout plans to clearly show each type of disturbance as defined in Schedule 1 of the MRF Regulations?	N/A					EIS Appendix W MCP Section 8
26	Does the MCP contain a schedule of research and trial activities?	Y					EIS Appendix W MCP Section 8.2.2
27	Does the MCP contain a schedule of progressive rehabilitation activities?	Y					EIS Appendix W MCP Section 8.4.1
28	Does the MCP include details of how unexpected closure and care and maintenance will be handled?	Y					EIS Appendix W MCP Section 7.2.1 Refer MMP APPENDIX S INITIAL STAGE CLOSURE SUMMARY
29	Does the MCP contain a schedule of decommissioning activities?	Y					EIS Appendix W MCP Section 8
30	Does the MCP contain a schedule of closure performance monitoring and maintenance activities?	Y					EIS Appendix W MCP Section 8

Q No	Mine Closure Plan (MCP) checklist	Y/N/NA	Page No.	Comments	Changes from previous version (Y/N)	Page No.	Summary
Closure Monitoring and Maintenance							
31	Does the MCP contain a framework, including methodology, quality control and remedial strategy for closure performance monitoring including post-closure monitoring and maintenance?	Y					EIS Appendix W MCP Section 9
Financial Provisioning for Closure							
32	Does the MCP include costing methodology, assumptions and financial provision to resource closure implementation and monitoring?	TBA					Refer MMP Section 8.3 Security Estimate
33	Does the MCP include a process for regular review of the financial provision?	N					Refer MMP Section 8.3 Security Estimate
Management of Information and Data							
34	Does the MCP contain a description of management strategies including systems and processes for the retention of mine records?	Y					EIS Appendix W MCP Section 8.6 Refer MMP APPENDIX S INITIAL STAGE CLOSURE SUMMARY

8.1 Life of Plan – Unplanned Closure

The MMP considers the possibility and impacts of unscheduled or unplanned termination of operations during the plan life. Specifically, the Initial Stage Closure EMP sets the project up for either early or long-term closure.

8.2 Background for Costing of Closure Activities

The current project information is provided to make an assessment of the pre-mining closure liability (Table 16-1).

Table 8-2 Mining Disturbance Table 2020

Disturbance type	Quantity	Volumes	Area (ha)	Total area (ha)
Open pit(s)	0			
Underground mine	N/A			
Waste rock dumps	0			
Product stockpiles	0			
Heap leach pads	N/A			
Tailings dams (Residue storage facility)	0			
Process water dams	0			
Potable water dams	0			
Mine site infrastructure (including workshops and fuel storage)	0			
Accommodation facility and associated infrastructure	0			
Bore field and pipelines (Exploration bores and pads)	0	0	1	1
Borrow pits	0			
Access tracks (station tracks)	1	0	0	0
Haul roads	0			
Laydown areas and other cleared ground not included elsewhere	1		3.7	3.7
Exploration (specify) Nolans Bore Area (returned to grazing and including non-disturbed area in between grid lines)	1	0	170	170
Other (specify)	N/A			

8.3 Security Estimate

Security estimates are presented in **Annexure A**.

9.0 REFERENCES

9.1 Arafura Resources Limited Documents

Ref No.	Title	Document Number
A1.	Arafura, 2019, *Arafura Definitive Feasibility Study - Summary Report*	
A2.	Arafura, 2021, *Arafura Feasibility Study Update Report*	

9.2 Guidelines, International Codes and Standards

Ref No.	Title	Document Number
B1.	ANCOLD 2012, *Guidelines on the consequence categories for dams*	
B2.	ANCOLD 2019, *Guidelines on Tailings Dams, Planning, Design, Construction, Operation and Closure*	
B3.	ANZECC / ARMCANZ. Australian and New Zealand Guidelines for Fresh and Marine Water Quality 2000	
B4.	AS 1940: 2017 The storage and handling of flammable and combustible liquids	
B5.	AS 2187.1: 1998 Explosives – Storage, transport and use	
B6.	AS 2187.1: 1998/AMDT 1-2000 Explosives – Storage, transport and use	
B7.	AS 2444: 2001 Portable Fire Extinguishers and Fire Blankets - Selection and Location	
B8.	AS ISO 31000: 2018 Risk Management	
B9.	AS/NZS 3833: 2007 Storage and Handling of Mixed Classes of Dangerous Goods in Packages and Bulk Containers	
B10.	AS/NZS 4452: 1997 The storage and handling of toxic substances	
B11.	AS/NZS 60079.10: 2009 Explosive atmospheres Classification of areas - Explosive gas atmospheres	
B12.	Australian Code for the Transport of Dangerous Goods by Road & Rail, Edition 7.6, 2018	
B13.	Australian Standard AS 4482.1–1999. Guide to the sampling and investigation of potentially contaminated soil - Part 2: Volatile substances.	

Ref No.	Title	Document Number
B14.	Australian Standard AS 4482.1–2005. Guide to the investigation and sampling of sites with potentially contaminated soil - Part 1: Non-volatile and semi-volatile compounds	
B15.	Australian Weeds Committee - Weeds of National Significance	
B16.	Department of Mines and Petroleum 2013, *Tailings storage facilities in Western Australia - code of practice*, Resources Safety and Environment Divisions, Department of Mines and Petroleum, western Australia	
B17.	Department of Mines and Petroleum 2015, *Guide to the preparation of a design report for tailings storage facilities (TSFs)*, Resources Safety and Environment Divisions, Department of Mines and Petroleum, western Australia	
B18.	Department of Sustainability, Environment, Water, Population and Communities - National Pollutant Inventory Emission Estimation Technique Manual for Mining Version 3.1, 2012	
B19.	Dept of Agriculture and Water Resources - Australian Weeds Strategy 2017 to 2027	
B20.	Friebel, E and Nadebaum, P (2011). Health screening levels for petroleum hydrocarbons in soil and Groundwater. Summary for NEPC. Technical Report no. 10, CRC for Contamination Assessment and Remediation of the Environment, Adelaide, Australia	
B21.	Globally Harmonized System of Classification and Labelling of Chemicals (GHS) Rev.7, 2017, UNECE	
B22.	http://www.agriculture.gov.au/water/policy/nwi/nonurban-water-metering-framework	
B23.	Model Code of Practice: Labelling of Workplace Hazardous Substances, Safe Work Australia, October 2018	
B24.	Model Code of Practice: Managing Risks of Hazardous Chemicals in the Workplace, Safe Work Australia, May 2018	
B25.	National Environmental Protection Council (NEPC), National Environment Protection (Assessment of Site Contamination) Measure (NEPM), 1999 as amended in 2013	
B26.	National Framework for Nonurban Water Metering: Policy paper, Department of Agriculture and Water Resources, Canberra, 2009.	

Ref No.	Title	Document Number
B27.	National Recovery Plan for the Greater Bilby (Macrotis lagotis)	
B28.	NHMRC, NRMMC (2011), Australian Drinking Water Guidelines Paper 6, National Water Quality Management Strategy.	
B29.	Northern Territory Survey Methods for Flora and Fauna Surveys Used for Standard Biodiversity Unit Survey Sites	
B30.	NSW Environment Protection Authority - Approved methods for the modelling and assessment of air pollutants in NSW	
B31.	NT Dept of Infrastructure, Planning and Logistics - Standard Specification for Environmental Management (2013/14)	
B32.	NT Dept of Land Resource Management - Buffel Grass Management Guide for Central Australia	
B33.	NT Dept of Natural Resources, Environment, The Arts and Sport - Guidelines for Weed Data Collection in the Northern Territory	
B34.	NT Dept of Natural Resources, Environment, The Arts and Sport - Northern Territory Weed Management Handbook	
B35.	NTEPA 2013, *Guidelines for the Siting, Design and Management of Solid Waste Disposal Sites*	
B36.	Recovery Plan for Five Species of Rock Wallabies 2012-2022.	
B37.	Recovery Plan for the Great Desert Skink (Egernia kintorei)[1]	
B38.	Survey Guidelines for Australia's Threatened Mammals: Guidelines for Detecting Mammals Listed as Threatened Under the EPBC Act	
B39.	Survey Guidelines for Australia's Threatened Reptiles: Guidelines for Detecting Reptiles Listed as Threatened Under the EPBC Act.	
B40.	The Burra Charter: The Australia ICOMOS Charter for Places of Cultural Significance, 2013.	
B41.	Threat Abatement Plan for Competition and Land Degradation by Rabbits	
B42.	Threat Abatement Plan for Predation by Feral Cats	

Ref No.	Title	Document Number
B43.	Threat Abatement Plan for Predation by the European Red Fox	
B44.	Threat Abatement Plan to reduce the Impacts on Northern Australia's Biodiversity by the Five Listed Grasses	
B45.	Victoria Environment Protection Authority - Environmental Guidelines for Major Construction Sites	
B46.	Victoria Environment Protection Authority - Mining and Extractive Industries Protocol for Environmental Management. Criteria for PM2.5 and PM10	
B47.	Victoria Environment Protection Authority - Victorian State Environment Protection Policy (Air Quality Management)	
B48.	Western Australia, Department of Mines, Industry Regulation and Safety "Mine Closure Plan Guidance Version 3.0 March 2020 https://www.dmp.wa.gov.au/Documents/Environment/REC-EC-112D.pdf	

9.3 Third Party Documents

Ref No.	Title	Document Number
C1.	[redacted]	
C2.	Aquatic Ecology Services, 2020, *Nolans Bore Rare Earth Mine Southern Borefield Stygofauna Pilot Study*	
C3.	Desert Wildlife Services, 2016, *Nolans Project Appendix 9: Vegetation of Day Creek and Associated Floodplain*, Supplement Report October 2016	
C4.	[redacted]	
C5.	[redacted]	
C6.	GHD, 2016, *Nolans Project Environmental Impact Statement (EIS)*, Arafura Resource Pty Ltd	

Ref No.	Title	Document Number
C7.	GHD, 2016, *Arafura Resources Nolans Environmental Impact Statement Volume 1, Chapter 9 Biodiversity*, Report	
C8.	GHD, 2016, Arafura Resources *Nolans Environmental Impact Statement Volume 3, Appendix M Biodiversity: Flora and Vegetation*, Report	
C9.	GHD, 2016, *Arafura Resources Nolans Environmental Impact Statement Volume 3: Appendix N: Biodiversity: Fauna and Threatened Species*, Report	
C10.	GHD, 2011, *Arafura Resources, Nolans Mine EIS Appendix 15: Stygofauna Pilot Survey*, Supplement Report February 2011	
C11.	GHD, 2016, *Nolans Environmental Impact Statement Volume 1, Chapter 15 Socio-economics*, Report	
C12.	GHD, 2016, *Nolans Environmental Impact Statement Volume 2, Appendix G: Risk Register (Social)*, Supplement Report	
C13.	GHD, 2016, *Nolans Environmental Impact Statement Volume 2, Appendix H: Community Consultation Report*, Supplement Report	
C14.	GHD, 2016, *Nolans Environmental Impact Statement Volume 2, Appendix L: Acid, Metalliferous Drainage Report*, Supplement Report	
C15.	GHD, 2016, *Nolans Environmental Impact Statement Volume 1, Chapter 6 Consultation*, Report	
C16.	GHD, 2016, *Nolans Environmental Impact Statement Volume 1, Chapter 8 Groundwater*, Report	
C17.	GHD 2017, *Nolans Project Environmental Impact Statement (EIS) - Supplementary Report*, Arafura Resources Pty Ltd	
C18.	GHD, 2018, *Southern Basins Borefield DFS Inputs (including GHD, 2018a to GHD, 2018h).*	
C19.	GHD, 2018j, *Southern Basins Borefield DFS Inputs Extended.*	
C20.	GHD, 2019, *Nolans Project Section 14A Notification*, Arafura Resources Pty Ltd	
C21.	GHD, 2019, Draft *Water Abstraction Management Plan (WAMP)*, Arafura Resources Pty Ltd Rev0	
C22.	GHD, 2021, *Water Abstraction Management Plan (WAMP)*, Arafura Resources Pty Ltd Rev1	

Ref No.	Title	Document Number
C23.	[redacted]	
C24.	Knight Piesold, 2018, *Residue Storage Facility Operating and Monitoring Manual*, prepared for Arafura Resources Pty Ltd	
C25.	Knight Piesold, 2018, Nolans – Mining Area Surface Water Management – Design Summary, prepared for Arafura Resources Pty Ltd, November 2018, Document Reference PE801-00140/07	
C26.	Knight Piesold, 2019, *Residue Storage Facility, Definitive Feasibility Study Design Report*, prepared for Arafura Resources Pty Ltd	
C27.	Knight Piesold, 2019, *Tailings Testing Report – Blend Tailings*, prepared for Arafura Resources Pty Ltd	
C28.	Knight Piesold, 2019, *Tailings Testing Report – Water Leach Residue*, prepared for Arafura Resources Pty Ltd	
C29.	Landloch, 2021a, *Baseline Soil Assessment: Nolans Project*	
C30.	Landloch, 2021b, *Strategic Guidance For Rehabilitated Waste Landforms: Nolans Rare Earth Project*	
C31.	Michels Warren Munday, 2016, *Arafura Resources Nolans Project, Appendix K: Social Impact Management Plan, Supplementary Report*	

10.0 ABBREVIATIONS

10.1 Abbreviations

Abbreviation	Meaning
AIMAT	Alherramp Ilewerr Mamp Arrangkey Tywerl
ARI	Average Reoccurrence Interval
AEP	Annual exceedance probability
Arafura / ARU	Arafura Resources Limited
AGP	Amadeus Gas Pipeline
AMD	Acid and metalliferous drainage
ANESA	Ammonium nitrate explosives storage area
BOO	Build, own and operate
CLC	Central Land Corporation
ERG	Emergency Response Group
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
FEED	Front-end engineering and design
FEL	Front end loader
GDE	Groundwater dependent ecosystem
GTSMR	Generalised Tropical Storm Method Revised
HDPE	High density polyethylene
IBC	Intermediate bulk container
ILUA	Indigenous land use agreement
IPMT	Integrated project management team
LCRS	Leak collection and recovery system
LOM	Life of mine
LV	Low voltage
MCC	Motor control centre
ML	Mineral lease
MMP	Mine Management Plan
MIA	Mine infrastructure area
NTA	Native title agreement
NTG	Northern Territory Government

Abbreviation	Meaning
NORM	Naturally occurring radioactive material
NPI	Non-process infrastructure
PLR	Pre-leach residue
PMP	Probable maximum precipitation
RL	Relative level
RO	Reverse osmosis
ROM	Run of Mine
RSF	Residue storage facility
SAG	Semi-autogenous grinding (mill)
SAP	Sulphuric acid plant
SAR	Site Access Road
SEG/HRE	Samarium, Europium, Gadolinium (Middle Rare Earths)/Heavy Rare Earths
SMU	Soil mapping units
SPC	Soil profile class
TARP	Trigger, Action and Response Plan
TBP	Territory Benefits Plan
WAMP	Water Abstraction Management Plan
WRD	Waste rock dump
WWTP	Waste water treatment plant

APPENDIX A	**ARMS-0000-H-PLN-N-0009 WEED MANAGEMENT PLAN**
APPENDIX B	**ARMS-0000-H-PLN-N-0002 BIODIVERSITY MANAGEMENT PLAN**
APPENDIX C	**ARMS-0000-H-PLN-N-0001 AIR QUALITY AND DUST MANAGEMENT PLAN**
APPENDIX D	**ARMS-0000-H-PLN-N-0007 WASTE MANAGEMENT PLAN**
APPENDIX E	**ARMS-0000-H-PLN-H-0002 HAZARDOUS SUBSTANCES MANAGEMENT PLAN**
APPENDIX F	**ARMS-0000-H-PLN-H-0012 EROSION AND SEDIMENT CONTROL MANAGEMENT PLAN**
APPENDIX G	**ARMS-0000-H-PLN-I-0001 CULTURAL HERITAGE MANAGEMENT PLAN**
APPENDIX H	**ARMS-0000-H-PLN-W-0001 SOCIAL IMPACT MANAGEMENT PLAN**
APPENDIX I	**ARMS-0000-H-PLN-H-0001 EMERGENCY RESPONSE MANAGEMENT PLAN**
APPENDIX J	**ARMS-0000-H-PLN-H-0003 NOISE, VIBRATION AND LIGHT MANAGEMENT PLAN**
APPENDIX K	**ARMS-0000-H-PLN-N-0010 RADIATION MANAGEMENT PLAN**
APPENDIX L	**ARMS-0000-H-PLN-N-0008 WASTE ROCK MANAGEMENT PLAN**
APPENDIX M	**ARMS-0000-H-PRO-N-0001 GROUNDWATER SAMPLING PROCEDURE**
APPENDIX N	**ARMS-0000-H-PRO-N-0002 SURFACE WATER SAMPLING PROCEDURE**
APPENDIX O	**ARMS-0000-H-PRO-N-0003 SEDIMENT SAMPLING PROCEDURE**
APPENDIX P	**ARMS-0000-H-PLN-N-0003 DIVERSION MANAGEMENT PLAN**
APPENDIX Q	**ARMS-0000-H-PLN-N-0006 RESIDUAL STORAGE FACILITY MANAGEMENT PLAN**
APPENDIX R	**ARMS-0000-H-PLN-N-0011 WATER ABSTRACTION MANAGEMENT PLAN**
APPENDIX S	**INITIAL STAGE CLOSURE SUMMARY**
APPENDIX T	**INCIDENT REPORTING TEMPLATE**
APPENDIX U	**STAKEHOLDER CONSULTATION AND ISSUES TEMPLATE**
APPENDIX V	**RISK ASSESSMENT**
APPENDIX W	**TERRITORY BENEFIT PLAN**
APPENDIX X	**INDIGENOUS ENGAGEMENT STRATEGY**
APPENDIX Y	**BASELINE SOIL ASSESSMENT: NOLANS RARE EARTH PROJECT (LANDLOCH, 2021A)**
APPENDIX Z	**STRATEGIC GUIDANCE FOR REHABILITATED WASTE LANDFORMS: NOLANS RARE EARTH PROJECT (LANDLOCH, 2021B)**
APPENDIX AA	**TOPSOIL MANAGEMENT PLAN**
APPENDIX BB	**KEROSENE CREEK SURFACE WATER DESIGN REPORT**
APPENDIX CC	**ANNEXURE A – SECURITY ESTIMATE MEMO INCLUDING THREE EXCEL CALCULATION SHEETS**