COVER PAGE

Ashburton Salt Project: Interim Mine Closure Plan Tenement Number M08/0535

Tenement Holder:
K plus S Salt Australia Pty Ltd (K+S)

22 December 2022

Version 1, Revision 1.1
Mining Tenement Number M08/0535
Site Name and Code: To be assigned by DMIRS

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1 INTRODUCTION, BACKGROUND AND PURPOSE

K plus S Salt Australia Pty Ltd (K+S) is an international resources company with headquarters in Germany. K + S is considering expansion to participate in supplying future growth in salt demand in Asia, and is evaluating the possibility of developing and operating a green field solar salt project (the proposed Ashburton Salt Project) on the Western Australian coast, approximately 40 km south-west of the township of Onslow, within the Shire of Ashburton (Figure 1).

This Mine Closure Plan (MCP) is submitted to support the Mining Proposal (MP) and Mining Lease Application for the Ashburton Salt Project (the Project), by K+S. It is not possible to submit a Mineralisation Report to support the Mining Lease Application as the Project is a Solar Salt Project, not a conventional Mining Project. Therefore, the only option is to submit a MP and MCP in support of the Mining Lease Application.

The Project was referred to the WA Environmental Protection Authority (EPA) under Part IV of the *Environmental Protection Act 1986* (WA; EP Act) in October 2016. In November 2016, the EPA determined that the Project would require assessment via a Public Environmental Review. The referral has since been amended several times under Section 43A of the EP Act. The amendment detailed changes relating to a refined layout and further definition of disturbance and other environmental impacts.

The Project was also referred in 2016 to the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) and determined to be a controlled action under the *Environment Protection and Biodiversity Conservation Act 1999* (Cth; EPBC Act). In early 2017 it was determined that the proposal would be assessed under the EPBC Act by the WA EPA as an accredited assessment. The EPBC referral has since been amended under Section 156A of the EPBC Act in February 2022. The amendment detailed changes relating to a refined layout and further definition of disturbance and other environmental impacts.

An Environmental Scoping Document (ESD) outlining the requirements of the proposed Environmental Impact Assessment studies was released for public comment in September 2017. The ESD was subsequently revised taking into account public feedback in December 2017 and approved by the EPA in January 2018.

From January 2018, K+S has been undertaking the required environmental studies as outlined in the ESD. These studies and the environmental impact assessment required by the ESD has been completed and were used in developing an Environmental Review Document (ERD) (See Section 5.11 for full list of completed studies). The latest versions of the draft ERD was submitted to the EPA in December 2022 and provides a detailed account of the Project and associated environmental impact assessment. The ERD is currently under review by EPA Services and will be released for public comment once accepted, followed by the response to submissions process, EPA Report and Recommendations and State and Federal Ministerial Decisions on the Project.

An initial MCP was submitted to the Department of Mines, Industry Regulation and Safety (DMIRS) in July 2021, before submission of the ERD. As a number of changes to the Project has occurred since this date, this MCP has been amended to align with current project design as detailed in the ERD and amended EPBC referral.

It is understood that due to the EPA Assessment under Part IV of the EP Act, the DMIRS decision on this MCP is constrained until a Ministerial Statement is issued approving the Project (if approved).

If necessary, K+S will submit a revised version of this MCP to DMIRS, reflecting any project changes that occur during the EPA Assessment, prior to DMIRS making a final decision on MCP approval.

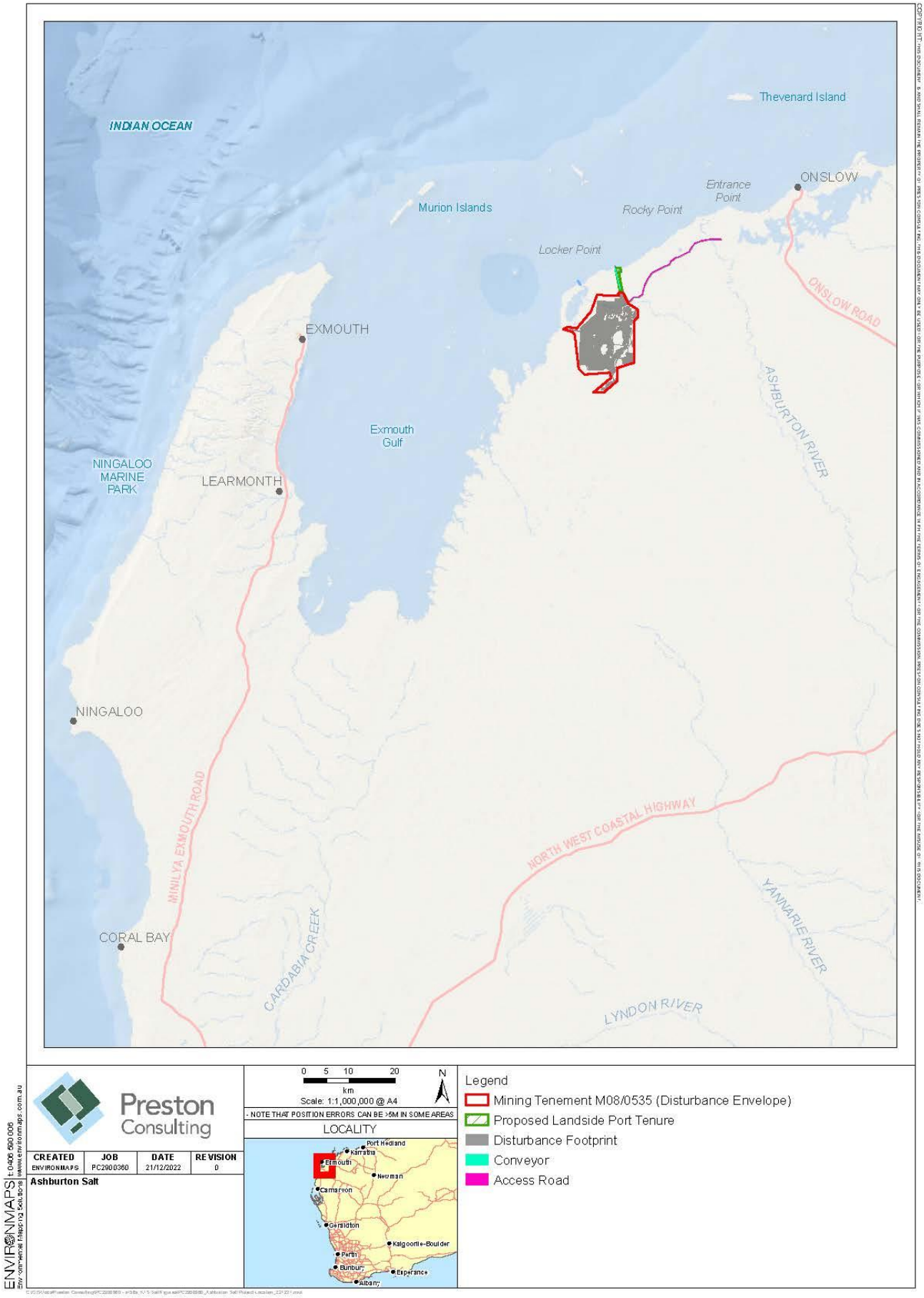

Figure 1: Project Location

2 PROJECT SUMMARY

A Project description is provided in the tables below. The estimated Project life is 50 years. It is anticipated that operations may commence in 2025 and cease in 2075 (after this point it is possible operations could continue with extension of mining lease duration terms).

Table 1: Summary of the Project

Project title	**Ashburton Salt Project**
Proponent name	**K plus S Salt Australia Pty Ltd**
Short description	It is proposed to construct and operate a solar salt project approximately 40 km southwest of Onslow, WA. The Project includes the construction of solar salt evaporation and crystallisation ponds and associated infrastructure/activities (*seawater intake pumps / channel / pipeline(s); seawater concentration ponds and salt crystallisation ponds; internal site roads; on-site diesel fuelled back-up/standby electricity generation and reticulation; fuel storage sites; a jetty and product loading facilities; a salt wash plant and associated ponds; salt stockpiles and conveyors; onsite buildings such as offices, storage, workshops and possibly accommodation; sewage treatment facilities and landfill; water supply/monitoring bore(s); an airstrip and/or helipad; desalination plant; equipment parking and laydown areas; bitterns discharge infrastructure which includes a channel, dilution pond, pipeline and diffuser; drainage diversion/s and levees; access roads; a service corridor borrow pit areas for rock, clay and other construction materials; and dredging and land based dredge spoil disposal.*)

Table 2: Location and proposed extent of physical and operational elements within M08/0535

Element	**Indicative location**	**Proposed extent authorised**
Physical elements		
Evaporation and crystallisation ponds	Figure 2	Clearing of no more than 10,397 ha within a 18,676 ha Disturbance Envelope
Support infrastructure	Figure 2	Clearing of no more than 1,572 ha within a 18,676 ha Disturbance Envelope (includes: seawater intake pumps/channel/pipeline(s); internal site roads; onsite diesel fuelled back-up/standby electricity generation and reticulation; fuel storage sites; a salt wash plant and associated ponds; salt stockpiles and conveyors; onsite buildings such as offices, storage, workshops and accommodation; sewage treatment facilities; landfill; water management/monitoring bore(s); equipment parking and laydown areas; bitterns discharge infrastructure which includes a channel, dilution pond, pipeline; drainage diversion(s) and levees; borrow pits; helipad; and desalination plant.

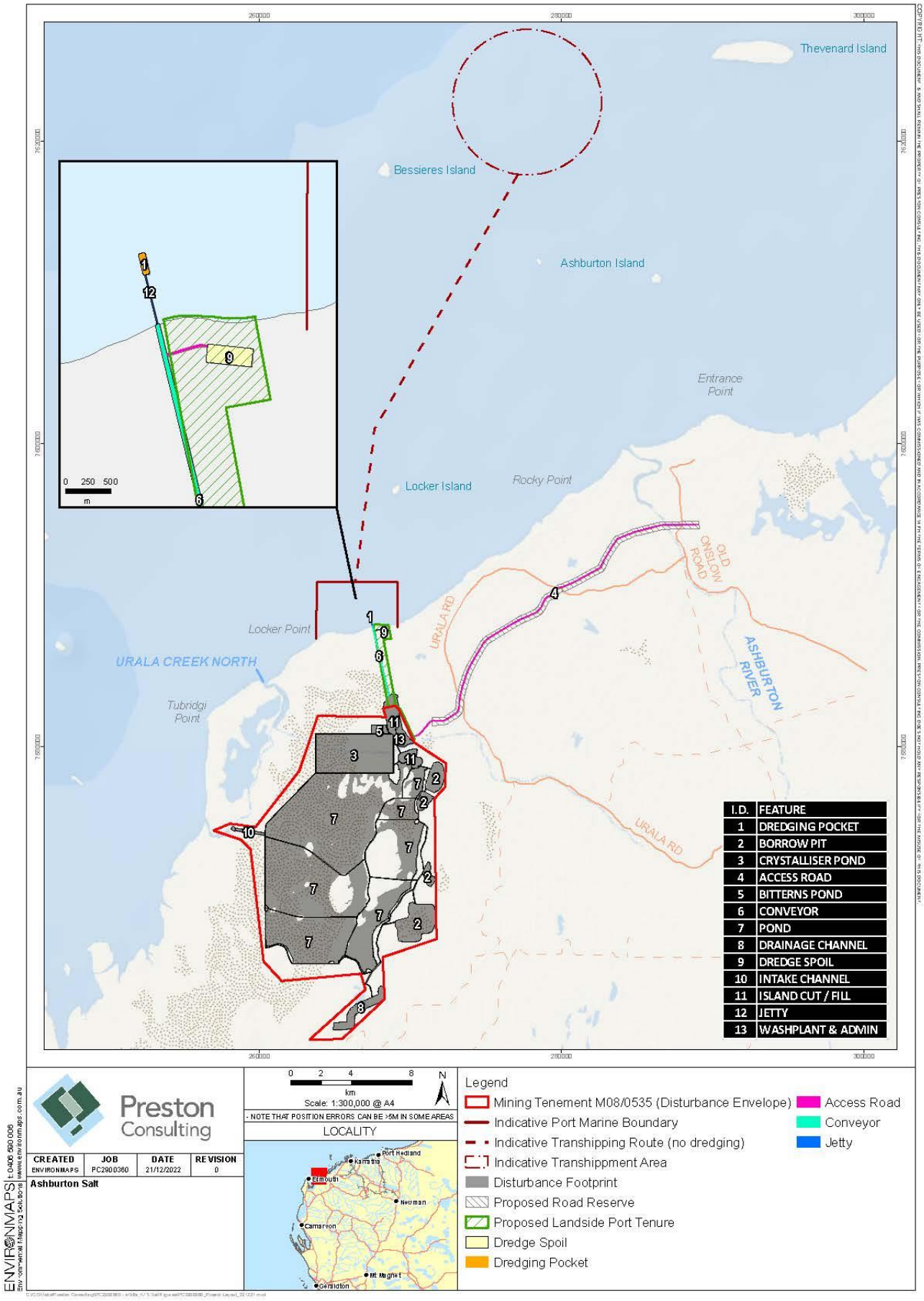

Figure 2: Project Layout

3 CLOSURE OBLIGATIONS AND COMMITMENTS

All legal obligations for rehabilitation and closure that will affect the post-mining land use and closure outcomes are detailed below.

Table 3: Closure Obligations and Commitments

Regulatory Instrument	Obligation/Commitment
Mining Tenement/s	• Not yet issued. • Closure related conditions will be included once issued.
Ministerial Statement	• Not yet issued. • Closure related conditions will be included once issued.
EPBC approval	• Not yet issued. • Closure related conditions will be included once issued.
DMIRS Statutory Guidelines for MCPS	• Prepare MCP in accordance with the guidelines • Review and resubmit MCP every three years in accordance with the guidelines
MCP	• Compliance with the approved MCP for the Project

4 STAKEHOLDER ENGAGEMENT

4.1 PRINCIPLES OF STAKEHOLDER ENGAGEMENT

K+S have undertaken its stakeholder engagement in accordance with Ministerial Council on Mineral and Petroleum Resources (MCMPR) Principles for Engagement with Communities and Stakeholders (2005). These principles are as follows:

Communication
Communication must be open, accessible, clearly defined, two-way and appropriate.

Transparency
The process and outcomes of community and stakeholder engagement should, wherever possible, be made open and transparent, agreed upon and documented.

Collaboration
A cooperative and collaborative approach to seek mutually beneficial outcomes is considered key to effective engagement.

Inclusiveness
Inclusiveness involves identifying and involving communities and stakeholders early and throughout the process, in an appropriate manner.

Integrity
Community and stakeholder engagement should establish and foster mutual trust and respect.

4.2 TARGETED COMMUNITY AND ENGAGEMENT STRATEGY

K+S has consulted with and will continue to consult with all stakeholders who are affected by, or are interested in the Project. This includes the decision-making authorities, relevant state (and Commonwealth) government agencies, local government authorities, the local community, and environmental non-government organisations.

4.2.1 STAKEHOLDER IDENTIFICATION

The foundation of the Stakeholder Engagement Strategy has been a detailed stakeholder identification process to ensure that all relevant stakeholders have been identified and included in consultation activities. The following list of stakeholders have been identified and consulted with:

- DMIRS
- EPA
- Department of Jobs, Tourism, Science and Innovation (DJITSI)
- Department of Water and Environment Regulation (DWER)
- Department of Biodiversity, Conservation and Attractions (DBCA)
- Department of Primary Industries and Regional Development (Fisheries)
- DCCEEW – Federal
- Pilbara Ports Authority
- Shire of Ashburton
- Shire of Exmouth
- Gascoyne Development Commission (GDC)
- Pilbara Development Commission
- Buurabalayji Thalanyji Aboriginal Corporation (BTAC)

- Cape Conservation Group (CCG)
- Onslow Town Community
- Exmouth Town Community
- Forrest & Forrest – sublease of Urala Station and owner of the neighbouring Minderoo Station
- Australian Gas and Infrastructure Group (AGIG) – holder of Urala Pastoral Lease
- Neighbouring Pastoral Stations
- Recreational Fishing Groups
- Exmouth and Onslow Prawn Fisheries

4.2.2 CONSULTATION PROCESS

The Project's stakeholder consultation process is well-established and a detailed understanding of the level of stakeholder interest and key issues, has been developed through consultation undertaken on the project since 2016.

K+S recognise that it is important that all stakeholder have their interests and concerns considered and where appropriate, addressed, and that the key stakeholders have an opportunity to provide feedback on the response or proposed action to address their interests and concerns.

The company maintains regular interactions with the Traditional Owner group BTAC regarding the heritage and environmental values of the project and anticipates this group will have an ongoing interest in the project.

Stakeholder consultation activities have included and continue to include:

- providing information on the Project;
- providing the results of key environmental studies;
- seeking feedback from key stakeholder on environmental impacts relevant to them; and
- incorporating stakeholder feedback into the Project design and proposed environmental management.

Methods of communication have included and continue to include:

- media briefings;
- regulator briefings;
- meetings;
- website publications;
- correspondence (emails, phone calls and letters);
- newspaper advertising; and
- community information days.

4.2.3 CONSULTATION REGISTER

All interactions with stakeholders are recorded in the Project's Stakeholder Consultation Register (Table 4).

Table 4: Stakeholder Consultation Register

Date	Description of Engagement	Stakeholders	Stakeholder comments/ issue	Proponent Response and/or resolution	Stakeholder Response
2016 – ongoing	Meetings; letters	DMIRS	Initial discussions around process and lead agency. Discussions regarding proposed National Park boundaries. MP, MCP and Post Mining Land-use (fauna habitat) discussed.	Lead agency was transferred to Department of Jobs, Tourism, Science and Industry. Issue was managed by Department of Conservation Biodiversity and Attractions. (DBCA)	Satisfactory
2016 - ongoing	Meetings; letters	DJTISI	Project was given lead agency status. Discussions regarding access, Ashburton North Strategic Industrial Area (ANSIA) and all government regulatory issues.	Continued discussions as project has lead agency status.	Satisfactory
2016 – ongoing	Meetings; Environmental briefing session; letters	EPA	Ongoing discussions with issues raised regarding protection of marine fauna, mangroves and wetlands. Ongoing discussions regarding assessment process, review of draft ERD.	Continued open discussions and addressed any environmental concerns during environmental scoping.	ESD approved. Three separate changes to Proposal under section 43A approved. ERD being reviewed for public release.
2016- ongoing	Feedback on Draft ESD	DWER	Comment on Draft ESD: Potential for prescribed premises 73, 54, 85 and 63 (chemical storage, sewage and landfill). May need to apply for works approval and licence. Need for identification of acid sulphate soils and if exist appropriate management. DWER guideline for contaminated sites also should be included.	Works approval and licence will be considered and applied for where relevant at appropriate time. Acid sulphate soils and DWER guideline for contaminated sites included in ESD.	Satisfactory
2016- ongoing	Meetings; letters	DBCA	Local officers of Exmouth DBCA are kept up to date with the Project and environmental studies. Discussions with DBCA Perth office on proposed Giralia National Park proposed some distance south of the Project.	Continue to provide regular updates on the project and environmental studies.	Satisfactory
2016 - ongoing	Meetings	Department of Primary Industries and Regional Development (Fisheries)	Ongoing engagement in development of an agent based model of prawns in Exmouth Gulf in order to predict impact of project on Prawn Fishery	Ongoing engagement as model is developed	Satisfactory

Date	Description of Engagement	Stakeholders	Stakeholder comments/ issue	Proponent Response and/or resolution	Stakeholder Response
2016 - ongoing	Meetings	DCCEEW	Engaged during development of EPBC referral. Comments provided on draft ERD.	Officially involved in current EPA assessment as it is an "accredited assessment". K+S is keeping DCCEEW officers up to date where relevant given a final decision re the EPBC assessment will still need to be made by Federal Minister. ERD revised to address comments	S156A application approved ERD being reviewed for public release
2016-ongoing	Meetings; phone calls; community updates; environmental briefing	Pilbara Ports Authority	Regular engagement with issued raised around ports, marine safety, environmental studies, shipping providers, anchor points, Native Title and transshipping.	All issues were addressed with follow up meetings with various parties and a site visit was coordinated with PPA. PPA have attended community updates.	Satisfactory
2016-ongoing	Meetings; phone calls; community updates; environmental briefing	Shire of Ashburton	Regular engagement with issued raised around river's flood plain, National Park, workforce housing, access road, bridge, turbidity, impact on Onslow Coast and management of infrastructure. Post-mining land use (fauna habitat) discussed.	All issued were addressed and engagement continues with the Shire of Ashburton.	Satisfactory
2016-ongoing	Meetings; phone calls; community updates, letters	Shire of Exmouth	Regular engagement with issued raised around river's flood plain, National Park, workforce housing, access road, bridge, turbidity, impact on Onslow Coast and management of infrastructure.		
2016-ongoing	Community updates; community info sessions; correspondence; community open day	GDC	Discussions with issues raised around ensuring GDC are kept up to date with the project and local community engagement.	Continue to provide regular updates on the project and local community engagement.	Satisfactory
2016-ongoing	Community updates; meetings	Pilbara Development Commission	Initial meeting to explain the project. Ongoing mailing of project updates.	Continue to provide regular updates on the project and local community engagement	Satisfactory
2016-ongoing	Community updates; meetings; mail outs; phone calls	Buurabalayji Thalanyji Aboriginal Corporation (BTAC)	Ongoing discussions with BTAC with issues raised around Native Title and Indigenous Employment. Post mining land use (fauna habitat) discussed.	Continue to be in discussions with BTAC on these issues.	Satisfactory
2016-ongoing	Community updates; meetings; environmental sessions	CCG	Ongoing discussions with issues raised around ensuring CCG are kept up to date with the project, marine life, salt pans and bitterns.	All issues are being considered in PER. CCG is invited to all community update sessions and has been provided updates on environmental studies.	Satisfactory
2016-ongoing	Meetings; community information days; newspaper advertisements; phone calls; mail outs; website and social publications	Onslow Town Community	Regular engagement with issues raised around prawn numbers, fisheries, jetty, dredging, local employment and shipping.	Addressed issues and provide ongoing forums for community feedback.	Satisfactory

Date	Description of Engagement	Stakeholders	Stakeholder comments/ issue	Proponent Response and/or resolution	Stakeholder Response
2016-ongoing	Meetings; community information days; newspaper advertisements; phone calls; mail outs; website and social publications	Exmouth Town Community	Regular engagement with issues raised around school engagement, jetty, Marine fauna, bitterns, fishing and environmental impacts.	Addressed issues and provide forums for ongoing community feedback.	Satisfactory
2016-ongoing	Meetings; community information days; correspondence; mail outs	AGIG – holder of Urala Pastoral Lease	Discussions with issues raised around road access, bridge, flooding, salt production process, gas storage project and Urala pastoral lease. Post mining land use (fauna habitat) discussed.	All issues are being considered as part of project design. Ongoing communication with AGIG is occurring.	Satisfactory
2016-ongoing	Meetings; emails; phone calls	Neighbouring Pastoral Stations (Koordarrie)	Discussions regarding property access for monitoring and drainage management. Koordarrie has provided access for monitoring and drainage management to be discussed at next project stage.	Continue to be in discussions with Koordarrie on these issues.	Satisfactory
2016-ongoing	Meetings; emails; phone calls	Recreational Fishing Groups	Regular engagement with issues raised around, fisheries, jetty, dredging, local employment and shipping.	Continue to be in discussions on these issues.	
2016-ongoing	Meetings; emails; phone calls	Exmouth and Onslow Prawn Fisheries	Regular engagement with issues raised around prawn fishery and potential impacts	Continue to be in discussions with Prawn Fisheries on these issues.	

4.3 ONGOING COMMUNITY AND STAKEHOLDER ENGAGEMENT STRATEGY

K+S plans to continue effective stakeholder engagement throughout the life of the project including:

- Ongoing stakeholder consultation activities planned as part of the environmental assessment and approval process including:
    - providing information on the Project design;
    - providing the results of key environmental studies;
    - seeking feedback from key stakeholder on environmental impacts relevant to them; and
    - incorporating stakeholder feedback into the Project design, proposed environmental management, post mining land use and proposed closure of the site.
- Should the project be approved, ongoing stakeholder consultation with key stakeholders during project construction, operation and closure including:
    - providing information on construction and operational activities;
    - providing the results of key environmental monitoring and management activities;
    - engagement of the local community during employment activities;
    - engagement of the local community regarding capacity building and partnership activities;
    - engagement of key stakeholders regarding the proposed end land use; and
    - engagement of key stakeholders regarding the proposed closure of the site.

5 BASELINE AND CLOSURE DATA AND ANALYSIS

5.1 STATUS OF BASELINE DATA COLLECTION AND IMPACT ASSESSMENT

This MCP is submitted to support the MP and Mining Lease Application for the Project, by K+S. It is not possible to submit a Mineralisation Report to support the Mining Lease Application as the project is a Solar Salt Project, not a conventional Mining Project. Therefore, the only option is to submit a MP and MCP in support of the Mining Lease Application.

The Project was referred to the WA EPA under Part IV of the EP Act in October 2016. In November 2016, the EPA determined that the Project would require assessment via a Public Environmental Review.

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From January 2018, K+S has been undertaking the required Environmental Studies as outlined in the ESD. These studies and the Environmental Impact Assessment required by the ESD have been completed and were used in developing an ERD. The latest version of the draft ERD was submitted to the EPA in December 2022 and provides a detailed account of the Project and environmental impact assessment. The ERD is currently under review by the EPA and will be released for public comment when accepted followed by the response to submissions process, EPA Report and Recommendations, and State and Federal Ministerial Decisions on the Project.

An original MCP was submitted to the DMIRS in July 2021 before submission of the ERD. As a number of changes to the Project has occurred, the MP and MCP have been revised to align with project design as amended under the EP Act and EPBC Act.

It is understood that due to the parallel processing of this MCP with the EPA Assessment under Part IV of the EP Act, the DMIRS decision on this Closure will be constrained until a Ministerial Statement is issued approving this project (if approved).

If necessary, K+S will submit further revisions of this MCP to DMIRS, reflecting any project changes that occur during the EPA Assessment, prior to DMIRS making a final decision on MCP approval.

5.2 CLIMATE

5.2.1 CLIMATIC ZONE AND SEASONAL PATTERNS

The climate at the Project site is classified as hot, semi-arid with the significant rainfall occurring during late January through March and then May through July. The dry season occurs from late August through to December. There is a tropical cyclone season that runs from the middle of December to April, with a peak occurring in the months of February and March.

Climate statistics for the Onslow Airport located approximately 40 km north-east of the Project are provided in the Table 5.

Table 5: Climate Statistics for Onslow Airport
(Bureau of Meteorology, 2020a)

Statistics	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual	Years	
Temperature															
Mean maximum temperature (°C)	36.4	36.4	36.2	33.9	29.4	26.0	25.5	27.3	30.1	33.0	34.4	36.0	32.1	54	1940 - 2020
Mean minimum temperature (°C)	24.5	25.0	24.3	21.5	17.4	14.3	13.0	13.6	15.5	18.0	20.1	22.4	19.1	54	1943 - 2020
Rainfall															
Mean rainfall (mm)	37.7	58.9	71.3	11.3	47.7	46.6	19.9	8.3	1.4	0.8	2.7	3.3	308.4	54	1940 - 2020
Decile 5 (median) rainfall (mm)	11.5	12.9	20.7	2.8	22.8	35.0	10.2	1.8	0.2	0.0	0.0	0.0	277.5	51	1940 - 2020
Mean number of days of rain ≥ 1 mm	2.3	2.8	2.2	1.0	2.6	2.4	1.5	0.9	0.3	0.1	0.3	0.4	16.8	50	1940 - 2020
Other daily elements															
Mean number of clear days	15.8	11.2	16.4	14.6	15.1	17.1	19.5	22.1	23.7	24.8	22.4	20.9	223.6	35	1940 - 1975
Mean number of cloudy days	5.2	6.7	5.3	5.8	7.9	5.9	4.9	3.3	1.7	1.3	1.5	2.4	51.9	35	1940 - 1975
9 am conditions															
Mean 9am temperature (°C)	30.3	30.3	29.4	27.0	22.5	18.9	17.9	19.7	22.9	25.9	28.0	29.7	25.2	47	1940 - 2010
Mean 9am relative humidity (%)	54	59	58	55	58	63	61	54	46	42	44	47	53	47	1940 - 2010
Mean 9am wind speed (km/h)	16.8	16.9	16.9	15.2	15.9	15.5	15.3	17.2	20.4	21.0	19.7	18.0	17.4	46	1940 - 2010
3 pm conditions															
Mean 3pm temperature (°C)	33.8	34.0	34.0	32.0	27.9	24.8	24.2	25.7	28.0	30.2	31.7	33.1	30.0	47	1940 - 2010
Mean 3pm relative humidity (%)	51	53	49	44	45	45	44	39	38	38	43	46	45	46	1940 - 2010
Mean 3pm wind speed (km/h)	27.9	26.5	23.9	19.6	18.1	17.5	17.7	19.6	23.6	26.8	28.8	28.9	23.2	46	1940 - 2010

5.2.2 RAINFALL

Areas on the west margin of the eastern side of the Exmouth Gulf are located within the Australian Southern Semi-arid Pasture Region land use with less than 75 mm of rainfall during the dry season. Due to the sparse and highly variable rainfall in this region, surface runoff is usually only generated during extreme weather conditions typically associated with tropical cyclones. During these events, discharge from the river system causes flooding of the salt flats. This is usually also accompanied by storm tide inundation (Blandford and Associates, 2005). The mean annual rainfall based on data for the last 54 years is 308 mm (Table 5).

5.2.3 EVAPORATION

The high temperatures in the region lead to high rates of evaporation, which results in high evaporation during summer months and lower rates during winter. Evaporation can impact shallow or still water bodies and cause local increases in salinity within coastal estuaries.

Evaporation is measured by the Bureau of Meteorology (BOM) at the Onslow and Learmonth Airports. The Learmonth data is averaged over the period of 1975-2017 and 1966-1975 for Onslow Airport. A summary of the monthly averages can be found in Figure 3. As shown, evaporation rates are highest through the summer months (11-12 mm per daily evaporation) and peak in December and are lowest through the winter months with the lowest recorded evaporation occurring in June at 4 mm. In this region, the annual average rainfall is significantly exceeded by the mean annual evaporation.

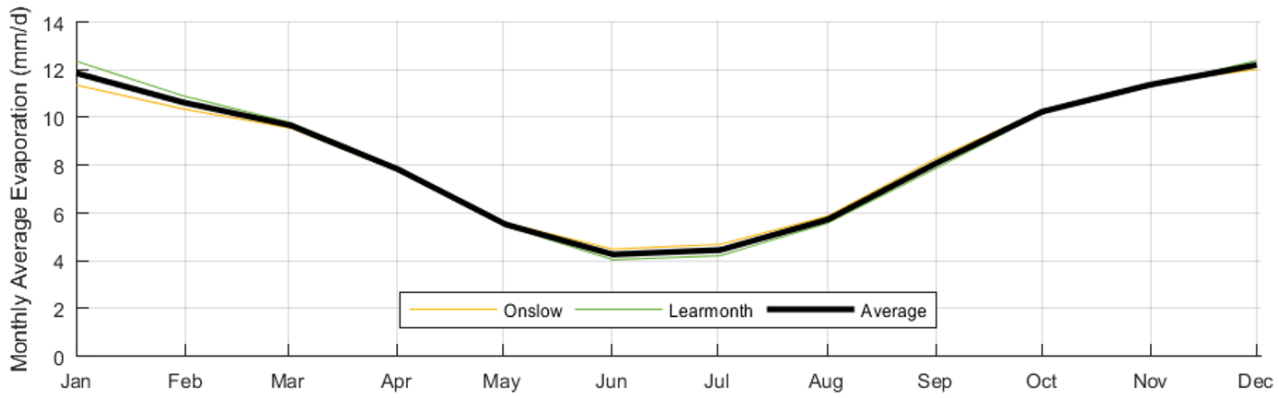


Figure 3: Average Monthly Evaporation for Onslow Airport
(Bureau of Meteorology, 2020a)

5.2.4 WIND SPEED AND DIRECTION

Dominant weather conditions around Exmouth Gulf are governed by:

- A sub-tropical high-pressure belt to the south; and
- A trough of low pressure that typically extends over the inland Pilbara during the summer months.

These two processes generate a general south or south-westerly wind regime for most of the year, with more south-westerly winds common during the summer months. North-easterly winds are generally common during afternoons in both summer and winter. In the warmer months, sea breezes are predominantly south-westerly or north-easterly (Blandford and Associates, 2005).

Wind roses for Onslow Airport, Learmonth Airport and Barrow Island Airport for the duration of hourly data availability are presented in Figure 4.

Wind roses for the following seasons are also presented for Onslow Airport in Figure 4:

- Winter: May to August
- Cyclone Season: mid-December to April
- Dry Season: September to mid-December

The cyclone season and the dry season demonstrate similar wind patterns with a general south through to north-westerly direction.

Most winds during these two seasons are close to 7.5 m/s, with higher wind typically blowing from westerly and north-westerly directions.

As illustrated in Figure 4 below, during the winter months relatively lower intensity winds (less than 5 m/s) are generally from the north and south.

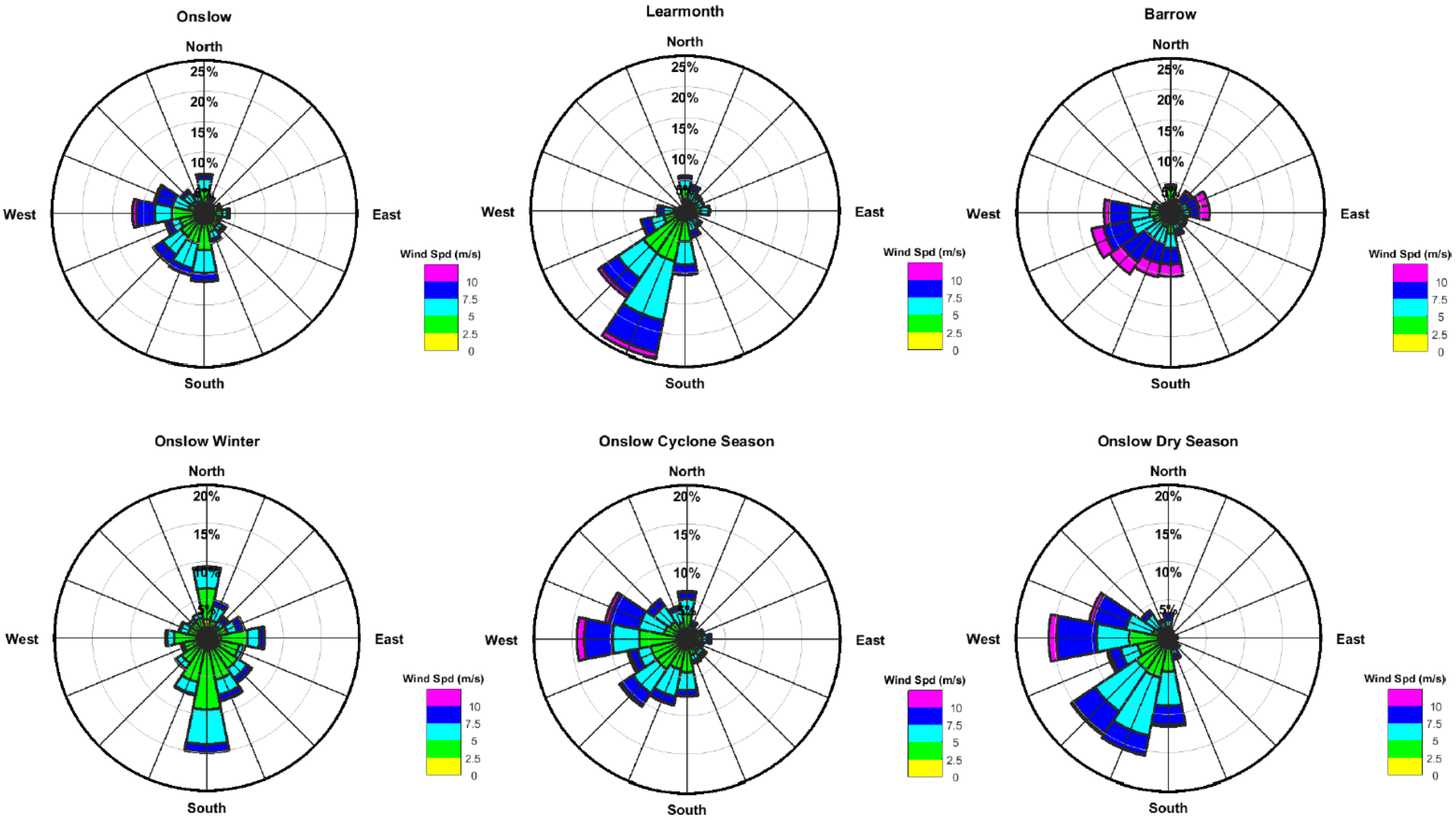


Figure 4: Wind Roses for Onslow Airport, Learmonth Airport and Barrow Island
(Bureau of Meteorology, 2020a)

5.2.5 HISTORIC CYCLONE EVENTS

The northwest Australian coastline is the most cyclone-prone region of the entire Australian coastline. Cyclones which may affect the region typically form in the Timor Sea, usually with a south-westerly track. However, the cyclones that affect the Exmouth Gulf take a more southerly or south-easterly track as they move further south (Blandford and Associates, 2005). Cyclones forming in this area typically occur from mid-December to April, peaking in February and March. Table 6**Error! Reference source not found.** summarises cyclones since 1985 which have influenced the Onslow/Exmouth region (BOM, 2020b).

The most intense tropical cyclone ever recorded to cross the Australian coast, tropical cyclone Vance, passed the Exmouth Gulf in March 1999. Vance was a Category 5 cyclone with the highest wind gust ever recorded on Australian mainland of 267 km/hr at Learmonth Airport on the 22nd of March 1999 (Blandford and Associates, 2005).

Table 6: Cyclones Affecting Exmouth / Onslow Coast Since 1985
(BOM, 2020b)

Name	Year	Description
Tina	1990	A very weak system that did not exhibit a typical tropical cyclone structure. The low passed very close to Exmouth near Learmonth.
Bobby	1995	Bobby crossed the coast as a category three near Onslow on the 25 February causing severe flooding across the north-west.
Vance	1999	Cyclone Vance made landfall over Exmouth as a strong category five, one of the strongest landfalling cyclones recorded in Australia. Exmouth was devastated, with the whole town badly damaged and many houses destroyed.
Steve	2000	Steve made two landfalls in WA, once near Karratha and again near Carnarvon. Damage was severe from flooding in Gascoyne River.
Glenda	2006	Made landfall over Onslow as a category three storm causing moderate damage (severe economic damage however).
Carlos	2011	Carlos brushed the Pilbara coast causing heavy rainfall and high winds from Broome all the way to Exmouth. Building damage was severe in Karratha.
Lua	2012	Cyclone Lua caused severe damage across isolated cattle stations in the Pilbara as a category four.
Olwyn	2015	Olwyn tracked the Western Australian coast from Exmouth, WA to Shark Bay, passing directly over Carnarvon.
Quang	2015	Formed about 1,000km to the northwest of Exmouth, weakened then landed at Exmouth 0n the 1st of May.
Veronica	2019	Veronica made came close to land near Karratha, then weakened below tropical cyclone strength by 26 March. The remaining low tracked over the North West Cape near Exmouth.

5.3 LANDSCAPE

5.3.1 LANDSCAPE DESCRIPTION

The Project area is located approximately 40 km south west of Onslow and approximately 20 km south west of Ashburton River.

The project area is dominated by an old alluvial/colluvial outwash plain of low relief, which to the east has been covered by a sand plain with a longitudinal and network dune system. The interdunal areas are generally dominated by deflation pans of varying depth, elsewhere, these interdunal areas are well vegetated sands. Towards the west, these features have been transformed during a period of higher sea level to a broad featureless salt flat up to 13 km wide. This featureless plain is, in turn, fringed by a belt of mangroves and tidal creeks along its western edge. Within the sand plain, discharge from the hydrological catchment, has resulted in the development of an extensive modern alluvial plain (Blandford and Associates, 2005).

5.3.2 IBRA CLASSIFICATION

The Interim Biogeographic Regionalisation of Australia (IBRA7) recognises 89 bioregions for Australia (Department of Agriculture, Water and the Environment, 2020).

The Project lies within the Cape Range subregion of the Carnarvon bioregion (CAR). The Cape Range subregion (CAR1) is 2,547,911 ha and is described as:

"Cape Range and Giralia dunefields form the northern part of Carnarvon Basin. Rugged tertiary limestone ranges and extensive areas of red aeolian dunefield, Quaternary coastal beach dunes and mud flats. Acacia shrublands over Triodia on limestone (Acacia stuartii or A. bivenosa) and red dunefields, Triodia hummock grasslands with sparse Eucalyptus trees and shrubs on the Cape Range. Extensive hummock grasslands (Triodia) on the Cape Range and eastern dune-fields. Tidal mudflats of sheltered embayments of Exmouth Gulf support extensive mangroves. Beach dunes with Spinifex communities. An extensive mosaic of saline alluvial plains with samphire and saltbush low shrublands along the eastern hinterland of Exmouth Gulf. Islands of the Muiron, Barrow, Lowendal and Montebello groups are limestone based. Climate is arid, semi-desert to sub- tropical climate, with variable summer and winter rainfall. Cyclonic activity can be significant, and cyclonic systems may affect the coast and hinterland annually" (Kendrick and Mau, 2003).

5.3.3 LAND SYSTEMS

Land systems mapping which covers the Project area is available from the Department of Primary Industries and Regional Development (DPIRD). The Project Development Envelope intersects three land systems (Dune, Littoral and Onslow), as summarised in the Table 7 and shown on Figure 5. All four land systems are widespread in the locality (van Vreeswyk, Payne, Leighton and Henning, 2004).

Table 7: Land Systems Intersected by Project

Land System	Description
Dune (RGEDUN)	Dune fields supporting soft spinifex grasslands
Littoral (RGELIT)	Bare coastal mudflats with mangroves on seaward fringes, samphire flats, sandy islands, coastal dunes and beaches
Onslow (RGEONS)	Undulating sandplains, dunes and level clay plains supporting soft spinifex grasslands and minor tussock grasslands.

5.4 MATERIALS CHARACTERISATION

5.4.1 SOILS

Soil unit mapping which covers the Project area is available from DPIRD. Four soil units have been mapped across the Project Development Envelope (

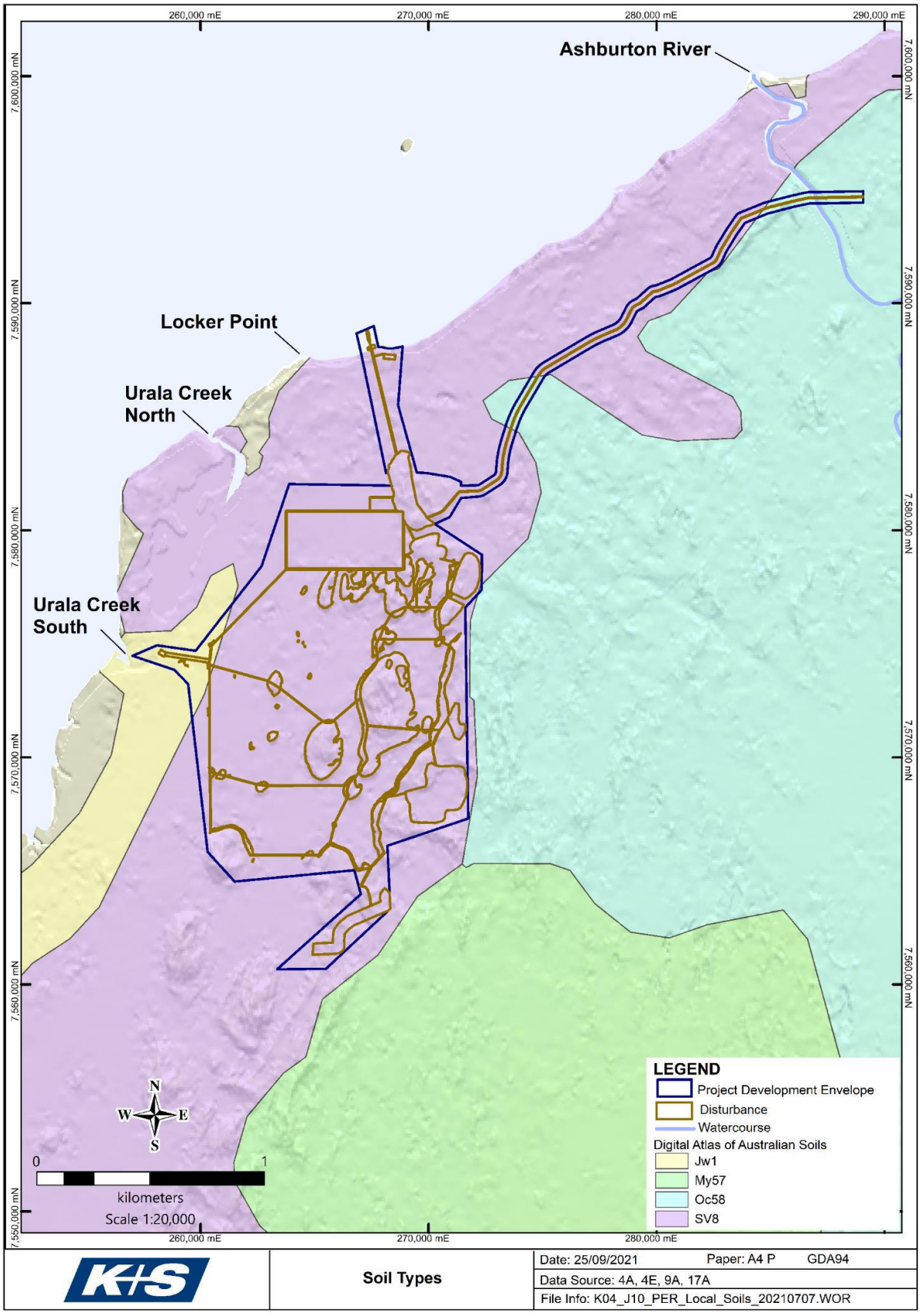


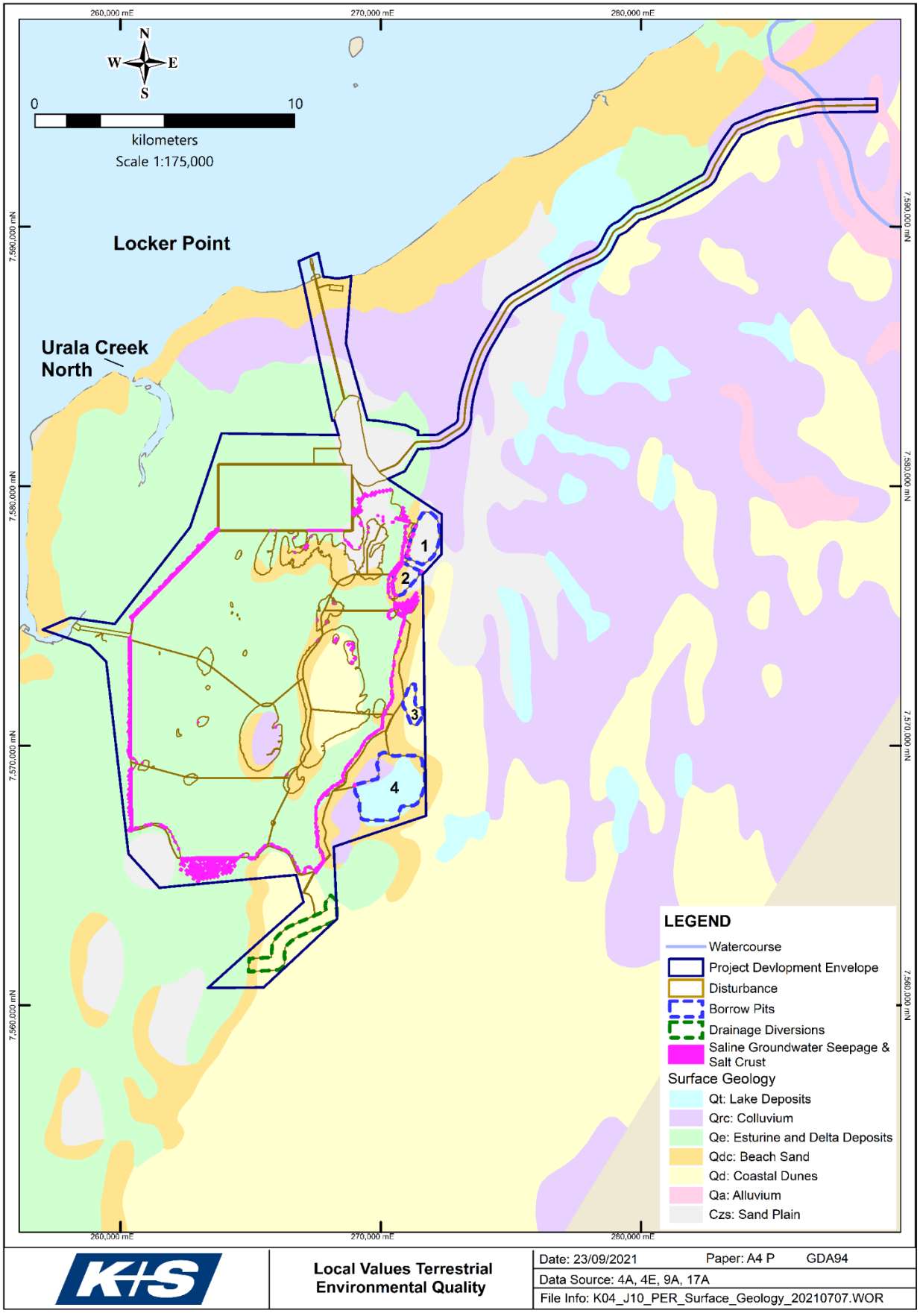
Figure 6 and Table 8). SV8 is the dominant soil unit.

Table 8: Soil Units Intersected by Project Development Envelope

Unit Code	Soil Description
Jw1	Low-lying coastal plains with some sand dunes: chief soils are saline clays (Uf1.41) on the flat to very gently sloping plains. Associated are (Ug5) and (Uf) soils along the inland margin of the plains; areas of saline muds (Um1) on slopes and flats submerged at high tide; and very small areas of calcareous sands (Uc1.1) and/or siliceous sands (Uc1.2) on coastal dunes.
My57	Extensive plains with parallel sand dune formations: chief soils of the plains are neutral red earths (Gn2.12) but there are also areas of acid (Gn2.11) and alkaline (Gn2.13) red earths with some hard red soils (Dr2.33) towards margins and around drainage lines. Chief soils of the dunes are red sands (Uc1.23) and (Uc5.21).
Oc58	Broad alluvial plains with a few clay pans and red sand dunes; some areas of cracking clays along creek lines: chief soils are hard alkaline red soils (Dr2.33) and (Dr2.13). Associated are (Uf) soils in clay pans; red sands (Uc1.23) on dunes; and areas of cracking clays (Ug5.38) along creeks. This unit grades northwards into unit Oc72.
SV8	Salt flats, tidal swamps, and coastal dune sands: chief soils are saline loams (Um1.3) and (Um1.4) with shelly sands (Uc1.11, Uc1.13). Small areas of calcareous earths (Gc) and shallow loams (Um) are associated with marls.

5.4.2 SURFACE GEOLOGY

The Development Envelope encompasses eight geological units (



KIS	**Local Values Terrestrial Environmental Quality**	Date: 23/09/2021 Paper: A4 P GDA94 Data Source: 4A, 4E, 9A, 17A File Info: K04_J10_PER_Surface_Geology_20210707.WOR

Figure 7 and Table 9), mapped by the Geological Survey of WA and collated in Geoscience Australia (2008). Qe is the dominant geological unit in the study area.

Table 9: Geological Units Occurring in the Development Envelope

Unit Code	Geological Description
Czs	Sand or gravel plains; quartz sand sheets commonly with ferruginous pisoliths or pebbles, minor clay; local calcrete, laterite, silcrete, silt, clay, alluvium, colluvium, aeolian sand
Qa	Channel and flood plain alluvium; gravel, sand, silt, clay, locally calcreted
Qd	Dunes, sandplain with dunes and swales; may include numerous interdune claypans; residual and aeolian sand with minor silt and clay; aeolian red quartz sand, clay and silt, in places gypsiferous; yellow hummocky sand
Qdc	Beach sand, sand dunes, coastal dunes, beaches, and beach ridges; calcareous and siliceous, locally shelly and/or cemented (beach rock); locally reworked
Qe	Coastal silt and evaporite deposits; estuarine, lagoonal, and lacustrine deposits
Qrc	Colluvium, sheetwash, talus; gravel piedmonts and aprons over and around bedrock; clay-silt-sand with sheet and nodular kankar; alluvial and aeolian sand-silt-gravel in depressions and broad valleys in Canning Basin; local calcrete, reworked laterite
Qt	Lacustrine or residual mud, clay, silt and sand, commonly gypsiferous and/or saline; playa, claypan, and swamp deposits; peat; peaty sand and clay; halitic and gypsiferous evaporites

5.4.3 SOIL AND SEDIMENT DISTURBANCE

It should be noted that due to the nature of the Project, it does not involve soil disturbance of the scale usually required by mining projects. The solar ponds will use the natural salt flats as their basement, without any disturbance of these salt flats required.

The only disturbances and excavations required are as follows:

- Borrow pits for materials for access road and conveyor construction.
- Pushing up of materials at the margins of the ponds to create pond embankment walls.
- Clearing of wash plant site to create foundations for plant and buildings.

5.4.4 SUBSURFACE MATERIALS AND PROCESSING WASTE

It should be noted that due to the nature of the Project, it does not involve mining of an area of mineralisation or orebody. No mining waste, tailings or processing waste will be produced.

The only waste materials resulting from the project are as follows:

- Dredge spoil from dredging of a small berthing pocket to be disposed on land in a controlled manner that does not create environmental harm.
- Bitterns, the wastewater produced from the solar salt process which is essentially seawater with the majority of sodium chloride removed and remaining naturally-occurring ocean salts concentrated. No chemicals are added to the salt production process and as a result, all substances within bitterns are naturally-occurring, however in their concentrated state the bitterns are harmful to marine biota. It is proposed to discharge bitterns from the operation into the marine environment via a combination of infrastructure, which will be designed and managed to ensure effective dilution of the bitterns and minimise changes in background water quality surrounding the discharge point. The location and design of the discharge infrastructure is currently be determined as part of the environmental studies being conducted for the project.

Modelling of surface water behaviour, flooding, assessment of surface water impacts and proposed management is provided as part of APPENDIX 2.

5.4.5 RISK FACTORS

Based on the known soil types and surface geology, it is considered highly unlikely that materials resulting from project disturbances will pose risks such as:

- acidic and/or metalliferous drainage (AMD)
- sodic or dispersive material
- naturally occurring radioactive material (NORM).

Disposal of dredge spoil will be on land in a controlled manner that does not create environmental harm.

Topsoil disturbed during borrow pit excavation, pond embankment and wash plant construction will be stockpiled and stored for use in rehabilitation activities. It is considered unlikely this will contain sodic or dispersive material due to the soil types present.

Extensive soil and sediment sampling and analysis is currently underway to confirm that soils, sediment and materials associated with the project disturbance are low risk.

Detailed modelling of bittern discharge and dilution is current underway as part of project environmental studies and will be included in the PER for assessment by the EPA.

All completed studies, assessment and management actions relevant to the Project are listed in Section 5.11and attached to this MCP as APPENDIX 2.

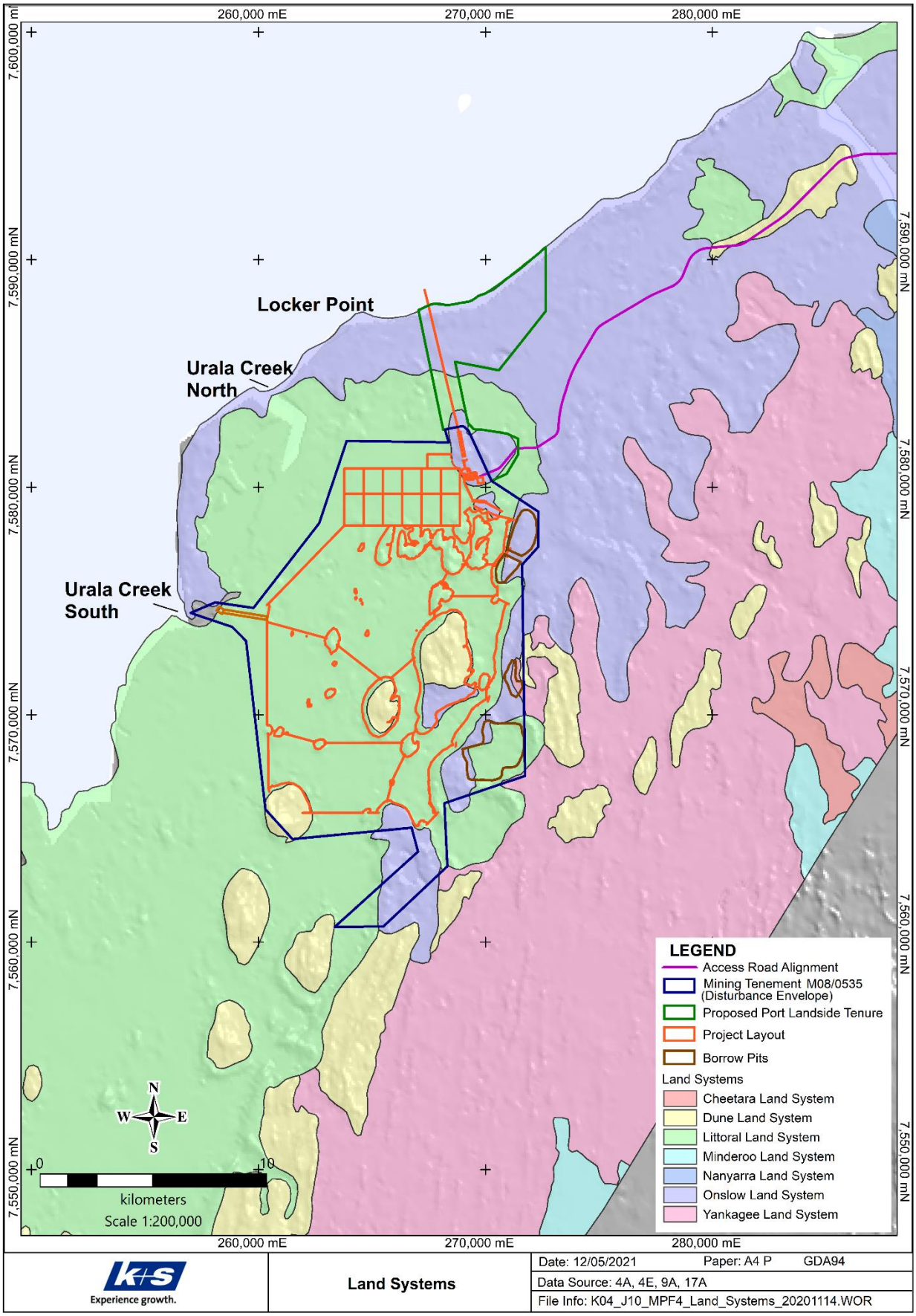


Figure 5: Land Systems (Note: previous design shown)

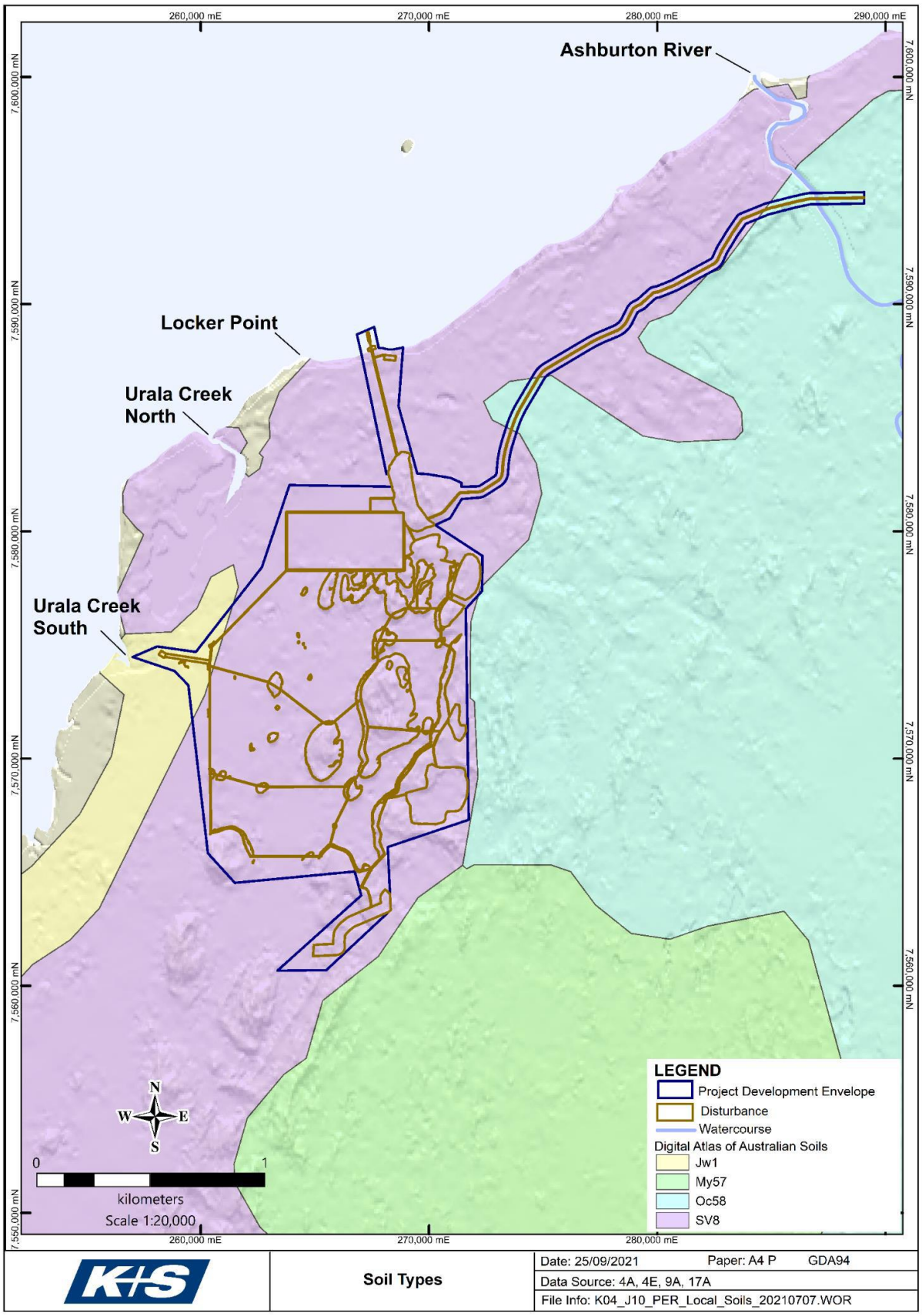


Figure 6: Soils (from draft ERD)

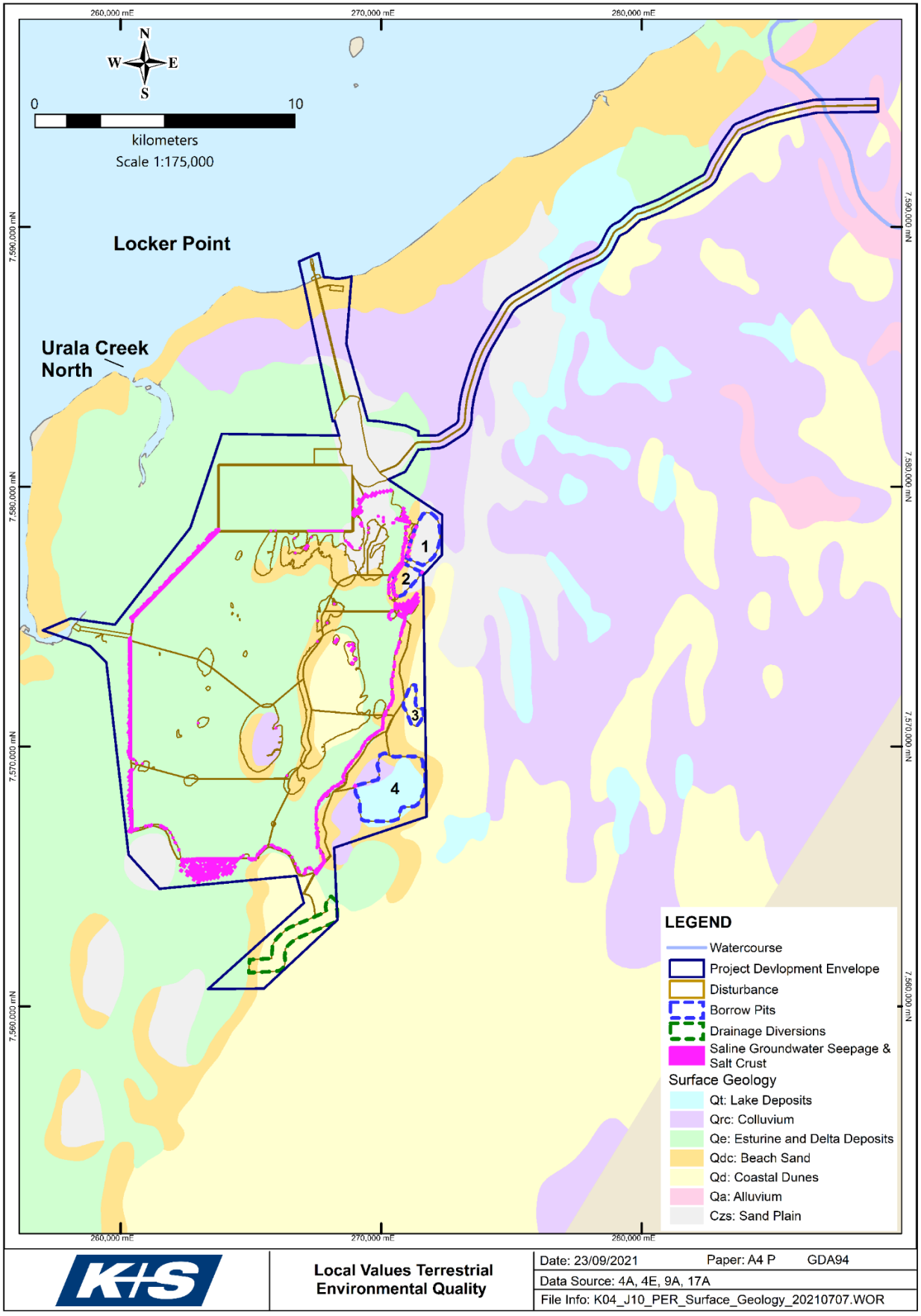


Figure 7: Surface Geology (from draft ERD)

5.5 BIODIVERSITY

All completed studies, assessment and management actions relevant to the Project are listed in Section 5.11 and attached to this MCP as APPENDIX 2, including detailed biodiversity related studies, flora, vegetation and terrestrial fauna surveys.

5.5.1 VEGETATION

A total of 18 vegetation types have been described and mapped for the study area, along with areas of bare mudflat and claypan. Each vegetation unit is summarised in Table 10. None of the vegetation types identified for the study area represent Threatened Ecological Communities (TEC's) listed either under the Commonwealth EPBC Act or the EP Act, and no Priority Ecological Communities (PECs) were identified in the study area (Biota, 2022a).

The vegetation of the study area was generally ranked as being in Very Good to Excellent condition. The samphire vegetation was largely weed-free, with only very occasional **Sonchus oleraceus* and **Cenchrus* grasses. Vegetation on sand dunes and plains generally contained at least scattered **Cenchrus* grasses, and sometimes dense patches or large infestations; condition was generally ranked as Very Good, with some areas ranked Good to Poor (e.g. within P2 and P4). A relatively small proportion of the study area had been cleared for tracks and for pastoral and gas storage infrastructure; these areas were scored as Completely Degraded. Vegetation type and condition mapping is included in APPENDIX 2 (Biota, 2022a)

Table 10: Vegetation within Project Area (Biota, 2022a)

Unit Code	Description
Vegetation of the Coastal Strand	
B1	*Spinifex longifolius* very open hummock grassland
Vegetation of Saline Mudflats and Clay Plains	
S1	*Tecticornia doliiformis*, (*T. indica, T. halocnemoides, Frankenia ambita*) low shrubland over *Sporobolus mitchellii, Eragrostis falcata* very open grassland
S2	*Tecticornia indica,* (*T. auriculata, T. halocnemoides*) low open shrubland over *Eragrostis falcata* scattered grasses
S3	*Tecticornia auriculata*, (*T. indica, T. halocnemoides*) low shrubland over *Eragrostis falcata* scattered grasses
S4	*Atriplex bunburyana* scattered low shrubs over *A. codonocarpa, Sclerolaena recurvicuspis* very open herbland with **Cenchrus* spp. scattered tussock grasses to very open tussock grassland
S5	*Acacia xiphophylla* tall open scrub over *Atriplex bunburyana* scattered low shrubs over **Cenchrus ciliaris* open tussock grassland
Vegetation of Creeklines and Drainage Areas	
C1	*Eucalyptus victrix* low open woodland over **Prosopis pallida* scattered tall shrubs over **Cenchrus ciliaris,* (**C. setiger*) open tussock grassland
C2	*Eucalyptus victrix* low woodland to low open woodland over *Acacia synchronicia, A. tetragonophylla* scattered tall shrubs to tall open shrubland over *Eriachne benthamii/flaccida,* (*Eulalia aurea, Sporobolus mitchellii*) tussock grassland
C3	*Acacia tetragonophylla,* (*A. synchronicia*) tall shrubland over *Eriachne benthamii/flaccida* open to very open tussock grassland with *Triodia epactia* scattered hummock grasses to very open hummock grassland
C4	*Acacia synchronicia, A. tetragonophylla* scattered tall shrubs over *Eriachne benthamii/flaccida*, (*Sporobolus mitchellii*) closed tussock grassland
Vegetation of Sand Plains	
	Acacia tetragonophylla, A. synchronicia, A. sclerosperma subsp. *sclerosperma*, (*A. coriacea* subsp.

Unit Code	Description
P1	*coriacea*) scattered tall shrubs to tall open shrubland over *A. stellaticeps* scattered low shrubs to low shrubland over *Triodia epactia* hummock grassland with **Cenchrus ciliaris* very open tussock grassland
P2	*Acacia synchronicia, A. tetragonophylla* scattered tall shrubs over *Triodia epactia* very open hummock grassland with **Cenchrus ciliaris* very open tussock grassland to tussock grassland
P3	*Acacia synchronicia, A. tetragonophylla* scattered tall shrubs over *Triodia glabra*, (*T. epactia*) hummock grassland
P4	*Acacia tetragonophylla, A. sclerosperma* subsp. *sclerosperma* tall open shrubland over *Triodia glabra, T. epactia*, (*T. avenoides*) hummock grassland over **Cenchrus* spp. very open tussock grassland
Vegetation of Sand Dunes	
D1	*Acacia coriacea* subsp. *coriacea* low open woodland over *Spinifex longifolius* very open to open tussock grassland with *Triodia epactia* scattered hummock grasses
D2	*Acacia coriacea* subsp. *coriacea* low open woodland over *Triodia epactia* open hummock grassland with **Cenchrus ciliaris* very open tussock grassland
D3	*Grevillea stenobotrya, Hakea stenophylla* subsp. *stenophylla*, *Acacia coriacea* subsp. *coriacea* tall open shrubland over *A. stellaticeps, Scaevola sericophylla, Quoya loxocarpa* low open shrubland over *Triodia epactia* open hummock grassland with **Cenchrus ciliaris* very open tussock grassland
D4	*Grevillea stenobotrya, Hakea stenophylla* subsp. *stenophylla*, (*Acacia coriacea* subsp. *coriacea*) tall open shrubland over *Acacia stellaticeps* open shrubland over *Scaevola sericophylla* low open shrubland over *Triodia avenoides*, (*T. epactia*) hummock grassland
Other Mapping Units	
X1	Bare mudflat/claypan
X2	Cleared areas

5.5.2 NATIVE FLORA

A total of 288 native vascular flora species from 126 genera and 45 families have been recorded from the study area based on all surveys to date. No species listed as Threatened flora under State legislation have been recorded in the study area to date, and none would be expected to occur. However, one species listed as Threatened under Commonwealth legislation was recorded: *Minuria tridens* is listed as Vulnerable under the EPBC Act. This species is only listed as a Priority 1 species in WA. The location of the single record of *Minuria tridens* was re-visited and the surrounding area searched during the recent targeted survey, however no individuals were located (Biota, 2022c).

A total of five Priority flora taxa were recorded from the study area during the current survey. These species are listed and briefly described in Table 11 and mapped in Figure 8. All except *Minuria tridens* have been documented previously from the broader locality (Biota, 2020a). The impacts to priority flora will be evaluated by the EPA during assessment of the PER.

One Priority flora species was recorded during the targeted survey, *Abutilon* sp. Pritzelianum (S. van Leeuwen 5095) (Priority 3) (Biota, 2022c). This species is described below and a map of locations in the study area is provided in Figure 9 (2022 records only).

Table 11: Summary of Significant Flora Recorded (Biota, 2022a) (Biota, 2022c)

Taxon	Status	Description	Local Distribution and Counts	Regional Distribution (Florabase, 2021)
Minuria tridens	Priority 1 (WA) and Vulnerable (EPBC)	A perennial subshrub growing to 30 cm tall with pale blue flowers. Currently represented in WA by a single specimen from near Cue, approximately 720 km south-southeast of Onslow. All other records are more than 1,700 km east of Onslow in the Northern Territory, where it occurs over a range of more than 300 km on "dolomite, limestone and calcrete impregnated sandstone hills, rises and ranges" (Nano et al. 2012). It seems questionable that the WA populations would represent the same entity present in the Northern Territory, however genetic analysis would be required to investigate this.	1 plant recorded in Phase 1 from an island surrounded by mudflat in the northern section of the study area. Mike Hislop from the WA Herbarium provided the following advice in relation to this specimen: "I recently inspected a flowering specimen from the same area and found no reason to doubt that it was *Minuria tridens*, notwithstanding the geographical disjunction from the nearest known population. While I am fairly confident that this material is of the same species, it is totally sterile and so there is a degree of uncertainty."	Two other recorded locations in WA- on the coast near Roebourne (Mardie Project) and in the East Murchison. Five new populations of 75 individuals were found at the Mardie Project (EPA, 2021) Also ~ 20 populations in Northern Territory (DNREAS, 2008), although given the disparate habitats between the WA populations and the Northern Territory populations, which are >1,800 km southeast, it is questionable whether the taxa are the same (Biota, 2022a).
Abutilon sp. Pritzelianum (S. van Leeuwen 5095)	Priority 3 (WA)	A perennial shrub growing to 1.5 m tall with yellow-orange flowers in August. This species occurs on sand plains with orange brown sandy loam substrate, and is distributed over a range of more than 700 km, extending from the southern Carnarvon bioregion through to Port Hedland in the Pilbara (DBCA 2020).	Three records of scattered individuals (in total seven individuals) recorded during the 2022 survey (Biota 2022c). These records represent additional records to the 29 individuals recorded from 12 locations in the study area during the Biota 2020 survey (Biota 2022a). A further 137 individuals recorded from 13 locations outside the study area. Most records from near coastal dune vegetation, but records also from sand plains, including in the far south of the study area.	Widespread record in WA. Recorded in the Carnarvon, Murchison and Pilbara IBRA regions.
Eremophila forrestii subsp. *viridis*	Priority 3 (WA)	A shrub growing to 1.5 m tall, with broad, deep green leaves that are covered in raised bumps and have a few branched hairs, and pale pink flowers from June to August (Brown and Buirchell 2011). Most records distributed over a range of 70 km in the area where the Carnarvon and Pilbara bioregions meet, with an outlying record over 1,000 km east on the Canning Stock Route.	935 individuals recorded from 54 locations in the study area. A further 13 individuals recorded from 2 locations outside the study area. Recorded from numerous locations on sand plains throughout the study area, including isolated islands surrounded by mudflat.	Two other recorded locations in WA - on the coast near Onslow and inland in the Great Sandy Desert.
Stackhousia clementii	Priority 3 (WA)	A dense, broom-like perennial shrub growing to 50 cm tall, with yellow tubular flowers, found on sandy plains and occasionally inundated areas (DBCA 2020). This species has a broad distribution across the breadth of the arid zone of WA, with most records from the Carnarvon, Pilbara and Murchison bioregions, but some records also towards the Northern Territory border.	390 individuals recorded from 9 locations on an island surrounded by mudflat in the northern section of the study area, all concentrated on an area of limestone pavement ~100x300 m in size.	Widespread records in WA. Recorded in the Carnarvon, Central Ranges, Great Sandy Desert, Great Victoria Desert, Murchison and Pilbara IBRA regions.
Triumfetta echinata	Priority 3 (WA)	A low spreading shrub to 40 cm tall with grey leaves densely covered with stellate hairs, and fruit with long spines. Recorded from the area where the Carnarvon, Pilbara and Gascoyne bioregions meet, where it occurs on red sand dunes; distributed over a range of only 42 km between Onslow and Uaroo Station.	1 plant recorded during targeted searches in 2019 towards the eastern end of the road corridor, occurring on the side of a track near the crest of a sand dune.	Several other records in WA. Recorded in the Ashburton, Cape Range and Roebourne IBRA regions.

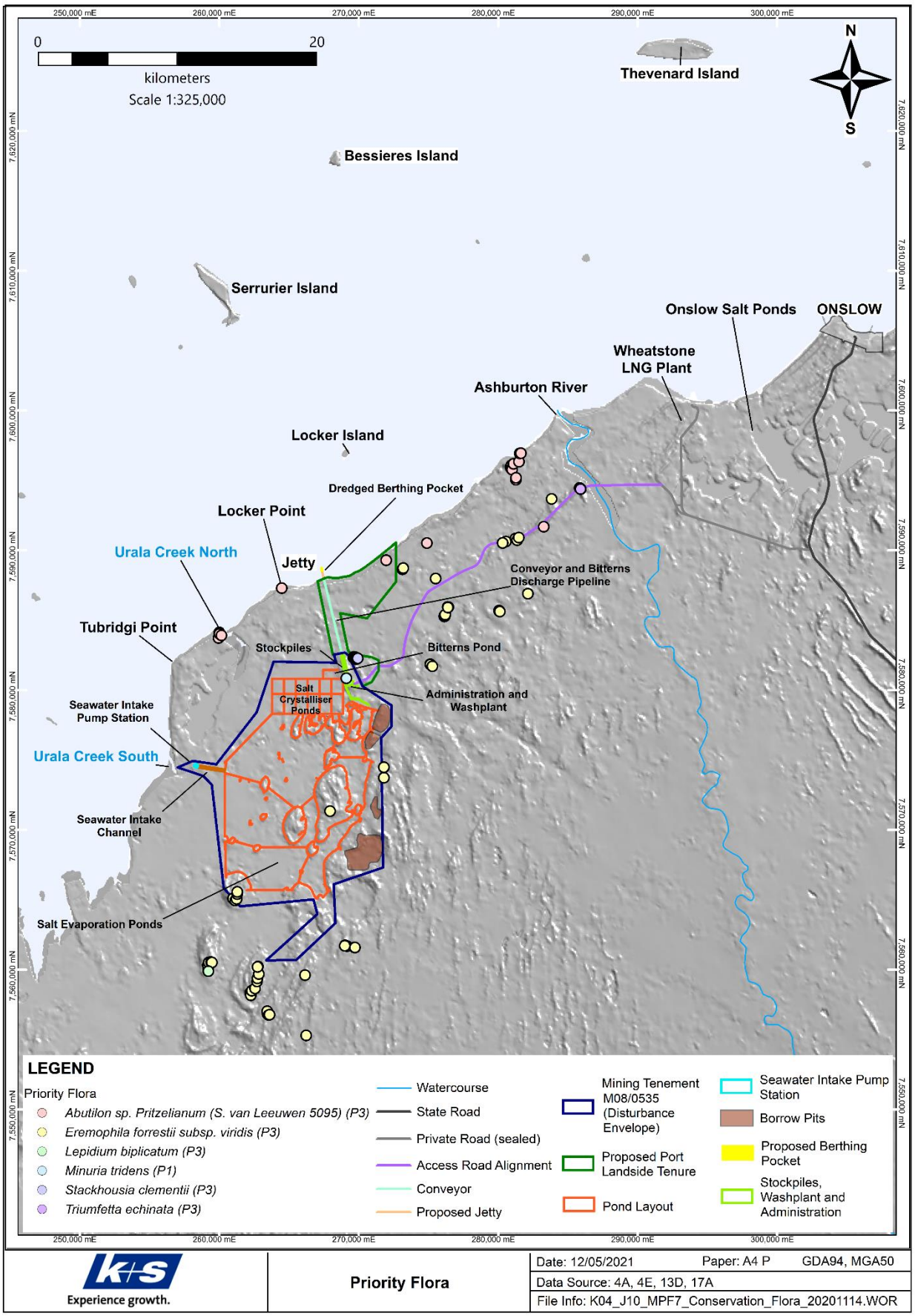


Figure 8: Significant Flora (previous design shown)

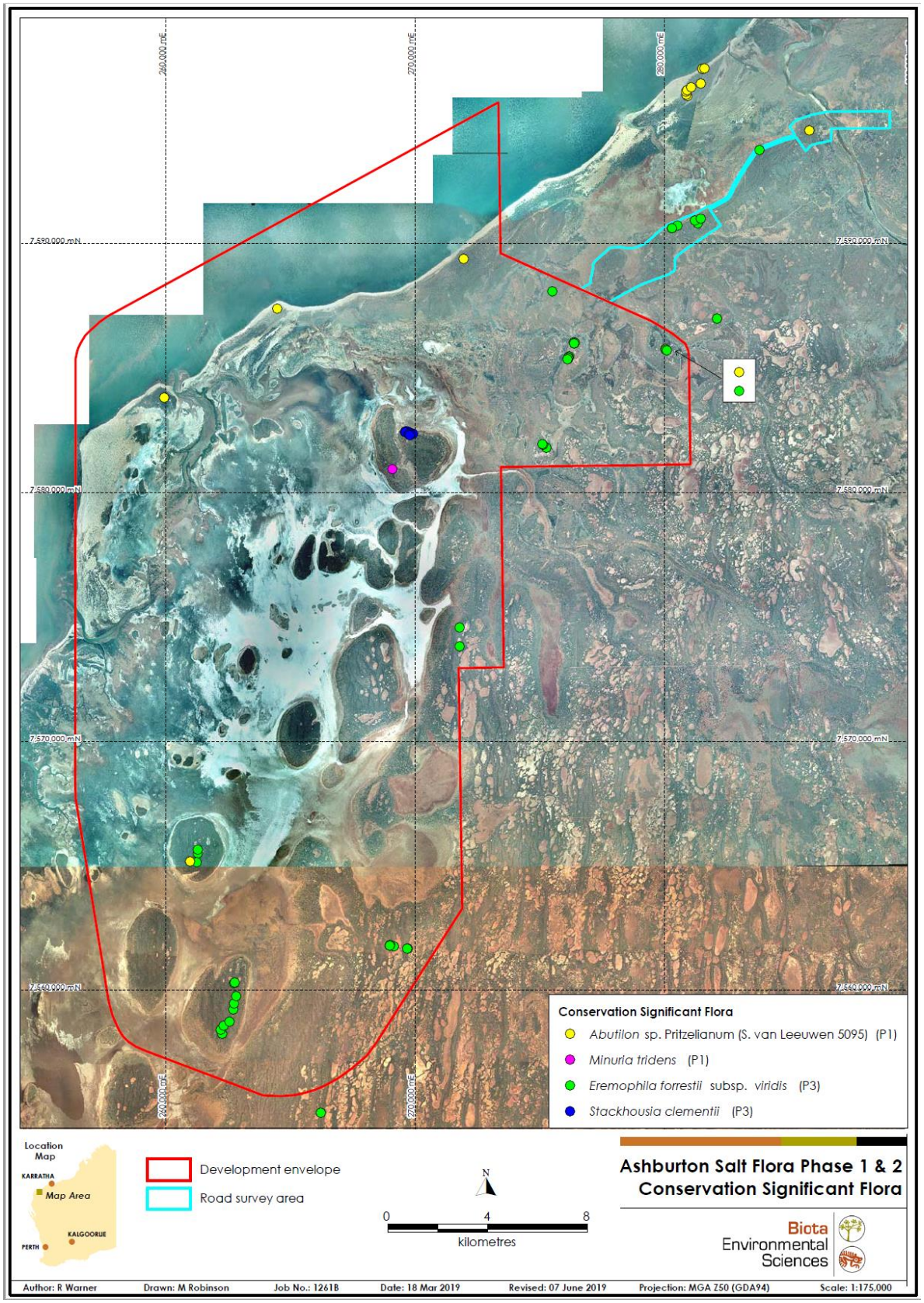


Figure 9: Flora recorded during Detailed Survey (Biota, 2022c)

5.5.3 INTRODUCED FLORA

A total of 16 introduced flora taxa (weed species) were recorded during the current surveys, one of which was only recorded outside the study area. Although weeds were widespread as scattered individuals, dense introduced species were most commonly recorded from areas of pastoral activity such as cattle pens, infrastructure areas and open grazed plains, and also in the vicinity of the Ashburton River (Biota, 2022a).

Three species recorded from the study area, **Parkinsonia aculeata* (Parkinsonia), **Prosopis pallida* (Mesquite) and **Tamarix aphylla* (Athel Pine) are declared plants under the *WA Biosecurity and Agriculture Management Act 2007* (BAM Act) and are also listed as Weeds of National Significance (Biota, 2022a).

5.5.4 VERTEBRATE FAUNA HABITAT

Five landscapes and associated landforms (fauna habitats) were determined for vertebrate fauna (Table 12). Habitat mapping is included in APPENDIX 2 (Biota, 2022b).

Based on examination of aerial imagery and land systems mapping, none of the fauna habitats identified during the survey are confined to the study area, as they are common throughout the mainland east of Exmouth Gulf. Although their attributes are typical of similar habitat types in the wider locality, mangrove habitat and the Ashburton River represent the habitat of highest fauna value in the study area, representing core habitat for the majority of conservation significant species recorded or likely to occur/potentially occurring within the study area (Biota, 2022b)

Table 12: Vertebrate Fauna Habitats (Biota, 2022b)

Landscape	Landforms
LANDSCAPE 1: Mainland remnants	• Longitudinal dune • Sand plain and clay plain • Freshwater clay pan
LANDSCAPE 2: Mud flats	• Supratidal salt flats (hypersaline mudflats • Intertidal mudflats (including algal mats)
LANDSCAPE 3: Inland dunes and plains	• Sand plain and clay loam plain • Gilgai plain • Longitudinal dune • Freshwater clay pan • River bank / creekline / drainage
LANDSCAPE 4: Coastal strand	• Coastal dune • Sandy beach
LANDSCAPE 5: Mangroves	• Mangrove

5.5.5 VERTEBRATE FAUNA

The survey recorded a total of 171 vertebrate species, comprising 54 herpetofauna species, 97 avifauna species, 13 ground-dwelling mammal species and seven bat species. The following 29 significant fauna species were recorded from the study area during the survey:

- Fork-tailed Swift, *Apus pacificus* (Migratory)
- Eastern Osprey, *Pandion cristatus* (Migratory)
- Pacific Golden Plover, *Pluvialis fulva* (Migratory)
- Grey Plover, *Pluvialis squatarola* (Migratory)
- Greater Sand Plover, *Charadrius leschenaultii* (Migratory)
- Bar-tailed Godwit, *Limosa lapponica menzbieri* (Critically Endangered / Migratory)

- Whimbrel, *Numenius phaeopus* (Migratory)
- Eastern Curlew, *Numenius madagascariensis* (Critically Endangered / Migratory)
- Terek Sandpiper, *Xenus cinereus*, (Migratory)
- Common Sandpiper, *Actitis hypoleucos* (Migratory)
- Grey-tailed Tattler, *Tringa brevipes*, (Priority 4 / Migratory)
- Common Greenshank, *Tringa nebularia* (Migratory)
- Ruddy Turnstone, *Arenaria interpres* (Migratory)
- Great Knot, *Calidris tenuirostris* (Critically Endangered / Migratory)
- Red Knot, *Calidris canutus* (Endangered / Migratory)
- Sanderling, *Calidris alba* (Migratory)
- Red-necked Stint, *Calidris ruficollis* (Migratory)
- Sharp-tailed Sandpiper, *Calidris acuminata* (Migratory)
- Curlew Sandpiper, *Calidris ferruginea* (Critically Endangered / Migratory)
- Broad-billed Sandpiper, *Limicola falcinellus* (Migratory)
- Little Tern, *Sternula albifrons* (Migratory)
- Fairy Tern, *Sternula nereis* (Vulnerable)
- Gull-billed Tern, *Gelochelidon nilotica* (Migratory)
- Caspian Tern, *Hydroprogne caspia* (Migratory)
- White-winged Black Tern, *Chlidonias leucopterus* (Migratory)
- Common Tern, *Sterna hirundo* (Migratory)
- Crested Tern, *Thalasseus bergii* (Migratory)
- Peregrine Falcon, *Falco peregrinus* (Other Specially Protected Fauna)
- Northern Coastal Free-tailed Bat, *Ozimops cobourgianus* (Priority 1).

Additionally, the Fairy Tern, *Sternula nereis* (Migratory) has previously been recorded within the study area, but not during the current survey. No reptiles or ground mammals of significance were recorded from the study area (Biota, 2022b).

5.5.6 FERAL ANIMALS

A number of species of introduced animals are also present at the site including the following (Biota, 2022b):

- *Canis lupus* (Dog)
- *Vulpes Vulpes* (Red Fox)
- *Felis catus* (Cat)
- *Equus caballus* (Horse)
- *Bos Taurus* (European Cattle)
- *Rattus rattus* (Black Rat)
- *Rattus tunneyi* (Pale Field-rat)
- *Mus musculus* (House Mouse)
- *Oryctolagus cuniculus* (Rabbit).

5.5.7 SHORT RANGE ENDEMICS AND SUBTERRANEAN FAUNA

Mygalomorph spiders and land snails were the only taxonomic groups recorded in the study area with the potential to include SRE species. Of the 12 invertebrate taxa collected during the survey, eight mygalomorph spider taxa from four families are considered to be potential SREs. The remaining taxa have been demonstrated to not be SREs (Biota, 2022b).

Of these, five are known solely from the study area, comprising: *Idiommata* sp. B38; *Conothele* sp. C26; *Conothele* sp. C27; *Aname* sp. N142; and *Aname* sp. N146. Although it is possible that these putative species exhibit highly localised distributions, they all occur on fauna habitats that are represented outside the study

area. Additionally, the *Conothele* and *Aname* taxa occur in locations where analogous landscapes extend contiguously beyond the study area. Given this, it is unlikely that these taxa are restricted to the study area (Biota, 2022b).

Although *Idiommata* sp. B38 was recorded on one occasion on mainland remnants, the biogeographical history of the study area and the distribution of other mygalomorph spiders in the study area indicate that this taxon is also likely to be more widespread than survey results indicate (Biota, 2022b).

Mygalomorph spider mapping has not yet been completed but will be included in the PER to be assessed by the EPA. If necessary, this MP will be updated at a later date to include this mapping.

5.5.8 BENTHIC HABITAT AND COMMUNITIES

All completed studies, assessment and management actions relevant to the Project are listed in Section 5.11 and attached to this MCP as APPENDIX 2 regarding assessment of benthic and communities.

5.5.9 MARINE FAUNA

All completed studies, assessment and management actions relevant to the Project are listed in Section 5.11 and attached to this MCP as APPENDIX 2 regarding assessment of benthic and communities.

5.6 SURFACE WATER

5.6.1 CATCHMENTS

The Project is located, between the Ashburton and Yannarie Rivers. Relevant surface water catchments are shown in Figure 10.

The Ashburton River lies approximately 25 km northeast of the Project area. It is the largest waterway in the vicinity of the Project site and has a catchment area of approximately 71,000 km^2, with a defined waterway all the way to the coast. The river is perched between natural levee banks, and any flood waters that escape from the channel tend to fan out across the floodplain, both to the west and east. The floodplain comprises a range of landforms and when flood waters from the river reach the outwash plain inland of the Project area, they inundate interdunal basins and claypans. Much of the water that reaches these storages is eventually lost through evaporation and to a lesser extent through infiltration. There is no direct waterway connection of the Ashburton River to the Project site, however there are some overland flow paths across the floodplain to the west of the main Ashburton River channel, which direct flows towards the salt flats and intertidal areas, including those near the Project site (Water Technology, 2021).

The Yannarie River lies approximately 50 km to southeast of the Project site. It has a catchment area of approximately 4,300 km^2, and a stream length of 185 km. The channel becomes poorly defined where it reaches the outwash plain inland of the Project site and its flood waters spread out across the outwash plain and dune field. Similarly, the adjacent Rouse Creek which has a catchment area of 1,700 km^2 and a stream length of 75 km has no defined channel once it reaches the outwash plain (Blandford and Associates, 2005). As with Ashburton River flows, when waters from these systems reach the outwash plain, they flood interdunal basins and claypans, where much of the water is eventually lost through evaporation and to a lesser extent through infiltration. During significant flood events, water from these systems can enter the salt flats and intertidal areas to the west of the Project area via overland flow paths (Water Technology, 2021).

The boundary in Figure 10 represents the local surface water catchment relevant to the Project which is 6,962 km^2 in size. Rainfall across the local catchment also contributes to runoff toward the Project area during significant rainfall events (Water Technology, 2021).

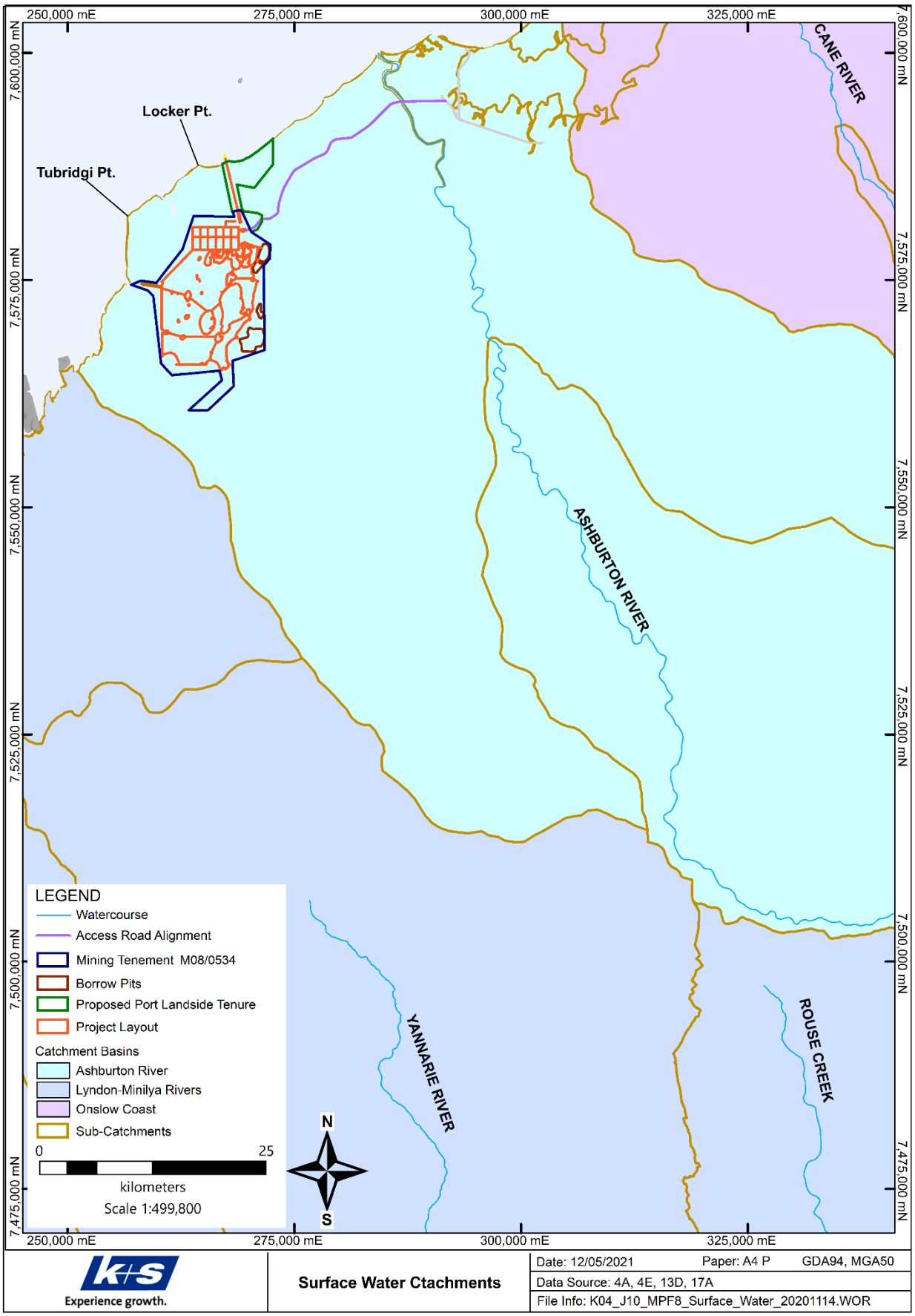


Figure 10: Surface Water Catchments (previous design shown)

5.6.1.1 CATCHMENT GEOMORPHOLOGY

Blandford and Associated (2005) describe the catchment geomorphology as follows:

- The Ashburton River catchment exhibits high topographic relief with waterways typically remaining channelised upstream of Nanutarra. Downstream of this location, the topography becomes much flatter, and numerous possible flow breakouts and extensive floodplains occur, with most of this depositional and erosional zone classified as outwash plains.
- The outwash plain landscape consists of alluvial and colluvial sediments. The alluvial sediments enter the plain from overland flows during flood events on the Ashburton and Yannarie Rivers, and consist of finer sediments such as clay, silt and fine sand particles. The colluvial sediments consist of coarser particles which include coarse sands and gravel.
- Further downstream, overland flows traverse the remnant dune field (Dune Land System). The dune field begins 15 km inland from the coast and runs parallel to the coastline, covering an area of approximately 3,225 km^2. The dunes are predominantly orientated north to south and were formed by aeolian transport. Vegetation cover on the dunes is abundant, indicating that they are relatively stable. The rows of dunes display longitudinal depressions or swales between them, allowing water to flow between and around the dunes, and sometimes act as significant storages where water can pond. There are also several defined overland flow paths across this area.
- Salt flats (part of the Littoral Land System) located on the seaward side of the dune field are typically inundated during extreme tide or storm events. During flood events on the Ashburton River, the area acts as an outlet for catchment flow paths. Given the low topographic gradient of the area, overland flows usually consist of shallow sheet flow across the area, with no clearly defined channels. The flats run from Sandalwood Peninsula to the mouth of the Harding River, covering an area of approximately 555 km^2.
- The coastal fringe separates the salt flats and the coastline. The coastal fringe is comprised of beach systems, sand sheets and limestone outcrops, and is the final outlet for overland flows. Tidal creeks, such as Urala Creek North and Urala Creek South, are abundant over the landscape and provide mangrove habitat.

5.6.2 SURFACE WATER FLOW PATHS

Surface water flow paths in and around the Project site is a complex interaction between watercourses including the Ashburton River, Yannarie River and Rouse Creek and the wide outwash plain, salt flats and dune fields adjacent to the coast.

Catchment inflows to the Project area have been modelled by Water Technology (2021). The generalised flow paths identified from this modelling are mapped below in Figure 129.

Breakout overland flows from Yannarie River and Rouse Creek typically enter the coastal system 35 km to the south of the Project. Yannarie River itself is located 50 km southeast of the Project, whilst Rouse creek is located approximately 75 km to the southeast of the Project.

Breakout overland flows from the Ashburton River combined with local runoff create sheet flow conditions across the catchment and flows that pass through the inland dune field and claypan system. Overland flows from the hinterland dune field immediately to the east of the Project enter the salt flats via large local basins adjacent to the eastern boundary of the proposed salt evaporation ponds. To the immediate north and south of the Project local flows are conveyed along more defined local flow paths, specifically ‘Chinty Creek’ to the north and an unnamed flow path to the south – Figure 11 (Water Technology, 2021).

All completed studies, assessment and management actions relevant to the Project are listed in Section 5.11 and attached to this MCP as APPENDIX 2 including modelling for surface water behaviour flooding and assessment of surface water impacts.

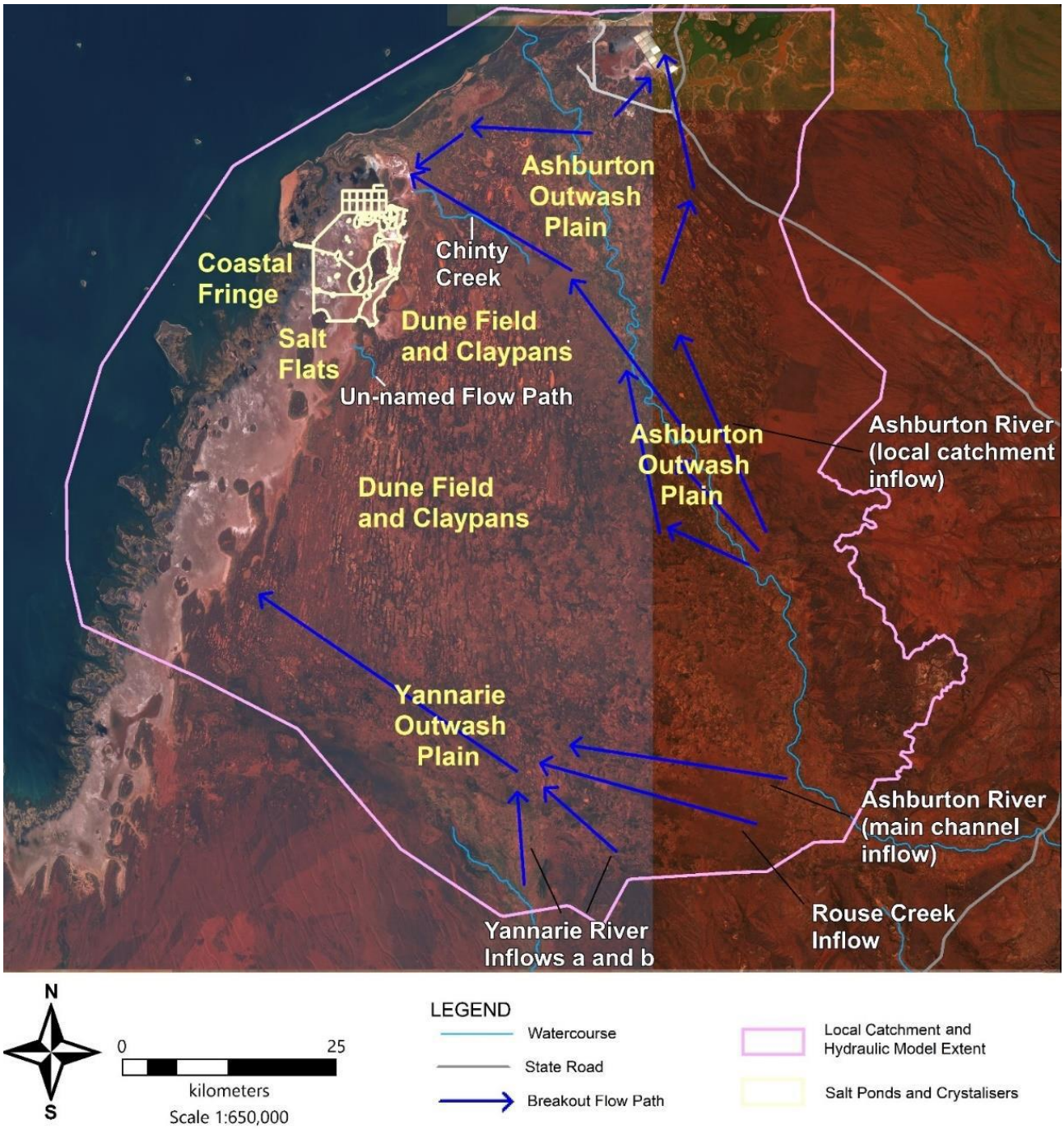


Figure 11: Local Catchment Geomorphic Features and Generalised Flow Paths (Water Technology, 2021)

5.6.3 SURFACE WATER MANAGEMENT AREAS

The Project occurs within the Pilbara Surface Water Area managed under the *Rights in Water and Irrigation Act 1914*. In this area it is illegal to take water from a watercourse without a licence to do so issued by DWER. No taking of surface water from a watercourse is proposed for this Project.

5.6.4 LOCAL SURFACE WATER FEATURES

Surface water modelling by Water Technology (Water Technology, 2021) has assisted with the identification of key surface water features in the Project area. These include (Figure 12):

- Chinty Creek a minor meandering overland flow path to the north and east of the Project area which conveys overland flow from the dunefields and basins to the east of the Project area. This flow path conveys both minor local flows (from minor rainfall events) and major flows including breakouts from the Ashburton River after major rainfall within the catchment.
- An un-named minor flow path to the immediate south of the Project which conveys sheetflow from the dunefield and basins to the east.
- A basin immediately adjacent to the proposed south-eastern pond embankments (South East Basin) which connects to the salt flats under flooded conditions and conveys sheet flow from the dune field and basins to the south east.

Figure 12 shows modelled pre-development flood levels for a minor rainfall event (50% Annual Exceedance Probability (AEP) or approximately 1 in 2 year rainfall event) with the above local surface water features labelled.

5.6.5 HYDROGEOLOGICAL CONCEPTUALISATION

The site investigation results and review of existing information were used by GHD to develop a hydrogeological conceptual model (GHD, 2021). The key features of the hydrogeological conceptualisation are as follows:

- The Project footprint covers a coastal area which has been emerging from previous seawater inundation for the last 5,000 years. The mostly flat area with ground elevations around 1 to 2 m AHD contains mainland remnant ‘islands’, up to 16 m AHD. To the east of the Project area exists an elevated dune landscape (16 – 19 m AHD) with interspersed claypans. The water levels in the salt flats (when inundated) are shallow (less than a metre) subjecting groundwater to evaporation effects.
- Groundwater salinity is affected by tidal flushing within intertidal areas which exports salt from the shallow groundwater in intertidal areas.
- Inland water flows import fresher although brackish water which is concentrated beneath the salt flat into a hypersaline state via evaporation.
- The hydrogeology is characterised by the presence of hypersaline groundwater beneath the supratidal salt flats. It is thought to have formed over time from the combined actions of:
    - Seawater submersion,
    - Evaporitic concentration of salts supplied periodically by tidal inundation and storm surge; and
    - Contribution from the regional throughflow from east to west.
- This has created a dense hypersaline waterbody underneath the salt flats which affects incoming shallow groundwater flows from inland areas.

This hydrogeological conceptualisation is represented in Figure 13.

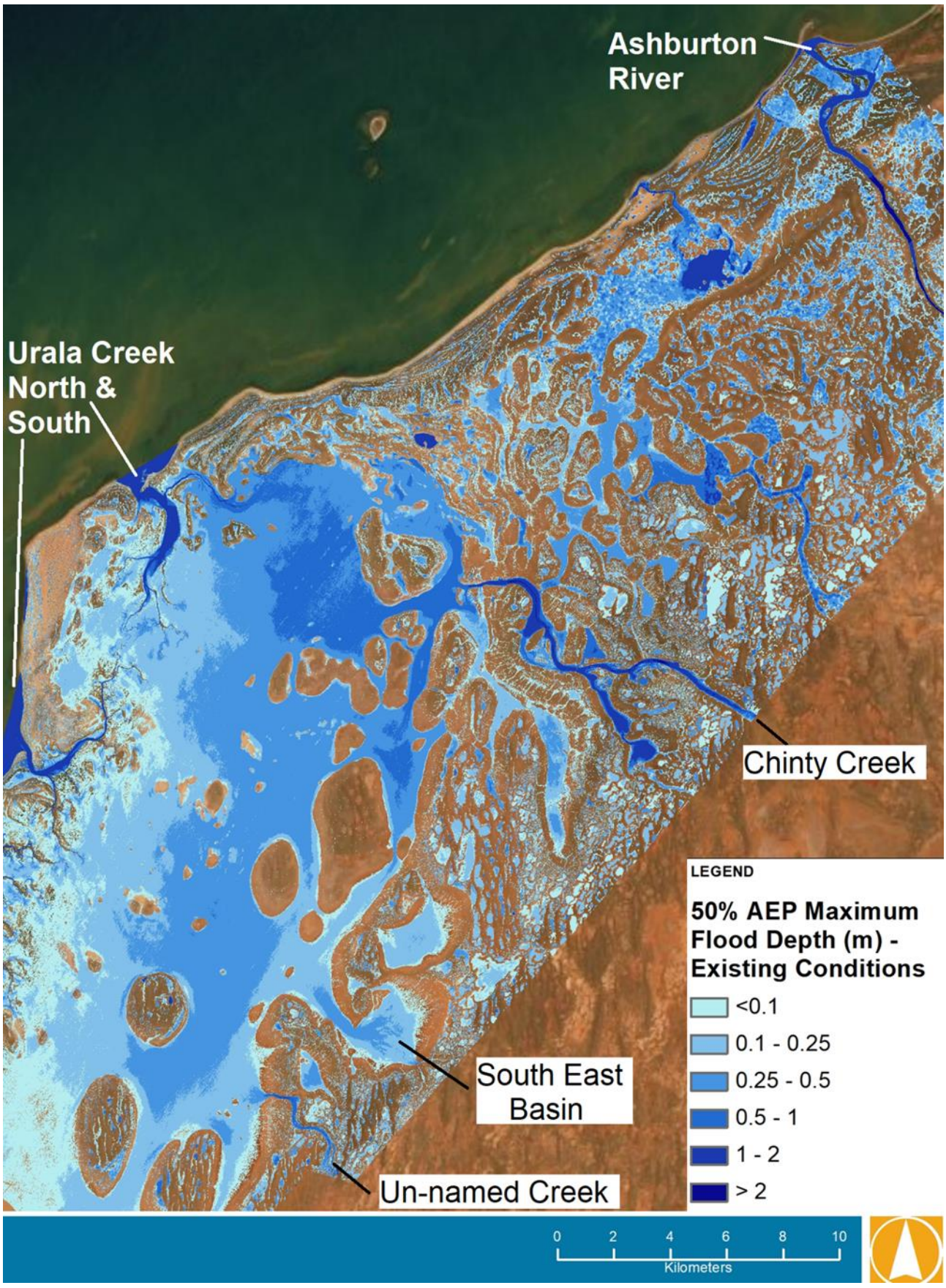


Figure 12: Modelled Pre-development 50% AEP Flood Levels and Local Surface Water Features (Water Technology, 2021)

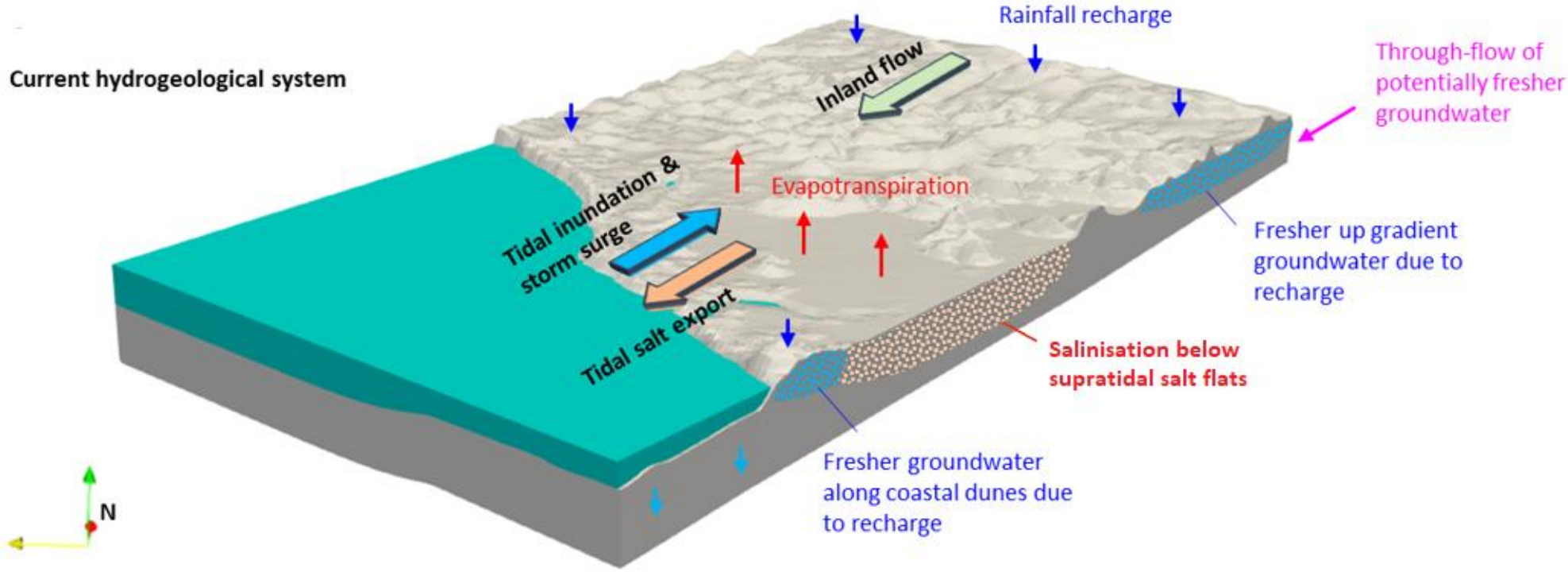


Figure 13: Hydrogeological Conceptualisation (GHD, 2021)

5.6.6 SURFACE WATER GROUNDWATER INTERACTION

The surface water and groundwater environment of the salt flats, including supratidal and intertidal flats has been formed by interaction of the on-going tidal action, flooding from occasional surface runoff, rainfall, evaporation, and groundwater discharge.

Water Technology, (2021) have identified two drainage pathways that can bring surface runoff to the Project area after large (10-year ARI and above) rainfall events including breakout inflow from Ashburton River (inflow branching off the main river course). However, given the low frequency of these rainfall events and high evaporation rates they are considered unlikely to have a major influence on local groundwater processes. Given the frequency of tidal inundation, it is considered to have a more frequent influence on the salt flats than surface runoff from rainfall events (GHD, 2021).

The majority of surface water (either from tidal or runoff flooding) in the salt flats is lost to evaporation, increasing the salt contents in the surficial sediments and the underlying groundwater. These salts are remobilised and redistributed by subsequent flooding leading to spread of salts and development of hypersaline groundwater (GHD, 2021).

In addition, the density-driven groundwater flow effects in combination with surface water sources result in the following:

- Gradual vertical downward movement of dense groundwater as it is displaced by less dense surface water sources.
- Occasional or temporary development of a thin layer of fresher groundwater in response to rainfall or tidal flooding of less saline water. In the mainland remnant sand islands embedded in the tidal flats this could lead to locally fresher lenses of groundwater floating on top of the hypersaline water body (similar to fresh groundwater lenses in ocean islands) prevented from high evaporative salinisation by greater topographic elevations of these features and subsequently localised greater depth to groundwater.
- More permanent presence (compared to salt flats) of less saline groundwater at the water table beneath tidal creeks due to more frequent tidal inundation (tidal flushing twice a day) resulting in a thin surface layer of less saline groundwater beneath tidal creeks (GHD, 2021).

5.6.7 LOCAL ENVIRONMENTAL VALUES

Local environmental values related to hydrological processes have been identified as follows:

- The connectivity of the local catchment and local surface water flows to the coast.
- The ability of the salt flats to act as a compensating basin during flood events.
- The availability of local flooded areas (habitat) after heavy rainfall.
- The local groundwater regime including water levels, water flows and recharge.

These local values have been mapped overlayed by the Project in Figure 14 using GIS data from the Project surface water study (Water Technology, 2021) and groundwater study (GHD, 2021).

5.6.8 REGIONAL ENVIRONMENTAL VALUES

Regional environmental values related to hydrological processes have been identified as follows:

- The connectivity of the wider Ashburton, Yannarie and Rouse catchments and regional surface water flows to the coast.
- The availability of regional flooded areas (habitat) after heavy rainfall.

- The surface water and groundwater regime of the Exmouth Gulf East Wetland (WA007) which is listed in the Directory of Important Wetlands in Australia.

These regional values have been mapped overlayed by the Project in Figure 15 using GIS data from the Project surface water study (Water Technology, 2021) and the Directory of Nationally Important Wetlands GIS boundary for Exmouth Gulf East Wetland (WA007).

5.6.9 REGIONAL SURFACE WATER QUALITY

The Ashburton River itself is located approximately 10 km north east of the Development Envelope. The Ashburton River is generally fresh, with Total Dissolved Solids (TDS) (a measure of salinity) being around 133 mg/L (Ruprecht and Ivanescu, 2000). This is similar to other rivers in the Pilbara region (TDS range 50 - 1,000 mg/L). Salinity in the Ashburton River, and all Pilbara region rivers, generally decreases with increasing flow and becomes more saline during times of low flow (URS, 2010).

Total suspended solids (TSS) and turbidity in the Ashburton River are generally Iow, and generally increase with increasing flow. The turbidity of the Ashburton River ranges from less than 10 Nephelometric Turbidity Units (NTU) over a range of flows, from 30 m^3/sec to 250 m^3/sec, to 3,300 NTU at a flow rate of around 250 m^3/sec. The flow weighted turbidity for Ashburton River is 1,705 NTU, which is higher than other Pilbara river sites, which range from 10 - 587 NTU (Ruprecht and Ivanescu, 2000).

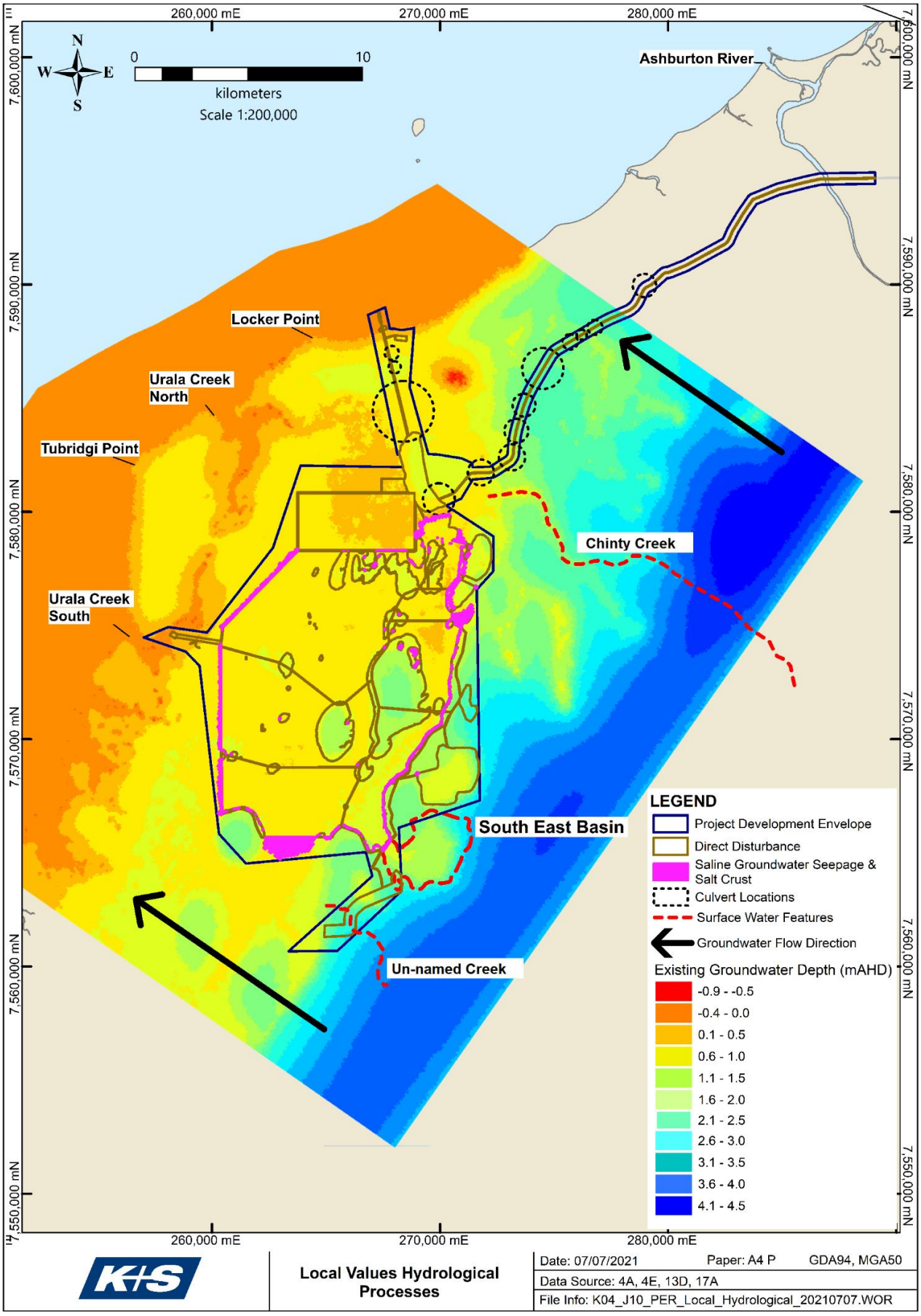


Figure 14: Local Values Hydrogeological Processes (from draft ERD)

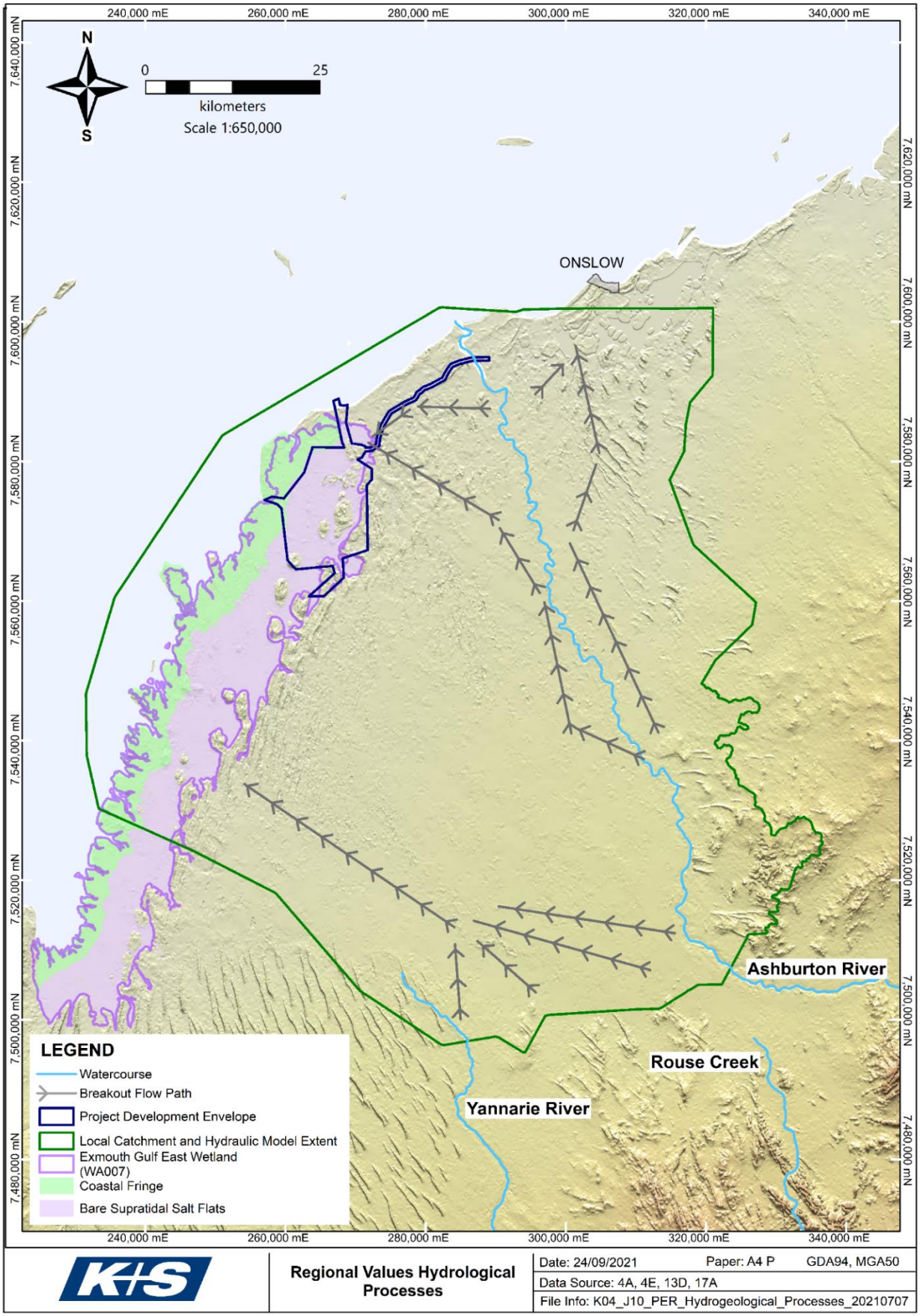


Figure 15: Regional Values Hydrological Processes (from draft ERD)

5.6.10 SITE-SPECIFIC SURFACE WATER QUALITY

Due to the low frequency of significant rainfall events resulting in surface water flows or flooding, limited local surface water quality data is available. Two significant rainfall events have occurred in the Project area since 2019 which have allowed K+S to sample the flooded salt flat areas (one rainfall event of 44 mm in April 2019 and another of 79.5 mm in March 2021). Both rainfall events resulted in flooding of local claypans and salt flats as illustrated in (Figure 16). The data from this sampling are presented in (Water Technology, 2021a) and show:

- TDS measurements indicate that surface water is saline to hypersaline on the salt flats with TDS in salt flat samples ranging from 45,000 mg/L to 120,000 mg/L.
- pH across the salt flats and inland flow paths ranged from neutral to slightly alkaline (pH range 7.3 – 8.6).
- TSS varied significantly with lower levels on the salt flats (<5 – 87 mg/L) and higher levels inland of the salt flats (up to 19,000 mg/L). Levels within an inland flow path were extremely high (resembling a slurry) at 510,000 mg/L.
- Levels of chlorophyll-a were low in all samples (<0.001 to 0.006 mg/L) except that from the overland flow sample which resembled a slurry (0.32 mg/L).
- The mean total nitrogen concentration across nine sites (excluding the high sediment sample) was 1.1 mg/L. The high sediment sample was excluded as it was more a sediment slurry, as opposed to a representative surface water sample.
- Samples were comprised of predominantly dissolved organic nitrogen (ranging from <.0.2 mg/L to 1.7 mg/L).
- The overland flow sample which resembled a slurry and had high total nitrogen content (120 mg/L), representative of nitrogen within the sediments from overland flows.
- Phosphorus was highest at the most inland sites and largely particulate at these locations. The sites with the high phosphorus also corresponded to sites with the highest TSS. This is the result of phosphorus adsorption to sediment. This observation adds further confidence to the assertation that the environment is nitrogen limited, as there is phosphorus readily available in soils across the site.
- The results show that the nitrogen in the water ponding on the bare salt flats is low compared with the other samples, particularly those received as suspended solids in overland flows (such as the highly turbid water from overland flows entering the salt flats). The data shows that the bare salt flats do not generate comparatively large amounts of nitrogen in ponded water, even after inundation with rainfall, compared with turbid overland flows/ponding from the hinterland.
- High levels of TDS in the samples from the bare salt flats indicate that the surface salt crust was dissolving into the ponded water on the bare salt flats, but there are comparatively low levels of nitrogen in this dissolved salt crust compared with overland flows.

Aerial view of flooded claypans from helicopter

Large expanse of flooded salt flat

Flooded claypan (cracking clay)

Flooded algal mat fringe, salt flat in background

Flooded claypan (highly turbid)

Flooded algal mat fringe

Figure 16: Photographs of Surface Water Flooding after Rainfall on 13th of April 2019

The Project will locally alter minor surface flow paths however these impacts are mitigated by locating Project infrastructure outside major flow paths, and implementing mitigation strategies, which include culverts, levees and drainage diversion channels (Water Technology, 2021).

5.7 GROUNDWATER

5.7.1 REGIONAL HYDROGEOLOGY

The Project area is associated with the alluvial aquifer of the Ashburton River. The Lower Ashburton River flows over the Onslow plain, which is covered with Quaternary alluvium. The alluvium is underlain by Tertiary and Cretaceous-aged sediments. Underlying the Cretaceous sediments are Palaeozoic and Proterozoic basement rocks. Although significant flow volumes are recorded in the Ashburton River, drilling data indicates that not enough alluvial thickness is present to develop a significant groundwater source. There are large supplies of brackish to saline water available from palaeochannels in the south-west portion of the Lower Ashburton River (Haig, 2008).

5.7.2 LOCAL HYDROGEOLOGY

The hydrogeology for the main landform types present within or adjacent to the Project area are described in Table 13.

Table 13: Local Hydrogeology (Blandford and Associates, 2005)

Landform	Description
Outwash Plains (associated with Ashburton River and other local rivers)	Freshwater flow in the river is the main recharge mechanism for this superficial aquifer. The water bearing calcrete unit is generally located close to the existing river channel suggesting the calcrete may be precipitated from recharge waters from the river channel. Groundwater electrical conductivity increases with distance from the river channel, indicating the main recharge mechanism is following River flow events. Groundwater quality in bores decreases significantly following periods of high abstraction due to up-coning of saline water, indicating that water recharged from the River is present as a lens overlying a more saline regional groundwater system.
Dune Fields and Claypans (associated with the hinterland inland of the salt flats and Project)	Groundwater is approximately 4 - 8 m below the level of the claypans coincident with thin, discontinuous lenses of calcrete. Rainfall infiltrates into the dunes surrounding each claypan, discharging at the base of the dune as a wetting front. Infiltrated rain water then flows onto the claypan surface and collects in the topographic lows of the claypans where it is lost to evaporation. It would also be expected that during significant rain events, some fresh water would infiltrate into the underlying formations.
Salt Flats (Project proposed to be constructed on these salt flats)	The salt flats are underlain by a thin surficial aquifer (2.6 - 5.0 m thick) of low permeability marine and terrestrial sediments (clayey silts and silty sands) containing saline to hypersaline water (34,000 - 306,000 mg/L). The small gradient of flow through the aquifer provides ample time for evaporation to occur and ensures the groundwater in this aquifer is hypersaline. This is supported by the extremely low hydraulic gradient of 0.00009. The surficial aquifer is underlain by a very low permeability sedimentary sequence, comprising plastic, red-brown clay and silty clay. This unit was found to be up to around 11 m thick. A deeper aquifer was found to underlie the clay. This consisted of sands and gravels and was found to be hydraulically separated from the upper surficial aquifer (based on an interpretation of differing chemistry and head values). Groundwater flow within the shallow aquifer is expected to approximately follow the topographic slope, with the flow expected to be from the higher ground to the east, discharging to the coastal region to the west.

5.7.3 GROUNDWATER LEVELS

Groundwater levels vary from a few centimetres below ground level in the salt flats to 4 - 8 metres in the dune fields. The drilling of boreholes was completed by GHD on 31st March 2020. Further fieldwork was undertaken between 30th August and 4th September 2020 to gather additional groundwater data for the hydrogeological modelling. The depth to groundwater records are included in Table 14 and Figure 17 (GHD, 2021).

Table 14: Bore Depth to Groundwater Summary (GHD, 2021)

ID	Type	Ground level (m AHD)	Depth to top of screen (m)	Depth to bottom of screen (m)	Depth to water (m)	Water level (mAHD)
BH01	Single bore: watertable (shallow)	7.08	2	8	Dry	0
BH02S	Pair: shallow bore	1.72	5	8	3.64	-1.92
BH02D	Pair: deep bore	1.72	12.2	18.2	3.66	-1.94
BH03S	Pair: shallow bore	2.51	2	5	1.42	1.09
BH03D	Pair: deep bore	2.51	11	14	1.56	0.95
BH04	Single bore: watertable (shallow)	3.45	3.4	8.4	2.96	0.49

ID	Type	Ground level (m AHD)	Depth to top of screen (m)	Depth to bottom of screen (m)	Depth to water (m)	Water level (mAHD)
BH05S	Pair: shallow bore	0.71	1	2	0.28	0.43
BH05D	Pair: deep bore	0.71	12	15	2.25	-1.54
BH07S	Pair: shallow bore	1.58	1.8	7.8	0.88	0.7
BH07D	Pair: deep bore	1.58	10.6	13.6	0.94	0.64
BH08	Single bore: watertable (shallow)	5.42	5.6	10.1	4.58	0.84
BH09S	Pair: shallow bore	3.37	0.5	3	2.27	1.1
BH09D	Pair: deep bore	3.37	6	9	2.32	1.05
BH10S	Pair: shallow bore	0.90	2	5	0.36	0.54
BH10D	Pair: deep bore	0.90	8.5	11.5	0.34	0.56
BH11S	Pair: shallow bore	1.21	1.5	4.5	0.41	0.8
BH11D	Pair: deep bore	1.21	6	9	0.42	0.79
BH12	Single bore: watertable (shallow)	9.94	4	10	7.43	2.51
BH13	Single bore: watertable (shallow)	6.88	3	6	2.31	4.57
BH14S	Pair: shallow bore	0.96	3	6	0.23	0.73
BH14D	Pair: deep bore	0.96	11	14	0.16	0.8
BH15S	Pair: shallow bore	1.49	2	5	0.66	0.83
BH15D	Pair: deep bore	1.49	9	12	0.76	0.73

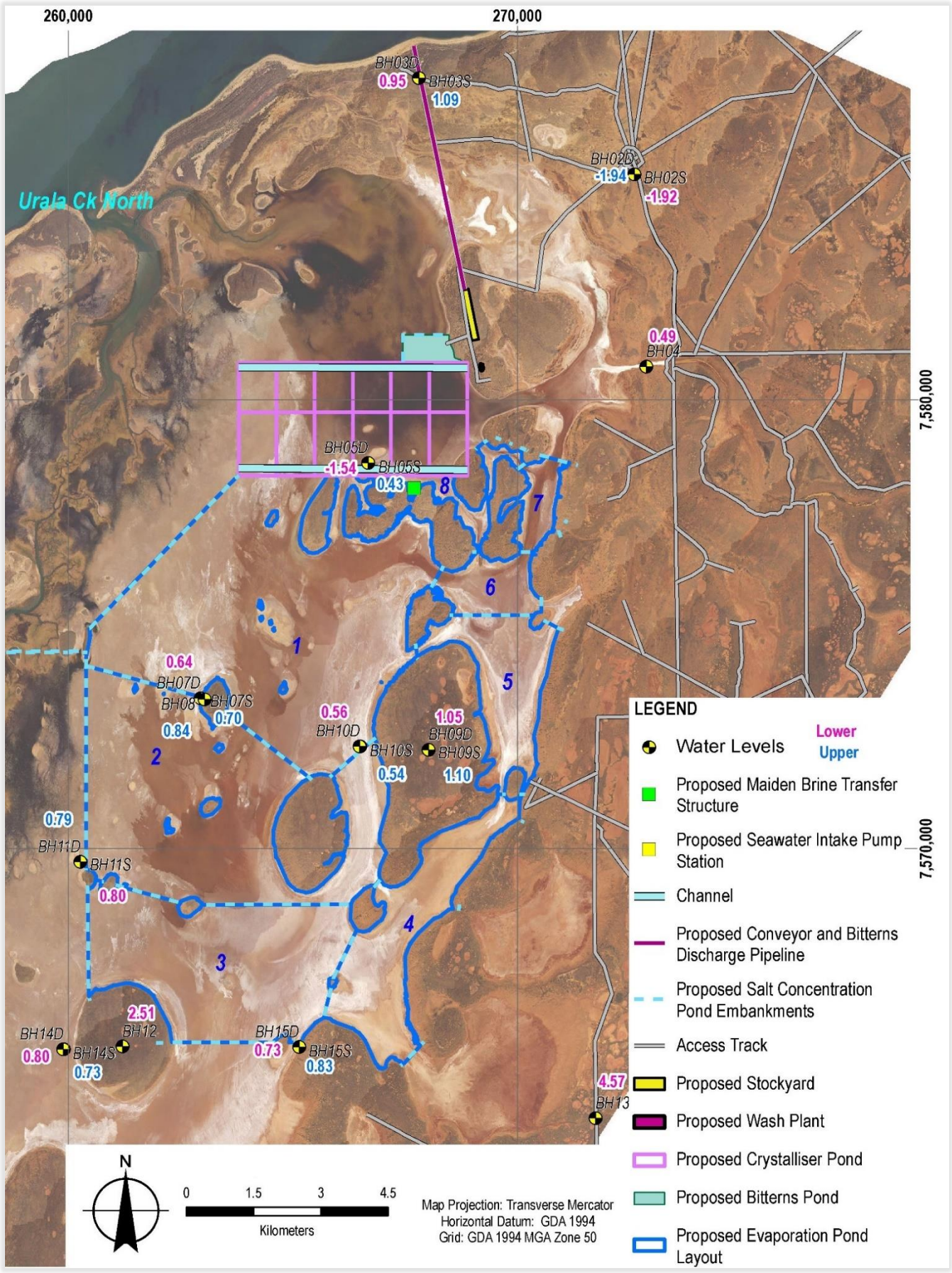


Figure 17: Measured Groundwater Levels (GHD, 2021)

5.7.4 GROUNDWATER FLOWS

Groundwater flow direction is generally from inland to the coast (east to west). The salt flats which act as a large evaporation basin intercept the groundwater flow from the upgradient dune field. Intercepted groundwater is lost to evaporation. Groundwater gradients in this area are flat, almost unmeasurable, resulting in almost stagnant groundwater kept in this state by evaporation effects (GHD, 2021).

The groundwater flow gradients are extremely flat due to two main factors:

- Strong evaporation from the flats which forces discharge from the groundwater system. This results in substantial removal of groundwater from the inflowing groundwater throughflow from the east and a water table controlled by evaporation. Net recharge is insignificant since all recharge is effectively removed by evaporation; and
- The higher permeability of sand dunes also results in flatter flow gradients. Following rainfall events any mounding of groundwater in the dunes is quickly removed radially from the centre of the mound and the water table equilibrates to its pre-recharge level (GHD, 2021).

It is possible that during some conditions, groundwater flows are reversed from the ocean to the centre of the flats (such as high tide events) (GHD, 2021).

Due to the high salinity of groundwater underneath the salt flats, groundwater flows are also affected by density differences. The hypersaline character of groundwater in salt flats has led to development of a saltwater edge on both the seaward and inland sides of the tidal flat strip. This zone of hypersaline groundwater developed parallel to the coast forces upward flow of inflowing groundwater from the dune fields. As groundwater comes to the surface along the edges of the hypersaline groundwater body it is exposed to evaporation which results in on-going salinisation (GHD, 2021).

5.7.5 GROUNDWATER MANAGEMENT AREAS

The Project occurs within the Pilbara Groundwater Area managed under the *Rights in Water and Irrigation Act 1914.* In this area it is illegal to take groundwater without a licence to do so issued by DWER. No taking of groundwater is proposed for this Project.

5.7.6 REGIONAL GROUNDWATER QUALITY

In order to assess existing groundwater data, a search was made of the DWER Water Information Reporting (WIR) database. This database includes records of existing and historic bores, including data on bore lithology, water levels and water quality. Following receipt of bore records within 50 km of the centre of the site, the data was collated and assessed, and summarised to provide relevant data on bore depths, groundwater depths, and water quality. A total of 126 bores are identified within the 50 km search radius, however of these only 26 bore records are within 25 km radius of the centre of the site. Bore locations closest to the site tend to be aligned either along the coast north of the site, or south of the site. Of the 126 bores recorded in the WIR data, drilled depth information is available for 92, with the depth ranging between 1 m and 694 m. The median depth of 12 m likely reflects that the majority of bores are relatively shallow stock bores.

The data shows that of the 126 bores within 50 km of the site, salinity data (as Total Dissolved Solids or Electrical Conductivity) is available for 51 bores. TDS (measured and calculated) ranges between 355 mg/L and 147,000 mg/L. The median TDS is 5,800 mg/L and the average TDS is 14,000, highlighting that the TDS data is skewed by the two maximum values of 130,000 mg/L and 147,500 mg/L. The two bore sites recording these high salinities are both located within the tidal flats south of the Project area. The majority of the bores located on the coastal ridge north of the site have relatively low salinities. It appears these bores, mostly stock watering bores, are located within the sand (and possibly limestone/calcrete) ridge adjacent to the shoreline. Whilst these bores are relatively fresh (TDS <5,000 mg/L), the presence of much more saline bores inland of the bores indicates that the freshwater aquifer is localised and possibly restricted to the elevated areas along

the coastal ridge. The freshwater aquifer is likely relatively thin and overlying the more saline, seawater affected groundwater (GHD, 2021).

5.7.7 LOCAL GROUNDWATER QUALITY

Geomorphology of the coastal area and interaction of tidal flooding, surface runoff, groundwater flow and evaporation has resulted in the salinity pattern observed at the site. Due the high evaporitic action, sodium-chloride dominates in groundwater. The coastal zonation ensures a strip pattern of salinity developed along the coast as follows (GHD, 2021):

- The salt flats host hypersaline groundwater in a strip parallel to the coast. The salinities in this zone vary between 150 to 300 g/L. Due to its high salinity, the groundwater forms a dense water body, potentially distorting incoming fresher groundwater flow from inland locations.
- The coastal dunes and mangrove swamps between the ocean and salt flats form a transition zone. This zone is influenced by seawater of lower salinity, fresh groundwater recharge from rainfall (unaffected by evaporation) in elevated dunes and the potential hypersaline wedge extending seaward from the salt flat zone. This area has a range of salinities between 20 and 100 g/L.
- The gradually emerging dune system rising landward from the salt flats is also a transition zone. It contains comparatively fresher but potentially still saline or brackish groundwater originated from the upgradient dune fields. This transition zone is considered to have a range of salinities from the brackish end (of about as low as 5 to 6 g/L) to hypersaline near the contact with the salt flats.

5.7.8 SITE SPECIFIC GROUNDWATER DATA COLLECTION

The drilling of boreholes was completed on 31st March 2020. Further fieldwork was undertaken between 30th August and 4th September 2020 to gather additional groundwater data for the hydrogeological modelling. Of the 14 selected and accessible locations, nine were completed as paired sites with two monitoring bores constructed to represent the shallow and deep groundwater horizons or units. At three of these locations a third bore was constructed using 100 mm diameter casing to facilitate aquifer testing of the site. Groundwater samples were analysed for a general suite to provide baseline data on groundwater quality (GHD, 2021).

5.7.8.1 TDS AND EC

EC and TDS results are summarised below:

- EC and TDS dry were found to be unreliable indicators of groundwater salinity, especially in hypersaline samples. In general, the correlation between EC and TDS for samples with salinity exceeding 150 g/L TDS (sum of dissolved ions as opposed to TDS dry) is unreliable beyond that salinity threshold. TDS as sum of dissolved ions is therefore adopted as the more reliable indicator of salinity.
- TDS is well correlated with chloride concentrations – chloride can be used as surrogate TDS indicator (Cl = 0.17 x TDS; R2 = 0.99).
- All the bores showed saline or hypersaline groundwater conditions. EC values ranged between 20 g/L (BH03S) to 306 g/L (BH14D, but only 234 g/L during September run). Largest salinities observed during the September sampling run were detected in BH10D and BH11D (251 and 269 g/L respectively).
- The least saline groundwater was measured in both the shallow and deep bores at BH03, where the shallow bore was slightly less saline than the deep bore (20 and 30 g/L the shallow and deep bore, respectively). The location of BH03 in an area of elevated dunes, and some distance from the supratidal flats, may suggest that there is the possibility of a fresher water lens at this location.
- The next lowest salinity was measured in BH13 (61 g/L). BH13 is the furthest inland located bore, indicating that background salinities are still high, suggesting only minor freshening from recharge. This is supported by the hypersaline groundwater also found at BH04 (105 g/L), located immediately adjacent to Chinty Creek. The hypersaline water here suggests (current) insufficient capacity and

availability of fresh water from this creek line to refresh groundwater (it was dry at the time of sampling).

- All the bores located within the supratidal salt flats showed hypersaline conditions. The average of these bores (BH05, BH07, BH08, BH10, BH11, BH14 and BH15) is 215 g/L, compared to an average of 78 g/L for the bores located either within mainland remnant islands or located off the flats (BH02, BH03, BH04, BH09, BH12 and BH13).
- All paired sites show a slight stratification of groundwater quality between deep and shallow bores, with higher salinities found in the deeper screened bores (GHD, 2021).

The TDS values for the bores (from September 2020 sampling run) are presented in Figure 18, with the paired sites (deep and shallow screens) highlighted.

5.7.8.2 INORGANIC CONSTITUENTS

Inorganic groundwater chemistry results are summarised below:

- pH results reported for groundwater indicate that groundwater across the site is relatively neutral. pH values ranged from 6.7 to 7.7 pH units, with the minimum pH reported at BH10S/D and maximum value reported at BH03S/D. pH values did not demonstrate significant variability between screen depths, with all shallow and deep paired wells displaying pH variance <0.2, with the exception of 0.5 difference between BH02S and BH02D. Spatially, pH values appeared to increase towards the peripheries of the site, with the lowest pH values returned for the central evaporation pond area.
- Alkalinity (total as $CaCO_3$) concentrations were generally consistent across the site with a minimum concentration of 77 mg/L, maximum of 690 mg/L and average of 162 mg/L. Two comparatively high results were returned at locations BH12 (690 mg/L) and BH09S (510 mg/L). Spatially, negligible variability is seen in alkalinity results, with the exception of the two high results being confined to mainland remnant islands within the evaporation pond area.
- Chloride concentrations are the dominant contributor to groundwater salinity. They vary from 11 g/L in BH03S to 190 g/L in BH14D. The highest values, consistent with TDS, are found in the salt flats.
- Sulfate concentrations demonstrated variability across the site with a minimum concentration of 1,700 mg/L (BH03S), maximum of 18,000 mg/L (BH07S – this value was only 8470 mg/L in September sampling run) and average of 7,978 mg/L. Comparatively high sulfate concentrations were reported for groundwater samples within the south- western evaporation pond area, while lower concentrations were reported further inland and in the northern portion of the site.
- Silica concentrations slight variability across the site with a minimum concentration of 9 mg/L (BH14S), maximum of 82 mg/L (BH15S) and average of 24 mg/L. Comparatively high silica concentrations were reported towards the southern portion of the site and generally confined to monitoring wells on or proximal to mainland remnant islands (GHD, 2021).

5.7.8.3 NUTRIENTS

Nitrogen species are represented as ammonia N and nitrate N:

- Ammonia concentrations are generally consistent across the site with a minimum concentration of 0.02 mg/L (BH03D), maximum of 6 mg/L (BH12) and average of 0.89 mg/L. Four exceedances of the *ANZG Freshwater 95% Guideline* assessment criteria were reported with comparatively high results returned for BH05D (5.2 mg/L) and BH12 (6 mg/L).
- Nitrate concentrations are on average generally low, with 52% samples below the detection limit. Largest concentrations, detected during the September sampling run, were obtained from BH15S and BH15D (8.2 and 8.8 mg/L as N) and BH08 (5.7 mg/L as N) (GHD, 2021).

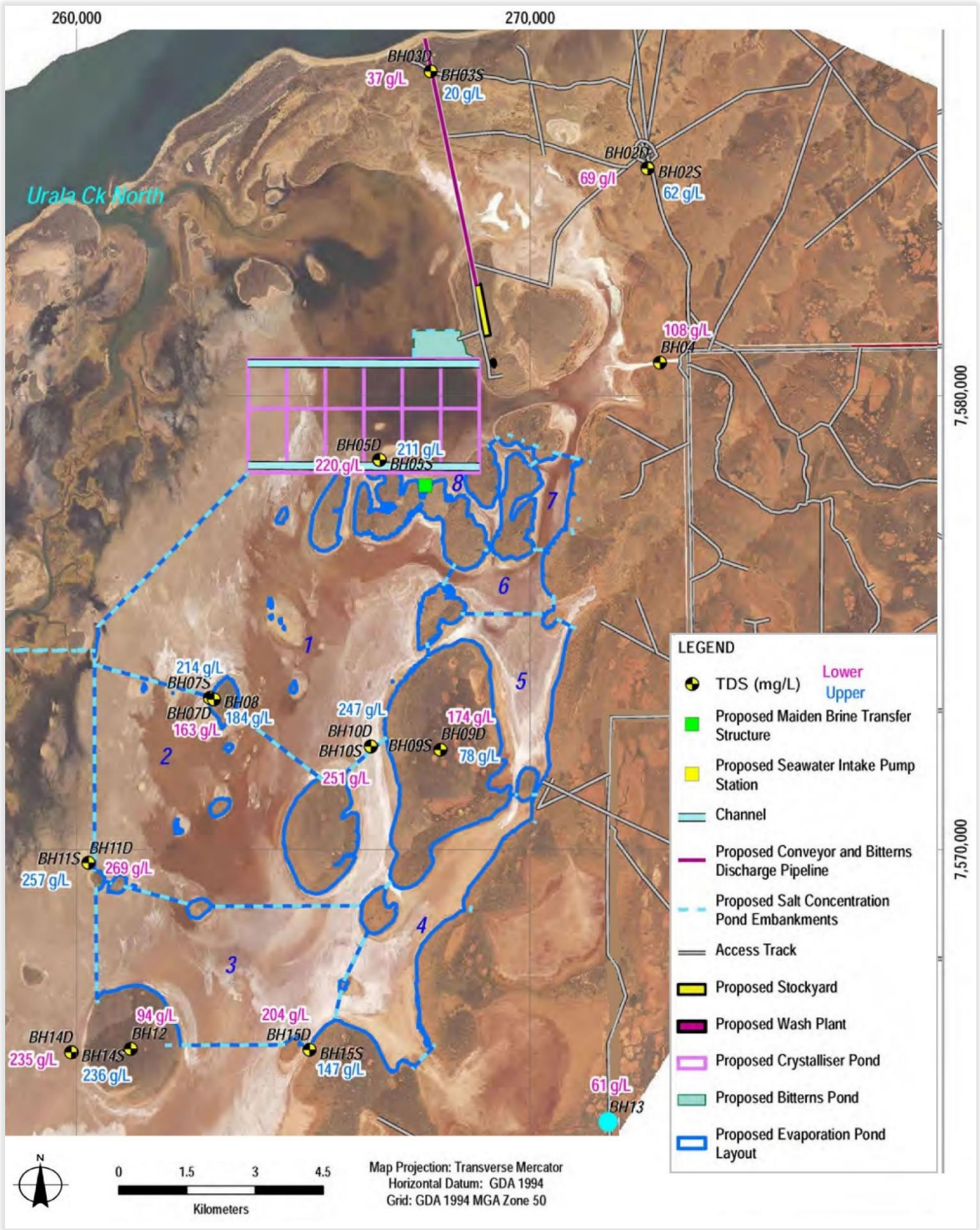


Figure 18: Measured Total Dissolved Solids in Groundwater (GHD, 2021)

5.7.8.4 METALS AND METALLOIDS

Metals groundwater chemistry results are summarised below:

- Aluminium (total) concentrations were reported above the ANZG Freshwater 95% Guideline (0.055 mg/L) at all locations, with the exception of BH10 and BH15D. Limited variability was seen in aluminium (total) across the site, however a comparatively high result of 200 mg/L was reported at BH09S.
- The aluminium (filtered) results were below laboratory limits of reporting (LOR) for all locations except for five locations which showed *ANZG Freshwater 95% Guideline* exceedances.
- Iron (total) concentrations were above the ANZG Freshwater 95% Guideline (0.055 mg/L) at all locations, with the exception of BH10 and BH15D. Limited variability was seen in iron (total) across the site, however a comparatively high result of 490 mg/L was reported at BH09S.
- The iron (filtered) results were generally below laboratory LOR and only one location (BH14D) showed a guideline exceedance (GHD, 2021).

5.7.9 GROUNDWATER DEPENDENT ECOSYSTEMS

The Project area is located within the Exmouth Gulf East Wetland (WA007) which is listed in the Directory of Important Wetlands in Australia. The Directory describes the significance of the wetland as “An outstanding example of tidal wetland systems of low coast of northwest Australia, with well-developed tidal creeks, extensive mangrove swamps and broad saline coastal flats. This wetland is tidal in nature and not considered to be groundwater dependent.

No Groundwater Dependent Ecosystems exist in the vicinity of the Project area. Generally, the hypersaline groundwater of the Project area is not tolerable by the majority of vegetation communities (GHD, 2021).

Mangroves receive tidal inundation by ocean water twice a day for their shallow root system. They are known to tolerate shallow groundwater that does not exceed salinity of approximately 90 g/L. The Onslow Salt Plain also host algae mats which are understood to be surface water (tide) dependent and do not rely on underlying groundwater. In the Project area these ecosystems are dependent on tidal flushing to retain hydration and remove salt from the system. These ecosystems are not groundwater dependent (GHD, 2021).

Due to the hypersaline character of the salt flats the vegetation is sparse or non-existent. Mainland remnant sand islands in the salt flat landscape can potentially host vegetation communities that could make use of relatively thinner (temporary) groundwater lenses that may occur at the top of the saturated profile after rainfall (GHD, 2021).

5.7.10 LOCAL ENVIRONMENTAL VALUES

Local environmental values related to groundwater have been identified as follows:

- The lack of surface hypersaline groundwater seepage in key ecosystems (mangroves, algal mats, terrestrial vegetation).
- A lack of contamination of the local surface and groundwater by acid sulfate soil disturbance, metals, NORMS, salt/bitterns spillage, hydrocarbons and chemicals.

These local values have been mapped overlayed by the Project in Figure 19 using GIS data from the Project surface water study (Water Technology, 2021) and groundwater study (GHD, 2021).

5.7.11 REGIONAL ENVIRONMENTAL VALUES

Regional environmental values related to groundwater have been identified as follows:

- The surface water and groundwater regime of the Exmouth Gulf East Wetland (WA007) which is listed in the Directory of Important Wetlands in Australia.

These regional values have been mapped overlayed by the Project in Figure 20 using GIS data from the Project surface water study (Water Technology, 2021) and the Directory of Nationally Important Wetlands GIS boundary for Exmouth Gulf East Wetland (WA007).

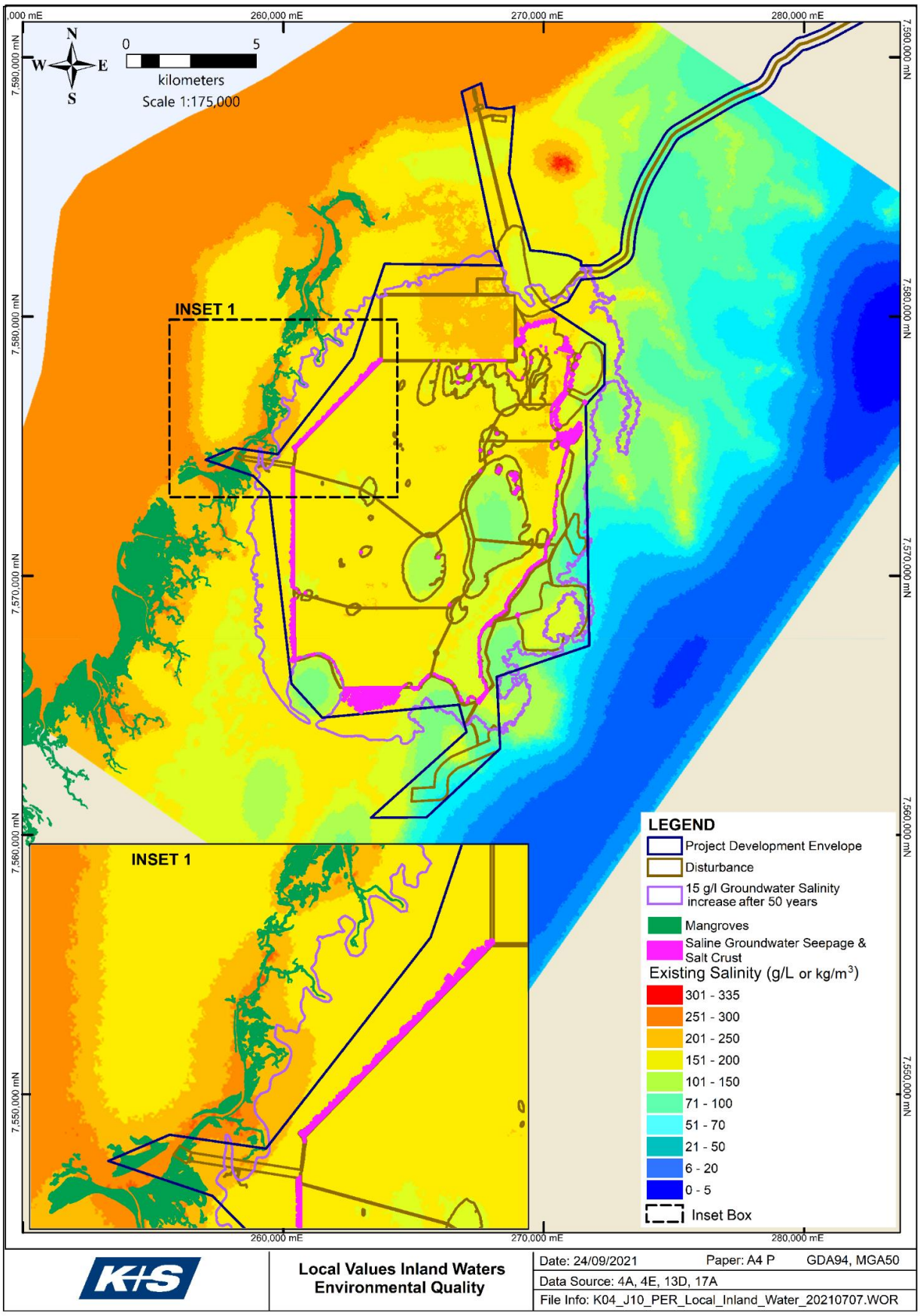


Figure 19: Local Values Inland Water Environmental Quality (from draft ERD)

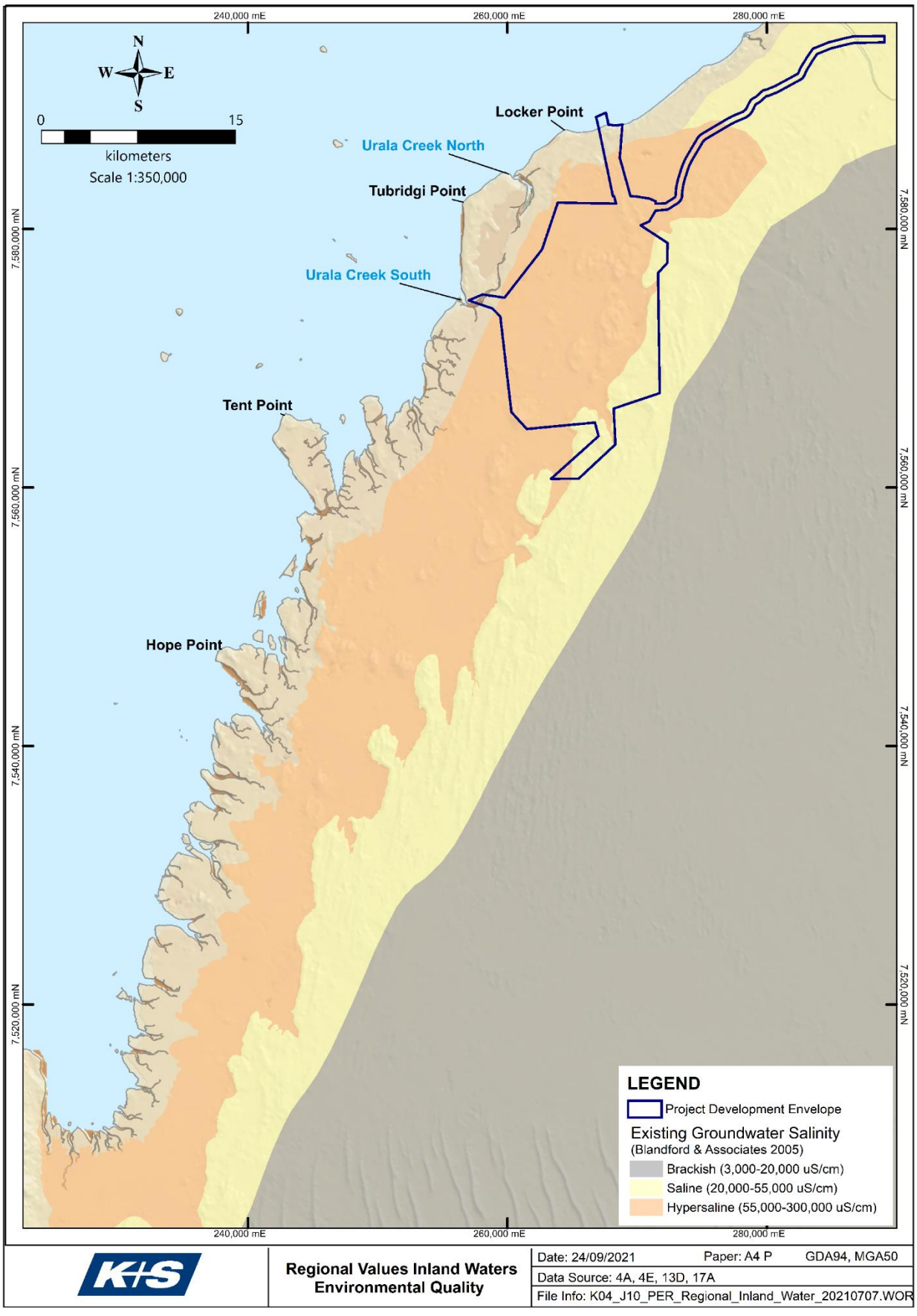


Figure 20: Regional Groundwater Values (from draft ERD)

5.8 HERITAGE

5.8.1 ABORIGINAL HERITAGE AND CULTURE OVERVIEW

K+S recognises the importance of Aboriginal culture and heritage in the communities in which we operate.

Aboriginal sites are places of importance and significance to Aboriginal people and to the cultural heritage of WA. Aboriginal sites include:

- Archaeological – places where material remains associated with past Aboriginal land use.
- Anthropological - places of spiritual importance and significance to Aboriginal people.

The WA *Aboriginal Heritage Act 1972* protects places and objects that may be of importance and significance to Aboriginal people in WA. The Department of Planning, Lands, and Heritage (DPLH) maintains a register of Aboriginal sites that are protected under the *Aboriginal Heritage Act 1972*. The *Aboriginal Heritage Act 1972* states it is an offence under this legislation to "excavate, destroy, damage, conceal, or in any way alter any Aboriginal site, without prior authorisation of the Registrar of Aboriginal sites and/or consent of the Minister for Indigenous Affairs".

5.8.2 CULTURAL HERITAGE STUDY

A Cultural Heritage Study for the Project has been completed by Archae-aus (2020) in consultation with the traditional owners for the area, the Thalanyji people. The full report is included as part of APPENDIX 2.

K+S consultation with the Thalanjyi people through their representative BTAC has been extensive and is ongoing (as described in Section 4). Through this consultation Thalanjyi cultural associations with the environment have been discussed.

5.8.3 ETHNOGRAPHIC BACKGROUND

The Thalanyji people are the traditional custodians and occupants of the Onslow region in the West Pilbara, Western Australia. The Thalanyji people's society and culture were first described in the late 1800s. Their traditional country is focussed along the lower reaches of the Ashburton River (Mindurru) and extends from the vicinity of Mt Stuart and Uaroo Station in the south-east to the current town of Onslow and the Old Onslow townsite in the north-west, including the pastoral stations of Mindearoo, Uaroo, Nanutarra, Yanrey, Emu Creek (Nyang), Urala, and Koordarrie (Archae-aus, 2020).

Mindurru (The Ashburton River) is central to Thalanyji culture. Detailed dreaming stories about the creation of the river by *Warnamankura* (water snake) are well understood by Thalanyji people and these stories imbue the River with a sacred significance. This significance has important practical applications for Thalanyji people because it enshrines a responsibility to protect and care for the river into law and custom, and all Thalanyji people understand that they inherit this responsibility from their ancestors and bequeath it to their children. In addition to sacred values, Mindurru was and continues to be an important resource for Thalanyji people for activities such as camping and hunting (Archae-aus, 2020).

Today, most Thalanyji people reside in Onslow, Carnarvon or elsewhere in the Pilbara or Perth. They still maintain deep connections to their traditional land and culture, maintaining distinct laws and customs that distinguish them as Thalanyji people (Archae-aus, 2020).

5.8.4 ARCHAEOLOGICAL BACKGROUND

Previous heritage surveys of the Onslow coastal region, stretching from Giarlia Gulf in the west to Cane River in the east, have recorded over 100 middens. Research has focused on the timing of economic shellfish exploitation and the extent to which changes in species reflect either cultural preference or coastal productivity. The Onslow coast is unusual within the context of the larger Pilbara region in that it is located within a sedimentary/limestone belt. It contains both terminal Pleistocene and emergent Holocene sand dunes and therefore has the ability to preserve both older and more recent coastal occupations (Archae-aus, 2020).

Results from archaeological research and previous cultural heritage work along Australia's northwest coast and its hinterland provide a data set on which to build an understanding of the *Thalanyji* people's ancestors past use of the landscape. This is an essential component in understanding and interpreting the results of the current archaeological survey (Archae-aus, 2020).

Archae-aus (2020) has compiled the results of over 20 Aboriginal heritage surveys with details of almost 700 Aboriginal sites from the northwest coastal area, primarily comprising work from around Onslow and Cape Preston. The results of previous archaeological works in the region show a predominance of open stone artefact scatters; with numerous middens / shell scatters, reduction areas, quarries and sites with grinding material; occasional rock shelters and rock art sites and small numbers of structures, burials, water sources, scarred trees, historical / maritime sites and ceremonial places. The majority (81%) of the sites in the sample include a stone artefact scatter component, with lesser numbers comprising middens / shell scatters (22%) and grindstones (13%) (Archae-aus, 2020).

5.8.5 SITE SPECIFIC DATA

5.8.5.1 CULTURAL HERITAGE SITES

For Archae-aus (2020) study, after a detailed desktop review of relevant environmental information and previous surveys of the area, fourteen Heritage Investigation Areas were selected to sample a range of environment types and previously recorded sites. They were accessed by Archae-aus using a helicopter to fly the survey team to each area between the 2nd and 6th of November 2019.

During the survey 14 areas were inspected. The 32 previously recorded sites were revisited and 19 newly identified sites that require further recording were identified (Table 15) (Archae-aus, 2020).

Table 15. Heritage Investigation Areas – Summary of Results (Archae-aus, 2020)

Heritage Investigation Area	Environmental Context	Archaeological Materials Observed During 2019 Fieldwork	Previously Recorded Sites	New Sites
HIA 001	Claypans and dunes	-	-	-
HIA 002	Claypans and eroding dunes	Stone artefacts (dolerite river pebbles, chert – flakes and cores)	-	TBR10
HIA 003	Claypans, vegetated dunes and limestone outcrops	Stone artefacts (including a tula adze) and shell Melo spp., Tegillarca granosa and Terebralia spp.	SS05-08, SS05-09, SS05-13, SS05-14, SS05-15	-
HIA 004	Vegetated dunes and claypans	Stone artefacts	SS05-11	-
HIA 005	Claypan	Stone artefacts (basalt, dolerite river pebbles – flakes, fragments, cores manuports)	-	TBR09
HIA 006	Claypan and Sand dunes	Stone artefacts (basalt, chert, quartz, silcrete -flakes, single platform cores, all small in size)	-	TBR08, TBR19
HIA 007	Claypan, red sand dunes	Chert reduction area (river rounded chert cores and flakes), possible weathered basal sandstone grindstone, mullers, baler shell	-	TBR05, TBR06
HIA 008	Claypan	Stone artefacts (Quartz, basalt, chert, silcrete, dolerite, banded iron formation,	-	TBR13, TBR12, TBR11

Heritage Investigation Area	Environmental Context	Archaeological Materials Observed During 2019 Fieldwork	Previously Recorded Sites	New Sites
		quartzite – flakes and single platform cores)		
HIA 009	Vegetated dunes	-	-	-
HIA 010	Claypan and eroding dunes	Stone Artefacts (silcrete, basalt, quartz, dolerite – flakes, cores), oyster shell	-	TBR18, TBR17
HIA 011	Red sand dunes and claypan	Baler shell and stone artefacts (dolerite, quartz, basalt and chert – manuports, flakes, cores)	DPLH-809, DPLH-15309, DPLH-15310	TBR03, TBR04
HIA 012	6-8 small claypans, sand dunes	Stone Artefacts (quartz, basalt, dolerite, silcrete, quartzite, chert - flakes, cores and manuports)	-	TBR16, TBR15, TBR14
HIA 013	Claypans and vegetated dunes. Cattle causing heavy ground disturbance	Stone artefacts (including large millstone and muller, quartz flakes, chert flakes, dolerite manuports, quartzite grinding fragment, dolerite muller fragment, basalt flakes, quartzite and chert single platform cores). Shell material (lots of broken Terebralia spp.	DPLH-814, DPLH-808	-
HIA 014	Claypans (some vegetated), vegetated and eroding sand dunes	Shell material (including Cerithiopsis, Tegillarca, baler, tellin) and stone artefacts (including quartz, - flakes, a tula adze, cores and manuports)	SS05-27, SS05-28, SS05-30, SS05-32, SS05-44, SS05-45, SS05-46, SS05-47	TBR07

5.8.5.2 PREDICTIVE MODEL

A predictive model or “heat map” of the likelihood of cultural heritage site occurrence within the Project Area was developed by Archae-aus (2020).

The modelling to create this heat map, was completed by comparing the results of past work and the recently identified places. A single point was created for each site. This was then plotted in GIS with an underlay of the surface geology. Within the model area the total area of each geological unit and its percentage of the area was calculated. The site locations were then compared against the surface geology area percentages to predict the likelihood of occurrence of Aboriginal archaeological sites within specific surface geology types (Archae-aus, 2020).

There are inherent assumptions within this type of modelling, however, the results are transparent and replicable. The major limitation is that this type of process fails to identify sites that don’t fit the pattern. Therefore, field checking and sampling in all areas of proposed disturbance, including areas with a low prediction, is still recommended prior to commencing ground disturbing activities (Archae-aus, 2020).

The predictive model is included in

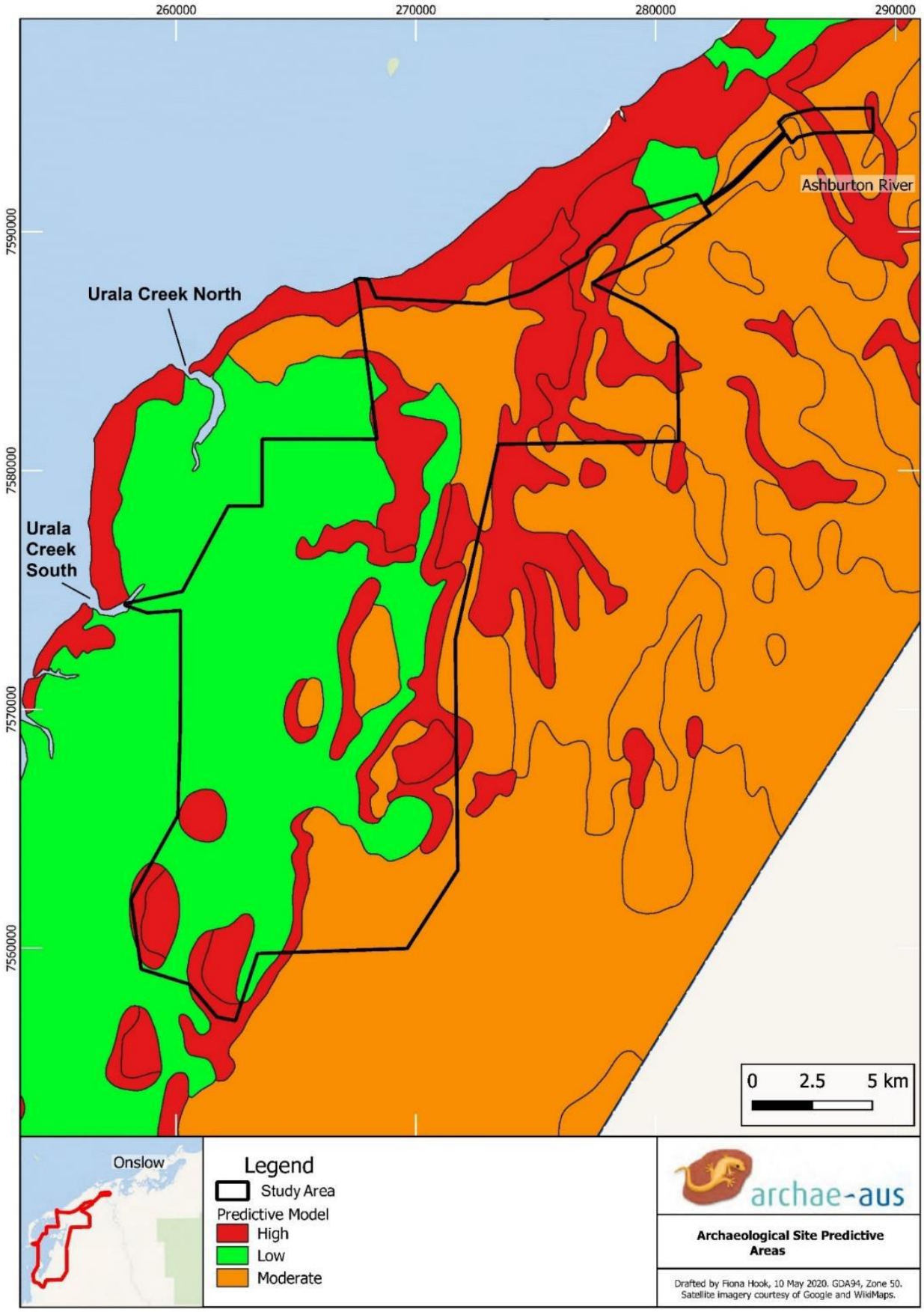


Figure 21.

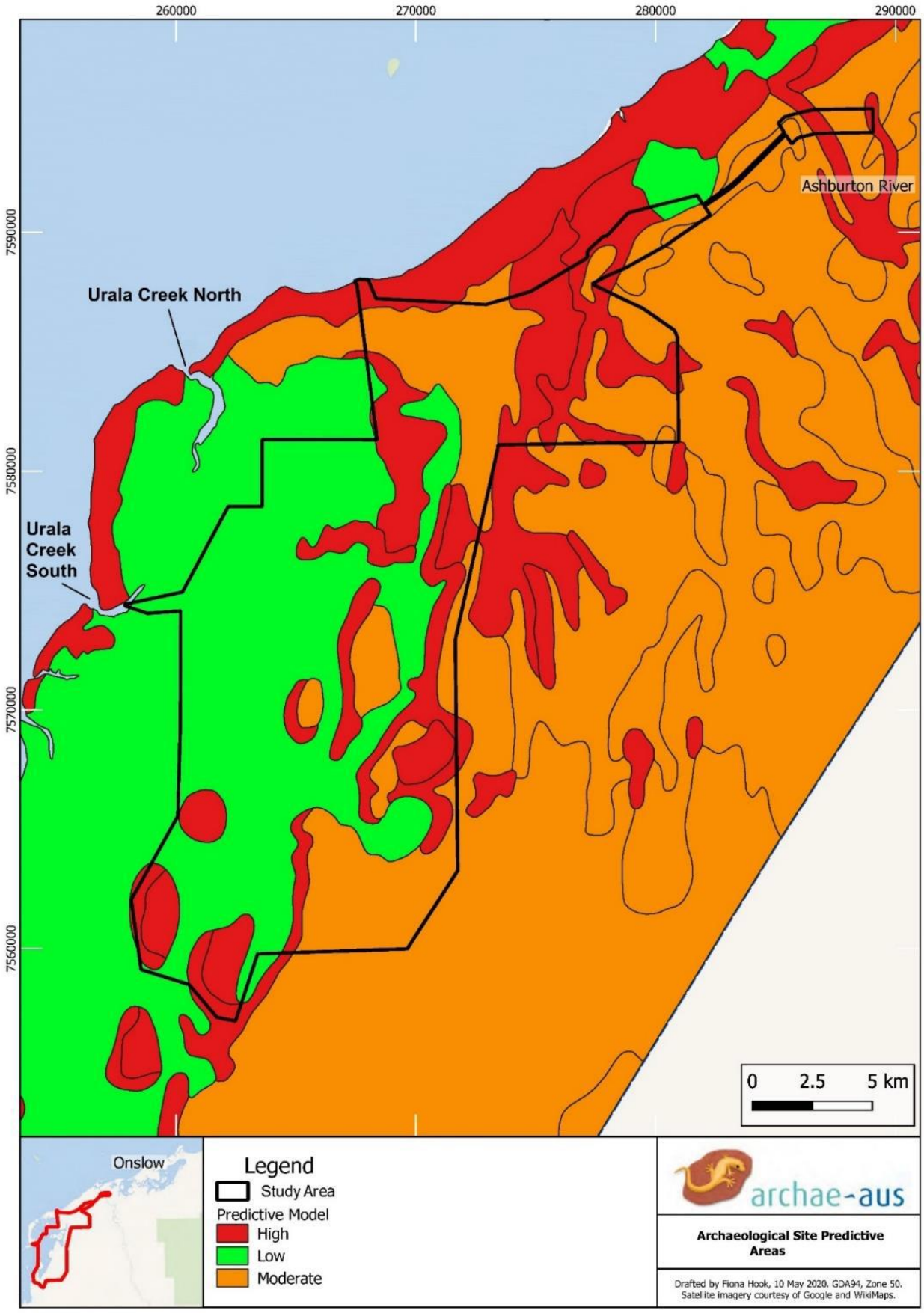


Figure 21: Predictive Model – Likelihood of Cultural Heritage Site Occurrence (Archae-aus, 2020)

5.9 ENVIRONMENTAL THREATS

5.9.1 ENVIRONMENTAL THREATS

The main environmental threats relevant to this Project include:

- Weeds: Construction activities could spread existing weed populations. Weed hygiene procedures will be adopted to prevent this.
- Feral Animals: Construction and operations could encourage feral animals if domestic waste is not managed appropriately. This will be avoided by ensuring all domestic waste is transported off site and no bins are accessible to feral animals.
- Marine Pests: Product shipping could result in introduction of marine pests in ballast water/hulls.
- Fire: Construction and operations could change the frequency and intensity of fire regimes. Careful procedures will be put in place to avoid construction and operations activities starting fires and fire response capability will be maintained on site.

Environmental threats which are not relevant include:

- Dieback: The site is not in a dieback risk area.
- Pathogens: No known pathogens exist in the area.

5.9.2 DUST, NOISE, AIR QUALITY

Dust and noise will be generated by mobile equipment during construction activities, however this will only last during construction and is not expected to have significant impacts on the surrounding environment.

Dust and noise will be generated during operations from the salt harvesting process and vehicle movements, however this is expected to be minor and is not expected to have significant impacts on the surrounding environment.

Construction dust will be managed via the use of a water cart when necessary.

No air emissions are expected from the project other than vehicle exhaust emissions.

5.10 CLOSURE RELATED DATA ANALYSIS

5.10.1 DATA ANALYSIS

An analysis of the baseline data that describes how the wider receiving environment, receptors and exposure pathways have been considered is provided in Table 16.

Table 16: Closure Related Data Analysis

Dataset	Data Analysis	Receiving Environment, Receptors and Exposure Pathways	Proposed Management
Climate	The northwest Australian coastline is the most cyclone-prone region of the entire Australian coastline. Tropical cyclones occur on average once every two years in the area in the vicinity of Onslow east of Exmouth Gulf. The cyclone season that runs from the middle of December to April, with a peak occurring in the months of February and March. Severe flooding can occur during cyclones. Climate change has the potential to cause sea level rise in the project area.	The closure landforms could: • Interfere with the ability of the salt flats to act as a compensating basin during flood events. • Cause impacts to surface water flows, nutrient movement and sediment movement/deposition. • Hinder the ability of mangroves and algal mat communities to adapt to climate change induced sea level rise.	Modelling of surface water behaviour, flooding, assessment of surface water impacts and proposed management is included in the draft ERD for assessment by the EPA. Post closure design to consider appropriate management of flood events and maintain the connectivity of the hinterland and salt flats to the marine environment. Post closure design to ensure maintenance of the pre-development ability of mangroves and algal mat to adapt to climate change induced sea level rise.
Landscape	The project is predominantly located on large expanses of salt flat areas.	The post closure landform should maintain the landform and ecosystem function of the salt flats as far as practicable.	Consider landform and ecosystem function of salt flats and ensure this is maintained at closure.
Materials Characterisation	Based on the known soil types and surface geology, it is considered highly unlikely that materials resulting from project disturbances will pose risks such as: • AMD • sodic or dispersive material • NORM.	Risks of AMD, NORM and sodic/dispersive material is considered low. Topsoil will be managed to ensure it is available for rehabilitation.	Extensive soil and sediment sampling and analysis confirm that soils, sediment and materials associated with the project disturbance are low risk. The ASSSMP will be implemented during operational and closure phases. Topsoil disturbed during construction will be stockpiled and stored for use in rehabilitation activities. It is considered unlikely this will contain sodic or dispersive material due to the soil types present. This will be confirmed as stated above.
Biodiversity	A total of 18 vegetation types have been described and mapped for the study area, along with areas of bare mudflat and claypan. A total of 288 native vascular flora species from 126 genera and 45 families have been recorded from the study area based on all surveys to date. No species listed as Threatened flora under State legislation have been recorded in the study area to	Potential closure risks include: • Inadequate rehabilitation vegetation type or composition (species diversity, density and/or dissimilar vegetation types to predevelopment).	Flora surveys (Biota, 2022a) (Biota, 2022c) provide flora species lists and vegetation composition / type data which can be used to assess rehabilitation success and will be incorporated into completion criteria. Weed monitoring and control to be included in rehabilitation planning and completion criteria.

Dataset	Data Analysis	Receiving Environment, Receptors and Exposure Pathways	Proposed Management
	date, and none would be expected to occur. However, one species listed as Threatened under Commonwealth legislation was recorded (*Minuria tridens*) and is listed as a Priority 1 species in WA. A total of five Priority flora taxa were recorded from the study area during the current survey. A total of 16 introduced flora taxa (weed species) were recorded during the current surveys, one of which was only recorded outside the study area. The survey recorded a total of 171 vertebrate species, comprising 54 herpetofauna species, 97 avifauna species, 13 ground-dwelling mammal species and seven bat species including 13 species of conservation significance. Of the 12 invertebrate taxa collected during the survey, eight mygalomorph spider taxa from four families are considered to be potential SREs.	• Weeds could impact the ability to meet completion criteria if they are allowed to spread or be of unacceptable density in rehabilitation. • Inadequate fauna habitat within rehabilitation areas (type, shelter and/or fauna resources available)	Fauna surveys (Biota, 2022b) provide fauna habitat mapping, descriptions and data which can be used to assess rehabilitation success and will be incorporated into completion criteria.
Hydrology	The surface hydrology in and around the Project site is a complex interaction between watercourses including the Ashburton River, Yannarie River and Rouse Creek and the wide outwash plain, salt flats and dune fields adjacent to the coast. From a groundwater perspective the project area is associated with the alluvial aquifer of the Ashburton River. The salt flats are underlain by a thin surficial aquifer (2.6 m to 5.0 m thick) of low permeability marine and terrestrial sediments (clayey silts and silty sands) containing saline to hypersaline water (34,000 mg/L to 306,000 mg/L). The surficial aquifer is underlain by a very low permeability sedimentary sequence, comprising plastic, red-brown clay and silty clay. Groundwater flow within the shallow aquifer is expected to approximately follow the topographic slope, with the flow expected to be from the higher ground to the east, discharging to the coastal region to the west	Potential impacts of closure design include: • Interfering with the ability of the salt flats to act as a compensating basin during flood events • Preventing adequate tidal inundation of the mud flat areas • Causing changes in surface water flows and resulting nutrient inputs • Contamination with hydrocarbons due to fuel storage activities • Biological contamination from sewage treatment facilities • Groundwater contamination from landfill activities • Erosion and scouring at drainage diversions leading to surface water contamination with sediment.	Modelling of groundwater and surface water behaviour, flooding, assessment of impacts and proposed management has been included in the draft ERD for assessment by the EPA. Proposed closure impact mitigation measures include: • Undertaking a comprehensive study of hydrology and nutrient flows. • Developing the closure design so that it does not interfere with the ability of the wetland to respond adequately during flood events. • Ensuring that post closure impacts to surface water flows and nutrient pathways/inputs are avoided and minimised. • Ensuring that tidal inundation and/or surface water flow is not altered significantly or in a way that could cause impacts to mangroves and algal mats post-closure. • Minimising impacts on groundwater quality.

Dataset	Data Analysis	Receiving Environment, Receptors and Exposure Pathways	Proposed Management
			• Appropriately remediating any contamination caused by operations. • Designing all Project infrastructure and Closure Landforms so that potential for contamination of inland groundwater and surface water is avoided and minimised. • Documenting and remediating any contamination prior to closure.

5.10.2 KNOWLEDGE GAPS

From January 2018, K+S has been undertaking the required environmental studies as outlined in the ESD. Several studies and EIA required by the ESD have been completed and were used in developing a draft ERD. The latest version of the draft ERD was submitted to the EPA in December 2022 and provides a detailed account of the Project and EIA. The ERD is currently under review by the EPA and will be released for public comment when accepted, followed by response to submissions, EPA Report and Recommendations, and State and Federal Ministerial Decisions.

Very few solar salt projects have entered the closure and rehabilitation phase, with most solar salt projects having long operational lifetimes. However, many solar salt projects are considering “tidal reconnection” of ponds on closure to be a potential end land use in recognition of the important intertidal, benthic and fauna habitat that salt ponds create (AECOM, 2022a). One example is the Dry Creek Salt field which is in closure stage after operating in Adelaide since the late 1930s. The Dry Creek Salt field has recently demonstrated a successful tidal reconnection trial for one of its salt evaporation ponds - Mosley et. al (2019).

Knowledge gaps exist regarding the viability of tidal reconnection of the ponds at the Project site, including detailed modelling to determine which pond walls to breach to create a functioning tidal wetland system, which is ideally resilient to sea level rise, longer than the existing surrounding habitat.
If necessary, K+S will submit a revised version of this MCP to DMIRS in the future, containing information to correct the above knowledge gaps, as well as any project changes that occur during the EPA Assessment. This would include full details of completed baseline environmental studies (including closure related information) prior to DMIRS making a final decision on MCP approval.

It is understood that due to the parallel processing of this MCP with the EPA Assessment under Part IV of the EP Act, the DMIRS decision on this Closure will be constrained until a Ministerial Statement is issued approving this project (if approved).

5.11 RELEVANT TECHNICAL REPORTS

Relevant environmental studies that have been completed to date are detailed in Table 17 and are appended to this MCP in APPENDIX 2.

Table 17: List of Conducted Studies relevant to closure

Report	Reference
Marine and Coastal Assessment and Modelling	Water Technology, 2022b
Surface Water Assessment and Modelling	Water Technology, 2022a
Marine, Coastal and Surface Water Data Collection	Water Technology, 2021a
Marine, Coastal and Surface Water Existing Environment	Water Technology, 2021b
Surface Water Assessment and Modelling	Water Technology, 2021
Peer Review of Coastal, Surface Water and Nutrient Pathway Modelling	DHI, 2021
Ashburton Salt Response to Sea Level Rise	Seashore Engineering, 2021
Ashburton Salt Projection of Future Habitat Area	Seashore Engineering, 2022
Nutrient Pathway Assessment and Modelling	Water Technology, 2021d
Acid Sulfate Soil and Sediment Study	GHD, 2021a
Assessment of Benthic Communities and Habitats	AECOM, 2022a

Report	Reference
Marine Fauna Impact Assessment	AECOM, 2022b
Migratory Shorebird Assessment	Biota, 2022e
Detailed Vegetation and Flora Survey	Biota, 2022a
Targeted Flora Survey 2022	Biota, 2022c
Level 2 Seasonal Fauna Survey	Biota, 2022b
Claypan Ephemeral Fauna Desktop Review	Biota, 2021
Materials Characterisation Study	GHD, 2021d
Memorandum Ashburton groundwater modelling- updated results.	GHD, 2022
Hydrogeological Investigation	GHD, 2021
Independent Review of Ashburton Salt Project Groundwater Modelling	CyMod Systems, 2022
Ashburton Salt Project Groundwater Modelling Independent Review	CyMod Systems, 2021
A Report of the Reconnaissance Assessment of Cultural Heritage Sites within the Ashburton Salt Project Area, Urala Station, Western Australia	Archae-aus, 2020
Meeting Notes: Heritage and Culture Commitee - K+S Social Surrounds Discussion	BTAC, 2021

6 POST-MINING LAND USE(S)

The post mining land use can be defined as the most likely long-term land use to occur after project operations finally cease.

In the absence of an alternative agreed post mining land-use, the proposed final land use is to return the site to a safe, stable and non-polluting ecosystem which is compatible with the surrounding land use (pastoral) and key surrounding ecosystem (salt flat) values.

If an economic end land use can be defined this will be explored through the stakeholder engagement process outlined in Section 4.

The proposed final landform will be comprised of a landscape that integrates into the surrounding landscape as much as practicable.

Topsoil stockpiles will be utilised during rehabilitation activities as growth media for revegetation. Product stockpiles will be sold and removed from site prior to closure, plant and infrastructure removed and the remaining footprint rehabilitated.

Through stakeholder consultation, K+S will ensure that the post mining land use is:

- relevant to the environment in which the mine will operate or is operating;
- achievable in the context of post-mining land capability;
- acceptable to the key stakeholders; and
- ecologically sustainable in the context of the local and regional environment.

6.1 SPECIFIC POST MINING AND USES UNDER CONSIDERATION

The following specific post mining land uses are current under consideration and consultation on these with key stakeholders is being conducted:

- Ponds to become wetland habitat for shorebirds including migratory birds which require “wetland areas” for migratory stop over.
- Ponds to become an active aquaculture business for growing prawns or other food species.
- Disturbed areas surrounding ponds to be decommissioned, rehabilitated and return to existing pastoral or environmental use.

6.2 STAKEHOLDER CONSULTATION ON POST MINING LAND USE

K+S preferred post closure land use is to leave the evaporation ponds in situ so that they become fauna habitat for shore birds (including migratory birds which require “wetland areas” for migratory stop over). If ponds are to be reconnected, this MCP will be revised to establish which bunds to breach that will enable inwards tidal movement bringing sediments and allowing tidal channels to expand naturally. Natural tidal flows will allow movement of mangrove plant and seed material which will passively revegetate the reconnected tidal areas. This will enhance the habitat values of the ponds post-closure. This post-mining land use has been discussed to date with:

- EPA Services.
- DCCEEW.
- Shire of Ashburton.
- DMIRS.
- BTAC.
- AGIG.

7 CLOSURE RISK ASSESSMENT

7.1 RISK ANALYSIS

K+S has a risk management process aligned with the International Standard ISO31000, which provides principles, framework and a process for managing risk. The Risk Assessment constitutes an analysis of the baseline data that describes how the wider receiving environment, receptors and exposure pathways have been considered.

Likelihood is an assessment of the probability or frequency that an event may occur. Consequence is an assessment of the outcome or impact of an event.

Risk ranking is achieved by assessing likelihood and consequence of a potential risk scenario occurring. In other words, consideration of the sources of risk, their consequences and the likelihood that those consequences may occur.

The K+S ratings applied for assessment of risk likelihood and consequence are provided below in Table 18, Table 19 and Table 20.

Table 18: Risk Likelihood Ratings

Score	Likelihood	Expected Frequency	Probability
5	ALMOST CERTAIN	Occurs more than once a year	Event will occur during the Project / period under review. High number of known incidents.
4	LIKELY	Occurs once a year	Event likely to occur during the Project / period under review. Regular incidents known.
3	POSSIBLE	Occurs once every 5years	Event may occur in some instances during the Project / period under review. Occasional incidents known.
2	UNLIKELY	Occurs once every 10 years	Event is not likely to occur during the Project / period under review. Some occurrences known.
1	RARE	Occurs once every 20 years	Event will occur in exceptional circumstances during the Project / period under review. Very few or no known occurrences.

Table 19: Risk Consequence Ratings

Factor	Insignificant	Minor	Moderate	Major	Severe
Score	0	1	2	3	4
Biodiversity	Alteration or disturbance to an isolated area with no effect on habitat or ecosystem. Loss of an individual plant / animal of conservation significance.	Alteration or disturbance to <10% of a habitat or ecosystem resulting in a recoverable impact within 2 years. Loss of multiple plants / animals of conservation significance.	Alteration or disturbance to 10-40% of a habitat or ecosystem resulting in a recoverable impact within 2-5 years. Loss of <50% known local population of plant / animal of conservation significance	Alteration or disturbance to 40-70% of a habitat or ecosystem resulting in a recoverable impact within 5-15 years. Loss of >50% known local population of plant / animal species with possible loss of entire local population.	Alteration or disturbance to >70% of a habitat or ecosystem resulting in a recoverable impact >15 years. Local loss of conservation significant or listed species. Extinction of a species.
Water Resources	Negligible change to hydrological processes, water availability or water quality.	Short-term modification of hydrological processes, water availability and quality within project tenure, but no change in beneficial use.	Medium-term modification of hydrological processes, water availability and water quality within project tenure, but no change in beneficial use. Short-term modification of hydrological processes, water availability and water quality outside project tenure, but no change in beneficial use.	Long-term modification of hydrological processes, water availability and water quality within project tenure, but no change in beneficial use. Medium-term modification of hydrological processes, water availability and water quality outside project tenure, with change in beneficial use	Long-term or permanent modification of hydrological processes, water availability or water quality outside project tenure, with impacts to a water-dependent environmental value and/or change in beneficial use.
Land & Soils	Clean-up by site personnel, rectified immediately. Confined to immediate area around source.	Clean-up by site personnel, remediation within 1 year. Confined to operational area.	Clean-up by site personnel, remediation within 1-3 years. Minor impact outside disturbance envelope or minor impact to soil stockpiles.	Clean-up requiring external specialist, remediation within 3-10 years. Impact has migrated outside the disturbance envelope or contamination of soil stockpiles.	Clean-up requiring external specialist. Remediation >10 years, or permanent residual impact. Impact outside the tenement boundary.
Rehabilitation & Mine Closure	Site is safe, stable a non-polluting. Post mining land use is not adversely affected.	Site is safe, all major landforms are stable, and any stability or pollution issues are contained and require no residual management. Post mining land use is not adversely affected.	Site is safe, and any stability or pollution issues require minor, ongoing maintenance by end land-user. Post mining land use cannot proceed without some management.	Site cannot be considered safe, stable or non-polluting without long-term management or intervention. Post mining land use cannot proceed without ongoing management.	Site is unsafe, unstable and/or causing pollution or contamination that will cause an ongoing residual affect. Post mining land use cannot be achieved.

The level of risk is determined by combining likelihood and consequence ratings using the K+S Risk Assessment Matrix below.

Table 20: Risk Assessment Matrix

Likelihood	Consequence				
	Insignificant 0	Minor 2	Moderate 3	Major 4	Critical 5
Almost Certain 5	Low 0	High 10	High 15	Extreme 20	Extreme 25
Likely 4	Low 0	Medium 8	High 12	Extreme 16	Extreme 20
Possible 3	Low 0	Medium 6	Medium 9	High 12	High 15
Unlikely 2	Low 0	Low 4	Medium 6	Medium 8	High 10
Rare 1	Low 0	Low 2	Low 3	Low 4	Medium 5

7.2 RISK ASSESSMENT AND TREATMENT

K+S has undertaken a Closure related Risk Assessment for this Project resulting in the Risk Register included in Table 21. The Risk Assessment constitutes an analysis of the baseline data that describes how the wider receiving environment, receptors and exposure pathways have been considered.

The following Risk Register will be updated once all Environmental Studies have been completed for this project (refer to Section 5.11 for a full list of studies).

Table 21: Closure Risk Register

Phase/ Factor	Risk Pathway	Untreated Risk Rating			Treatment	Residual Risk Rating		
		C	L	R		C	L	R
Rehab. & Mine Closure	End land use does not blend in with surrounding land uses	4	3	12H	• End land uses proposed are consistent with surrounding land uses (pastoral and salt flat) and rehabilitation will be undertaken aiming to return vegetation that is similar to surrounding vegetation.	4	1	4L
	End land use does not meet stakeholder expectations	4	3	12H	• Stakeholder consultation will ensure end land use is agreed with relevant stakeholders	4	1	4L
	End landforms unsafe	4	2	8M	• DMIRS approval will be required prior to relinquishment	4	1	4L
	Weeds impacting the ability to meet completion criteria	4	2	8M	• Weed control will be conducted, if required, during operation and rehabilitation	4	1	4L
	Insufficient growth of vegetation / inappropriate species composition in rehabilitation	4	2	8M	• Preliminary Rehabilitation plan includes monitoring and corrective action where required	4	1	4L
	Insufficient topsoil	4	2	8M	• Topsoil management measures will be developed and implemented as part of the CEMP	4	1	4L
	Contamination of land due to poor storage of hydrocarbons or chemicals or past practices/activities	4	2	8M	• Hydrocarbon and chemical management measures will be developed and implemented as part of the OEMP • Any contamination identified will be remediated.	4	1	4L
	Post closure design disrupts natural surface water or groundwater hydrology	4	2	8M	• Risk of disruption to surface water and groundwater hydrology will be reviewed, Surface Water and Groundwater management plans implemented and post closure design will consider hydrology.	4	1	4L

8 CLOSURE OUTCOMES AND COMPLETION CRITERIA

K+S aims to achieve:

- Site-specific closure outcomes consistent with the post-mining land use(s) that are realistic and achievable based on the closure risk assessment.
- Completion criteria that are specific, measurable, achievable, relevant and time-bound, and will demonstrate the achievement of the closure outcomes and monitoring.

Completion criteria are necessary to provide the basis on which successful rehabilitation and achievements of closure outcomes are determined. They must be developed in consultation with key stakeholders, be appropriate to the developmental status of the project, and follow the S.M.A.R.T principle below:

- **S**pecific enough to reflect a unique set of environmental, social and economic circumstances;
- **M**easurable to demonstrate that rehabilitation is trending towards analogue indices;
- **A**chievable or realistic so that the criteria being measured are attainable;
- **R**elevant to the objectives that are being measured and the risks being managed and flexible enough to adapt to changing circumstances without compromising objectives; and
- **T**ime-bound so that the criteria can be monitored over an appropriate time frame to ensure the results are robust for ultimate relinquishment.

Detailed completion criteria, based on closure outcomes, have been developed and are included in Table 22. These closure completion criteria will be reviewed as part of regular reviews of the Closure Plan and stakeholder consultation regarding closure.

Table 22: Closure Outcomes and Completion Criteria

Criterion	Criterion Outcome	Domain	Criterion standard or milestone	Monitoring Criteria
1. FINAL LAND USE				
1.1 Final Land Use	Agreed final land use has been determined in consultation with relevant stakeholders.	All	The whole site is to be rehabilitated to be compatible with the surrounding land use (pastoral) and key surrounding ecosystem (salt flat) values. In the event that the proposed end use changes, this approach will need to be revised.	Land use and objectives are documented in the MCP as reviewed and agreed by stakeholder groups.
2. SAFETY				
2.1 Safety	The site is safe for use by humans and wildlife under the agreed final land use	All	All hazards that could endanger the safety of any person or animal have been identified and eliminated where practical. All residual safety and health hazards have been identified, controlled through appropriate active controls, and appropriate isolations (e.g. fences) and warning signs have been put in place.	Report on Rehabilitation Standards and Procedures, landform stability assessment, erosion monitoring, and visual inspection as previously described.
2.2 Landform Safety	Final landforms are safe.	All	Landforms have been constructed as described in criterion 2.1. They conform to DMIRS guidelines for structural stability, with no significant slumping or failure. No hazards to humans or wildlife have developed thorough erosion, subsidence, Acid Drainage or otherwise. Inspections of the rehabilitated landforms have been conducted to monitor their stability over time, with monitoring conducted after each significant rainfall season.	Report on landform construction methods, and any additional maintenance works undertaken. Rehabilitation inspections (including those undertaken on maintenance earthworks) (photographic) confirm earthworks have met final landform designs. Rehabilitation monitoring results (photographic) (including erosion monitoring) confirm final landforms are safe. Report on performance in relation to design criteria and DMIRS Guidelines.
3. LANDFORMS				
3.1 Visual Amenity	Visual amenity of constructed landforms is compatible with that of local landforms.	All	Within the constraints imposed by aspects such as the physical nature of the materials available, tenement boundaries, and proximity to landforms have been constructed to blend into the surrounding landscape and are similar to the existing regional landforms.	Report on rehabilitation works confirms landform construction undertaken according to the Closure Plan. Rehabilitation inspections (photographic) confirm earthworks have met final landform designs.

Criterion	Criterion Outcome	Domain	Criterion standard or milestone	Monitoring Criteria
3.2 Landform Stability	Constructed landforms are structurally stable.	All	Post-mining landforms have been constructed according to commitments and procedures outlined in the Closure Plan. Landform contours are suitable for final land use.	Report on rehabilitation works at construction confirms all DMIRS Guidelines have been met and landforms comply with the Closure Plan. Rehabilitation inspections (photographic) confirm final landform designs have been implemented.
3.3 Surface Stability	The constructed surface similar to pre-mining surface.	All	The post-mining landform responds to erosive forces in a similar manner to equivalent naturally occurring landforms composed of similar material types. Maintenance works performed to improve performance, where necessary.	Report on landform construction methods, and any additional maintenance works undertaken. Rehabilitation inspections (photographic) confirm final landform designs have been implemented. Rehabilitation monitoring results (including erosion monitoring) (photographic) indicate gullies and rills are stabilising.
3.4 Landform Surface	Landform surface material promotes water infiltration and reduces erosion and crusting.	All	There has been topsoil replacement in relevant areas and if necessary ripping (light or deep) of rehabilitated surfaces as required to maximise water infiltration, compliment natural drainage lines to reduce erosion potential and support establishment of vegetation.	Report on landform construction methods. Rehabilitation inspections (photographic) confirm final landform designs have been implemented.
4. SUSTAINABILITY				
4.1 Sustainability	Rehabilitation is sustainable and the land capability are suitable for the agreed end land use.	All rehabilitated areas	Monitoring and site inspections indicate that the rehabilitation will be sustainable and will continue to fulfil rehabilitation objectives relating to the agreed final land use in terms of flora, vegetation, fauna, and surface and groundwater hydrology.	Documented in relevant rehabilitation monitoring reports and site inspections.
4.2 Resilience	Vegetation is sustainable and resilient to likely impacts such as fire, drought and grazing (where applicable, if managed according to agreed guidelines).	All rehabilitated areas	Monitoring has shown that recruitment of native perennial species consistent with pastoral use is occurring or is likely to occur on the site (e.g. evidence of flowering, fruiting, soil seed bank or second generation seedlings). Monitoring has shown that the rehabilitation can survive one or more seasons of low rainfall.	Rehabilitation monitoring results reported to DMIRS in Annual Environmental Report.
4.3 Soil and/ or Growth Media	A suitable growth medium has been utilised to	All where revegetation is planned	The depth and characteristics of newly constructed landforms topsoil and/or growth media are suitable for plant growth in terms of their structure, water	Rehabilitation monitoring results provide feedback to determine suitability of growth medium.

Criterion	Criterion Outcome	Domain	Criterion standard or milestone	Monitoring Criteria
	facilitate plant establishment and growth.		holding capacity, and lack of materials that might affect plant growth or survival (i.e. they are suitable for establishing target vegetation communities and supporting the agreed final land use).	Rehabilitation monitoring results reported to DMIRS in Annual Environmental Report.
4.4 Provenance	Vegetation is locally endemic.	All with revegetation	Revegetation has established native species recorded in the area prior to mining (comparable with analogous systems) and consistent with land use.	Rehabilitation monitoring results demonstrate locally endemic species are establishing. Rehabilitation monitoring results reported to DMIRS in Annual Environmental Report.
4.5 Vegetation Development	Vegetation is suited to the agreed final land use.	All with revegetation	Established vegetative cover should be self-sustaining and similar to the surrounding undisturbed vegetation (comparable with analogous systems) and consistent with land use. Monitoring of rehabilitated areas has been undertaken until it can be demonstrated that the landscape and vegetation is progressing towards a self-sustaining state.	Monitoring of rehabilitation development that vegetation is occurring. Monitoring results reported in Annual Environmental Report (AER).
4.6 Weeds	Potential for rehabilitation to meet the agreed post-mining use is not limited by the presence of weeds.	All with revegetation	No Declared Plants (as defined under the *Agriculture and Related Resources Protection Act 1976*) are present in greater abundance than surrounding areas. Weed abundance does not exceed baseline. All Declared Plants and environmental weeds recorded in the rehabilitation have been effectively managed.	Review weed monitoring (photographic) and control undertaken. Report on weed monitoring (photographic) and control records. Monitoring and visual inspection of vegetation establishment and representative reference areas.
5. HYDROLOGY				
5.1 Surface Hydrology	Rehabilitation drainage patterns have been established and impacts on natural surface water flows minimised.	All where relevant	There are no significant, physical off-site impacts of surface water drainage. All spills reported and cleaned up appropriately.	Relevant monitoring and/or modelling of post closure surface water flows demonstrates impacts are not significant. Relevant closure surface water issues reported in the closure section of the AER.
5.2 Groundwater Hydrology	Project-related impacts on groundwater hydrology have been minimised.	All where relevant	No significant project-related seepage of groundwater occurring post closure. All spills/contamination reported and cleaned/remediated up appropriately.	Relevant monitoring and/or modelling of post closure groundwater seepage demonstrates impacts are not significant.

Criterion	Criterion Outcome	Domain	Criterion standard or milestone	Monitoring Criteria
				Relevant closure groundwater issues reported in the closure section of the AER.
6. DECOMMISSIONING				
6.1 Decommissioning	Access roads have been de-commissioned and removed, or handed to another party	Access Roads	Access roads fully decommissioned and rehabilitated or handed to another party.	Site inspection and documentation of road removal and rehabilitation operations, or evidence of legally binding road handover.
6.2 Decommissioning	Site infrastructure has been de-commissioned and removed, or handed to another party	All plant and infrastructure	Site infrastructure fully decommissioned and rehabilitated or handed to another party.	Site inspection and documentation of plant and infrastructure removal and rehabilitation operations, or evidence of legally binding road handover.
7. CONTAMINATED SITES				
7.1 Contaminated Sites	Contaminated sites have been documented and addressed	All where relevant	All commitments relating to the identification and management of contaminated sites, as per *Contaminated Sites Act* (2003) have been fulfilled. All spills reported and cleaned up appropriately.	Report documenting compliance with specific requirements.
8. LAND MANAGEMENT				
8.1 Land Management	Long-term management requirements have been addressed.	All	At the time closure is considered complete, site land management requirements will be no greater than those of areas prior to the project (or comparable areas); alternatively, where additional management actions are required, these will be identified in agreement with regulators, and K+S will make adequate provisions so that this additional management can be undertaken.	Reports into sustainability and long-term management requirements identified in the monitoring carried out as per Criterion 4.

9 CLOSURE IMPLEMENTATION

In summary, closure implementation will be managed utilising the following strategies:

- A closure work program for achieving the closure outcomes, with implementation strategies and timeframes for each domain and/or feature.
- Closure designs for landforms.
- Contingencies for premature closure.

Each of these strategies is detailed further below.

9.1 CLOSURE WORK PROGRAM

Figure 2 provides a disturbance layout plan, showing each type of disturbance as a domain which will ultimately require closure and rehabilitation. The site layout plan will be maintained over the life of the operation using modern ground survey techniques and Geographic Information Systems (GIS) technology to ensure it is accurate and up to date.

Table 23 provides a closure work program for each domain currently identified for the Project.

Table 23: Closure Work Program

Domain	Features Included	Implementation Strategies	Timeframes
Landforms	• Topsoil stockpiles • Product stockpiles • Drainage diversion/s • Dredge spoil disposal area (on land) • Pond walls (berms)	• Topsoil stockpiles to be used for rehabilitation on site. • Product stockpiles to be removed from site and the area rehabilitated. • Drainage diversion/s to be evaluated and modified if necessary, to achieve post closure surface water outcomes. • Dredge spoil disposal area to be designed to blend in with surrounding landscape and contours, deep ripped and rehabilitated (may be used for construction of pond walls or building footings and therefore not constitute a separate landform). • Crystalliser and bitterns pond walls will be left in-situ. They are low in height, already designed for long term stability and will assist in creating fauna habitat and management of hydrological regimes post closure. Salt contaminated soil in the basement of these areas will be removed and disposed appropriately. • Evaporation pond walls (berms) will be left in-situ. They are low in height, already designed for long term stability and will assist in creating fauna habitat and management of hydrological regimes post closure.	Years 1 to 5 after closure *(except dredge spoil disposal area which will be rehabilitated 1 – 5 years after dredge spoil disposal area no longer required)*
Plant and Infrastructure	• Seawater intake	• Removal of buildings, infrastructure and equipment.	Years 1 to 5 after closure

Domain	Features Included	Implementation Strategies	Timeframes
	• Electricity reticulation • Fuel storage sites • Jetty and product loading facilities • Salt wash plant • Conveyors • Onsite buildings such as offices, storage, workshops and possibly accommodation • Sewage treatment facilities • Water monitoring bore(s) • Helipad • Desalination plant • Parking and laydown areas • Bitterns pipeline and diffuser	• Removal and appropriate disposal of hydrocarbon and chemical storage areas. • Removal (i.e. break up) of concrete footings/slabs/hardstands and placement within areas of general backfill or in-situ burial to a suitable depth. • Deep ripping. • Re-spreading topsoil. • Oversize or vegetative material will be placed strategically to prevent erosion and encourage revegetation and create fauna habitat. • Weeds controlled. • Seeding topsoil areas with local seed if re-colonisation is not progressing adequately after monitoring.	
Borrow Pits	• Borrow pits (for construction)	• Removal of all equipment. • Recontouring area to blend in with surrounding landscape. • Deep ripping. • Re-spreading topsoil. • Oversize or vegetative material will be placed strategically to prevent erosion and encourage revegetation and create fauna habitat. • Weeds controlled. • Seeding topsoil areas with local seed if re-colonisation is not progressing adequately after monitoring.	Years 1 – 5 after borrow pits no longer required
Service Corridors and Minor Disturbance	• Roads • Tracks • Conveyor corridor • Power line corridors • Other Minor Disturbance	• Roads, tracks and other minor disturbance to be rehabilitated via ripping, topsoil replacement and weed control. • Seeding topsoil areas with local seed if re-colonisation is not progressing adequately after monitoring.	Years 1 - 5 after closure

9.2 LANDFORM DESIGN

The following constructed landforms are required for the project:

- Topsoil stockpiles.
- Product stockpiles.
- Drainage diversion/s.
- Dredge spoil disposal area (on land).
- Crystalliser pond walls.
- Bitterns pond walls.

- Evaporation pond walls.

Topsoil and product stockpiles will not exist after site closure - topsoil will be used in rehabilitation and all salt product will be removed from site.

Drainage diversion/s which have been installed during project construction to maintain natural hydrological regimes and connection of surface water flows upstream of the project area to the coast, will need to be evaluated and modified if necessary, to achieve post closure surface water outcomes. This will involve modelling post closure water flows and determining whether the existing drainage diversions can remain in situ without modification or whether modification is needed in order to meet post closure surface water outcomes. If modification is required, closure landform designs for drainage diversions will be developed once modelling is completed.

The dredge spoil disposal area will be required to dispose of a very small amount of dredged material. This material may be used for construction of pond walls or building footings and therefore not constitute a separate landform. If a separate landform is required it will be designed to blend in with surrounding landscape and contours, deep ripped and rehabilitated after it is no longer required.

Crystalliser and bitterns pond walls will be left in-situ. They are low in height, already designed for long term stability and will assist in creating fauna habitat and management of hydrological regimes post closure. Salt contaminated soil in the basement of these areas will be removed and disposed appropriately.

The pond walls for the solar evaporation ponds will be left in-situ. They are low in height (up to 6 m above ground level), already designed for long term stability and will assist in creating fauna habitat and management of hydrological regimes post closure. The typical final landform design for these pond walls is provided below in Figure 22.

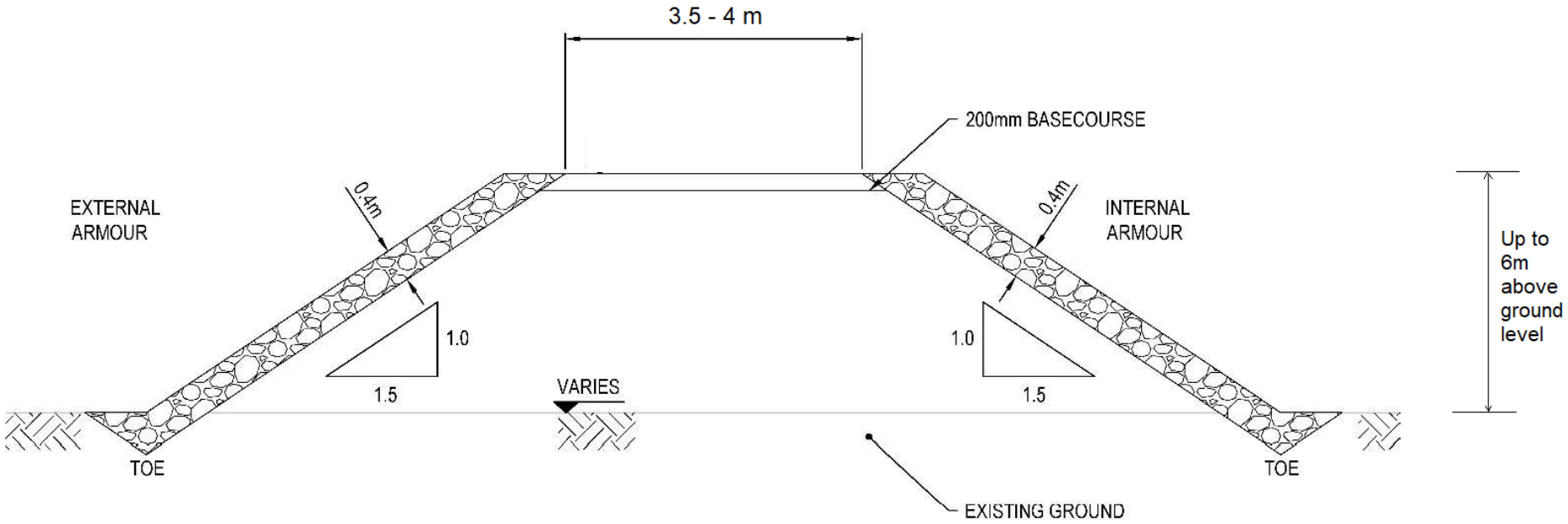


Figure 22: Final Landform Design – Evaporation Pond Walls

9.3 REHABILITATION

Rehabilitation will focus on revegetation with native species. Therefore, K+S will:

- Establish a safe and stable land surface which supports native vegetation growth.
- Revegetate the access ramps and tracks to establish vegetation appropriate for the area and final land use.

Natural vegetation will be promoted by deep-ripping access tracks to a nominal depth of 300 mm, as this has proved to be an effective revegetation tool in the region for other projects.

Topsoil will be stockpiled during development of the Project, so it can be re-spread to promote revegetation. The rehabilitation of key areas will involve re-distribution of this topsoil, following appraisal of records for contamination and following any required stabilisation works.

Should there be a topsoil deficit, the mining industry has experience in the establishment of native vegetation cover without the provision of a separate topsoil layer (via deep ripping), and K+S considers this to be an effective approach for this project if inadequate topsoil resources are available.

Broadcast seeding and seedling planting is unlikely to be required, however if it proves necessary to encourage native cover establishment or maintenance. then local provenance species will be used. Revegetation will occur progressively where possible, to ensure that minimal areas are left open, however there will be limited areas where this can occur (such as the borrow pits and possibly dredge spoil disposal area).

Rehabilitation and revegetation techniques are discussed further in APPENDIX 1 (Preliminary Rehabilitation Plan).

9.4 PREMATURE CLOSURE

As described in Section 11 the closure provision account includes costs set aside for unexpected closure and/or sudden placement of the site into care and maintenance. Should unexpected closure occur, this Closure Plan will be refined with further detail, then implemented to rehabilitate areas no longer required for future operations. Parts of the operation likely to be required for future salt production or other uses will be “idle” until future plans are confirmed.

In the unlikely event that temporary closure of the site was required, the following work would be undertaken:

- All mobile and fixed plant would be turned off and left in a condition that would prevent safety and environmental risks.
- Progressive rehabilitation for the current activities would be completed as far as practicable (this would only be possible for temporary disturbances that would not be required for ongoing use in the future).
- Any stockpiles remaining on site would be recorded and marked (GPS location recorded, documented in register and stockpile is signposted).

10 CLOSURE MONITORING AND MAINTENANCE

The purpose of this section is to provide a:

- monitoring framework to monitor the progress of the closure implementation strategies for achieving closure outcomes and completion criteria and description of proposed post-closure monitoring
- description of the monitoring methodology.

K+S will report the monitoring and maintenance results to DMIRS in the Annual Environmental Report (AER) for the operation to show progress against achievement of completion criteria. Monitoring will provide a basis for identification of any adverse changes in site conditions that may require maintenance or remedial works.

10.1 MONITORING FRAMEWORK AND DESCRIPTION

The proposed monitoring framework and description is provided in Table 24.

Table 24: Monitoring Framework and Description

Monitoring Type	Description	Timeline / Frequency	Monitoring Rationale
Water	Monitoring of post closure surface water hydrology to ensure that drainage diversions and/or post-closure drainage management regimes are operating as expected.	Annually, commencing at closure	Annually for 5 years after closure after which it will reduce to biannually for at least 3 years
Rehabilitation area stability	Visual assessment of rehabilitated areas for evidence of significant erosion or impact on surrounding watercourses/vegetation from sediment transport off site.	Annually, commencing at closure	Identify instability of rehabilitated surfaces and requirement for maintenance/ corrective action. Report on progress in AER.
Re-establishment of vegetation assemblages similar to that locally.	Visual assessment (photographic) of vegetation establishment (presence/absence) on rehabilitated areas.	Annually, commencing on any areas rehabilitated during operations or closure	Report on progress of revegetation AER.
Weeds	Visual assessment (photographic) of weed infestation (presence/absence and population size estimates) on rehabilitated areas.	Annually, commencing on any areas rehabilitated during operations or closure	Report on progress of revegetation and weed infestation (and treatments) in AER.
Assessment of the species composition in rehabilitated areas against pre-development species list	In order to demonstrate that the rehabilitation has achieved a sustainable ecosystem post closure that is compatible with the surrounding area, K+S will undertake an assessment of species composition in the rehabilitated areas against pre-disturbance vegetation types and species list to confirm that vegetation establishment is compatible with and similar to pre-disturbance ecology.	5 – 6 years after rehabilitation of disturbed areas to promote revegetation	Confirm revegetation is appropriate for site relinquishment.

10.2 MONITORING METHODOLOGY

The proposed monitoring methodology is described in Table 25.

Table 25: Monitoring Methodology

Monitoring Type	Description	Methodology	Timeline / Frequency
Water	Monitoring of post closure surface water hydrology to ensure that drainage diversions and/or post-closure drainage management regimes are operating as expected.	Loggers installed in strategic locations (identified via modelling) upstream and downstream of project, to confirm post-closure hydrology is as expected.	Annually, commencing at closure
Rehabilitation area stability	Visual assessment of rehabilitated areas for evidence of significant erosion or impact on surrounding watercourses/vegetation from sediment transport off site.	Photographic monitoring of at least five landform locations, representative of rehabilitation types, in areas where erosive forces may exist.	Annually, commencing at closure
Re-establishment of vegetation assemblages similar to that locally.	Visual assessment (photographic) of vegetation establishment (presence/absence) on rehabilitated areas.	Photographic monitoring of all rehabilitation areas at selected consistent locations.	Annually, commencing on any areas rehabilitated during operations or closure
Weeds	Visual assessment (photographic) of weed infestation (presence/absence and population size estimates) on rehabilitated areas.	Photographic monitoring of all rehabilitation areas at selected consistent locations, representative of weed infestations occurring (if any).	Annually, commencing on any areas rehabilitated during operations or closure
Assessment of the species composition in rehabilitated areas against pre-development species list	In order to demonstrate that the rehabilitation has achieved a sustainable ecosystem post closure that is compatible with the surrounding area, K+S will undertake an assessment of species composition in the rehabilitated areas against pre-disturbance vegetation types and species list to confirm that vegetation establishment is compatible with and similar to pre-disturbance ecology.	Flora survey of rehabilitation areas by qualified botanist, including the establishment of sampling sites (quadrats, transects and/or releves) as appropriate to assess species composition in the rehabilitated areas against the pre-disturbance vegetation types and pre-development species list. Formal vegetation survey report to be produced.	5 – 6 years after rehabilitation of disturbed areas to promote revegetation

11 FINANCIAL PROVISIONING FOR CLOSURE

In accordance with international accounting standards and internal policies, K+S maintains financial provisions where there is any legal or constructive obligation to rehabilitate a site. A legal obligation can exist by contract or through respective approvals and regulations. A construction obligation can be as committed through public communication or internal policy. K+S, being an international company, undertakes financial reporting in accordance with strict standards.

11.1 CLOSURE COSTING METHODOLOGY

K+S has in place closure provisioning processes in which the annual costs of rehabilitation activities, decommissioning activities and closure programmes are calculated out to final closure. A 'closure provision' is then created to address site final closure costs. A closure cost has been estimated for the project, and as per K+S policies the provision will be reviewed regularly. Key aspects of the closure costing methodology are outlined in the sub-sections below.

K+S utilises a schedule of rates for various required activities to estimate closure costs.

The schedule of rates is kept up to date on the basis of current undiscounted costs, current legal requirements and current technology.

11.2 ASSUMPTIONS

Closure costs are calculated to reflect, as far as possible, the real cost of closure and include:

- Decommissioning costs (which occur at or near the end of Operation life) such as:
    - Demolition and removal of unwanted facilities and services on the site.
    - Remediation: the clean-up of contaminated areas of soil or water to an agreed quality.
    - Maintenance and Monitoring: the management of the site through to relinquishment.
- Rehabilitation costs, which include the cost of rehabilitating disturbed areas that (for an operational or environmental reason), were not progressively rehabilitated during the life of the Operation.
- Project management costs, which include the human resourcing, facilities and administration related support required to implement closure activities.

Examples of items included in each category above are further detailed in Table 26.

Table 26: Examples of Items Included in Provision Accounts

Closure Category	Example Items Included

Decommissioning	• Decommissioning and removal of infrastructure, plant and equipment.
	• Waste disposal.
	• Remediation of contamination:
	  ○ Survey program
	  ○ Remediation program
	  ○ Maintenance and monitoring.

Rehabilitation	• Earthmoving and landscape forming. • Revegetation. • Post Closure management of surface water drainage and erosion. • Maintenance and monitoring programs.
Project Management	• Ongoing stakeholder consultation.

Closure Category	Example Items Included
	• Administration support. • Office and accommodation facilities. • Specialist and consultant fees. • Legal requirements.

11.3 UNCERTAINTIES

Uncertainties may include things such as:

- Legal requirements at the time of closure.
- Stakeholder requirements at the time of closure.
- Costs of decommissioning and closure contracting, civil and rehabilitation works at the time of closure.
- The level of contamination that may exist at the time of closure.

K+S will manage these uncertainties by maintaining best practice accounting methods, whereby future costs are projected and accounted for as far as practicable. K+S will keep up to date with current costs of activities and as they change (or are projected to change) K+S will update its provisioning amounts accordingly.

11.4 UNEXPECTED CLOSURE

The provision includes costs set aside for unexpected closure and/or sudden placement of the site into care and maintenance.

11.5 CLOSURE COSTING DOCUMENTATION

K+S maintains thorough documentation of its closure provisions and assumptions behind cost estimates in company accounting databases and reports.

12 MANAGEMENT OF INFORMATION AND DATA

12.1 MANAGEMENT OF RECORDS AND DATA

K+S maintains an Environmental Management System (EMS) which is aligned with the international standard ISO 14001.

The EMS is based on the Plan, Do, Check, Act improvement cycle and includes the elements as depicted in the diagram below (Figure 23). Maintenance of records is managed under the "Checking" part of the EMS which requires the following and is applied to the management of closure related records and data:

- Monitor and measure environmental interactions
- Evaluate compliance
- Establish a nonconformance, corrective action and preventative action system
- Manage and maintain data and records
- Perform periodic audits of the EMS.

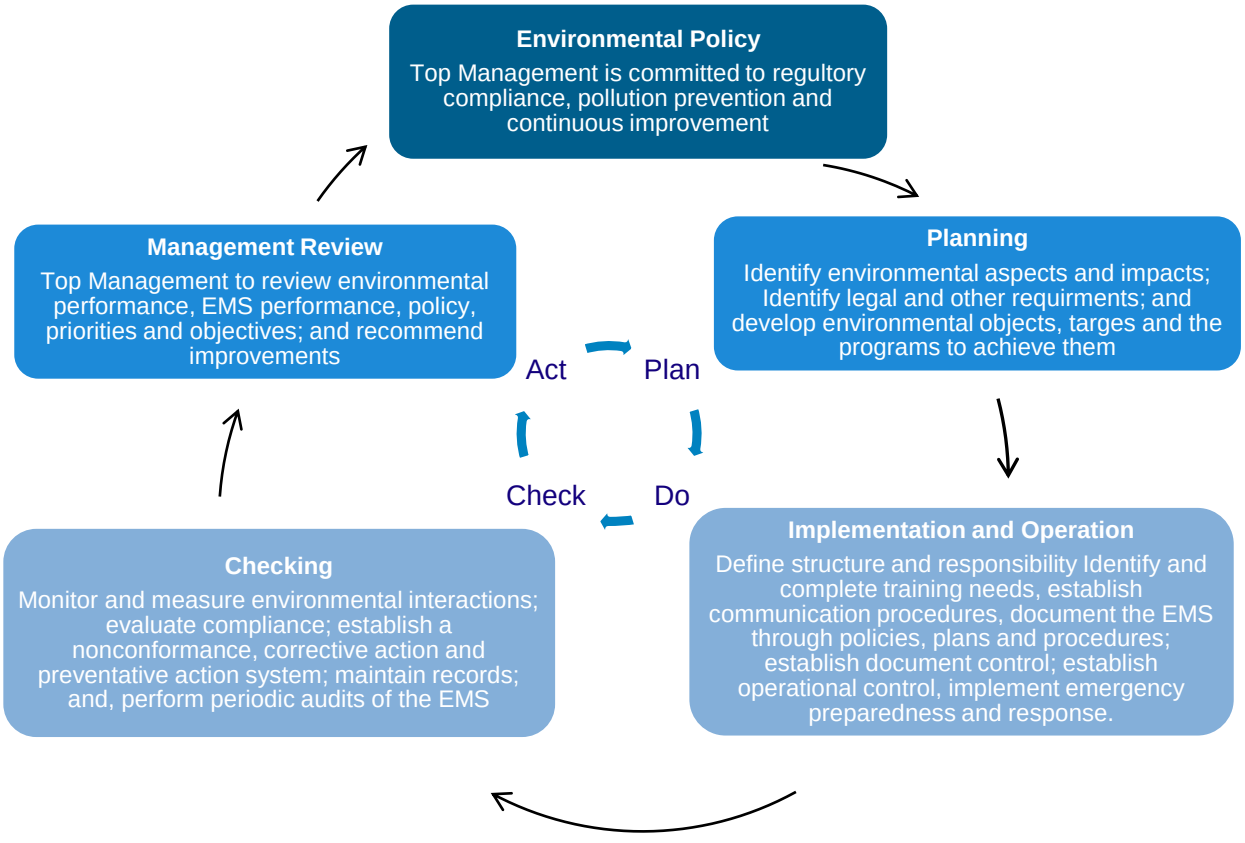


Figure 23: Structure of K+S Environmental Management System

The EMS includes high quality processes for the retention of mine records and all information and data relevant to mine closure. It is anticipated that the EMS will be utilised as a framework for management of closure data, records and information. It is anticipated that through the EMS a closure database will be established for each domain or feature, where all available information is collated and reviewed with the objective of building a "base" of information for that particular domain or feature. Such information may include, but is not limited to, the current status of the domain or feature, information from spatial datasets and databases, design and construction information, operation and monitoring information or other information that meets a specific purpose (e.g. maps, area statistics, species lists or modelled environmental impacts). All technical reports relevant to closure will be referenced and included in the database.

12.2 RECORDS TO BE KEPT

K+S will maintain copies of all environmental approvals, licences and permits relevant to the operation. These records will be updated as necessary to include new operating approvals and updated licences. In addition, K+S maintains a list of Closure Obligations and Commitments which summarises all environmental legal obligations relevant to closure (Section 3).

K+S will maintain active records as to processes that may impact upon the rehabilitation of the Project areas. This will provide the basis for interpretation of later rehabilitation monitoring outcomes. Amongst the records to be maintained include the following:

- rehabilitation records;
- register of contaminated sites;
- locations of topsoil and other stockpiles;
- environmental monitoring records; and
- environmental incident records.

K+S will record the details of each rehabilitation campaign so that they are available for later interpretation of rehabilitation monitoring results, with the aim of continually improving rehabilitation standards on site. The key parameters to be recorded include:

- landform design details;
- site preparation techniques (e.g. deep-ripping);
- weather conditions;
- photographic records; and
- initial follow-up care and maintenance works.

12.3 REVIEW OF THE CLOSURE PLAN

Once approved, this Closure Plan will be reviewed every 3 years.

13 REVIEWED CLOSURE PLANS

This section is not relevant as this is a revision of the first version of this Closure Plan and the proposed Project is a new site.

GLOSSARY

Term	Meaning
AEP	Annual Exceedance Probability
AER	Annual Environmental Report
AGIG	Australian Gas and Infrastructure Group
AMD	Acidic and/or metalliferous drainage
BAM Act	*WA Biosecurity and Agriculture Management Act 2007*
BOM	Bureau of Meteorology
BTAC	Buurabalayji Thalanyji Aboriginal Corporation
CCG	Cape Conservation Group
CEMP	Construction Environmental Management Plan
DAWE	Department of Agriculture, Water and Environment
DBCA	Department of Biodiversity, Conservation and Attractions
DJITSI	Department of Jobs, Tourism, Science and Innovation
DMIRS	Department of Mines, Industry Regulation and Safety
DPIRD	Department of Primary Industries and Regional Development
DPLH	Department of Planning, lands and Heritage
DSMP	Dredge and Sediment Management Plan
DWER	Department of Water and Environmental Regulation
EMS	Environmental Management System
EP Act	*Environmental Protection Act 1986* (WA)
EPA	Environmental Protection Authority (WA)
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cth)
ERD	Environmental Review Document
ESD	Environmental Scoping Document
GDC	Gascoyne Development Commission
GIS	Geographic Information Systems
GWMMP	Groundwater Monitoring and Management Plan
IMPMMP	Introduced Marine Pest Monitoring and Management Plan
K+S	K plus S Australia Pty Ltd
Km	Kilometre
LMP	Light Management Plan
LOR	Limits of Reporting
mAHD	Australian Height Datum
MCP	Mine Closure Plan
MEQMMP	Marine Environmental Quality Monitoring and Management Plan
MFMP	Marine Fauna Management Plan
MP	Mining Proposal
MSAMMP	Mangrove, Samphire and Algal Mat Management Plan
NORM	Naturally occurring radioactive material
NTU	Nephelometric Turbidity Units
OEMP	Operations Environmental Management Plan
OMC	Optimum Moisture Content

Term	Meaning
PEC	Priority Ecological Community
SMDD	Standard Maximum Dry Density
SWMP	Surface Water Management Plan
TDS	Total Dissolved Solids
TEC	Threatened Ecological Community
TSS	Total Suspended Solids
WIR	Water Information Reporting
WMP	Waste Management Pan

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APPENDIX 1. PRELIMINARY REHABILITATION PLAN

This Rehabilitation and Revegetation plan has been developed to provide overarching guidance for the project. This plan will be updated periodically in the light of new information and monitoring results.

The following plan is designed to minimise open areas and rehabilitate the site in a progressive manner with a view to establishing permanent vegetation cover that is suitable for pastoral use.

Rehabilitation Program

Purpose

The purpose of the rehabilitation program will be for the whole site is to be rehabilitated to be compatible with the surrounding land use (pastoral) and key surrounding ecosystem (salt flat) values.

Objective

The broad objective is to: establish a diverse, effective and permanent vegetation cover capable of plant succession and regeneration to return disturbed areas to their pre-development condition. Note that this objective will be modified in the event of changes to final land use.

Process

The rehabilitation process will incorporate:

- Removal of buildings, infrastructure and equipment.
- Removal and appropriate disposal of hydrocarbon and chemical storage areas.
- Remediation or removal of any contaminated material.
- Removal (i.e. break up) of concrete footings/slabs/hardstands and placement within areas of general backfill or in-situ burial to a suitable depth.
- Re-contouring as necessary to achieve closure outcomes.
- Deep ripping.
- Re-spreading topsoil.
- Oversize or vegetative material will be placed strategically to prevent erosion and encourage revegetation and create fauna habitat.
- Control of weeds.
- Seeding topsoil areas with local seed if re-colonisation is not progressing adequately after monitoring.

Monitoring

ACTIVE MINING RECORDS

K+S will maintain active records as to processes that may impact upon the rehabilitation of the Project areas. This will provide the basis for interpretation of later rehabilitation monitoring outcomes. Amongst the records to be maintained include the following:

- rehabilitation records;
- register of contaminated sites;
- locations of topsoil and other stockpiles;
- environmental monitoring records; and
- environmental incident records.

REHABILITATION METHODOLOGY RECORDS

K+S will record the details of each rehabilitation campaign so that they are available for later interpretation of rehabilitation monitoring results, with the aim of continually improving rehabilitation standards on site. The key parameters to be recorded include:

- landform design details;
- site preparation techniques (e.g. deep-ripping);
- weather conditions;
- photographic records; and
- initial follow-up care and maintenance works.

ANNUAL REHABILITATION INSPECTION

Annual inspections of rehabilitated areas (photographic) will be undertaken over the life of the operation and during closure to assess stability, erosion, sediment transport off site, vegetation establishment (presence/absence) and weed infestation (presence/absence and population size estimates). Outcomes of the annual rehabilitation inspection will be recorded, reported in the AER and any required management actions that are identified as part of the inspection shall be implemented as soon as practical. Where necessary, rehabilitation procedures will be amended accordingly with the aim of continually improving rehabilitation standards.

LONG TERM REHABILITATION MONITORING

The objective of this monitoring is to evaluate the progress of rehabilitation towards fulfilling long term land use objectives.

This will occur 5 – 6 years after rehabilitation of disturbed areas in order to demonstrate that the rehabilitation has achieved a sustainable ecosystem post closure that is compatible with the surrounding area, K+S will undertake an assessment of species composition in the rehabilitated areas against pre-disturbance vegetation types and species list to confirm that vegetation establishment is compatible with and similar to pre-disturbance ecology. This will be in the form of a flora survey of rehabilitation areas by qualified botanist, including the establishment of sampling sites (quadrats, transects and/or releves) as appropriate to assess species composition in the rehabilitated areas against the pre-disturbance vegetation types and species list. A formal vegetation survey report will be produced.

Completion Criteria

The following completion criteria are proposed (Table 1).

Table 1: Rehabilitation Completion Criteria

Criterion	Criterion Outcome	Standard or Milestone	Monitoring Criteria
Provenance	Vegetation is locally endemic.	Revegetation has established native species recorded in the area prior to mining (comparable with analogous systems) and consistent with land use.	Rehabilitation monitoring results demonstrate locally endemic species are establishing. Rehabilitation monitoring results reported to DMIRS in Annual Environmental Report.

Criterion	Criterion Outcome	Standard or Milestone	Monitoring Criteria
Vegetation Development	Vegetation is suited to the agreed final land use.	Established vegetative cover should be self-sustaining and similar to the surrounding undisturbed vegetation (comparable with analogous systems) and consistent with land use. Monitoring of rehabilitated areas has been undertaken until it can be demonstrated that the landscape and vegetation is progressing towards a self-sustaining state.	Monitoring of rehabilitation development that vegetation is occurring. Monitoring results reported in Annual Environmental Report (AER).
Weeds	Potential for rehabilitation to meet the agreed post-mining use is not limited by the presence of weeds.	No Declared Plants (as defined under the *Agriculture and Related Resources Protection Act 1976*) are present in greater abundance than surrounding areas. Weed abundance does not exceed baseline. All Declared Plants and environmental weeds recorded in the rehabilitation have been effectively managed.	Review weed monitoring (photographic) and control undertaken. Report on weed monitoring (photographic) and control records. Monitoring and visual inspection of vegetation establishment and representative reference areas.

Reporting

K+S will provide the following regulatory reporting on rehabilitation efforts:

- Yearly: Annual Environmental Report (AER)
    - Summary of new rehabilitation activities (location and area).
    - Report rehabilitation outcomes and proposed changes.

APPENDIX 2. TECHNICAL REPORTS