Environmental Impact Statement (EIS) assessment report under the Environmental Protection Act 1994

St Elmo Vanadium Project

proposed by Multicom Resources Ltd

25 August 2020

Queensland Government

Prepared by: Environmental Impact Assessment, Department of Environment and Science

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Contents

List of figures and tables

List of acronyms and abbreviations

ACH Act	*Aboriginal and Cultural Heritage Act 2003*
AEP	Annual exceedance probability
AHD	Australian height datum
ARI	Average reoccurrence interval
ASS	Acid sulfate soils
BoM	Bureau of Meteorology
BPA	Biodiversity Planning Assessment
CBA	Cost-benefit analysis
CHMP	Cultural Heritage Management Plan
CGE	Computable general equilibrium
DAF	Department of Agriculture and Fisheries
DATSIP	Department of Aboriginal and Torres Strait Islander Partnerships
DIDO	Drive-in drive-out
DNRME	Department of Natural Resources, Mines and Energy
DO	Dissolved oxygen
DAWE	Department of Agriculture, Water and Environment
DES	Department of Environment and Science
DSDTI	Department of State Development, Tourism and Innovation
DTMR	Department of Transport and Main Roads
EA	Environmental authority
EIS	Environmental impact statement
EP Act	*Environmental Protection Act 1994*
EP Regulation	Environmental Protection Regulation 2008
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
EPBC EOP	EPBC Act Environmental Offsets Policy
ERA	Environmentally relevant activity
ERP	Emergency Response Plan
ESA	Environmentally sensitive area
ESCP	Erosion and sediment control plan
FA	Financial assurance
FIFO	Fly-in fly-out
FTE	Full-time equivalent
GDE	Groundwater dependent ecosystems
GES	General ecological significance
GHG	Greenhouse gas
GL	Gigalitre
GRP	Gross regional product
GSP	Gross state product

HES	High ecological significance
IAS	Initial advice statement
LCM	Loose cubic metres
LOM	Life of mine
LNG	Liquefied Natural Gas
MDL	Mining development lease
MIA	Mine infrastructure area
ML	Mining lease
MLA	Mining lease application
MR Act	*Mineral Resources Act 1989*
Mtpa	Million tonnes per annum
NC Act	*Nature Conservation Act 1992*
NT Act	*Native Title Act 1993*
OCG	Office of the Coordinator General
PASS	Potential acid sulfate soils
PM	Particular matter (e.g. $PM_{2.5}$, PM_{10})
PRCP	Progressive Rehabilitation and Closure Plan
RE	Regional ecosystems
REMP	Receiving Environment Monitoring Program
ROM	Run-of-mine
SDPWO Act	*State Development and Public Works Organisation Act 1971*
SEA	Strategic environmental area
SIMP	Soicial impact management plan
SIMR	Social impact management report
SSRC Act	*Strong and Sustainable Resource Communities Act 2017*
STP	Sewage treatment plant
TEC	Threatened Ecological Community
TI Act	*Transport Infrastructure Act 1994*
TOR	Terms of reference
TSF	Tailings storage facility
TSS	Total suspended solids
VEEP	Voluntary Ecological Enhancement Program
VM Act	*Vegetation Management Act 1999*
VRFB	Vanadium redox flow battery
WMP	Water Monitoring Plan

1 Introduction

This Environmental Impact Statement (EIS) assessment report ('assessment report' hereafter) for the Saint Elmo Vanadium Project (the project) was prepared by the Department of Environment and Science (the department) pursuant to Chapter 3 of the *Environmental Protection Act 1994* (EP Act). It provides an evaluation of the EIS prepared by Multicom Resources Limited ('the proponent' hereafter). The scope of the matters dealt with in the EIS were defined in the Terms of reference (TOR) published by the department.

This report is an assessment of the EIS prepared by the proponent. It outlines the findings of the EIS and information provided through the public and agency consultation. This assessment report:

- summarises the proposed project, the EIS process and the regulatory approvals that would be necessary for the project to proceed (section 3)
- evaluates the potential environmental, economic and social impacts of the proposed project
- assesses the potential impact on prescribed environmental matters under State and Commonwealth legislation
- outlines avoidance, planning, management, monitoring and other measures proposed to minimise adverse environmental impacts
- assesses the suitability of the project and identifies matters required to be dealt with for the proposed project to proceed
- identifies issues that were not resolved or that require specific conditions or recommendations for the proposed project to proceed
- recommends conditions relevant to the siting, operation, monitoring, management, offset and other requirements
- completes the EIS assessment process for the Saint Elmo Vanadium Project under the EP Act.

This assessment report has been prepared and completed in accordance with the requirements of the EP Act and will assist the department in making decisions under Chapter 5 of the EP Act and other departments in making decisions under their respective legislation. The EP Act EIS process is accredited for the assessment of matters of national environmental significance (MNES) under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) in accordance with the Bilateral Agreement between the Commonwealth of Australia and the State of Queensland (2014). A copy of this assessment report will be given to the Commonwealth Minister for the Environment, who will decide with respect to the controlled action under Part 9 of the EPBC Act.

2 Project description

A detailed description of the project is provided in Chapter 3, Project Description of the amended EIS June 2020. For completeness and clarity about what this assessment report refers to, a summary of the key project elements is provided below.

The proponent is proposing to develop a greenfield, shallow open cut vanadium mine and associated infrastructure. The proposed project would be located approximately 15 kilometres (km) east of the town of Julia Creek in north-west Queensland. The total project area is approximately 9246 hectares (ha). The mine area would be located on mining lease application (MLA) 100162, an area covering approximately 8882ha. The Off-site Water Storage Facility (OWSF) would be located on MLA100244, an area of 246ha. The associated pipeline would be located on MLA100245, an area of 133ha across 23km and the aqueduct would be located on MLA100246, an area of 6ha. Subject to the necessary approvals, the construction of the mine is planned to commence in 2021.

The proposed project would require north-south aligned strip mining panels to be sequentially mined, backfilled and rehabilitated. Up to 15 million tonnes per annum (tpa) of material would be mined disturbing an area of 7454ha to produce up to 20,000tpa of vanadium pentoxide (V_2O_5) over a mine life of at least 25 years.

The processing of the mineral ore would be conducted using an atmospheric leaching method in a hydrometallurgical processing plant. There are four main processing stages: stage 1 – beneficiation; stage 2 – leach; stage 3 – purification; and stage 4 – refining. A significant number of reagents are required to run the flotation, leaching and downstream processing units of solvent extraction, desilication, ammonium metavanadate precipitation and de-ammoniation.

The total water demand for a 20,000tpa operation will be 5 gigalitres per annum (GL/pa) of raw water. A water entitlement for harvesting flood waters from the Flinders River is required. Water will be diverted from the Flinders River and channelled through an aqueduct approximately 480m to the OWSF. An area of 246ha adjacent to the Flinders River, would be used for the OWSF consisting of four water storage cells sized at 40ha each with a total capacity of 11,300 megalitres (ML). An associated water pipeline would then transport the water approximately 24km west to a 61ha water storage dam on MLA100162.

The proposed project would consist of:

- clearing of approximately 7672ha of native vegetation
- a shallow (average depth of 1 to 5 meters (m) with a maximum depth of 20 to 40m, depending on the depth of overburden) open cut pits, with north-south aligned strip-mining panels to be sequentially mined, backfilled and rehabilitated
- a run-of-mine and processing pad
- overburden and topsoil storage and management areas
- an area for blending run-of-mine stockpiles to minimise feed grade variation through the processing plant
- road access from the Flinders Highway
- railway line to the site, siding and loading facility
- haulage roads, plant roads, access roads
- an infrastructure area, including offices, laboratories and workshops
- a sewage treatment plant and associated irrigation area
- an OWSF and associated 24km long underground pipeline to store and deliver water to the site
- a tailings storage facility (TSF) consisting of three cells
- an evaporation pond

- onsite water management infrastructure including; raw water dam, mine water dam and dirty water storage (17sediment dams)
- a power station comprising a diesel and gas generator and proposed area for a solar farm
- diesel fuel, gas tank, chemical and waste storage areas.

The proposed project would employ approximately 200 people during construction and approximately 150 people once operational at a production level of 10,000tpa increasing to 250 people at the expected expanded production levels. Workforce accommodation would be sourced and constructed within the vicinity of Julia Creek, allowing for some local lodging of employees and integration with the nearby township.

The proposed project is estimated to result in an economic benefit to Queensland of between $1.34 billion to $1.92 billion. Royalties are estimated to be approximately $325 million.

The project description provided in the submitted EIS was considered adequate for the purposes of public consultation and met the requirements of the TOR.

A summary of submissions received on the EIS is provided in section 3.3.5 of this report. Information was requested for the project description in submissions. The proponent provided further detail of project elements. Additionally, further details of project elements will be requested in the conditions of an EA.

The Department of Transport and Main Roads (DTMR) provided advice that they would not approve the proposed new rail level crossing into the site. The proponent was advised and is progressing an alternative transport option. DTMR has provided in-principle support to this option and will liaise with the proponent and Queensland Rail in the post-EIS approval space.

2.1 Project location

The proposed project would be located approximately 15km east of Julia Creek, in North–west Queensland, within the McKinlay Shire Council local government area. Regionally the proposed project is located within the North West Minerals Province and is approximately 250km east of Mount Isa, 140km east of Cloncurry and 125km west of Richmond. The closest community, Julia Creek, has a population of approximately 511 people.

The proposed mine site is generally flat and located on a slightly elevated anticline of approximately 130 -160 m elevation within the Flinders River catchment. An OWSF would be located approximately 24km east of the proposed mine site adjacent to the Flinders River. The Flinders River is Queensland's longest river and flows approximately 400km north-west into the Gulf of Carpentaria. The proposed project is predominantly within the Mitchell Grass Downs bioregion with the OWSF located within the Gulf Plains bioregion. The proposed project area is bounded by the Flinders Highway and the Mount Isa Rail Line to the south, and the Flinders River in the north-east. The total project area is approximately 9246ha. The proposed project location and transport corridor is provided in Figure 1. The proposed project site and mine infrastructure area (MIA) is shown in Figure 2. The OWSF and associated infrastructure is shown in Figure 3.

The proposed project site currently comprises several grazing pastoral properties and would be located within both grazing leasehold and freehold tenure. A grazing Stock Route bisects the site with McKinlay Shire Council as trustee.

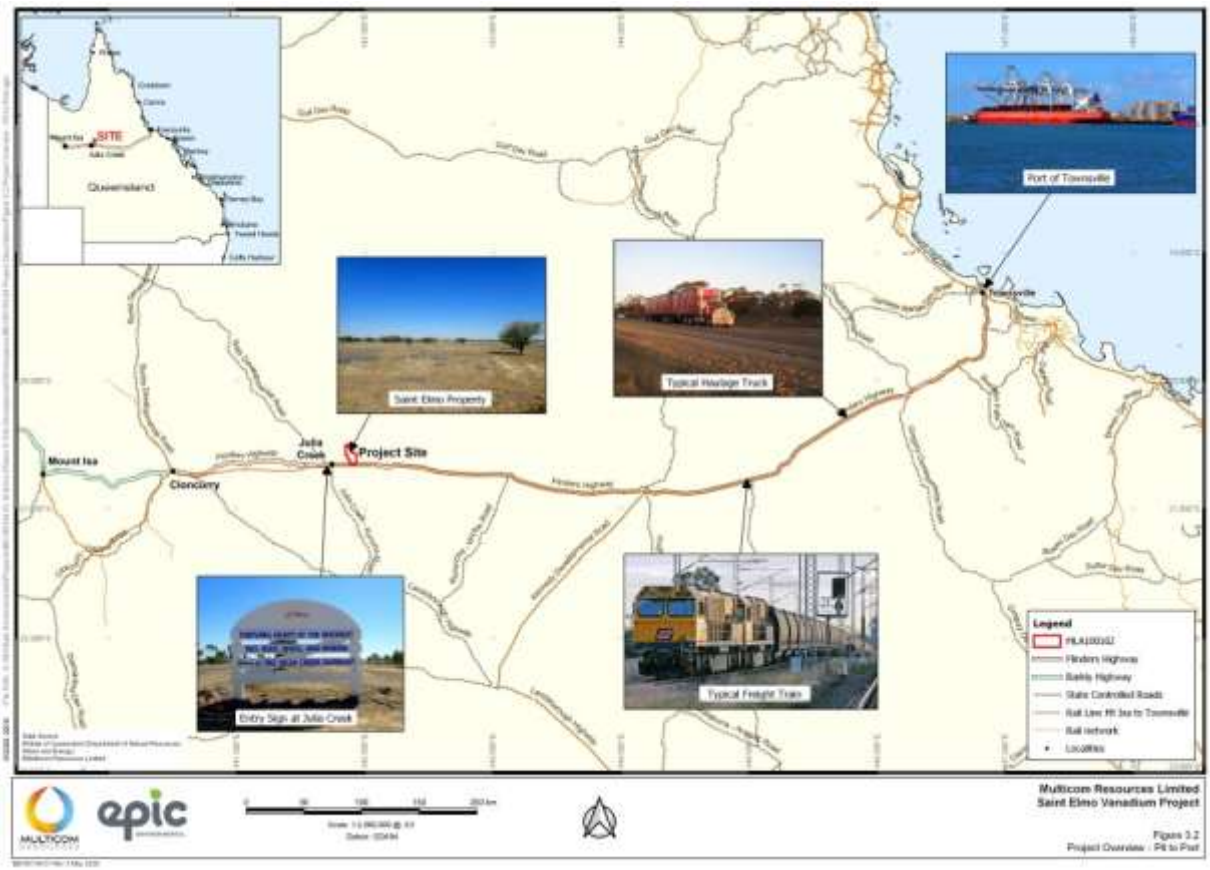

Figure 1: Project overview*

* from AEIS Figure 3.2

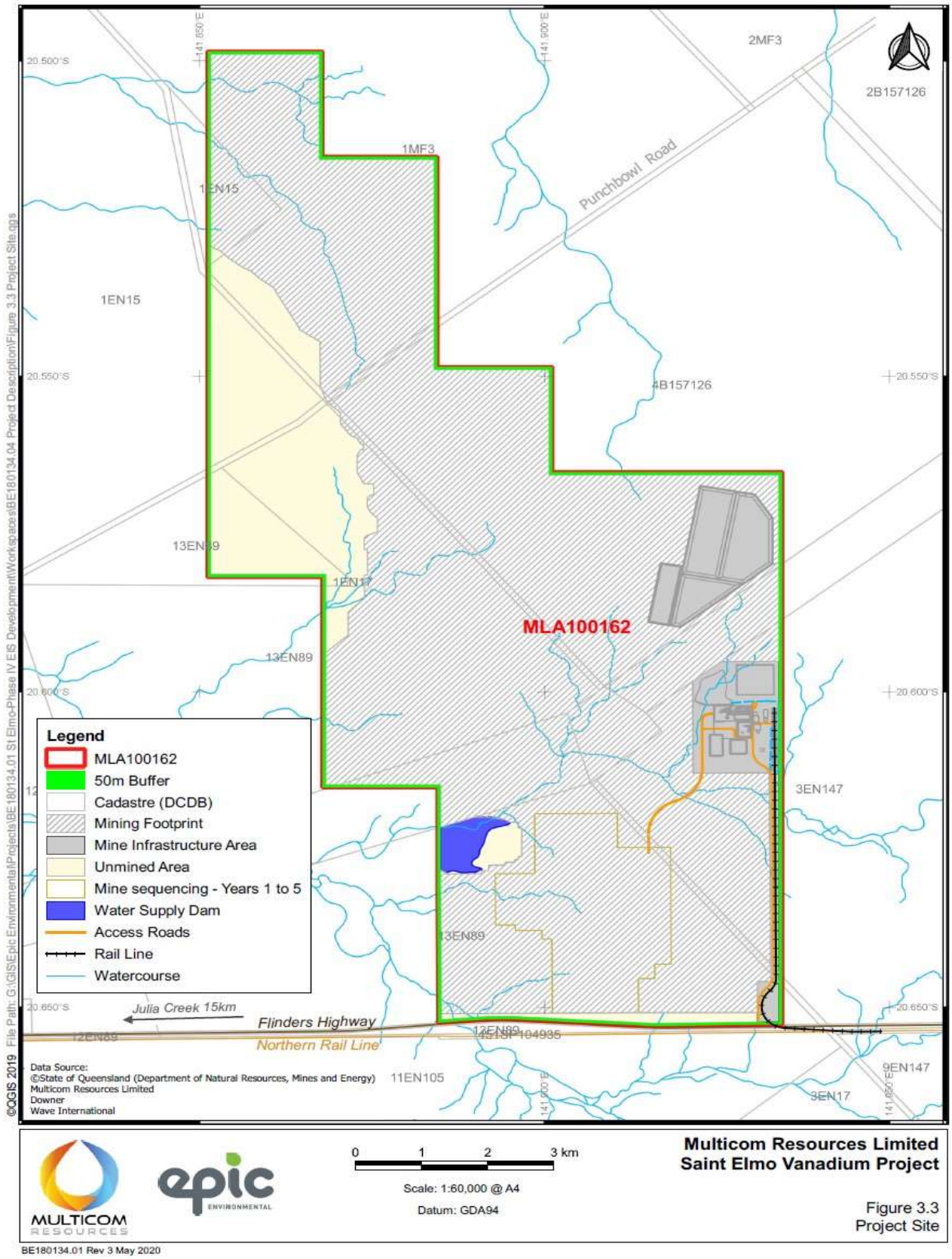

Figure 2: Project site and project infrastructure*

* from AEIS Figure 3.3

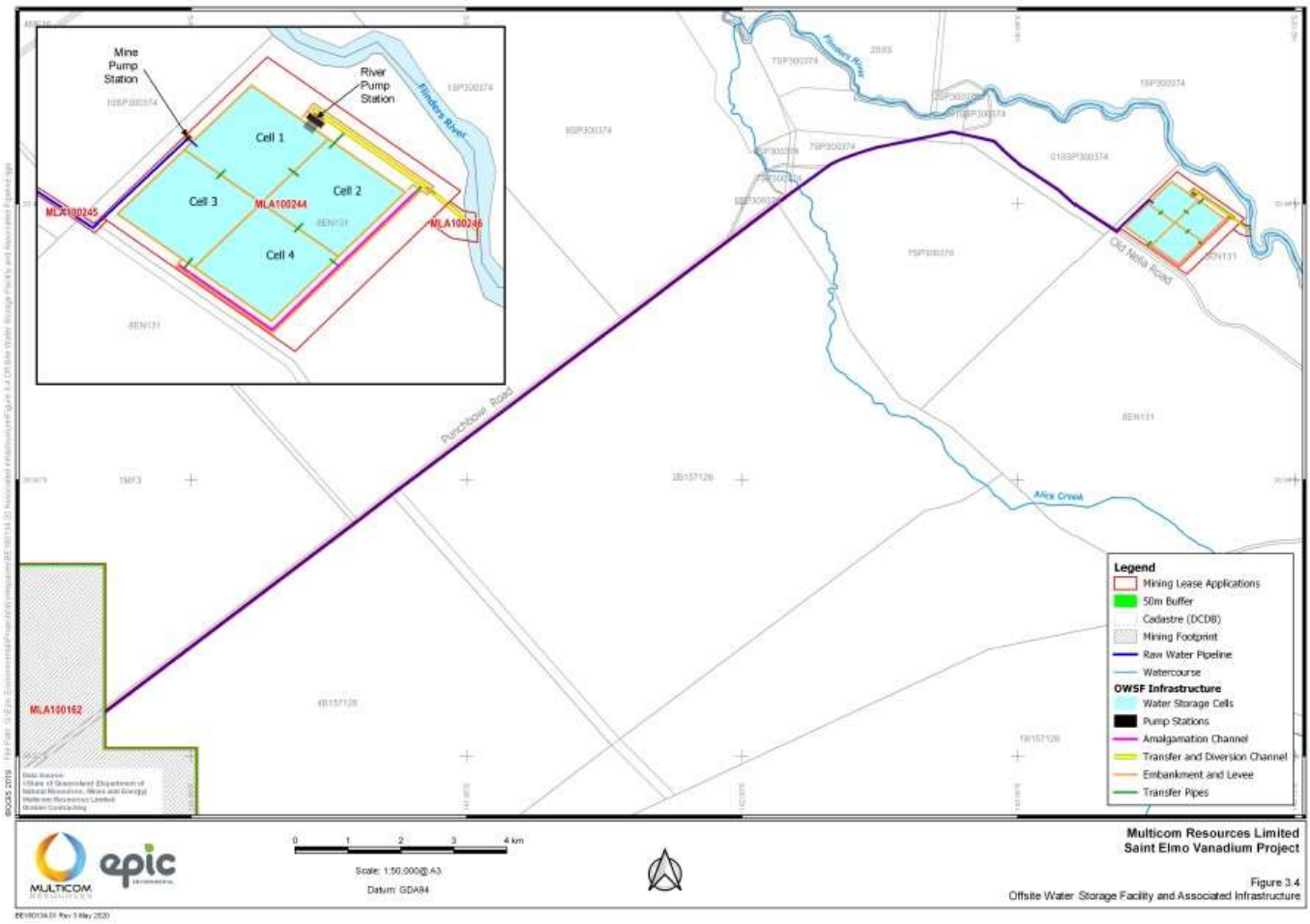

Figure 3: Offsite water storage facility and associated infrastructure*

* from AEIS Figure 3.4

2.2 Tenure

The proposed project area consists of ten land parcels, approximately 51% is lands lease, 39% is freehold and 10% is State land (road parcels).

The proponent originally made an application to the department for an exploration permit for minerals (EPM) that was granted in early 2017. More recently the proponent has applied for an EPM over the OWSF and adjacent lands.

The mine would be situated on MLA100162. Three additional MLAs have been applied for to include the area of the OWSF (MLA100244), the associated pipeline (MLA100245) and the aqueduct (MLA100246). These MLAs accord with the mining infrastructure lease tenure that was recommended in the EIS submission by the Department of Natural Resources, Mines and Energy (DNRME).

The tenure required for the OWSF and aqueduct will be applied for as a mining infrastructure lease under the *Mineral Resources Act 1989* (MR Act). The tenure required for the associated pipeline will be applied for as a mining lease for transportation through land under the MR Act.

2.3 Sensitive receptors

Five dwellings located within 10km of the proposed project area were identified as sensitive receptors that have the potential to be impacted by proposed project activities. The closest residential receptor (Saint Elmo homestead) is located approximately 270m outside of the mining area (MLA100162) in the central west. Argyle Homestead is located approximately 4.2km further west of the proposed project

area. Burwood homestead is located approximately 6.8km north, Lindfield homestead is located approximately 10km to the north-east and Garomna homestead approximately 8.5km to the south.

The EIS did not identify any other types of sensitive receptors. It is noted that the nearest protected area, Rungulla National Park, also classed as an Environmentally Sensitive Area (ESA) is located approximately 200km to the north-east, well outside the area of potential impacts.

2.4 Workforce

The workforce will comprise contractors, labourers and suppliers sourced from the economic catchment that includes communities from Townsville west to Mount Isa. It is estimated that up to 200 employees would be required during construction and 250 at peak operations.

The proposed project would be 75% drive-in drive-out (DIDO) and 25% fly-in fly-out (FIFO). Access would be by road and air transport, with DIDO workers from regional areas would be able to travel by company supplied buses. Local workers are defined as those living within one hour of the proposed project site and able to drive to work. These workers are expected to reside within Julia Creek, local communities and properties and are estimated to comprise 12% of the workforce at the start of the proposed project. Non-local workers are defined as workers living more than a one hour drive to the proposed project. The towns of Cloncurry, Richmond and Mount Isa are considered to be the main centres where workers will likely be sourced from and housed. Workers from these towns are estimated to comprise 63% of the workforce at the start of the proposed project. A workforce accommodation village is proposed to be constructed to house workers in Julia Creek.

The mine would operate 24 hours a day, seven days a week. A proposed worker roster is for three day shifts and three night shifts with a 10.5 hour shift length followed by three days off. Contractors would most likely work a two-week on, and one-week off roster.

2.5 Vanadium resource

The proposed project area contains shallow marine sediments of the Eromanga Basin. Within the marine basin is the Toolebuc Formation consisting of a cocquinite and underlying oil shale between 6m to 45m thick. A vanadium enrichment zone of approximately 6m occurs within a 12m calcareous oil shale unit. The cocquina resource is shallowest generally along the north-south and east-west axis of a geological anticline. The vanadium deposit occurs as vanadium pentoxide, V_2O_5, with an estimated 20.5Mt measured resource, 228Mt indicated resource and 245Mt inferred resource.

The expected end use of the vanadium pentoxide flake product is as an additive in manufacturing high-grade steel and in the use of renewable battery technology for vanadium redox flow batteries.

The project is located in the North West Minerals Province, an area the Queensland Government has promoted for mining development (State of Queensland, 2017).

2.6 Government designation

The proponent applied for and was granted ‘major project status’ on 11 December 2019 by the Australian government’s Major Projects Facilitation Agency. Major project status recognises a project’s potential for economic growth and employment for regional Australia.

The proponent also applied for and was granted ‘prescribed project status’ on 25 February 2020 under the Queensland *State Development and Public Works Organisation Act 1971* (SD Act). Prescribed projects are recognised as being of economic or social significance to Queensland.

2.7 Mine pit configurations

The mining pit locations were determined by the location of vanadium deposits. Mining would consist of open cut pits excavated to a maximum depth of 40m. The mining sequence would commence in the south and progress to the north over a 25 year mine life. There are three main mining stages after the vegetation clearing and construction starts in year 0: year’s 1 to 5; 6 to 18 and; 18 to 25. The mining

sequence has been further sub–divided into 11 project disturbance domains for the purposes of the Progressive Rehabilitation and Closure Plan (PRCP). Five of the domains cover a total disturbance area of 6797ha. Domain 11 is an unmined area of 1429ha that includes the 50m perimeter buffer area. Mining would occur across approximately 77% of the 8882ha tenement (MLA100162). Mine pits would be set back a minimum of 50m from the MLA boundary.

2.8 Mining infrastructure

A dedicated MIA and access road from the Flinders Highway would be situated on the eastern boundary of MLA100162 covering an area of approximately 595ha. The MIA would consist of a bespoke mineral processing plant for vanadium based on mineral processing plant design for other mineral ores. The process cycle would consist of four stages: beneficiation; leach; purification and; refining, each with associated infrastructure. The processing waste management infrastructure would cover an additional area of 259ha consisting of a 33.5ha evaporation pond and a 225ha tailings storage facility (TSF). The TSF would consist of three cells lined with a compacted clay liner situated 15.5m below ground level and raised 5m above ground level.

2.9 Construction

Construction would commence once approvals are obtained, and the workforce would use existing housing and new accommodation in the vicinity of Julia Creek.

The construction of the MIA, OSWF, haul roads and other associated mine infrastructure works is planned to commence in year zero, and take up to one year, prior to the commencement of mining. Approximately three truck deliveries per day and a total of 1105 vehicles are expected to be required during the construction period for equipment and materials.

2.10 Mining operation

The first shipment of vanadium product is planned for approximately one year after construction. The process for mining and processing of the vanadium ore is:

- Progressive pre-clearance surveys, clearing of vegetation and disposal
- Removal and storage of topsoil – stockpiled adjacent to voids or directly used in rehabilitation
- Removal of overburden – overburden that is removed before mining a site would be progressively deposited in the mined-out areas
- Vanadium excavation – one or two excavators would be used to remove ore and reject material. No drilling or blasting is required as the ore would be free dug from the relatively shallow deposits of between approximately 1m and 40m below ground level (BGL)
- Transport of material – the excavated ore would be hauled using seven to 13 dump trucks to the product stockpile at the MIA
- Dust control – Dust would be managed using two water trucks on the haul roads and in-pit
- Sediment and erosion measures – would be constructed and managed
- Rehabilitation – Mined areas would be progressively rehabilitated to achieve the agreed final land use. Overburden material would be placed and shaped, before being covered with topsoil and any available composted material
- Final landform – Final landform is dictated by the vanadium resource floor and the amount of overburden replaced in the pit. In most areas, this is expected to be stable with good drainage. Where necessary additional excavation/earthworks would be carried out to achieve a suitable land profile or drainage outcome. These works are standard for mining operations and would be achieved using existing mining equipment.

2.11 Site disturbance

The total disturbance area for the Project is 7672ha.This is comprised of 7454ha for the mining footprint, MIA and water storage dam; 196ha for the OWSF; 20ha for the water pipeline; and 2ha for the aqueduct.

The proposed project area comprises 7461ha of remnant vegetation and 211ha of non-remnant land. Approximately 7204ha of Mitchell grass community would be cleared on MLA100162 or 81% of the total MLA area of 8882ha. The amended EIS surveyed the impact areas for the OSWF and associated pipeline and re–calculated disturbance extents based on the mine infrastructure layout changes. A total of 218ha of native vegetation would be cleared on MLA100244, MLA100245 and MLA100246.

A minimum 50m buffer from the ML boundaries for access and buffers from the mining areas is proposed. This buffer area is also proposed to be used as a temporary stock route between year's 9 and 22 of operation. Two areas within MLA100162 are currently not proposed to be mined. These two areas and the 50m buffer to the perimeter of the site total 1429ha.

3 Environmental impact assessment process

The EIS for the proposed project was jointly assessed under Queensland's EP Act and the Commonwealth EPBC Act. The EIS process under the EP Act was used in accordance with the assessment bilateral agreement between the Commonwealth of Australia and the State of Queensland. Further information on the EIS process under the EP Act is described in the department Guideline titled *'The EIS process for resource projects under EP Act'* which is available on the department's website at www.des.qld.gov.au.

3.1 Environmental Protection Act 1994

The key steps undertaken in the project's EIS assessment process is provided in Table 1.

- On 6 November 2017, the proponent applied to the department for approval to voluntarily prepare an EIS. The application included an initial advice statement, draft terms of reference (TOR) and a list of interested and affected persons. On 27 November 2017, the department approved the application. On 17 March 2018 the draft TOR was publically notified inviting comment on the draft TOR. The proponent responded to all comments received by the department during the comment period. Then the department considered the responses and all comments received, and issued the final TOR for the EIS on 21 June 2018.
- In October 2019 the proponent submitted an EIS and the department decided that it substantially addressed the TOR and could progress to the public notification stage. A 30-day submission period was nationally advertised and commenced on 4 November 2019 and closed 16 December 2019.
- On 13 January 2020 20 properly made submissions were received by the department and provided to the proponent. On 8 June 2020 the proponent provided its response to submissions and an amended EIS to the department.
- On 6 July 2020 the department decided that the proponent's response to submissions and the submitted EIS were adequate for the EIS process to proceed to the assessment report stage. Providing the assessment report to the proponent completes the EIS process under Chapter 3 of the EP Act.
- Upon completion of the EIS process under Chapter 3 of the EP Act, any current application process suspended by the EIS process resumes pursuant to their respective law. For the proposed project, the EA application resumes under Chapter 5 of the EP Act. Under section 172 of the EP Act, the department must then decide if the EA application is approved subject to conditions or is refused.

- If a draft EA is issued it will be provided to the proponent and EIS submitters who are then given the opportunity to object and have the matter referred to the Land Court as per Chapter 5 of the EP Act.

Table 1. Key steps undertaken during the EIS process for the project

Step in the EIS process	Date completed
Proponent was granted a tenement to explore (EPM26410)	9 February 2017
A mining lease application was applied for (MLA100162)	17 October 2017
Proponent referred the project to the Commonwealth Environment Minister for the Department of Agriculture, Water and the Environment former Department of Environment and Energy	9 August 2017
Commonwealth Minister for the Environment decided the project is a 'controlled action'	6 September 2017
The proponent prepared and submitted a voluntary EIS application to the department	6 November 2017
The department approved the voluntary EIS application	27 November 2017
The proponent prepared and submitted a draft TOR to the department	22 February 2018
Comment period for the draft TOR	19 March 2018 to 2 May 2018
The department finalised TOR	21 June 2018
Proponent submitted the EIS	15 February 2019; with revisions on 5 September and 22 October 2019
The EIS submission period	4 November 2019 to 16 December 2019
Submissions were provided to the proponent	13 January 2020
The period within which the proponent had to prepare a response to submissions was changed by agreement	11 February 2020 to 30 June 2020
The proponent responded to the submissions, provided any amendments of the EIS; and submitted an EIS amendment notice to the department	8 June 2020
The department decided if the response to submissions and amended EIS were adequate for the EIS process to proceed	6 July 2020
The department prepared the EIS assessment report	14 July 2020
EIS assessment finalised and issued to the proponent completing the EIS process	25 August 2020

3.2 Environment Protection and Biodiversity Conservation Act 1999

The proposed project was referred on 9 August 2017 to the the former Commonwealth Department of the Environment and Energy (EPBC 2017/8007) to determine whether the action should be controlled. On 6 September 2017, the Minister for the Environment determined the proposed project to be a controlled action to be assessed by EIS in accordance with the bilateral agreement with the State of Queensland. The Minister determined that the proposed action was likely to have a significant impact on one controlling provision:

- sections 18 and 18A (listed threatened species and communities).

The potential impacts of the proposed project on the controlling provision was assessed under Queensland's EIS process which has been accredited for the assessment under the EPBC Act in accordance with the Bilateral Agreement between the Commonwealth of Australia and the State of Queensland (2014).

Based on the information available in the referral the the former Commonwealth Department of the Environment and Energy decided that the proposed project would be likely to have a significant impact because:

- the action would involve clearing of vegetation which may provide suitable habitat for listed threatened species, including but not limited to the Star Finch (eastern sub-species, *Neochmia ruficauda ruficauda*), listed as endangered, and the Julia Creek dunnart (*Sminthopsis douglasi*), listed as vulnerable.

On 21 June 2018 the department finalised the TOR for the project which included a specific appendix for MNES.

On 15 February 2019 the proponent submitted a draft EIS to the department. An adequacy review requested revisions in order for it to meet TOR requirements.

On 22 October 2019 the proponent submitted a revised EIS to the department that was subsequently released for public notification between 4 November 2019 and 16 December 2019. The department, as the assessing agency, reviewed the submitted EIS for the proposed project against the information requirements outlined in Appendix 3 of the TOR, EPBC Act guidelines and other relevant recovery plans, conservation advices and technical information.

On 7 January 2020 the Department of Agriculture, Water and Environment (DAWE) made a decision to accept a variation to the original proposal. The variation was to capture the additional areas presented in the EIS relating to the OWSF and associated infrastructure. The varied action was for the same controlling provision.

As per the Bilateral Agreement, DAWE carried out its own review of the EIS assessment documentation and provided the department with a submission on the EIS. DAWE also provided comments to the department on the draft EIS report as required by the administrative arrangements under the bilateral agreement. Section 4.16 MNES of this report explains the extent to which the Queensland Government EIS process addresses the actual or likely impacts of the proposed project on the controlling provision under the EPBC Act, the potential impacts and provides a conclusion about the acceptability of the impacts in light of the commitments to undertake mitigation and management measures.

A copy of the final EIS assessment report will be given to the Minister for the Environment who will decide whether to approve or refuse the controlled action under part 9 of the EPBC Act and if relevant, apply conditions to the approval necessary to protect MNES.

3.3 Consultation

3.3.1 Commonwealth Department of Agriculture, Water and the Enviornment (formally Department of the Environment and Energy

DAWE was consulted throughout the assessment and attended various meetings with the department and the proponent, including a visit to the proposed project site in early December 2019. DAWE, in its capacity as an advisory agency to the department, provided adequacy reviews of the TOR and EIS prior to public notification. DAWE was also invited to make a formal submission during the public consultation timeframes and to review the proponent's response to its submission on the submitted EIS.

3.3.2 Public consultation

Chapter 2 of the EIS outlined the public consultation program carried out by the proponent in detail. The proponent completed the statutory requirements for advertising the TOR and EIS notices and the mailing

of those notices to identified interested and affected parties. In addition, the proponent undertook community consultation with members of the public and other stakeholders before, during and after the public submission period of the EIS in accordance with the Coordinator-General's Social Impact Assessment guideline (required in the TOR).

The proponent reported that community and stakeholder consultation activities included:

- one-on-one meetings with landholders and local community groups
- government agency meetings and briefings
- elected representative briefings
- establishment of key project contact points
- factsheets/ newsletters and letters
- media releases
- statutory consultation and public notice advertisements published in local and national newspapers
- information provided on the proponent's website; including making the EIS available online.

3.3.3 Advisory body

The department consulted the following organisations to assist in the assessment of the TOR and or EIS for the proposed project:

- Department of Aboriginal and Torres Strait Islander Partnerships
- Department of Agriculture and Fisheries
- Department of State Development, Tourism and Innovation and the former Department of State Development, Manufacturing, Infrastructure and Planning
- Department of Education
- Queensland Fire and Emergency Services
- Department of Health
- Department of Housing and Public Works
- Department of Natural Resources, Mines and Energy
- Department of Transport and Main Roads
- Office of the Coordinator–General (under DSDMIP)
- Queensland Ambulance Service
- Queensland Police Service
- Queensland Treasury (Workplace Health and Safety Queensland)
- Department of Agriculture, Water and Environment (Commonwealth)
- McKinlay Shire Council
- Townsville City Council
- Aurizon
- Energy Queensland
- Powerlink Queensland
- Port of Townsville.

3.3.4 Public notification

In accordance with statutory requirements, public notices were placed in *The Australian* and in *The North West Star* newspapers to notify the availability of the draft TOR and EIS for review and public comment. In addition, notices advising the availability of the draft TOR and the EIS for public comment were displayed on the department's website. The EIS was available to the public on the proponent's webpage.

The draft TOR and EIS were placed on public display at the following locations during their respective public comment and submission periods:

- the department's Business Centre: Level 3, 400 George Street, Brisbane QLD 4000
- the department's website: https://www.qld.gov.au/environment/pollution/management/eis-process/projects/current-projects/saint-elmo-vanadium-project
- the proponent's website: https://saintelmoproject.com.au/environmental-impact-statement (EIS only).

3.3.5 Key matters raised in submissions

The department finalised the TOR after considering comments from the proponent, the advisory body, the public and others.

20 submissions on the published EIS were received within the submission period, including one from the department, one from DAWE, 12 from other state government organisations, three from government-owned corporations, one from a regional development organisation, and two from local governments. Four of these submissions had nil comments on the proposed project.

All government agencies that made submissions raising matters were given the opportunity to review and provide comments about any amendments made to the EIS. The department also sought comments and recommendations on conditions that should apply to the proposed project and on the adequacy or otherwise of the amended EIS chapters in addressing concerns raised in submissions.

Key matters raised in submissions are summarised in Table 2. These matters, as well as other comments and recommendations made in submissions were addressed by the proponent in their response to submissions and in changes made to the EIS. These matters raised and any other comments and recommendations made by the advisory body on the EIS documents were considered by the department in undertaking the assessment of the EIS and in reporting the findings and recommendations in this assessment report.

Table 2. Key matters raised in public and agency submissions

Topic	Issue summary
Project description	• Infrastructure location, design and inclusion on maps at appropriate scale • Impacts of construction • Impacts on matters of state environmental significance (MSES) • MIA buildings and activities – location outside flood areas and containment
Water	• Adequacy of monitoring locations • Erosion and sediment control plan • Inadequate sediment sampling • Unsuitable water quality sampling and surface water monitoring program • Water quality guidelines and limits have not been derived in accordance with water quality guidelines • Inadequate information on watercourse diversions and flood bunds • Receiving Environment Monitoring Program • Water supply and the water resources, Gulf Water plan • Water licence entitlements for the Flinders River

Topic	Issue summary
	• Groundwater and surface water contamination risk from backfilling voids
Land/ ecology	• Insufficient information on mitigation and management of waste rock, tailings and spoil, including inadequate sampling results • Insufficient waste characterisation studies to determine environmental risk and management of waste rock material • Revision of the Mine Material Management Plan to adequately incorporate the contaminant risk associated with acid mine drainage • Additional information on rehabilitation success and final landform • Design inadequacies of the TSF and clay liner • Ecology surveys required for the OWSF and pipeline • Impacts on Julia Creek dunnart from clearing and mining of Mitchell grass plains • Offset requirements for MSES and MNES, including an offset strategy for the Julia Creek dunnart • Adequacy of sampling of aquatic ecosystems outside of flow events • Waterways assessment for fish passage
Social	• Percentage of FIFO workers and where they would be sourced from • Baseline assessment of affected landholders • Social impact assessment of extracting water from the Flinders River • Noise impacts on sensitive receptors – accommodation village • More information on the locations of worker's accommodation • A commitment to an indigenous employment target • A commitment to an indigenous procurement target of 3% for local businesses • Ongoing engagement and consultation has been incorporated into project design decisions • Workforce accommodation, the housing strategy and population census assumptions • Housing strategy to accommodate peak workforce
Economic	• Recognition of benefits for local employment and procurement • Diversifying the economy • Supporting other businesses along the supply chain • Providing additional employment for the solar generation and storage • Rail and road transport of materials and product would benefit a range of local governments along the corridor to Townsville • Highlights the opportunity for manufacturing vanadium batteries at the Lansdown Industrial Precinct, accessible from the rail line • The proposed project aligns with the North West Regional Plan 2010 and the Queensland Plan at a regional scale • Impacts on the local road network from worker transit • Cumulative impacts from other mining projects to inform economic impact analysis
Other	• Requirement for a Noise Management Plan to achieve compliance at the St Elmo homestead sensitive receptor • Insufficient information on the sewage treatment plant • Tenure issues associated with the pipeline and the Punchbowl Road reserve • Potential impacts on non-indigenous cultural heritage sites • Re-routing the Stock Route to avoid potential mining impacts • Emergency response procedures require local and regional stakeholder engagement

Topic	Issue summary
	• Post-mine life considerations for incorporating the OWSF, STP and solar farm into Council's infrastructure • Road safety risk

3.4 Matters considered in the EIS assessment

This assessment report fulfils the requirements of the prescribed matters of the EP Regulation and the EP Act.

The following matters were considered by the department in the assessment of the EIS:

1. The final TOR for the EIS, issued on 21 June 2018, set out the key information requirements to be considered in the EIS, including critical and routine matters. While they were not exhaustive, the TOR outlined the scope of critical matters that should be given detailed treatment in the EIS. The TOR stated that if significant matters arose during the course of preparation of the EIS that were not incorporated in the TOR (e.g. currently unforeseen issues that emerge as important or significant from environmental studies) then these issues should also be fully addressed in the EIS.
2. The submitted EIS refers to the combined submitted documents provided by the proponent. The submitted EIS comprised:
    - the EIS that was made available for public submissions from 4 November 2019 to 16 December 2019
    - the proponent's summary of the submissions, received by the department 8 June 2020
    - a statement of the proponent's response to the submissions EIS (referred to as the 'Response to Submissions' in this assessment report), received by the department on 8 June 2020
    - any amendments made to the submitted EIS because of the submissions (referred to as the 'amended EIS' in this assessment report), received by the department on 8 June 2020
    - Any other information provided to the department prior to the Assessment Report being completed.
3. All properly made submissions and any other submissions accepted by the chief executive.
4. The standard criteria listed in schedule 4 of the EP Act.
5. Matter(s) prescribed under a regulation. For the purpose of assisting the decision stage of the EA assessment, the regulatory requirements, which the department is required to comply with for all environmental management decisions, are listed in Chapter 4 of the EP Regulation and include:
    - assessment against the environmental objectives and performance outcomes specified in schedule 8, part 3 of the EP Regulation for the operational assessments of air, water, wetlands, groundwater, noise, waste and land (Table 1); and the land use assessment of site suitability, location on site and critical design requirements (Table 2).
    - environmental values declared under the regulation
    - the attributes for the area under the Regional Planning Interests Act 2014
    - environmental protection policies
    - MNES under the EPBC Act (listed threatened species and ecological communities).
6. Section 59 of the EP Act requires that an EIS assessment report must:
    - address the adequacy of the EIS in addressing the final terms of reference

- make recommendations about the suitability of the project
- recommend any conditions on which any approval required for the project may be given
- contain another matter prescribed under a regulation.

4 Assessment of the EIS

This assessment report fulfils the content requirements of sections 56A of the EP Act and section 9 of the EP Regulation. This assessment also suitably addresses the requirements of Schedule 8 of the EP Reg. For regulatory purposes, additional information is required as outlined in section 4 of this report. Section 4 of this assessment report provides a summary of the environmental values, potential impacts and avoidance, mitigation and management measures, commitments and any recommendations and regulatory requirements for the project to be suitable to proceed.

The department determined that the EIS submitted in October 2019 adequately addressed the TOR, including the mandatory and further requirements of an EIS, relevant legislation, methodology, impact identification, avoidance and mitigation, as a result, the EIS was publically notified. During the public submission period, a number of significant issues were raised in submissions (see section 3.3.5) and these were provided to the proponent to respond to. The proponent sought an extension of time and a period of six months to address these submission comments was granted. On 8 June 2020 an amended EIS addressing submission comments was provided to the department.

The proponent's response to relevant issues raised in submissions were considered fromby the Department, DTMR, DAF, DNRME, DSDIT and DAWE were initially thought to have not adequately addressed their submissionthe submissions comments. However, after further investigation and discussion with advisory agencies, the delegate determinedthose comments were determined not to be of the proponants responses were not so deficient such significance that they would stop the proposed project from proceeding. The department, in consultation with and advisory agencies considered that these issues could be adequately addressed through appropriate conditioning of any required approvals (such as an Environmental Authority). On 6 July 2020 the delegate decided that the responses to the submissions were adequate to allow the EIS process to be completed.

The assessment of the amended EIS by the department and advisory agencies has identified further assessment work that would need to be completed prior to the EA application and prior to environmental conditions being finalised for an EA approval. Recommendations for resolving these issues are detailed in relevant sections of the Assessment Report.

This section of the assessment report discusses in more detail the adequacy of the EIS, taking into account key matters of concern identified in the EIS and particularly those of significant concern raised in submissions. The level of detail of the assessment considers the significance of the potential impacts of the project, particularly having regard to the affected environmental values. Where possible, outstanding matters that need further assessment prior to statutory decisions are identified, particularly to address State policy and legislative requirements.

4.1 Project alternatives

The EIS described feasible alternatives to the proposed project. A number of scenarios were considered to evaluate the relative social, economic and environmental advantages and disadvantages of different project alternatives. Results were used to select the final project proposal and scope, largely confined by the fixed location of vanadium resources and MLA areas.

Locality and technological alternatives were documented in the EIS.

- **No development scenario** – it was stated that existing threatening processes to the environment (cattle grazing, infestations of prickly acacia and the presence of feral cats) would persist if the proposed project area was not developed. Not developing the proposed project was stated as significantly detracting from the development of a sound steel production and renewable energy technology in Australia.

- **Location alternatives of mine pits and infrastructure** – the EIS stated that locations are limited by the presence of vanadium deposits and the beneficial locality to existing rail and road infrastructure. Impacts on MNES habitat for the Julia Creek dunnart is unavoidable due to the extensive clearing of Mitchell grasslands for the proposed project. Some small areas of MSES regulated vegetation and waterways for fish passage would be impacted by the proposed location of the OWSF and associated infrastructure.
- **Processing alternatives** – a bespoke design is required for vanadium processing and is based on similar mining processing plants for mineral ores.
- **Water supply alternatives** – harvesting flood waters from the Flinders River was considered the only feasible option after discounting the potential unacceptable impacts from using groundwater.
- **Power supply alternatives** – existing limitations on the availability of power in the region led to the decision to use diesel fuel for the construction and Liquefied Natural Gas (LNG) for the operational power supply. An area of 30ha within the MIA has also been allocated for use as a future potential solar farm.
- **Transport alternatives** – rail was considered the preferred form of transporting materials and vanadium product due to the environmental, economic and social benefits of not significantly adding heavy vehicles onto the existing road network.

The positive and negative impacts, mitigation and management measures and environmental protection commitments of the proposed project were addressed in later sections of the EIS.

4.2 Climate

EIS documents used to assess climate include Chapter 4 – Climate; and the appendices A12 Historical Climate Data from Julia Creek Post Office Station; and A13 Historical Climate Data from Toorak Research Station. Additional information was also sourced from Appendix A14 – Air Quality and Greenhouse Gas Technical Report. Natural events (e.g. heatwave, flood and cyclone) are further described in Chapter 12 – Hazards and Safety of the EIS and section 4.10 of this assessment report. Climate hazards are risk assessed in Chapter 19 – Risk Assessment.

The TOR required the EIS to describe the existing local climate of the proposed project area, assess the vulnerability of the proposed project area to natural or induced climatic hazards or impacts from climate change in the region, and describe possible adaptation strategies to minimise the risk of impacts from climate change.

4.2.1 Assessment

The EIS adequately described the regional climatic conditions and the potential impacts of climate, natural disasters, natural hazards (including floods, bushfires and cyclones) and climate change. It also sets out climate change adaptation strategies.

The extreme rainfall event in February 2019 that resulted in widespread flooding of land surrounding the proposed project area has been incorporated within the project's flood modelling. It is noted that the proposed mining area on MLA100162 is located outside of the mapped Flinders River floodplain.

It is anticipated that climate change is likely to increase the occurrence and consequence of climatic hazards and this would have the potential to impact on all phases of the project and its workforce. The EIS stated that rainfall projections for North West Queensland indicate likely reductions in rainfall frequency but increased intensity of heavy rainfall events. Potential impacts may impact on mining operations related to water supply, flooding, erosion and sediment control.

The EIS has proposed a range of mitigation measures that meet appropriate standards, protect the health and safety of employees and reduce the risk of potential impacts from natural or induced climatic hazards and climate change to an acceptable level. For example, changes in the variability of rainfall will be addressed in the proponent's Water Management System by designing water storages to accommodate future needs, and developing processing technologies to reduce water consumption and

increase water conservation.

4.2.2 Conclusions and recommendations

The EIS adequately addressed the requirements of section 9.1 of the TOR in relation to climate. The values and the potential risks have been adequately described. Climate factors have been assessed in relation to the proposed project's discharges to water and air, and the propagation of noise.

The proposed project included design controls and strategies to adequately mitigate risks of climate factors. Climate change risk would continue to be assessed during further stages of the proposed project's implementation. The EIS has considered adaptation measures in the design and operation of the proposed project, including protecting infrastructure from the risk of floods. Commitments are proposed to manage the risk.

Recommendations

- An Emergency Response Plan must be developed in consultation with emergency services providers. The plan must outline procedures and courses of action in the event of a flood, bushfire or cyclone.
- A Health and Safety Management Plan must be prepared and implemented. The plan must detail the safety procedures to manage the health and safety of its employees in regard to natural hazards, including heat due to increasing average temperatures and heatwaves.
- A Bushfire Management Strategy must be prepared as part of the Construction Environmental Management Plan (CEMP) and Operational Environmental Management Plan (OEMP) in consultation with the Julia Creek Rural Fire Service.

4.3 Land

EIS Chapter 5 – Land, described and assessed in Part 1 – Land Resources, topography, geology, soils, visual amenity, land-use and tenure of the project. Rehabilitation was addressed in Chapter 5, Part 2 – progressive rehabilitation. Additional information was also sourced from Appendix A26 (Soils and Land Suitability Assessment) and A27 (Mine Material Assessment – Soil Fertility, Geochemical and Physical Properties).

Impacts associated with water resources are detailed in Chapter 6 – Water. Impacts on vegetation are detailed in Chapter 8 – Flora and fauna. Management of waste streams are detailed in Chapter 11– Waste. Potential impacts on native title rights and interests were discussed in EIS Chapter 13 – Cultural Heritage. Social impacts on neighbouring land uses are detailed in Chapter 14 – Social.

Section 9.2 of the TOR required the EIS to adequately describe any changes to the landscape and visual amenity; tenure arrangements; temporary or permanent land use changes; any conflicts in land use and suitable proposed mitigation measures; impacts to the existing stock route; whether there is contaminated land on the site; and existing or potential native title rights impacted by the proposed project.

Section 9.2.1 of the TOR required that elements of land rehabilitation be addressed, including progressive rehabilitation requirements, final landform and final land-use. The TOR also required that the EIS must meet all requirements of the Queensland mining rehabilitation reforms. These regulatory changes came into effect in November 2019.

4.3.1 Land assessment

The project will result in significant land disturbance. The project is located in a rural area with cattle grazing as the principal land use. The EIS adequately described most aspects relating to the TOR requirements.

The following matters were raised in submission comments on the EIS.

4.3.1.1 Realignment of stock route

The EIS identified that a part of the State's stock route network would be affected by the proposed project that bisects the southern portion of MLA100162. DAF and DNRME in their submissions on the EIS sought additional information on the proposed realignment of the existing stock route on the proposed mine site. DNRME stated that proposed mining activities would severely impact on the connectivity and functionality of the stock route network. It also stated that the EIS did not adequately demonstrate how mining activities and cattle/drover movement activities could successfully and simultaneously co-exist.

The amended EIS provided a realigned stock route within MLA100162 that had been negotiated with DNRME prior to submission of the amended EIS. The realignment would follow the southern boundary of MLA100162 within the designated buffer area spanning the projects' operational year's 9 to 22. The realignment would require a revised mining sequence. Suitable mitigation measures have been proposed for each year of the proposed mine life to reduce potential impacts on stock route functionality and connectivity.

4.3.1.2 Change to mining tenure

McKinlay Shire Council (MSC) and DNRME in their submissions sought clarification on tenure aspects relating to the proposed OWSF and the associated pipeline within the road easement along Old Nelia Road and the road reserve along Punchbowl Road. The submissions noted that these critical aspects of the proposed project were not within the existing MLA and therefore would not be approved as part of any future EA under the EP Act should the proposed project be allowed to proceed. Instead, any operational works would trigger development assessment and relevant approvals under MSC's planning scheme and the *Planning Act 2016*.

DNRME provided advice that the proposed OWSF and associated infrastructure would be located on numerous state land tenures, including reserves and leasehold parcels. The submission comment stated that the proposed activities were not considered consistent with the current state land tenure arrangements and that an alternative tenure would likely be required to facilitate the proposed infrastructure.

The proponent consulted with DNRME to determine the most appropriate pathway for the proponent to obtain the necessary tenure for these aspects of the proposed project. It was agreed that the proponent should make application for a mining infrastructure lease (for the OWSF and the aqueduct) and a mining transportation lease (for the pipeline). It was also considered that a mining purpose lease would benefit the proposed water entitlement allocation resulting from the Project of Regional Significance declaration. See section 2.2 for details on the resultant MLAs.

Assessment and approval of the proposed OWSF and associated infrastructure is now incorporated within the mining activity for an EA to be approved under the EP Act.

4.3.1.3 Waste rock characterisation

Mitigation and appropriate management measures for waste material have not been adequately described. This has significant implications for waste management, rehabilitation success and approval of the final landform. The department's submission stated that the EIS did not sufficiently address waste rock characterisation, including providing sufficient information to determine the risk of acidic and neutral mine drainage, to appropriately inform effective waste rock disposal and management strategies. This has implications for determining if the proposed rehabilitation method is suitable, meets the rehabilitation outcomes of being safe to humans, stock and wildlife, non-polluting, stable, and able to sustain an agreed post mining land use.

The amended EIS presented information indicating that material characterisation has substantially been completed, but kinetic testing, conceptual models and numerical modelling is ongoing. Block modelling and certified final landform designs have not been completed. Static tests indicate that there is a moderate to high risk of saline mine drainage. Coarse washery rejects and calcite float tailings have no acid mine drainage (AMD) potential but would likely produce a neutral pH, low to moderate salinity and

metalliferous drainage. Acid leach tailings are unlikely to generate AMD but neutralised tailings would produce moderately saline drainage. The department would condition the proponent to complete a significant proportion of the waste characterisation studies for the mined ore material, tailings and waste rock prior to the commencement of mining activities.

4.3.1.4 Overburden storage

The department in a submission on the EIS sought additional detail about the scale and extent of overburden storage heights and storage times before being returned to the mined pits. This related to having adequate management measures in place, particularly in relation to erosion potential if removed overburden was exposed directly to wind and rainfall. The amended EIS stated that 95% of the 124 stockpiles of overburden and 72 stockpiles of topsoil would be temporarily stockpiled for no more than 28 days, and the dimensions of topsoil and overburden stockpiles located adjacent to voids were provided. Erosion potential of stockpiles stored greater than 28 days would be reduced by cover crops sown to stabilise the batters.

The geochemical properties of the land area to be mined were raised in relation to the sampling data. Identified deficiencies and delays in the sampling program are discussed in section 4.9 Waste management of this report.

4.3.1.5 Final landform

The EIS stated that the final landform would be analogous with the existing landform. The proposed management measure is to backfill mined voids to pre-disturbance grades using overburden material and beneficiation rejects. The department in its submission considered this outcome to be very unlikely as there had been no discussion of the bulking factor of excavated material.

The amended EIS provided a suitable discussion of bulking factor that accounted for the natural swelling of overburden following ground extraction. An estimated bulking factor of approximately 72% was calculated for the total mined material (topsoil, overburden and ore) for the life of mine (LOM). After compaction measures and backfilling of all voids it was calculated that approximately 740,293 loose cubic metres (LCM) of excess material would require onsite disposal. The excess material would be disposed of in the existing abandoned quarry voids.

The EIS states that only inert material will be backfilled into the pits. Characterisation of the overburden material to date suggests that most of the overburden material is non-acid forming (NAF) and acid consuming, but there is a probability that the material may result in neutral mine drainage (NMD). The potential impacts of NMD have not been discussed.

The potential impacts of the backfilled material on the re-instatement of the final landform has not been sufficiently addressed. Appendix A27 of the amended EIS states that the loading of the soil and the effects of wetting and drying over time will result in an overall net reduction of 10% in the volume of the land i.e. a net reduction in elevation of 1m in a 10m profile. This statement suggests that the final landform may be up to 1m below the pre-mining landscape and therefore will not be able to meet the final landform commitments proposed in the EIS.

The amended EIS provided revised information contradicting the previously stated objective to reinstate pre-mining landforms/contours. It was stated that the final landform heights for the TSF and evaporation pond would not be returned to existing un-mined levels. No reason was provided in the EIS as to why these elements of the mine infrastructure would not be returned to pre-mine contours.

The proposed maximum height of the capped evaporation pond would be 2.2m above the ground surface area and the capped TSF would be 5.7m above the surface. The total area of the TSF and evaporation pond is approximately 259ha.

There is concern that the final hydrologic system will not able to be re-established in the vicinity of the TSF and evaporation pond.

4.3.1.6 Tailings storage facility

Clay liner

The TSF consists of three cells of different shapes and sizes to store beneficiation tailings rejects. The EIS stated that a leachate barrier of compacted clay would minimise the potential for contaminants to leach into the underlying soil. The department's submission sought clarification on the proposed use of the underlying oil shale as a liner. The amended EIS proposed both a clay liner and clay capping once a cell has been filled. The amended EIS stated that the TSF would no longer intercept the groundwater table.

The department sought further detail on the TSF clay lining and capping specifications and their ability to lower the potential for contaminants to leach into groundwater dispersal pathways. The amended EIS responded with minimum liner specifications for the TSF and evaporation pond. However, the department notes inconsistencies regarding the thickness of the clay layer. The risk of the liner integrity being compromised also has not been adequately addressed. Seepage management systems were addressed briefly for the evaporation pond but not for the TSF. There is also uncertainty in whether sourcing suitable clay from the site is likely to be achieved due to the sodic nature of the clays sampled.

TSF sizing

The amended EIS states that the current TSF cell sizing is insufficient to accommodate the MIA waste stream over the LOM. The 2019 EIS stated the TSF would consist of five cells of 29ha surface area each, totalling 145ha. The amended EIS states that the total TSF and evaporation pond surface area is now 259ha, an increase of approximately 56%.

The clay liner is intended to be impermeable to prevent potential seepage of contaminants from the TSF and the evaporation pond to groundwater. It is stated that the maximum depth for the TSF of 15.5m BGL provides a 3–4m buffer distance to the shallow water table. The water table depth is estimated to be between 20 and 35m BGL but no groundwater monitoring bore data was provided in the proposed location to confirm this depth. It is assumed that the depth of the TSF and the surface area for containment are limiting factors that reduce the potential land available to be mined.

The current sizing of the TSF is only designed to remediate approximately 46% of the projected LOM capacity of beneficiation tailings rejects. No reason was provided as to why the design of the TSF was not sized to accommodate the projected total LOM waste stream. However, the EIS states that backfilling all process waste streams into the pit voids is the preferred long-term strategy as it will negate the need for a large TSF. This will be dependent on ongoing testing, analysis and numerical modelling to verify that there are geochemically low risks from waste streams and no risk of environmental harm.

The amended EIS states that this limitation would result in a future mine amendment once the TSF has reached 75% of its capacity. No projected timeframe was provided for when this capacity threshold would be reached. Additional TSF capacity would require an additional area of land for a second TSF and evaporation pond. Based on current mine sequencing this may require an additional area of more than 259ha of land. It is noted that there is no land close to the MIA available to be used for this purpose. The only land available would be from the adjacent mining tenement to the east (currently held by another mineral resource company) or on mined and rehabilitated land that would need to be converted to a TSF and evaporation pond.

There are rehabilitation implications for this scenario with an assumed significant additional area of land not able to be reinstated to pre-mining landforms/contours. There is also concern that the final hydrologic system will not able to be re-established in the vicinity of the TSF and evaporation pond.

4.3.1.7 Land contamination

The EIS found no evidence of existing land contamination within the project area. Model mining conditions relating to the management of contaminated soils and land would suffice to manage this risk if any contaminated land is encountered during mine construction and operational stages.

Activities that may lead to land contamination are required to be listed as notifiable activities under

Schedule 3 of the EP Act. Four anticipated notifiable activities for the project were identified in the EIS. One of these notifiable activities – storing mine wastes containing hazardous chemicals in tailings dams – is assessed in section 4.9 Waste management.

4.3.2 Rehabilitation assessment

The EIS addressed rehabilitation in Part 2 of Chapter 5 – Land. It described the post mining land use and how progressive rehabilitation would be undertaken over the life of mine.

The proponent is required to develop and submit a proposed PRC plan, which addresses the statutory information requirements outlined in the department's Guideline *Progressive rehabilitation and closure plans (PRC plans)* (DES 2019) (the PRCP guideline). A requirement under the PRCP guideline is that the constructed landforms post mining must be subject to rehabilitation goals, objectives, material specification, design criteria and performance criteria.

A PRCP must be submitted to the department for approval prior to the commencement of project activities providing sufficient information regarding rehabilitation of the site in accordance with the PRCP guideline and legislative requirements.

4.3.2.1 Rehabilitation goal and strategy

The stated rehabilitation objective is to return the project area to the local native grassland community that is consistent with the pre-mine land use of grazing land.

Based on projected mine domain disturbance areas, approximately 7454ha of disturbed land on MLA100162 would be subject to clearing for mining and infrastructure and would require rehabilitation. An area of approximately 217.5ha would require rehabilitation that would be subject to construction of the proposed OWSF, aqueduct and pipeline. Rehabilitation is planned to commence in year two after the first stage of mining has been completed. Two areas of unmined land and the boundary buffer area on MLA100162 totalling approximately 1428ha would not be disturbed and therefore would not require rehabilitation, but would require active site management to achieve effective weed control, particularly for prickly acacia.

The rehabilitation strategy proposes a post-closure landform and stability objective of returning the site to pre-mined contours; with a 95% compaction of all backfilled pits; reinstating watercourse and drainage features; reinstating the existing stock route, and planting or providing suitable conditions for the regeneration of Mitchell grass ground cover vegetation. As previously noted in section 4.3.1.5, the TSF and evaporation pond are not proposed to be returned to the pre-mine contours.

All infrastructure would be decommissioned unless otherwise agreed with a post mining land owner and regulators. MSC's submission recognised that water storage infrastructure, sewage treatment infrastructure and the proposed solar farm should be considered for inclusion in future Council trunk infrastructure. The proponent responded that they would consider MSC's request and would continue these conversations.

The MIA would be subject to a contaminated land site investigation and a Remediation Action Plan.

The first rehabilitation area of 125ha is expected to be completed five years after mining commences i.e. at the end of year six. After completion of mining in year 25 of operation there would be five years of ongoing rehabilitation until completion by the end of year 30. Management milestones would be developed to track progress against the approved PRCP Schedule and any conditions imposed by the department.

Completion criteria have been nominated in the EIS in line with *Rehabilitation Guidelines for Mining Resource Activities, Version 2.01* (DES 2018). Amendments to the EP Act commencing on 1 November 2019 to introduce new requirements for the progressive rehabilitation and closure of mined land requires the proponent to nominate completion criteria in accordance with the revised PRCP guideline in order to achieve the nominated post mining land use.

4.3.2.2 Proposed Rehabilitation Methods

The revegetation program would be reliant on passive regeneration of annual or perennial grass species from seeds stored in the soil. Direct seeding would also be undertaken especially for *Eucalyptus coolabah* and *E. microtheca* along alluvial drainage lines. The EIS stated that a grassland vegetation community is less complex than a woodland ecosystem and it considered that the ability for rapid recovery of cover would be very high. No site-specific data and limited supporting information was provided in the EIS to support this assertion. Soil suitability analysis of the four Soil Management Units indicated that the use of nitrogen fertilisers and gypsum ameliorants to topsoils would be required. Stock would be excluded from grazing the rehabilitated area until agreed completion criteria have been met. Weed control and management will be undertaken with an emphasis on controlling any outbreaks of prickly acacia.

Most of the mine site would be subject to shallow mining (up to 40m) with overburden material and benign beneficiation rejects returned to the mined-out pit area and rehabilitated. No risk of acid mine drainage is predicted to occur provided that the basement materials underlying the oxide vanadium resource are not mined or disturbed. The majority of overburden and topsoil would be stored for less than 28 days on average. Predicted lower topography following mining may result in the potential for a slight increase in the water holding capacity within the mined areas. While not considered significant, this could result in a slightly different ratio of local species, such that the Mitchell grass ecosystem may incorporate a higher number of non-native grass species than occurred in the pre-mining ecosystem.

The department and DAWE provided submissions querying the likelihood of success and the timeframe of the proposed rehabilitation methods, particularly in relation to restoring suitable habitat for the Julia Creek dunnart. It is unknown whether the shrink-swell properties of the cracking clay soils would be fully restored subsequent to back-filling and compaction of the pits, and over what timeframe this is likely to occur. The amended EIS responded that monitoring soil plasticity and geological function to model wetting and drying cycles would be undertaken to achieve the correct bulking factor and wetting cycles. The amended EIS also confirmed that the main aim of rehabilitation is to return the land to a grazing purpose. However, the proposed completion criteria state that rehabilitation would create suitable habitats that could support recolonisation of fauna, particularly the Julia Creek dunnart.

Concern remains that the soil physico-chemical properties and microbial activity of the reconstructed soil profile would be deficient. The high bulk density of backfilled material and the compaction at surface layers may act to inhibit rainfall infiltration and soil water storage capacity (Duncan et al 2020). This in turn may impact ecosystem function and vegetation dynamics. Some site specific research has been conducted on Mitchell grass rehabilitation at the Ernest Henry Mine, located approximately 120km west of the project (Vickers et al 2012). There is concern that the vegetation biomass accumulation that appeared to stop developing in rehabilitation sites two years and older would make the rehabilitation more susceptible to disturbance events such as drought and pest species invasion. The department considers that adequate biomass and cover would be important requirements for the Julia Creek dunnart in protecting it from predation.

The department notes that no trial rehabilitation sites were established on site to demonstrate successful rehabilitation outcomes. Submissions provided by the department and DAWE sought examples of either successful rehabilitation trials on site or in the region that could justify proposed rehabilitation techniques. No evidence of rehabilitation trials undertaken on site were provided. Some limited discussion was presented from the rehabilitation research at the Ernest Henry Mine. The department notes from this research that rehabilitated sites may never reach the same ecological functioning as reference sites and if they did not meet end land use and closure criteria they would then require management intervention measures (Vickers et al 2012).

The proponent has committed to onsite revegetation trials once rehabilitation commences. However, it is the department's position in line with the PRCP guideline that rehabilitation trials should occur prior to land becoming available for rehabilitation. The subsequent PRCP application/EA should consider trial results to inform the success of rehabilitation methods, materials and species mix in order to achieve the agreed rehabilitation completion criteria in the PRCP schedule.

4.3.3 Conclusions and recommendations

Land

Recommended conditions for these matters would include the following:

- Realignment of existing stock route: DNRME considered the proponent's response adequate and have provided recommended conditions for the proposed realigned stock route in Appendix 4.
- Final landform: the amended EIS does not adequately address the potential impacts of backfilled material on the final landform. This may result in an overall net reduction of 10% in the volume of the land. In addition, the final landform heights for the TSF and evaporation pond would not be returned to existing pre-mined levels and would be elevated up to 5.7m above the existing surface level, particularly regarding potential impacts on hydrology that were not addressed in the EIS. Additional information regarding this matter must be addressed in the PRCP application that is required to be submitted with the EA application. Commitments in the EIS to finalise the waste characterisation studies prior to the commencement of mining are supported. Note that a significant proportion of the waste characterisation studies will be required to be completed and submitted with the PRCP application which is required to be submitted with the EA application.
- TSF – clay liner: the amended EIS does not adequately address the information requested regarding the design specifications and adequacy of the TSF clay liner. Additional information is required to address this matter in support of the PRCP application that is required to be submitted with the EA application.
- TSF – sizing: the amended EIS does not provide sufficient information on TSF cell sizing to accommodate the MIA waste stream over the LOM. Additional information regarding this matter must be addressed in the EA application.

Rehabilitation

The amended EIS has not provided sufficient detailed information to allow the department to adequately assess the mine site rehabilitation outcomes, including completed waste characterisation, block modelling and final landform designs as set out in the department's submission. The requirement to develop a PRC plan is a critical element of the Queensland Government's recent Mined Land Rehabilitation reforms. The EP Act now requires the proponent to develop and submit a suitable PRC plan which addresses a number of statutory information requirements outlined in the PRCP Guideline. The proposed PRC plan will be considered concurrently as part of an EA application and would be subject to a further information and notification stage.

Refer also to the assessment and recommendations in section 4.9 Waste management that address waste characterisation issues.

4.4 Water

EIS documents used to assess water include Chapter 6 – Water; Chapter 20 – Offsite Water Storage Facility and Associated Pipeline; and the appendices: A16 – Surface Water Technical Assessment Report; A17 – Surface Water Baseline Monitoring Results; A18 – Groundwater Technical Report; and A19 – Groundwater Baseline Monitoring Results. Regulated structures are discussed in Chapter 7 – Regulated Structures.

Engineering designs, specifications and drawings for the OWSF and associated infrastructure are presented in Appendix 29, Water Supply Infrastructure for the Saint Elmo Vanadium Project. An assessment of the diversion of the Flinders River for supplying surface water for the project was provided in Appendix 30 – Hydrological Assessment for the Saint Elmo Vanadium Project within the Flinders River Basin. A Groundwater Monitoring Plan was provided in Appendix 31 – Groundwater Monitoring Plan. A failure impact study for the OWSF was provided in Appendix 32 – Water Storage Facility Failure Impact Assessment. A flood impact assessment was provided in Appendix 34, Offsite Water Storage Facility Flood Impact Assessment.

Section 9.3 of the TOR required the EIS to conduct an impact assessment in accordance with departmental guidelines for both water quality, water resources, and flooding.

Environmental Protection (Water and Wetland Biodiversity) Policy 2019 (EPP Water and Wetland Biodiversity)

The EPP (Water and Wetland Biodiversity) does not currently have a schedule for environmental values and associated water quality objectives for waters in the Gulf Catchments. In the absence of a clear and agreed set of environmental values for a particular water resource, a conservative approach should be taken and all appropriate environmental values should be applied, including: the biological integrity of an aquatic ecosystem that has effectively unmodified biological indicators, but slightly modified physical, chemical or other indicators; the suitability of the water for agricultural purposes; and the suitability of the water for recreational or aesthetic purposes.

In the absence of WQOs for the Gulf Catchment, the default Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG) 2018 thresholds have been proposed based on the determination that the site contains slightly to moderately disturbed waters due to the grazing land use and higher salinity results measured within Julia Creek and the Flinders River. A lowland water type has been adopted due the project area's elevation of 140m to 150m AHD.

4.4.1 Assessment

The Water chapter of the EIS described the existing surface water and groundwater resources likely to be impacted by the proposed project. It discussed how WQOs would be met for all stages of the project. The main source of water supply for the site is proposed to be water harvesting from the Flinders River, storage within the OWSF and piping the water to the mining area on MLA100162. The operational project water management system would be composed of three systems:

1. A clean water management system consisting of the OWSF and associated infrastructure; the stage 1 and stage 2 watercourse diversions on the Horse Creek tributaries; and the Horse Creek levee. Clean, non-mine affected water would be redirected around disturbance areas and the MIA via bunds and open drains. The watercourse redirections, levee and drainage channels would be used to protect pits from flooding.
2. A dirty water management system consisting of the water supply dam; and 17 sediment dams. Sediment dams would be progressively constructed as required by mine sequencing in order to capture suspended solids (e.g. fine sediment) from runoff generated by storms up to the 1:5 average recurrence interval (ARI) event. The water supply dam would be designed to allow collection of both clean and dirty water runoff.
3. A mine/process water management system consisting of the raw water dam; MIA sediment dam; mine water dam; TSF; evaporation pond; and active mining pits. All project mine water would be collected from open mine pits and any water used or produced from the processing plant. Design criteria allows for the containment of wet season inflows and no uncontrolled releases of mine water.

The EIS adequately described most aspects relating to the TOR requirements. Issues raised in submissions that were considered not to have been adequately addressed in the amended EIS are discussed below and would be appropriately conditioned.

4.4.1.1 Water quality

The project area is located within the Flinders River catchment, an area of approximately 109,000km^2 which contains the Flinders, Cloncurry and Saxby Rivers that flow north to the Gulf of Carpentaria. The Flinders River is located approximately 24km east of the proposed mining area and adjacent to the proposed OWSF and aqueduct. The proposed water pipeline from the OWSF would traverse Alick Creek, classified as a major watercourse. Horse Creek is the only named watercourse on the proposed mining area on MLA100162 and is one of three minor tributaries traversing the site that flow to Julia Creek, located approximately 14km to the west.

Surface water quality

A surface water monitoring program commenced in 2018 to outline the physio-chemical, biological and toxicant indicators and their limits for the project. Draft WQOs were developed in the EIS based on ANZECC (2000) thresholds, noting these guidelines were superseded by the 2018 revision of the Water Quality Guidelines (ANZG (2018)). These thresholds are proposed to be amended once sufficient sampling has been undertaken to confirm site-specific limits. Some collected site sampling data results consistently exceeded or were outside the range of the thresholds (e.g. pH data collected exceeds the maximum threshold for aquatic ecosystem protection). Dissolved vanadium was recorded at most sampling locations reflecting its natural presence in the background receiving environment.

Surface water quality baseline data

The department's submission identified that insufficient water quality baseline data had been collected to determine site-specific WQOs. Only 13 sampling events have been conducted since 2018. It recommended that collection of samples be undertaken in accordance with the Queensland Water Quality Guidelines (DEHP 2009) in order to derive suitable water quality data that is reflective of the receiving environment.

The amended EIS stated that an additional three rounds of sampling had been undertaken since the 2019 EIS. However, it still observed that insufficient samples have been collected to draw any solid conclusions on the surface water quality characteristics of the receiving environment. It is uncertain when sufficient data would be attained in order to accurately reflect the characteristics of the local environment.

A condition in an EA would detail that recommended sampling be undertaken in accordance with the Queensland Water Quality Guidelines (DEHP 2009). In the absence of sufficient site-specific data, stringent water quality objectives based on ANZG aquatic ecosystem values must be adopted and included in an EA.

Sediment sampling

The department's submission considered the sediment sampling regime undertaken in watercourses to be inadequate. Only one round of sampling was conducted at the seven offsite surface water monitoring locations with no sampling undertaken onsite. The department recommended additional sediment sampling and additional monitoring sites to be established in tributaries within the proposed project site.

The amended EIS indicated one further round of sediment sampling had been undertaken in April 2020 but no details were provided.

The department notes that the downstream monitoring points used for sediments are the same as for surface water monitoring and these are considered to be located too far from the site to be appropriate to detect any potential impacts on water resource values. A condition in an EA would require the proponent to nominate additional suitable sediment and surface water monitoring locations to protect the environment. Additionally, in the absence of sufficient site-specific data, stringent sediment values based off ANZG aquatic ecosystem values must be adopted and included in an EA.

Contaminated water releases

The department's submission sought more information on the unauthorised release of 'dirty water' that may occur from the sediment dams in the event of heavy rainfall events. It was not clear from the EIS whether the proponent was proposing to have authorised controlled releases of contaminated water from the project site. A release of contaminants to the receiving environment needs to be assessed in the EIS and then conditioned in any issued EA.

The amended EIS clarified information regarding release of water within the project site. It stated that it is not proposed to release water to the receiving environment. However, it also states that uncontrolled overflows from the water supply dam and sediment dams would occur in extreme events (approximately greater than the 100 year ARI). These overflows would make their way to the

receiving environment via the project area's watercourses. The EIS states that the receiving waters will already have natural flow and that the water quality would be significantly diluted.

The department's review identified that there will be releases of water from the site that have not been adequately assessed. An EA would either need to be conditioned to allow controlled releases from the sediment dams with stringent release limits or not authorise controlled or uncontrolled releases of water to the receiving environment. Further detailed information is required to be provided during the subsequent EA application assessment process.

Mine process water

The department in a submission sought additional detailed information on the suitability of the proposed project's dams to contain dirty or mine process water. This is to ensure that no interaction occurs between the dirty or mine/process water and surface water and groundwater. Information requested included details of the materials used to construct the dams.

The amended EIS did not include the necessary details regarding the materials to be used to construct dams. Therefore, it is difficult to fully ascertain the suitability of the dams to contain dirty or mine/process water and the justification that no interaction occurs between the dirty or mine/process water and surface water and groundwater. A condition in an EA would require further dam material and design details to be provided by the proponent.

Watercourse diversions

An unnamed tributary that flows through the site would be redirected to drain clean water around the mine footprint on MLA100162 in order to avoid interaction with disturbed areas. In stage one of the diversion the western portion of the watercourse would be redirected into a drainage channel representative of the existing watercourse. Earthworks would use rehabilitated spoil. Runoff captured in the diversion would remain within the pre-existing catchment. No waterway barriers are proposed so fish passage would not be impacted.

The department's submission requested additional information regarding the design of the watercourse diversions and flood bunds and the potential impacts to the receiving environment as a result of the diversion of watercourses.

The amended EIS considers that the minor tributaries proposed to be realigned would not be classified as watercourses by DNRME. DNRME has provided advice that a watercourse determination has not been requested or completed for MLA100162. If the tributary is determined not to be a watercourse it would be mapped as a drainage feature. The potential impacts of the take or interference of water must be assessed as part of a subsequent EA application and include a suitable condition about the diversion of the watercourse, if required.

The department considers that the design of watercourse diversions and flood bunds would need to be provided in the subsqent EA application so the department can determine what conditions would need to be applied.

Surface water monitoring program

The department's submission recommended that some current proposed monitoring points be amended and that additional surface water monitoring locations were required in order to better describe and assess the potential impacts of the mining activity on environmental values. The department recommended four new downstream monitoring locations close to the boundaries of the proposed project site.

The amended EIS did not incorporate the recommendations. It noted that the Preliminary Surface Water Management Plan (WMP) would be subject to constant revisions and that the relocation of monitoring locations or the ability to add new monitoring locations would be considered. However, the department considers that surface water monitoring locations should be located much closer to the proximity of the mining area on MLA100162. A condition in an EA would detail the surface water monitoring locations.

4.4.1.2 Groundwater Quality

The EIS did not fully describe the existing groundwater resources within and surrounding the proposed project area, the potential impacts of the project on groundwater resources and proposed measures to avoid and minimise potential impacts.

The Hooray Sandstone is the primary aquifer for the mining project site and is approximately 60m thick. The proposed project will not use water from the Hooray Sandstone as it would lead to unacceptable impacts on existing water bore users. The aquifer underlies the Wallumbilla Formation, comprising mainly mudstone and siltstone, which is approximately 200m thick and acts as an aquitard. The Allaru Mudstone is the main outcrop geology in the vicinity of the mining area. The Toolebuc Formation is the host formation for vanadium and is approximately 25m thick. It outcrops on the site along the Saint Elmo anticline. The Flinders River alluvium is located approximately 20–25km east of MLA100162 and is not located within the proposed mining area.

Five monitoring bores installed in the proposed mining area on MLA100162 identified the Allaru Mudstone and Toolebuc Formation are unsaturated. The water table lies near the base of the Toolebuc Formation at depths less than 10m BGL to greater than 30m.

The department's submission considered that the five groundwater monitoring bores installed within MLA100162 to assess shallow groundwater conditions were not sufficient as they are too deep (i.e. between 15.5m and 19.3m BGL). Monitoring shallow groundwater less than 10m BGL is important for managing potential impacts resulting from the backfilling of the pits, which would likely no longer have the same hydraulic structure and function as pre-mining. A condition in an EA would detail the installation of shallow groundwater bores in depths <10m BGL to address potential interaction between surface water and groundwater from the backfilled pits.

Groundwater quality data

The department's submission stated that the groundwater monitoring data presented in the EIS is insufficient to establish baseline conditions. Due to the risk of groundwater contamination from contaminant seepage (from acid rock drainage, water storage and tailings dams, processing plants and hazardous storage areas) a robust baseline data set is required to establish site-specific water quality objectives for the groundwater monitoring program. The department recommended additional baseline data; using appropriate guidelines and; providing groundwater quality triggers and limits based on site-specific data or on more conservative guideline values.

The amended EIS acknowledged that insufficient groundwater monitoring data had been provided, but highlighted that the mine is located within low permeability formations and that modelling indicates very slow rates of potential contaminant movement. It noted that progressive mining would in most cases provide more than five years data prior to the mine activity. It highlighted that the Groundwater Monitoring Plan (GMP) includes response triggers for investigation of leaks or seepage. All monitoring bores are now proposed to be installed prior to the commencement of mining.

The department considers that the response is inadequate as it does not commit to the required baseline sampling approach. The amended EIS has not provided the minimum of eight samples per location (preferably over a two-year period), including seasonal variation, to establish baseline groundwater data (quality and levels).

In the absence of sufficient site-specific data a condition in an EA would state stringent water quality objectives based on ANZG aquatic ecosystem values.

An EA would be conditioned for bi-monthly sampling to increase the monitoring frequency and the number of samples collected, and allow water levels to recover before the next sampling event.

"Bucket" aquifer

The department's submission commented on the inadvertent construction of a "bucket" aquifer in the backfilled and reject material in the void discharging contaminated water to the surface. This was stated as most likely to occur at the south-western corner of Horse Creek. There was no impact or risk assessment or proposed mitigation measures.

The amended EIS noted that insufficient data is available to undertake a detailed assessment and that any potential impacts to environmental values are unquantifiable. It stated that the risk of the scenario was low due to the low permeability of the intact geology that would surround the backfilled pit. Suitable mitigation measures are proposed, including the placement of two monitoring bores to assess the level of contaminant leaching from emplaced backfill.

A condition in an EA would require monitoring of groundwater at the perimeter of the pit areas to identify the risk of the "bucket" aquifer developing. It would also nominate triggers for mitigation measures such as the installation of an active or passive pumping system to maintain groundwater levels in the backfilled void below ground elevation.

Groundwater contamination

The department's submission recommended that the amended EIS contain additional information regarding the proposed mitigation measures to ensure groundwater with elevated elements does not occur. This included undertaking appropriate material characterisation and an assessment of the contamination potential to groundwater and surface water from the backfilling of pits. It also sought additional information on the proposed seepage management program to ensure any contaminated material is effectively managed and would not adversely impact surface water and groundwater resources.

The amended EIS provided a draft GMP that includes a requirement to develop an interim mitigation plan following the completion of the characterisation and modelling, and a final mitigation plan within 10 years of the commencement of mining.

The department does not consider the proponent's response adequately addressed its submission as the proposed interim mitigation plan would only be developed at the completion of the waste characterisation studies, and there is no detail as to what mitigation measures would be proposed - only committing to groundwater monitoring.

A condition in an EA would ensure that the proponent's commitment to finalise the waste characterisation studies prior to the commencement of mining activities. This information should inform the final Groundwater Monitoring Plan.

Conceptual hydrological model

The department's submission stated that the conceptual model of site hydrogeology and groundwater flows did not indicate the direction of shallow groundwater. There are implications for dam water potentially entering the groundwater and causing contamination. Additional information was recommended to better understand the potential connection between the mining pit(s), the dam, the shallow groundwater and the Flinders River downstream.

The amended EIS provided additional information about the flow of groundwater and an analysis of the potential for seepage from the pits to impact groundwater. However, the EIS notes that the geochemical analysis to characterise the reject materials to be placed back in the pits is ongoing. Commitments have been included in the EIS regarding the completion of all waste characterisation and modelling prior to the commencement of mining activities.

Groundwater dependent ecosystems

The assessment of potential impacts of mining on groundwater dependent ecosystems (GDEs) used the Bureau of Meteorology's GDE Atlas mapping to determine the potential for the presence of GDEs. The majority of MLA100162 was not mapped as supporting GDEs. The closest mapped terrestrial GDEs are the watercourse vegetation associated with Alick Creek and the Flinders River. The aquatic ecology desktop assessment concluded that the mining project area does not provide suitable habitat for stygofauna. GDEs have been further assessed in Section 4.6.1.9 of this report.

4.4.2 Water resources

4.4.2.1 Gulf water resources and water entitlement

The *Water Plan (Gulf) 2007* (Water Plan) under section 26 of the *Water Act 2000* provides the regulatory framework for sustainably managing water and for the take of water. Under the Water Plan, the Flinders River is declared a prescribed watercourse and groundwater under land within one kilometre of a prescribed watercourse is declared to be water in the watercourse.

The proponent applied to DNRME seeking to have the project declared a Project of Regional Significance pursuant to section 27 of the Water Plan. DNRME assessed and granted the application on 5 July 2019 declaring it a Project of Regional Significance.

Gaining Project of Regional Significance status means that the proponent is eligible to acquire a water entitlement from unallocated water of the Flinders River held by the State in the strategic reserve. The proponent has submitted an application to DNRME to register an interest for a water entitlement from the 17,850ML of unallocated water per year of the Water Plan's strategic reserve.

Initial water requirements are estimated to be 2500ML of water per year for a 10,000tpa vanadium pentoxide production level increasing to 5000ML for the full vanadium pentoxide production scenario from year two onwards. The proposed diversion threshold was stated to be 1728ML which is approximately 10% of the total volume for strategic unallocated water in the Flinders River catchment area. The projected impact on downstream users is estimated to be 200–1000ML/year depending on the stage of OWSF development. The EIS stated that this would require discussion with impacted parties and mitigation of impacts under a final set of operational rules.

The project would harvest water from the Flinders River in wet season flow events via an off-take device and divert it along a channel with a control structure to manage flow. The OWSF would consist of four cells with a total storage design capacity of 11,300ML. A 1400ML pump station would pump up to 4500ML of water per year along the 24km pipeline to the mine site's raw water dam.

The four storage cells would have a surface area of approximately 40ha each and are sized at 7.2m depth. Moving water to as few cells as needed would reduce the surface area of the storage in order to mitigate the high evaporation rates experienced in the region.

It is noted from Appendix 30, that a stage 5 development scenario may seek to construct two additional cells of approximately 3000ML each. This would result in a total storage volume of 17,326ML. This was the only scenario provided to meet the full production water requirement of 5000ML.

A water licence approval would be made under the Water Plan to supply surface water from the Flinders River and the collection of overland flow water to the project. The Water Plan provides for the sustainable management and an economic outcome for water to support growth in the mining industry of north-west Queensland. The allocation would also need to consider other uses of the resource, environmental impacts, and detail the required flow scenarios that must be achieved at nominated gauging stations prior to water harvesting.

4.4.2.2 Underground water impact report

The underground water management framework is established under Chapter 3 of the *Water Act 2000*. When a mine pit is dewatered or experiences evaporative losses from the open cut, underground water levels decline in the surrounding area potentially affecting any active landholder bores. Resource holders have an obligation to prepare an underground water impact report (UWIR) to identify potential immediate and long-term affected area groundwater impacts. 'Make good' obligations require resource holders to provide make good measures to bores that are likely to be impaired with the relevant bore owners.

A UWIR for a mining lease would be required to be prepared and submitted to the department prior to the exercise of the underground water rights. The proponent, in the EIS, has committed to undertaking this process. The EIS also reported that there are no active landholder groundwater

supply bores that extract water from the Flinders River alluvium.

The extraction of 'associated water' – the take of underground water as a result of carrying out an authorised activity – would occur as part of the mining of the Toolebuc formation with some vanadium deposits to be mined as deep as 40m BGL. It is estimated that approximately 67% of the area to be mined would be below the water table. An analytical assessment estimated potential pit inflows would be less than 0.5L/s. Drawdown associated with the inflow identified no impacted bores or GDEs within the estimated area of influence of 1.5km to 2km after 30 years of continuous pit inflows. The evaporation rate significantly exceeds the estimated pit inflow volume indicating a low likelihood of active pit water management measures being required.

The EIS stated that there was potential for groundwater extraction in the construction phase prior to the harvesting of surface water from the Flinders River. No estimation of volumes, duration or locations were provided. An analytical model was developed to determine whether potential impacts could be managed. The model scenario predicted alluvium drawdown of less than 2m at a distance of approximately 6.3km from the point of extraction. The take of this underground water would require an authorisation as described above.

The proponent's subsequent EA application would be required to address section 126A of the EP Act in order to exercise underground water rights. The proponent must complete an initial UWIR before the day the mining tenure holder exercises its underground water rights. The proponent must adhere to their obligations under Chapter 3 of the *Water Act 2000*.

4.4.3 Flooding

The EIS stated that the Flinders River Catchment experiences frequent flooding with the expansive floodplains dependent on 'flood pulses' that allow exchange of fauna and nutrients between the main channel and the surrounding floodplain. Heavy rainfall events that can lead to widespread flooding are often the result of cyclonic influences in the Gulf of Carpentaria.

Isolated waterholes within the dryland river channel are known to persist for up to two years between flood events without surface or groundwater inflow.

The Bureau of Meteorology operate a flood warning system using rainfall and river height observations. The project area is located in an area that can be impacted by major floods and is included within the flood warning area.

A devastating flood in the region in February 2019 inundated extensive areas of land for several weeks and killed upwards of 500,000 head of cattle with economic losses estimated at $300 million. The EIS stated that the flood impact on the proposed mining site was equivalent to slightly greater than a 1:100 ARI flood event.

Flood hydrologic models were developed for the Julia Creek and Flinders River catchments to determine design flood flows based on ARI, peak flow and critical storm duration. Flow behaviour of regional and local watercourses was estimated for a range of design flood events using a hydraulic model that accounted for extent of inundation, flood water depth and flow velocities.

Flood modelling undertaken for the EIS concluded that the construction of the proposed OWSF would increase the localised flooding depth, velocity and duration of inundation at Old Nelia Road but impacts were considered to be minor.

Flood modelling results indicate that the southern portion of the project area would be impacted by flooding of the three minor tributaries over all the design flood events (i.e. ARIs equating to 10, 100, 1000, and the worst-case flood event, the probable maximum flood).

The Horse Creek levee that is proposed to be 2.6km in length and designed for a 1m freeboard height above the 1:1000 ARI event would prevent flooding of the south-western mining voids. However, the levee would increase flows in Horse Creek resulting in upstream and downstream flooding impacts including a 0.5–1m flood level increase for major events at the Flinders Highway.

The mine and process water management system consisting of the raw water dam, TSF, evaporation

pond, MIA sediment dam and mine water dam are all located outside of the 1:1000 ARI flood extents. Additionally these structures would be sized to contain the 1:100 ARI flood event using embankments from their construction.

The water supply dam and the 17 sediment dams are sized to contain 1:5 ARI events in accordance with the proposed WMP and the Erosion and Sediment Control Plan (ESCP). They are designed to overflow only during flood events where the receiving waters are flowing. The expectation is that the potential water quality impacts from uncontrolled overflows of these 'dirty water' structures would be significantly diluted. Potential impacts to aquatic ecosystems are predicted to be low risk due to the aquatic species' tolerance of ephemeral flows and variable water quality.

4.4.4 Conclusions and recommendations

The department has determined that the EIS did not adequately address a range of departmental submissions relating to surface water and groundwater quality. However, it is considered that many of the outstanding issues are committed to be addressed via planned field studies and the provision of specific management plans by the proponent prior to the commencement of works. Any residual environmental risk would be addressed via conservative conditioning.

Recommended conditions for these matters would include:

- Surface water quality baseline data – a condition in an EA would detail that recommended sampling be in accordance with the Queensland Water Quality Guidelines (DEHP 2009). In the absence of sufficient site-specific data, stringent water quality objectives based on ANZG aquatic ecosystem values must be adopted and included in an EA.
- Sediment sampling – a condition in an EA would require the proponent to nominate additional sediment/surface water monitoring locations. Additionally, in the absence of sufficient site–specific data, stringent sediment values based off ANZG aquatic ecosystem values must be adopted and included in an EA.
- Contaminated water releases – a condition in an EA would either allow controlled releases from the sediment dams with stringent release limits or not authorise certain controlled or uncontrolled releases of water to the receiving environment.
- Mine process water – a condition in an EA would state dam material and design details.
- Watercourse diversions – temporary watercourse diversions will be conditioned in an EA.
- Surface water monitoring locations – a condition in an EA would detail the surface water monitoring locations.
- Groundwater quality – a condition in an EA would detail the installation of shallow groundwater bores in depths <10m BGL to address potential interaction between surface water and groundwater from the backfilled pits.
- Groundwater quality data – in the absence of sufficient site-specific data a condition in an EA would state stringent water quality objectives based on ANZG aquatic ecosystem values.
- Groundwater quality data – an EA would be conditioned for bi-monthly sampling to increase the monitoring frequency and the number of samples collected, and allow water levels to recover before the next sampling event.
- Bucket aquifer – a condition in an EA would require monitoring of groundwater at the perimeter of the pit areas to identify the risk of the "bucket" aquifer developing. It would also nominate triggers for mitigation measures such as the installation of an active or passive pumping system to maintain groundwater levels in the backfilled void below ground elevation.
- Groundwater contamination – a condition in an EA would ensure that the proponent's commitment to finalise the waste characterisation studies prior to the commencement of mining activities. This information should inform the final Groundwater Monitoring Plan. The final

Groundwater Monitoring Plan must be approved by the administering authority prior to the commencement of mining activities.

- Conceptual hydrological model – a condition in an EA would ensure that the waste characterisation studies are completed and submitted for assessment and approval prior to the commencement of mining.
- UWIR – EA conditions would require the proponent to adhere to their obligations under Chapter 3 of the *Water Act 2000*.

4.5 Regulated structures

EIS documents used to assess regulated structures include Chapter 7 – Regulated Structures and Appendix A16 – Surface Water Technical Assessment Report. Proposed project water infrastructure is also described in Chapter 6 – Water, and Chapter 20 – Offsite Water Storage Facility and Associated Pipeline.

Section 9.4 of the TOR required the EIS to conduct impact assessments on regulated structures in accordance with departmental guidelines; describe the purpose and location of all proposed dams and levees; undertake a consequence category assessment for structures proposed to store potentially hazardous materials; and to describe how risks relating to storage failure, seepage or overtopping would be avoided, minimised or mitigated.

4.5.1 Assessment

In the EIS a preliminary consequence category assessment (CCA) was undertaken to determine the risk of failure of the proposed project's water storages due to seepage, overtopping or dam breakages. Six regulated structures are proposed for the project, including: a mine water dam; Horse Creek levee; the TSF; the evaporation pond; the MIA sediment dam and a raw water dam.

Consequence categories for 'high' or 'significant' were assigned to the six structures in accordance with the TOR requirements.

Regulated structures require design criteria for wet season containment and spillway capacity. Additionally, the TSF and evaporation pond would require seepage design requirements for containment, leak detection and monitoring. Management measures to mitigate potential impacts for clean water, dirty water and mine/process water infrastructure are in accordance with the management hierarchy of the EPP (Water and Wetland Biodiversity).

The OWSF is not classed as a regulated structure and would only contain clean water. In addition, a Failure Impact Assessment determined there was no population at risk from failure event scenarios.

The EIS stated that the mining pits are not intended as water storages and would be actively dewatered after rainfall events. The EIS classified mine pit water as mine/process water. This water is considered a potentially hazardous contaminant requiring a CCA. The department's submission on the EIS identified that the EIS should include a CCA for all mining pits. The amended EIS responded that the mining pits do not require assessment as they are not intended as water storages and any rainfall captured within them would be actively dewatered. The amended EIS stated that all mine affected water, including pit water would be directed to the onsite mine water dam which would also potentially reduce the volume of water drawn from the OWSF.

The EIS committed to completing a revised CCA during the detailed design phase of the project based on further refinement of the proposed mine plan and mine sequencing. It is recommended that the CCA Report is developed prior to design and construction of the structure.

4.5.2 Conclusions and recommendations

Certified CCAs are required for each of the six regulated structures to ensure that sufficient investigation work has been undertaken, and that all foreseeable environmental and safety risks of the structures are identified and suitably assessed before departmental approval of the proposed project. The CCA report must discuss the mining pits and determine whether they should be assessed as regulated structures.

4.6 Flora and fauna

A number of EIS documents described flora and fauna of the project area, namely Chapter 8 – Flora and Fauna, Chapter 17 – MNES and Chapter 20 – Offsite Water Storage Facility and Associated Pipeline. Appendices A1 – Offset Strategy; A20 – Terrestrial Ecology Technical Report; A28 – Aquatic Ecology Assessment and Stygofauna Pilot Study; and A33 – Offsite Water Storage Facility and the Associated Infrastructure Technical Ecology Report also dealt with impacts on flora and fauna.

On 7 January 2020 DAWE decided to accept a variation to the original proposal (EPBC 2017/8007) to include the OWSF and associated pipeline. Additional ground-truthed fauna and flora survey data in support of the referral variation, updated and additional information relating to terrestrial ecology, MNES, and offsets was subsequently provided in the amended EIS.

This section of the assessment report assesses the EIS conclusions for terrestrial and aquatic ecology. It focuses on the Queensland regulatory requirements and MSES. Environmental offsets for MSES are discussed in section 4.6. MNES and the Commonwealth regulatory requirements are discussed separately in section 4.15.

The TOR required the EIS to describe the biodiversity and existing environmental values of the project area, the effectiveness of any proposed avoidance, mitigation or management measures and propose suitable offsets for any significant residual impacts consistent with the Queensland Government and Commonwealth's environmental offsets framework. It also required the EIS to identify and adequately assess biosecurity matters, including detailing measures to effectively remove, control and limit the spread of pests and weeds on the proposed project area.

4.6.1 Assessment – existing environmental values

The following section is a summary of the predicted occurrence of environmental values based on database searches, field surveys and habitat assessments as documented in the EIS. A number of site surveys and studies were undertaken as part of the EIS process to gather data about ecological and flora and fauna values.

The EIS identified that the proposed mining area and OWSF is within the Mitchell Grass Downs bioregion (Central Downs subregion) which is characterised by undulating downs dominated by Mitchell grass (*Astrebla* spp.) with deep cracking clay soils. The majority of the project area is composed of the *Astrebla lappacea, Aristida latifolia* and *Panicum decompositum* remnant grassland community. The OWSF and associated pipeline traverses the adjoining Gulf Plains bioregion (in the Woondoola Plains subregion) to the north.

4.6.1.1 Environmentally sensitive areas

No environmentally sensitive areas (ESA) were identified for the project using the department's mapping.

4.6.1.2 High Ecological Value waters/wetlands

No high ecological value waters or wetlands listed under the Environmental Protection (Water and Wetland Biodiversity) Policy 2019 are mapped or ground-truthed within the project area.

4.6.1.3 Vegetation communities

The proponent identified four regional ecosystems (REs) within the project area based on Queensland Regional Ecosystem (RE) mapping (version 11). However, field surveys identified seven REs in total, two of which were less than 10ha in extent. The proponent adopted the ground-truthed maps for the purpose of the EIS.

The majority of the project area (approximately 65%) consists of *Astrebla* grassland mapped as RE 4.9.1c. Large areas of the northern area of the proposed mine site (approximately 34%) are mapped as a mosaic of RE 4.9.1c and RE 4.9.1b. All REs are listed as 'least concern' under the *Vegetation Management Act 1999* (VM Act) and 'no concern at present' under the Queensland Herbarium's biodiversity status. Some REs occuring within the area of the OWSF and associated pipeline are within the Gulf Plains bioregion. Ground-truthed REs identified in the mine lease and OWSF and associated

pipeline areas are shown in Table 3.

Table 3. Regional ecosystems ground-truthed within the project area (Adapted from Table 8.11 of the EIS)

Regional ecosystem	Description	VM Act status	Biodiversity status*
RE 2.3.3	*Astrebla squarrosa* and/or *A. elymoides* and/or *Iseilema* spp. tussock grassland on alluvial plains	Least concern	No concern at present
RE 2.3.3/ 2.3.4	*Astrebla squarrosa* and/or *A. elymoides* and/or *Iseilema* spp. tussock grassland on alluvial plains; *Eulalia aurea*, *Panicum decompositum*, *Astrebla pectinata* and *Dichanthium* spp. in mixed tussock grasslands on alluvial plains	Least concern	No concern at present
RE 2.3.3 / 2.3.17a	*Astrebla squarrosa* and/or *A. elymoides* and/or *Iseilema* spp. tussock grassland on alluvial plains; *Eucalyptus microtheca* low open woodland to woodland; riverine wetland	Least concern	No concern at present
RE 2.3.17a/ 2.3.3	*Eucalyptus microtheca* low open woodland to woodland; riverine wetland; *Astrebla squarrosa* and/or *A. elymoides* and/or *Iseilema* spp. tussock grassland on alluvial plains	Least concern	No concern at present
RE 2.3.17a	*Eucalyptus microtheca* low open woodland to woodland; riverine wetland	Least concern	No concern at present
RE 2.9.1	*Astrebla* spp. grassland downs on shales with cracking clays soils	Least concern	No concern at present
RE 4.3.15	*Astrebla squarrosa +/- Dichanthium spp. +/- Eulalia aurea* grassland on alluvium	Least concern	No concern at present
RE 4.3.4f	*Eucalyptus coolabah* and/or *E. microtheca* low open woodland. Occurs on drainage lines on *Astrebla spp.* undulating plains and braided channels on alluvial plains, particularly north-east riverine wetland or fringing riverine wetland	Least concern	No concern at present
RE 4.9.1c	*Astrebla lappacea +/- Aristida latifolia +/- Panicum decompositum* grassland on Cretaceous sediments	Least concern	No concern at present
RE 4.9.1c/4.9.12x8	Mixed low open woodland, including combinations of the species *Atalaya hemiglauca, Ventilago viminalis, Corymbia terminalis* and *Denhamia oleaster.* A sparse shrub layer may occur. The ground layer is tussock grasses, including *Aristida* spp., *Enneapogon* spp. and *Astrebla lappacea.* Occurs on rises of exposed Cretaceous mudstone (Toolebuc Formation) with rocks to the surface	Least concern	No concern at present
RE 4.9.2b	Mixed tussock grassland, with combinations of the species *Astrebla spp., Aristida latifolia, Enneapogon sp.* mixed tussock grassland. Emergent *Atalaya hemiglauca, Ventilago viminalis* and *Corymbia terminalis* commonly occur. Occurs on rises of exposed Cretaceous shale and limestone with rocks to the surface. Cracking clay soils	Least concern	No concern at present

RE 4.9.1c / 4.9.2b	The patches of 4.9.2b that occur within the mosaic of 4.9.1c are slight rises with surface limestone rocks. They were not delineated and remain as a mixed polygon	Least concern	No concern at present

*conservation status used for assessments under the EP Act.

4.6.1.4 Terrestrial flora

No threatened flora species listed under the *Nature Conservation Act 1992* (NC Act) were found within the project area during the March and July 2017 field surveys on the proposed mining area or the November 2019 and March 2020 field surveys for the OWSF and associated infrastructure area. Records of the plant species *Oldenlandia spathulata*, listed as endangered under the NC Act, are known from the region and are associated with RE 4.9.1c, the dominant vegetation community in the project area. A record of *Croton magneticus*, listed as vulnerable under the NC Act, has been recorded approximately 56km north-west of the OWSF.

4.6.1.5 Terrestrial fauna

One comprehensive fauna survey was conducted on the proposed mining area on MLA100162 in March 2017. A targeted Julia Creek dunnart survey was conducted in July 2017 within MLA100162. A targeted Star Finch survey was conducted in April 2018 within MLA100162. A spotlighting survey was conducted in November 2018 within MLA100162. Two flora and fauna surveys were conducted on the OWSF and associated infrastructure area: one in November 2019 and one in March 2020.

Fauna surveys were dominated by bird species (91 species recorded on MLA100162) with the Australian Bustard, *Ardeotis australis*, considered a regionally significant species that was regularly recorded along the proposed pipeline route and on the OWSF area. Only four native terrestrial mammal species were observed – the eastern grey kangaroo, the red kangaroo, the dingo and the Lakeland Downs mouse. The EIS speculates that native terrestrial mammal species may not have recovered from the catastrophic flooding of February 2019. Five bat species were identified based on Anabat analysis from the March 2020 survey.

Reptile species assemblage was small with nine species recorded on MLA100162, likely reflecting the lack of structural complexity of treeless Mitchell grass plains. Eleven reptile species and five frog species were recorded at the OWSF survey sites.

The likelihood of occurrence of threatened terrestrial fauna species in the project area and within a 50km buffer is listed in Table 4. Conservation significant species were identified from database searches of the EPBC Act Protected Matters Report, the department's Wildlife Online and the Atlas of Living Australia. Refinement of likely species was based on proximity of nearby records and the presence of suitable habitat.

Table 4. Likelihood of occurrence of threatened terrestrial fauna species (Adapted from EIS Table 8-9, Table 8-13 and Table 8-14)

Species	NC Act status[1]	EPBC status	Likelihood of occurrence[2]
Julia Creek dunnart (*Sminthopsis douglasi*)	Endangered	Vulnerable	Possible
Greater bilby (*Macrotis lagotis*)	Endangered	Vulnerable	Unlikely/ Not expected
Red goshawk (*Erythriorchis radiatus*)	Endangered	Vulnerable	Not expected
Australian painted snipe (*Rostratula australis*)	Endangered	Endangered	Possible/ Unlikely
Curlew sandpiper (*Calidris ferruginea*)	Endangered	Critically endangered	Possible/ Unlikely

Masked owl (northern subspecies) (*Tyto novaehollandiae kimberlii*)	Vulnerable	Vulnerable	Not expected
Painted honeyeater (*Grantilla picta*)	Vulnerable	Vulnerable	Not expected
Yellow chat (*Epthianura crocea crocea*)	Vulnerable	Not listed	Possible
Gouldian finch (*Eryhrua gouldiae*)	Endangered	Endangered	Not expected
Star Finch (eastern) (*Neochmia ruficauda ruficauda*)	Endangered	Endangered	Not expected
Ghost bat (*Macroderma gigas*)	Endangered	Vulnerable	Unlikely/ Not expected
Plains death adder (*Acanthopsis hawkei*)	Vulnerable	Vulnerable	Unlikely
Fork-tailed Swift (*Apus pacificus*)	Special least concern	Migratory	Known to occur
Glossy Ibis (*Plegadis falcinellus*)	Special least concern	Migratory	Known to occur/ Possible
Oriental Plover (*Charadrius veredus*)	Special least concern	Migratory	Known to occur/ Possible
Latham's Snipe (*Gallinago hardwickii*)	Special least concern	Migratory	Unlikely
Common Sandpiper (*Actitis hypoleucos*)	Special least concern	Migratory	Possible/ Unlikely
Pectoral Sandpiper (*Calidris melanotus*)	Special least concern	Migratory	Possible/ Unlikely
Sharp-tailed sandpiper (*Calidris acuminate*)	Special least concern	Migratory	Known to occur/ Possible
Sanderling (*Calidris alba*)	Special least concern	Migratory	Unlikely/ Not expected
Common Greenshank (*Tringa nebularia*)	Special least concern	Migratory	Possible/ Unlikely
Marsh Sandpiper (*Tringa stagnatilis*)	Special least concern	Migratory	Known to occur/ Unlikely
Oriental Pratincole (*Glareola maldivarum*)	Special least concern	Migratory	Unlikely
Caspian Tern (*Hydroprogne caspia*)	Special least concern	Migratory	Possible/ Unlikely
Oriental Cuckoo (*Cuculus optatus*)	Special least concern	Migratory	Unlikely
Grey Wagtail (*Motacilla cinerea*)	Special least concern	Migratory	Not expected
Yellow Wagtail (*Motacilla flava*)	Special least concern	Migratory	Unlikely

[1] conservation status under the NC Act.

[2] likelihood of occurrence. (Note – where a second option is provided this denotes a different likelihood assessment for the OWSF and associated infrastructure. Based on EIS conclusions that may differ from the department's assessment of likelihood of occurrence).

4.6.1.6 Habitat values and connectivity

The project area is located in a predominantly intact bioregion where habitat fragmentation is not currently a threat to most species. The native Mitchell grass vegetation is widespread across undulating downs on shales and limestones and is subject to periodic wet season flooding. A significant environmental pressure on regional wildlife habitat is habitat degradation resulting from cattle grazing practices and the infestation of prickly acacia, *Vachellia nilotica* subsp. *Indica*.

The EIS stated that prickly acacia dominates the project area and is a serious invasive weed distributed widely through central-western and north-western Queensland. Weed seeds are distributed by cattle

grazing which is the dominant land use activity in the regional landscape. The department notes the impact of prickly acacia infestation on native plant and animal communities of the region has been little studied, except where intensive eradication efforts have been undertaken.

The EIS stated that fauna habitat features in the Mitchell grass downs contain relatively homogenous habitat features for fauna with sparsely scattered Eucalyptus trees mainly on watercourses and stony rises, sheltering and cover opportunities, and extensive large cracks in the soil profile. The deep cracking clay soils provide shelter from the heat to a range of fauna, including dasyurids such as the Julia Creek dunnart with fauna surveys recording reptiles such as the soil-crack whipsnake, *Demansia rimicola*, speckled brown snake, *Pseudonaja guttata*, the Downs bearded dragon, *Pogona henrylawsoni*, and Spencer's monitor, *Varanus spenceri* in the project area.

According to the EIS no wetlands occur on the project area and only one ephemeral watercourse, Horse Creek, occurs on the proposed mine site at the southern boundary. The department noted from the project site visit in December 2019 that drainage features also occur and exhibit signs of wet season flooding such as vegetative debris captured in prickly acacia and localised erosion. An existing dam of approximately 55 ha in area located in the central portion of the site currently provides artificial wetland features for waterbirds and a stopover point for migratory birds. The migratory bird species Glossy ibis, Oriental plover, Marsh sandpiper and Sharp-tailed sandpiper were recorded using either this dam or other artificial waterbodies such as abandoned quarries. Watercourses and artificial wetland features provide important late dry season resources for native fauna as well as introduced species such as pigs and cattle. They also have the potential to contain ecological values, including refugia for some native fish habitat, for the birds' persistence in a dry environment and the provision of system recharge after drought.

The project area straddles the Central Downs subregion of the Mitchell Grass Downs bioregion and the Woondoola Plains subregion of the Gulf Plains bioregion. Both subregions are dominated by Mitchell grass plains and the majority of the project area is mapped as having a 'local or other values' biodiversity significance under the Mitchell Grass Downs Biodiversity Planning Assessment (BPA) (Qld 2009). The southern part of the project area (approximately 2km) is within a 10km wide bioregional corridor of State significance. The Biodiversity Planning Assessment, Mitchell Grass Downs Bioregion Landscape Expert Panel Report (Qld Gov, 2009) identifies this corridor as linking core areas of Mitchell grass within areas of low disturbance.

The EIS undertook analysis of the proposed vegetation clearing on local and regional connectivity using the State's Landscape Habitat Connectivity and Fragmentation Tool. The Tool is used for calculating whether a project's clearing is considered to be a significant residual impact under the State's environmental offsets framework. The result of the analysis using the Tool is that local connectivity (within 5km of the proposed project) and regional connectivity (within 20km of the proposed project) would not be significantly changed. The threshold for significant impact is 20% clearing of local connectivity and the proposed project would result in a potential 18.7% impact. The Central Downs subregion is mapped as consisting of 97.9%[1] remnant vegetation.

4.6.1.7 Waterways

The proposed project area is located in the Cloncurry River catchment that is within the Flinders River Basin. The Flinders River is perennial with ephemeral tributaries that flow less than 30% of the time (Petheram et. al 2013). Stream flows are highly variable but typically occur during wetter months (October to March), with low to no flows the rest of the year. Wet season flood events deliver nutrients to the floodplain and provide refugial waterholes on the Flinders River that sustains local fauna populations.

The OWSF and a portion of the pipeline network would be located within the Flinders River floodplain. The pipeline would cross Alick Creek, a waterway categorised as 'major' by the DAF waterway barriers mapping and similarly mapped for its watercourse vegetation.

[1] DES, Subregions – remnant vegetation, https://www.publications.qld.gov.au/dataset/subregions-remnant-veg sourced on 01 June 2020.

Three minor watercourse tributaries of Julia Creek occur on the proposed mine site. Two unnamed watercourses would be subject to mining and would require waters to be diverted. The other watercourse is named Horse Creek and is an ephemeral creek located near the southern boundary.

4.6.1.8 Wetlands

Terrestrial flora surveys did not locate any wetlands of high ecological significance within the proposed project area.

The EIS described a range of farm dams and quarry ponds occurring within the project area, most of which are classified as general ecological significance wetlands based on the Queensland Wetlands Program mapping. These wetlands are mapped as lacustrine highly modified waterbodies and translate to ponds/dams created for grazing purposes and abandoned quarries from mining exploration activities.

Five conservation significant migratory birds were recorded in these wetlands across wet and dry season surveys. Dams often provide suitable habitat conditions especially during migratory passage. In the immediate vicinity of the proposed project area there are similar artificial lacustrine wetlands on adjacent grazing properties.

The OWSF off-take and channel would be located within the Flinders River riverine wetland vegetation, mapped as RE 2.3.17a, *Eucalyptus microtheca* low open woodland to woodland. Approximately 1.7ha of riverine wetland vegetation would be impacted. This wetland vegetation is not mapped as an HES wetland. The proponent has committed to avoiding impacting habitat trees and the restoration of habitat features in the decommissioning phase.

4.6.1.9 Groundwater dependent ecosystems

The EIS did not address groundwater dependent ecosystems (GDE) as required by the TOR. An aquatic ecology desktop assessment was undertaken but no results from the GDE Atlas were provided. The MNES chapter presented GDE Atlas mapping that showed no terrestrial GDEs within the vicinity of the proposed project. The central dam area was mapped as an area reliant on sub-surface expression of GDEs however, no analysis of this feature was presented in the amended EIS.

No GDE ground-truthed field surveys were undertaken on the project site or in the vicinity of the proposed project.

A Stygofauna Pilot Study was provided in Appendix 28. The likelihood of the presence of stygofauna was assumed to be low due to the low permeability and unsaturated nature of the surficial geology within the proposed project area. A desktop assessment of stygofauna habitat was undertaken in accordance with the Guideline for the Environmental Assessment of Subterranean Aquatic Fauna (Department of Science, Information Technology and Innovation, 2015).

The Flinders River is an ephemeral river subject to groundwater discharge (baseflow). Aquatic ecosystems associated with the river are therefore seasonally dependent on the discharge of groundwater which maintains pools in the dry season. Riparian vegetation is supported by surface flows and groundwater, either from alluvial aquifers or surface expressions. The department notes that waterholes are potentially sensitive to changes in hydrogeological regimes, and the EIS did not provide an analysis of how waterholes located downstream of the water off-take may be potentially impacted by local changes to baseflow.

Where the proposed water pipeline crosses at Alick Creek is mapped by the GDE Atlas as having a high potential for reliance on surface expression of groundwater for riverine wetland vegetation.

The EIS identified that ephemeral springs were present in the wider vicinity with the nearest active spring located approximately 28km north-west of the site. These springs were not identified in the EIS as GDEs. Their presence indicates the likelihood of other ephemeral springs' presence in the area. No aquatic ecology field survey was conducted on the project area to determine the presence and condition of springs or wetlands. The EIS states that the terrestrial flora surveys conducted in 2017, 2018, 2019 and 2020 did not identify any springs.

4.6.1.10 Aquatic ecology surveys

No site-specific aquatic ecology surveys were undertaken across the proposed project area to support the EIS assessment in either the wet or dry season survey periods of 2017 and 2018. Instead, a desktop assessment was provided in the EIS.

DAWE, DAF and the department's submissions recommended that aquatic surveys be undertaken in the 2019–2020 wet season. The amended EIS did not present any updated aquatic ecology field surveys for the period from November 2019 to March 2020, corresponding to the early wet season. Only terrestrial field surveys were undertaken at the OWSF area in February 2020. The EIS stated that a field survey had been planned for May 2020 but was postponed to mitigate risks associated with COVID-19. No additional surveys undertaken post the easing of travel restrictions on 1 June 2020 were presented in the amended EIS.

The proponent has committed to undertaking aquatic surveys prior to commencement of any clearing activities. A recommended condition in an EA would detail the aquatic ecology survey requirements. A suitable assessment and approval of those aquatic ecology survey results by the department would be required before commencement of any mining activities.

A desktop aquatic ecology assessment was conducted in May 2019 and results presented in Appendix A28. It includes macroinvertebrate data from the Monitoring River Health Initiative (surveys conducted between 1994 and 1996). Data is provided for Eastern Creek and the whole Flinders River basin but no specific data was presented for Yambore Creek, Punchbowl, Eastern Creek Carrum, Flinders River Punchbowl, and Flinders River at Richmond.

The department's submission recommended that more recent aquatic ecosystem surveys of the near-field receiving environment were required to adequately assess the current condition of the receiving environments and any potential impacts associated with the proposed mining activity.

The amended EIS was updated to include a more detailed desktop assessment of aquatic ecology.

The department will require more recent aquatic ecosystem surveys of the near-field receiving environment to adequately assess the current condition of the receiving environments and potential impacts associated with the proposed mining activity. In the absence of field data to inform relevant management plans, recommended conditions in an EA would apply stringent water quality limits to help manage potential environmental impacts to aquatic ecosystems.

4.6.1.11 Weeds and pests

The proponent identified two declared weed species on and adjacent to the project site. The dominant introduced weed species is prickly acacia which is distributed widely within central-west and north-west Queensland.

Both prickly acacia and parkinsonia (*Parkinsonia aculeata*) are listed as restricted invasive plants under Schedule 2 of the *Biosecurity Act 2014* and are also listed as Weeds of National Significance.

Feral cats, foxes, goats, pigs and wild dogs were recorded in the project area and are classified as restricted matter – invasive animals under Schedule 2 of the *Biosecurity Act 2014*.

The proponent has general biosecurity obligations to control weeds under the *Biosecurity Act 2014*, including undertaking weed control and vehicle hygiene in accordance with relevant environmental management plans and committed to prepare an effective aquatic weed and pest management strategy. Prickly acacia would be required to be removed from the project site during clearing associated with the mining activities. Rehabilitation and weed management conditions in an EA would require ongoing and effective monitoring of prickly acacia outbreaks and corrective actions to be detailed in the proposed Weed Management Strategy.

4.6.2 Assessment – potential impacts and proposed mitigation measures

4.6.2.1 Loss of habitat for terrestrial flora and fauna

The proposed project would impact on remnant Mitchell grass vegetation that provides suitable habitat

for the Julia Creek dunnart. The most significant impacts from mining would be disturbance of the soil profile that provides both potential shelter and breeding habitat for the Julia Creek dunnart, as well as loss of the Mitchell grass community that provides food resources and breeding sites for the dunnart's prey species. The EIS stated the total impact area to the species is approximately 7419ha consisting of 7204ha on MLA100162 and 214.5ha on the OWSF and associated infrastructure.

A range of environmental management plans have been proposed in the EIS to mitigate the direct impacts related to loss of habitat, and from the indirect impacts of mining related to lighting, noise and dust. However, they are only described in outline for the Environmental Management Plan framework. Committed management plans such as the terrestrial fauna management plan, terrestrial flora management plan, and aquatic ecology management plan and associated proponent commitments will be conditions of project approval.

The EIS identified that noise emissions can impact an animal's physiology and behaviour, and can have deleterious impacts on reproductive success and longevity. However, the potential impacts of noise emissions from proposed project activities on the Julia Creek dunnart was not assessed.

The EIS stated that rehabilitation outcomes are likely to improve ecosystem function due to the removal of prickly acacia.

Rehabilitation conditions will stipulate site-specific progressive rehabilitation and closure plan requirements for the proposed project. Stages will be monitored based on vegetation successfully meeting the completion criteria milestones. Where standards are not being met, threshold criteria will trigger reporting to the department and the requirement of remedial actions detailed in the PRCP. No rehabilitation trials were undertaken on site to demonstrate that Mitchell grass could be successfully rehabilitated.

4.6.2.2 Loss of habitat for aquatic flora and fauna

The EIS identified that the proposed project may result in a number of potential impacts to aquatic ecological values, but these impacts were considered low risk. The loss of minor waterways due to mining was stated to be temporary until rehabilitated and only limited aquatic habitat would be impacted. DAF in submission comments highlighted that it is inaccurate to assume the habitat is poor and that impacts would be minor until suitable aquatic ecology surveys have been undertaken in appropriate flow conditions and been presented for assessment.

The potential discharge of mine-affected water from flooding events is stated to be captured by the onsite Water Management System and not released to the receiving environment. No controlled releases of mine-affected water are proposed but any EA conditions would either stipulate stringent release limits or prohibit releases.

Sedimentation and increases in turbidity from earthworks can potentially lead to smothering of stream beds and decreasing available habitat, if not appropriately managed. Implementation of the ESCP and progressive rehabilitation are proposed to mitigate sediment and turbidity impacts.

The OWSF water diversion from the Flinders River was identified as potentially leading to reductions in the flow and duration of downstream flow events. The EIS stated that the take of water would only be in high flow events and be subject to sustainable discharge-based water take volumes.

The OWSF and associated infrastructure has the potential to strand fish and impact fish from poor water quality. A range of mitigation measures are proposed, including design features that incorporate a permanent deep-water refugial area for fish during dry periods; implementation of a Water Quality Monitoring and Fish Salvage Plan; and the incorporation of artificial habitat elements for fish shelter from predators.

The construction of the water pipeline across and underneath Alick Creek has the potential to act as a waterway barrier to fish and freshwater turtles during flow events. DAF's submission sought details on MSES waterways providing for fish passage and how the proposed project would avoid and mitigate potential impacts in the first instance, proposed appropriate mitigation and management measures and then offset any remaining significant residual impact. The amended EIS provided information on

proposed mitigation measures, including the preference to conduct works when no water is present in accordance with relevant standards and construction of a temporary waterway barrier, if required. An aquatic ecology field survey has been proposed at this location. The EIS did not provide a significant residual impact assessment for this MSES value and no offset for the loss of fish passage was proposed.

DAF in its review comments stated that the amended EIS did not adequately address the submission. DAF considers that the mining activity and long duration of the impact is likely to result in a significant residual impact to this MSES value. This is due to the reduction in the extent, frequency or duration of fish passage previously found at the site; the substantial modification and fragmentation of fish habitat necessary for breeding and/or survival of fish; and in the likely substantial and measurable change in the hydrological regime (i.e. volume, depth, timing, duration, and frequency of flows) of the waterway. DAF has recommended a condition for the offsetting of this MSES value if aquatic field surveys and an significant residual impact assessment conclude that an offset is required.

4.6.3 Cumulative impacts

Currently there are no other active mining projects close to the site. The nearest active mines are the Eloise Copper Mine located approximately 100km south-west of the mine and the Ernest Henry Mine, a copper and gold mining and processing operation located approximately 120km west of the proposed project area. The Cannington silver and lead mining and processing operation is located approximately 170km south-west.

There are currently 65 mineral exploration tenements covering 984,000ha or 27% of the area within 100km of the proposed project. The proposed project tenements are adjacent to EPMs held by other companies. There is the potential for long-term, cumulative mining impacts on the Mitchell grass vegetation community and habitat for the Julia Creek dunnart if those exploration permits are progressed to production. Cumulative impacts were discussed in the EIS, but no analysis was provided in relation to the Julia Creek dunnart.

Future mining activities for critical minerals, including vanadium, molybdenum and nickel in Queensland's North West Minerals Province are projected (State of Queensland, 2017). The EIS stated that there is more likely to be fundamental and potentially irreversible losses in ecosystem function as a result of intensive commodity production. Any future mining projects would need to consider the cumulative impacts of the clearing of Mitchell grass vegetation at a larger scale than the boundary of their individual project.

Connectivity of localised habitats would be lost due to the broadscale clearing impacts of mining. Rehabilitated areas would also likely experience disturbance impacts from adjacent mining activities (e.g. noise, dust, vehicle movements and light impacts) over an extended duration if those future projects are progressed.

Accordingly, any proposed mitigation measures and offsets would need to assess potential cumulative impacts. This assessment may result in constraining development footprints and increased levels of protection for Julia Creek dunnart habitat features. The provision of corridors in key habitats such as riparian areas would be an important regional strategy to maintain connectivity. Standard buffer distances to environmental values would also act to mitigate potential impacts.

4.6.4 Biosecurity

The proponent's general biosecurity obligation under the *Biosecurity Act 2014* was acknowledged. Controls and mitigation measures in relation to biosecurity risks and biosecurity events were detailed.

The EIS identified five weed species declared as restricted matters under the *Biosecurity Act 2014* have the potential to occur in the project area. Two of these species, prickly acacia and parkinsonia were confirmed onsite.

Vast stands of prickly acacia dominate the site and are particularly abundant along drainage lines. Current grazing management practices are likely to spread the weed. All landholders have a general biosecurity obligation under the *Biosecurity Act 2014* to control environmental weeds.

The pest fauna species feral cats, foxes, goats, pigs and wild dogs were recorded in the project area and are also declared as restricted matters under the *Biosecurity Act 2014*.

Restricted aquatic biosecurity matters that have been recorded near the project area include the aquatic weeds salvinia and water hyacinth, and the fish *Gambusia holbrooki*.

DAF's submission identified a range of matters that required further assessment. The amended EIS adequately addressed these matters. Weed and pest management strategies will be incorporated into the Project's CEMP, OEMP and PRCP and will include a biosecurity monitoring program. The proponent proposed a number of suitable mitigation measures to reduce the introduction and/or spread of weeds, including vehicle wash-down protocols and any imported soil material requiring a weed hygiene declaration.

DAF's submission recommended the EIS include a detailed pest management plan. The amended EIS stated a commitment to only develop an aquatic weed and pest management strategy including a biosecurity monitoring program. DAF recommends that the proponent should develop a suitable weed and pest management plan that would include a monitoring program to gauge the success of biosecurity measures, identifies whether objectives have been met, and describes corrective actions to be used if monitoring indicates objectives are not being met.

4.6.5 Conclusions and recommendations

The proposed project area is located within the Mitchell Grass Downs and Gulf Plains bioregions in the hot dry tropics climatic region of northern Australia. The project proposes to clear Mitchell grassland communities and associated wildlife habitats within the Central Downs subregion of the Mitchell Grass Downs bioregion.

The proposed project is the first vanadium mining and processing operation in Queensland to be progressed. Extensive broadscale clearing of 7419ha is proposed with only a 50m buffer of the Mitchell grass community preserved around the MLA100162 boundary. Mining would be staged over 25 years and disturbed areas are proposed to be progressively rehabilitated.

The EIS stated that the clearing impacts would result in a temporary loss of ecosystem function due to the progressive rehabilitation of mined areas. However, there is uncertainty in the likely success of the proposed EIS rehabilitation plan as no rehabilitation trial has been undertaken on site. The department notes that the post-mine land use objective is to return the land to grazing.

The EIS stated that the sequencing of the clearing and progressive rehabilitation of mined areas is predicted to restore localised connectivity of habitats. However, the proposed completion criteria estimates that native grassland would take at least three years to establish. There is uncertainty as to whether the mined land would re-establish a suitable sub-soil profile crucial for providing shelter for the Julia Creek dunnart or the associated Mitchell grass foraging habitat it relies on.

A range of environmental management plans proposed in the EIS to mitigate the direct impacts related to loss of habitat, and from the indirect impacts of mining related to lighting, noise and dust would be conditions of project approval in an EA.

Terrestrial Flora

Despite no threatened flora species being recorded in the proposed project area, the department recommends that pre-clearance surveys are undertaken. If during the pre-clearing survey protected plants are identified in areas to be cleared a Clearing Permit (Protected Plants) would be required. Protected plants found in the impact zone should be considered for translocation into adjacent suitable habitat away from direct and indirect impacts. Relevant approvals under the NC Act would be required for translocation.

Terrestrial Fauna

Only terrestrial fauna species that were found to be present or considered likely to occur were given detailed assessment in the EIS. The proponent concluded that the project would not have significant residual impacts on any threatened species listed under the NC Act.

The department disagreed with the likelihood of occurrence assessment for the Julia Creek dunnart. The department considers this NC Act listed endangered species is likely to occur in the proposed project area because it is known from the region and there is suitable habitat on the project site. This species is also listed as threatened under the EPBC Act. Under the bilateral agreement the assessment of the Julia Creek dunnart has been undertaken in section 4.15 MNES of this assessment report.

The department recommends that if approved, any Australian Government approval for the proposed project should contain suitable offset conditions for this species. The department also recommends that targeted pre-clearance surveys be undertaken prior to clearing habitat. A Species Management Program under the NC Act, to manage impacts of interfering with animal breeding places, must be completed.

The department notes that appropriate mitigation measures and offsets for this species would also provide benefits for two sympatric dunnart species, the fat-tailed dunnart, *Sminthopsis crassicaudata*, and the stripe-faced dunnart, *Sminthopsis macroura*, which are known to occur in the region, but were not assessed in the EIS.

Watercourses

No direct impacts on wetlands are proposed from mined areas but some indirect impacts may occur to the riverine wetland vegetation of the Flinders River in the vicinity of the OWSF. An offset for the loss of this vegetation community will be conditioned.

The department recommends that conditions in the Receiving Environment Monitoring Program (REMP) of an EA should provide for specific monitoring of the riverine watercourse habitat in the Flinders River and the riverine watercourse habitat associated with the pipeline crossing of Alick Creek.

4.6.6 Offsets

Under Schedule 1 of the Environmental Offsets Regulation 2014 (EO Regulation), a resource activity carried out under an Environmental Authority under the EP Act is a prescribed activity for the purposes of the *Environmental Offsets Act 2014* (EO Act). Any MSES values listed in Schedule 2 of the EO Regulation subject to mining activities are therefore required to be assessed. The proponent identified and assessed the potential impacts of the proposed project on prescribed environmental matters defined as MSES.

The EO Act requires offsets to compensate for significant residual impacts on MSES after all onsite avoidance and mitigation measures have been applied. The proponent demonstrated that all reasonable onsite avoidance and mitigation measures have been applied to most MSES. However, in some instances relatively minor impacts to regulated vegetation and waterways providing for fish passage cannot be avoided.

Based on material provided in the EIS the department expects that the following MSES would be impacted by proposed project mining, OWSF and water pipeline construction and operational activities:

- regulated vegetation – vegetation within a defined distance from defining banks of a relevant watercourse (RE intersecting a watercourse)
- protected wildlife habitat (habitat for an animal that is endangered or vulnerable wildlife or special least concern animal)
- waterways providing for fish passage.

The EIS did not undertake any aquatic ecology surveys for the project area and instead relied on a desktop assessment. Submissions from DAF and the department recommended the proponent undertake the required aquatic ecology surveys as part of the amended EIS. However, planned surveys were not undertaken due to the COVID-19 pandemic restricting internal travel within Queensland and limiting access to properties. The proponent has committed to undertake the wet season aquatic survey program and to present the relevant report to the department for assessment prior to the start of construction. The department has accepted this commitment and would recommend a condition stating survey requirements in an EA.

4.6.6.1 RE intersecting a watercourse

Table 1 of the Queensland Environmental Offsets Policy – Significant Residual Impacts Guideline states that clearing for linear infrastructure greater than 25m wide in a grassland or sparse RE within the defined distance of a watercourse is a significant impact on MSES.

The pipeline would impact on an area of regulated vegetation greater than 25m wide through two sections of watercourse REs. The proponent identified that 5.75ha of RE 4.3.4f in a un-named watercourse on the proposed project area would be cleared. The proponent also identified that 0.68ha of RE 2.3.3/2.3.17 and 2.3.17/2.3.3 would be cleared in the crossing of the Alick Creek for the proposed construction of the water pipeline.

The department notes in the amended EIS that the proposed location of the OWSF has been revised and is now closer to the Flinders River. Clearing for the diversion channel and aqueduct would now impact a 1.02ha area of *Eucalyptus microtheca* woodland mapped as RE 2.3.17. This is mapped as MSES regulated vegetation – watercourse associated with the fringing channels of the Flinders River.

The total clearing of 7.45ha of watercourse vegetation would be a significant impact requiring an offset. An offset condition for this prescribed matter would be recommended for an EA.

4.6.6.2 Protected wildlife habitat

The proponent did not identify a significant residual impact under the Queensland environmental offsets framework for the Julia Creek dunnart. However, the proponent has identified a significant impact under the EPBC Act Offsets Policy, see section 4.15.6.4 MNES for the offset assessment.

Offsets for impacts on this species would typically be required under the EO Act. However, the species is also listed as threatened under the EPBC Act and an assessment of impacts is presented in section 4.15 MNES of this assessment report. In order to avoid duplication of offset conditions the department recommends that the Australian Government impose a condition requiring offsets to compensate for the proposed project's significant residual impacts on this species. The proponent would need to submit an offset proposal that is consistent with the *EPBC Act Environmental Offsets Policy 2012* (EPBC Act EOP).

4.6.6.3 Waterway providing for fish passage

Waterway barrier works are regulated under the *Fisheries Act 1994* when barriers to fish movement, including partial barriers, are installed across waterways. The EIS stated that all project infrastructure, including the OWSF and pipeline route is within mining infrastructure leases. Assessment and approval of impacts to waterways providing for fish passage – an MSES value – is assessed through the EIS process using the environmental offsets framework.

A waterway barrier is proposed for Alick Creek. The pipeline is proposed to be constructed in the dry season (when the creek is not flowing) and would only be subject to a minor and temporary (approximately 1 week) impact.

Horse Creek is categorised as a moderate waterway barrier, however proposed mining activities would not interfere with the creek as the location of the proposed levee would be offset from the creek alignment.

No significant residual impact assessment was provided for this MSES value and no offsets for the loss of fish passage are currently proposed. The department notes DAF's amended EIS review comments stated that its desktop assessment calculated a potential impact to waterways providing for fish passage of approximately 7.6ha.

In the absence of aquatic ecology field survey results, the department would require a preliminary disturbance limit of 7.6ha of waterways providing for fish passage requiring a potential offset on MLA100162. The total significant residual impact area for all impacted waterways in the proposed project area would require further assessment using results from the planned aquatic ecology surveys. An interim offset condition for this prescribed matter would be recommended for an EA.

4.6.7 Conclusions and recommendations

Offsets applicable for the project under the EP Act and EO Act for the significant impact on MSES regulated vegetation (intersecting a watercourse) are summarised in Table 5 and would be reflected in the recommended conditions in an EA.

Section 14 of the EO Act states that the administering agency must consider any offset condition that has been imposed under another Act. Since the endangered terrestrial species the Julia Creek dunnart is also listed as threatened under the EPBC Act, the department recommends that DAWE impose a condition requiring offsets for substantially the same matters. Hence, the proponent would not be required to provide offsets under Queensland's EO Act. Refer to section 4.15 MNES of this assessment report for the detailed assessment of MNES offset requirements.

Offsets proposed under the EPBC Act would effectively account for offsets required under the EO Act. Any outstanding offsets for unavoidable impacts to MSES would need to be offset in accordance with the EO Act. This may occur in relation to MSES for any protected plants identified in pre-clearance surveys and any MSES aquatic flora and fauna identified in future committed surveys.

The proponent must note that regardless of the requirement under the EPBC Act, there are also requirements under the NC Act for tampering with any breeding places for NC Act listed species. This would require management of any potential impacts under an approved species management program.

Table 5. Significant residual impacts on MSES requiring an offset

MSES	Description	Significant residual impact (ha) requiring an offset
Regulated vegetation (intersecting a watercourse) • VMA Act watercourses	• RE 2.3.17a • RE 2.3.17a/2.3.3 • RE 2.3.3/2.3.17a	• 1.02ha of watercourse vegetation to be cleared for the aqueduct • 0.57ha of watercourse vegetation to be cleared for the aqueduct and OWSF • 0.11ha of watercourse vegetation to be cleared for the aqueduct and OWSF • 5.75ha of RE 4.3.4f • 0.68ha of watercourse vegetation at Alick Creek
Protected wildlife habitat: • habitat for an animal that is endangered, vulnerable or special least concern wildlife	• Julia Creek dunnart (endangered)* • Astrebla spp. grassland REs	• 7204ha of protected wildlife habitat to be cleared for the mining area on MLA100162 • 214.5ha of protected wildlife habitat to be cleared for the OSWF and associated infrastructure
Waterway providing for fish passage	• Waterways on MLA100162 • Waterways on MLA100244; MLA100245; and MLA100246	• 7.6ha • TBC based on planned aquatic ecology surveys and SRI assessment

* The species listed is also identified as MNES and was assessed in accordance with the bilateral agreement under the EPBC Act. Any offsets required for these matters would be decided and administered under the EPBC Act.

4.7 Air

The relevant sections of the EIS used to assess the air shed and management of likely air impacts were EIS Chapter 9 – Air Quality, Chapter 20 – OWSF and associated infrastructure, and Appendix A14 – Air Quality and Greenhouse Gas Technical Report. Further information was provided to include the OWSF and address the submissions in the amended EIS.

Section 9.6 of the TOR required the EIS undertake a range of assessment measures to ensure that the activity will be operated in a way that protects the environmental values of air.

4.7.1 Environmental Protection (Air) Policy 2019 (EPP Air)

The EIS stated that the assessment criteria for the project has been designed to protect the environmental values defined in the EPP Air which include: human health and wellbeing; protecting the aesthetics of the environment; protecting agriculture; and health and biodiversity of ecosystems.

4.7.2 Assessment

Air quality impacts from the project were assessed through estimating emissions from two operating scenarios and dispersion modelling from emissions on the identified sensitive receptors (dwellings) and the local area. The EIS described local air quality using onsite air quality data to determine existing airshed values. This included background air quality affected by wind-blown dust, agricultural activities and bushfires. However there was insufficient data to describe quality throughout the year and data presented in the EIS was supplemented by air quality monitoring data from Mount Isa.

Two scenarios were modelled to represent the likely worst-case impacts of the proposed project on air quality. Scenario 1 was based on year eleven of operations and scenario 2 on year 23 of operations. The nearest sensitive receptors to the mining operations on MLA100162 are the Saint Elmo homestead and Argyle station.

The likely impact on sensitive receptors was predicted using air dispersion modelling which included total suspended particulates (TSP); particulate matter less than 10µm diameter (PM_{10}); particulate matter less than 2.5µm ($PM_{2.5}$); and dust deposition.

The dust PM_{10} concentration is predicted to exceed the criterion for scenario 2 at the nearby Saint Elmo homestead located approximately 270m west of the project area. The risk rating for dust impacts was extreme in relation to clearing for construction. The mitigation measure is to restrict the use of dozer and scraper activities to daytime operations between the months of March to May in the pit closest to the homestead.

An emissions inventory for the processing plant was provided for the different stages of mineral processing. It is noted that greenhouse gas (GHG) emissions from chemicals used in processing are considered to be negligible.

4.7.3 Conclusions and recommendations

The department determined that the EIS adequately addressed the TOR. It also met the air quality environmental objectives and performance outcomes stated in schedule 8, part 3 of the EP Regulation.

The methodology used in the EIS to characterise background air quality and model the potential impacts of the project on air quality and GHG emissions was appropriate to establish protection limits for an EA. Suitable avoidance and mitigation measures were proposed to minimise emissions of contaminants to air and achieve regulatory limits generally consistent with the department's model mining conditions.

The department provided a submission on air quality and raised issues on diesel and gas generator emissions as well as GHG emissions. These issues were adequately addressed in the amended EIS. The EIS stated that the major source of GHG emissions for the proposed project is for the onsite power generation from LNG fuel combustion and the roaster kiln gas burner. It is further stated that GHG emissions from the exposure of the ore body and oil shale units are considered negligible.

The department in a submission comment requested continuous monitoring of ambient PM_{10} levels at the Saint Elmo homestead in relation to the enhanced risk of adverse impacts from dust and particulates. The amended EIS has proposed a new condition to comply. However, it was noted that the criterion has only narrowly been achieved and it is considered that the potential for unacceptable impacts at this location remains. A site-specific air management condition would address this issue.

The department requested that an Air Quality Management Plan (AQMP) be provided for assessment in the amended EIS. The AQMP has adequately addressed requirements of the TOR and provides

additional information on actions related to air quality management roles and monitoring. Proposed dust deposition monitoring for the Saint Elmo homestead is needed to trigger the implementation of adaptive dust management measures by the proponent. These are described in the AQMP and would also be addressed in the proposed project's CEMP and OEMP.

Specific recommendations from the department's assessment include adopting custom conditions to capture the proponent's commitments to minimise impacts on air values.

4.8 Noise and vibration

EIS Chapter 10 – Noise and Vibration, assessed the proposed project's noise and vibration emissions that have the potential to adversely impact the surrounding environment and in particular sensitive receptors. EIS Appendix A21 – Noise and Vibration Assessment Technical Report detailed the existing noise environment, provided noise modelling and vibration analysis, and produced a draft Noise Management Plan. Further information was submitted in the amended EIS in response to the department's submission.

Section 9.7 of the TOR required the EIS undertake a range of assessment measures to ensure that mining and related activities would operate in a way that protects the environmental values of the acoustic environment. This included describing how the environmental management objectives for noise and vibration would be achieved, monitored, audited and reported, and how corrective actions would be managed particularly in relation to sensitive receptors.

4.8.1 Environmental Protection (Noise) Policy 2019 (EPP noise)

The EIS stated that the management hierarchy for noise from the EPP Noise would be used to manage noise from construction and operations activities. The acoustic quality objectives in schedule 1 of the EPP Noise have been considered, and it is accepted that the Model Mining Conditions for Noise would adequately address these objectives, whilst maintaining effective measures to regulate the noise impacts of the proposal.

4.8.2 Assessment

Existing background noise values were collected from three on-site noise monitoring loggers and incorporated into a noise model that predicts noise impacts from the mining fleet on the five sensitive receptors. No site vibration measurements were undertaken as the project does not intend to undertake blasting. Assessment was based on potential minor vibration sources such as construction activities, earthmoving equipment and train movements.

The highest predicted noise levels relating to construction and operation of pump stations at the OWSF will occur at the Lindfield homestead located approximately 12km west from the OWSF and are considered by the EIS to be minor in comparison to the mine operation noise emissions. Construction noise is predicted to comply with nominated mining noise limits for the OWSF pipeline construction based on not exceeding the use of 25 construction vehicles during the daytime and evening, and seven construction vehicles in the night.

Saint Elmo homestead sensitive receptor

The major source of noise impacts over the lifetime of the mine will be from the mining fleet operating on MLA100162. Two operations scenarios were modelled to represent the likely worst-case impacts of the proposed project on air quality. Scenario 1 was based on year six of operations and scenario 2 on year 23 of operations. The nearest sensitive receptors to the mining operations on MLA100162 for these scenarios are the Saint Elmo homestead and Argyle station.

The highest predicted noise levels will be at the Saint Elmo homestead, located approximately 270m west of the mine, occurring during the day and night in Year 6 and Year 23 of the proposed mining schedule. Noise modelling predicted that both the daytime and night noise limits at the Saint Elmo homestead will be exceeded for both scenarios. Year 23 exceedances will be highest with the day noise level exceeded by 17dBA and the night period by 27dBA.

The department's submission stated that not achieving the best practice noise objectives as detailed in the EPP (Noise) for the Saint Elmo homestead was unacceptable. Additional information was requested to describe how the environmental management objective would be achieved through appropriate and effective mitigation strategies. A Noise Management Plan was recommended and the amended EIS provided this in Appendix A21.

The draft Noise Management Plan proposes a range of mitigation measures including ceasing operations in various time periods, undertaking noise mitigation measures at the homestead or relocating the homestead. It is noted that the homestead residents would require acceptance of these measures and that the homestead would need to be relocated at least 3km west to achieve compliant noise levels.

4.8.3 Conclusions and recommendations

The requirements of the TOR in relation to noise were adequately addressed in the amended EIS. It also met the noise quality environmental objectives and performance outcomes stated in schedule 8, part 3 of the EP Regulation.

The EIS has provided information on the noise exceedances at the Saint Elmo homestead and the inability to achieve proposed EPP (Noise) limits with noise attenuation limits. Recommended EA noise conditions would take into account proposed noise limit criteria and ensure that nominated noise levels are in accordance with EPP (Noise) objectives. The provision of a Noise Management Plan prior to commencement of mining is recommended to ensure that the acoustic quality objectives for the Saint Elmo homestead are achieved.

4.9 Waste management

EIS Chapter 11 – Waste management identified the waste streams expected to be generated by the project's activities, provided an assessment of the potential impacts of generated waste and described management options for waste minimisation and disposal for all phases of the proposed project. The physical and chemical characteristics of waste streams and their management are described. The waste management impacts associated with the OWSF and associated infrastructure were described in Chapter 20 – Offsite Water Storage Facility and Associated Infrastructure. Additional information was also sourced from Appendix A27 (Mine Material Assessment – Soil Fertility, Geochemical and Physical Properties) that was substantively updated in the amended EIS. The proponent addressed the risk assessment of the potential impacts on surface and ground waters within Chapter 6 – Water.

4.9.1 Assessment

Waste streams

The main waste streams anticipated to be generated from the project include:

- waste generated through the construction, operational and decommissioning phases of the project, including: building and construction waste, general domestic waste generated by construction and operational workforce (including putrescible food waste of 400t/pa), recyclable waste such as plastics (30t/pa in the construction phase) and regulated waste such as tyres (50t/pa) and sewage
- plant and equipment waste generated by the vehicles, plant and equipment used to undertake construction activities such as waste oil (50t/pa)
- mine waste generated during the mining and the processing of ore, including: overburden (14,963,388t/pa) and processing waste consisting of three waste streams:
    - beneficiation rejects (172,015,346 LCM over the LOM);
    - beneficiation tailings rejects; and
    - solvent extraction rejects.

The characteristics and volume of general waste predicted to be generated through the project, potential disposal options and proposed waste management strategy for each waste was adequately described.

The EIS stated that there is expected to be negligible waste generated in the operational phase of the OWSF and pipeline associated with general maintenance activities.

The proponent is committed to implementing best practice waste minimisation and efficiency strategies and would ensure that construction and operation activities are in line with the waste and resource management hierarchy outlined in the Waste Management and Resource Recovery Strategy (Queensland Government 2019).

The EIS stated that the majority of waste generated would be beneficially reused onsite. No onsite landfill is proposed for this project, with general, recyclable and regulated wastes being removed from site by a waste transport contractor for treatment and disposal either at the Julia Creek Recycling and Waste Management Facility, at three local landfill sites (Kynuna, McKinlay and Nelia) or via other licenced waste collection companies yet to be contracted. Some waste stream types may be transported to Mount Isa or Townsville, locations that are subject to the waste levy zone provisions of the Waste Reduction and Recycling (Waste Levy) Amendment Regulation 2019.

Sewage treatment plant

A sewage treatment plant (STP) would be constructed in the MIA with an associated effluent disposal area. The STP would be sized to cater for the projected peak construction and operational workforce. The EIS stated that this would be 250 persons but it is noted elsewhere in the EIS that there would likely be an overlap of the construction and operational workforces in year three or four of operation resulting in a total workforce of 305. The department considers the wastewater generation rate of 30L/day/per person is inadequate and should accord with Australian standards for 70L/day/per person. The effluent disposal area would also require to be re-sized (from 0.2ha to 0.5ha) to meet the STP ERA 63 requirements.

4.9.1.1 Mine processing waste streams

The EIS identified three key mine processing waste streams – benign beneficiation rejects; beneficiation tailings rejects; and solvent extraction rejects. The estimated mine processing waste stream volume for the life of the project is 260,629,312 LCM.

According to the EIS 66% of the total mined ore would be composed of ‘benign’ beneficiation rejects. These are composed of coarse washery rejects and washery rejects underflow (slimes) from the scrubbing, screening, cyclone and thickening processes. Testing of this material indicates neutral to mild alkalinity, very low sulfide sulfur content, and a low potential to produce saline drainage. As a result, the benign beneficiation rejects are proposed to be directly backfilled to the mined open cuts.

According to the EIS, 33% of the total mined ore includes process slurry wastes consisting of calcite float tailings. Both beneficiation tailings rejects and solvent extraction rejects have chemicals (such as sulphuric acid) added during processing. These rejects would be emplaced in the TSF with the solvent extraction rejects (1%) siphoned and piped underground to the evaporation pond due to their highly saline nature.

There would not be any waste material stockpiles retained out-of-pit at the cessation of mining.

The amended EIS concluded that the environmental risk of the process waste streams associated with acid, saline and metalliferous drainage is very low.

4.9.1.2 Geochemical characterisation

Geochemical and physical sampling

Static and kinetic testing of soil samples across the mining area is an important requirement in understanding the geochemical properties of the project area and the potential contamination risk of the mine materials.

Only 10 completed test pits were undertaken out of 216 samples from the northern portion of the site, known as the Lindfield deposit. This area is not planned to be mined until years 20 to 25. The department’s submission sought further sampling especially in the southern half of the site, within the

area scheduled to be mined in year's 1 to 10. Only one test pit in the south has been completed in the six month period after the northern sampling program from October 2019. Access restrictions due to COVID-19 came into effect in April 2020 effectively delaying the sampling program.

The proponent has committed to the collection and analysis of 120 samples in Q3 2020, subject to COVID-19 health restrictions. Conditions of approval would require the sample results provided in the Mine Material Management Plan to be assessed and approved prior to commencement of mining.

Existing geochemical whole rock assay data from 2599 samples from exploration activities in the 1990s were presented for the southern half of the site. Results indicate calcium and sulfate salts are likely to dominate the mining materials.

A block model was requested by the department in its submission to allow characterisation and analysis of the nature of the mined ore material, tailings and waste rock. A geo-environmental block model was not provided in the amended EIS, but has been committed to be provided. A recommended condition for an EA would require that this is submitted for assessment and approval prior to the commencement of mining.

Waste characterisation

The department's submission on the EIS considered that the geochemical and physical characterisation of waste rock, tailings and spoil, including identification of the risk of acid or neutral mine drainage had not been sufficiently described. This was in relation to supporting the EIS conclusions that the environmental risk of the process waste streams associated with acid, saline and metalliferous drainage is very low.

Once sufficient geochemical characterisation has been undertaken and analysed the management of the site must be reviewed to ensure that the proposed rehabilitation strategy, the TSF design and surface water and groundwater management effectively mitigates and manages the identified environmental risks and potential impacts.

The department recommended additional information, including a revised Mine Material Management Plan (and associated Chapter 11) that describes the likely physical behaviour and chemical reactivity of the waste materials under the conditions in which they would be stored.

The amended EIS provided a description of the waste material characterisation. The department's review of the amended EIS noted that material characterisation is mostly complete, however required kinetic testing and modelling is ongoing. A revised Mine Material Management Plan has been submitted. It indicates that the sampling regime is quite thorough and consistent with best practice methods, however has not been completed.

Work has not yet been completed in the northern area of the mining lease (i.e. the Lindfield area), which relies instead on the whole rock assay undertaken at the southern area of the mining lease. The spatial distribution of test drill holes is also not considered to be consistent across the entirety of the proposed mine area.

The proponent has committed to completing sampling and analysis of waste rock prior to mining activities commencing and this would be conditioned in an EA. It is also important to note that a significant amount of this work will be required to inform the proposed PRCP that must accompany an application for a site-specific EA.

4.9.2 Conclusions and recommendations

Waste that is sent offsite would be managed in accordance with licenced transport and recycling and disposal facilities where required by law. The amended EIS commits to managing the waste in accordance with the waste management hierarchy and all waste streams are either intended for reuse onsite or transported offsite and recycled where possible. The proposed waste management approach is consistent with industry practices and was addressed in sufficient detail by the EIS. Environmental values are unlikely to be affected unless there is a spill or a containment or waste transfer failure occurring. Bunding and the use of specific waste bins would be used to isolate waste liquids, chemicals and hazardous wastes. Spill kits would be located close to areas where chemicals are being kept or

used. Licenced contractors would be used to regularly remove waste to the appropriate facility.

Sewage treatment plant

The recommended conditions for the ERA 63 (1)(b)(i) are based on the scale of the proposed STP and would require a 0.5ha effluent disposal area and a 50m buffer for adequate treatment of “Class C” treated sewage effluent. The environmental impact of this scale facility is considered low.

Waste characterisation

The department determined that the amended EIS had not adequately addressed the TOR requirements and the department’s submission on the EIS relating to waste characterisation. There were a range of issues identified by the department in the EIS submission regarding waste characterisation that were considered to elevate the risk to environmental values.

A commitment by the proponent to complete stages 2 and 3 of the geochemical and physical sampling and analysis program is supported and would be conditioned in an EA prior to the commencement of mining activities.

A commitment by the proponent to implement the Mine Material Management Plan is supported and would be conditioned in an EA.

Waste characterisation was also addressed in section 4.3.1.3 of this report and recommendations provided for the final landform and the TSF are in section 4.3.3.

Waste management would be conditioned in an EA.

4.10 Hazards and safety

EIS Chapter 12 – Hazard and Safety, described the potential hazards and risk to people and property that may be associated with the project based on qualitative risk assessments. Chapter 14 – Social, assessed the risk to the workforce, stakeholders, environment and local communities.

Section 9.9 of the TOR required the EIS describe the potential risks to people and property associated with the proposed project in the form of a risk assessment; and details of the proposed safeguards that would reduce the likelihood and severity of hazards.

Mining activities and the associated transport of materials and product to and from the project area are proposed to accord with relevant hazards and safety legislation, standards and guidelines.

4.10.1 Assessment

A qualitative environmental risk assessment was undertaken for the construction, operation and decommissioning phases of the proposed project. The EIS hazard analysis assessment identified that the proposed storage on site of 1.1ML of LNG will exceed the threshold limits of the *Workplace Health and Safety Regulation 2011* (WHS Regulation) and the mine site will require a licence for operating a Major Hazard Facility (MHF). Workplace Health and Safety Queensland regulates MHFs in accordance with the WHS Regulation and the nationally endorsed key principles for MHF regulation. An application to register as a MHF must be made with the Chief Inspector of Mines. If there is a sufficient buffer to sensitive receivers, the mine may be deemed to be a possible major hazard facility.

The proposed project would store and use a number of hazardous substances, including those listed in the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG Code). Hazchem storage onsite would consist of approximately 800,000L of diesel fuel in above ground tanks and approximately 4.2ML of sulphuric acid stored for use during mineral processing. The proposed project must have a hazardous substance or dangerous goods management plan for any quantity of materials exceeding thresholds. Additionally, if the mine is planning to hold any scheduled poisons then the mine will require additional license(s) from Queensland Health.

Should the mode of transporting hazardous substances change due to DTMR requirements then the safety of the revised mode will need to be re-assessed.

Materials brought to site would be stored on an appropriately constructed hardstand at the MIA. All hazardous materials, including chemical and combustible liquid storage would be stored and managed at the MIA in accordance with Australian Standards and the mine site hazardous chemicals and combustible liquids management plan.

4.10.2 Conclusions and recommendations

The department determined that the EIS adequately assessed the impacts of natural and project induced hazards on people and property addressing section 9.9 of the TOR. Identified potential impacts associated with the proposed project include contamination from spills or leaks, traffic accidents, air and noise pollution, injuries to project personnel, fire, flooding and vector–borne diseases (e.g. malaria). These hazards and risks are considered adequately managed in accordance with the proposed project's Health and Safety Management Plan and commitments in the EIS.

McKinlay Shire Council in a submission comment identified that the OWSF was in the 1% AEP flood overlay requiring a new flood report. This was provided in the amended EIS as Appendix A34 OWSF Flood Impact Report. McKinlay Shire Council responded that the submission was adequately addressed.

Queensland Ambulance Service (QAS) requested that they be formally consulted and engaged regarding the proposed Emergency Response Plan (ERP) so that access strategies and on-site medical capacity be reviewed. The proponent has committed to formally notify and engage with QAS in developing the ERP.

Recommendations

- The proposed project must register as a major hazard facility with the Chief Inspector of Mines on the approved form with the supporting information and at least six months before the mine starts operation.
- A Health and Safety Management Plan must be prepared and implemented. The plan must detail prevention and or minimisation of risks to the environment, site personnel and the public. The plan must be provided for assessment and approval prior to the commencement of mining.

4.11 Cultural heritage

The environmental values relevant to Indigenous and non-indigenous cultural heritage for the project area were described in EIS Chapter 13 – Cultural Heritage, and were supported in EIS Appendix A23 – Historical Heritage Assessment; and Appendix A24 – Aboriginal Cultural Heritage Tenement Search.

Potential impacts of the project on cultural heritage values and proposed management and mitigation measures were also described.

Section 9.10 of the TOR required that the EIS was to conduct the impact assessment in accordance with the department's EIS information guidelines: Indigenous cultural heritage; and non-Indigenous cultural heritage and to develop a Cultural Heritage Management Plan (CHMP).

4.11.1 Assessment

Indigenous cultural heritage

The project area consists of Freehold land, Grazing Homestead Perpetual Lease and stock route tenure. The first two tenure types extinguish native title. A search of the Native Title Tribunal Register did not identify any Indigenous Land Use Agreements or native title determinations that have been entered into as no claimants were identified for the project area. There are no cultural heritage parties for the project area registered on the Aboriginal Cultural Heritage Register and Database.

The proponent advertised the mining lease application for MLA100162 as required under the *Native Title Act 1993* on 11 July 2018. No claims were lodged after the three month notification period. The OWSF on MLA100244 is located on exclusive land and does not need to be notified. Both the pipeline on MLA100245 and the aqueduct on MLA100246 are currently going through the native title notification process.

The *Aboriginal Cultural Heritage Act 2003* (ACH Act) imposes a duty of care on proponents when carrying out an activity to take all reasonable and practicable measures to ensure the activity does not harm Aboriginal cultural heritage. One of the duty of care matters is the extent to which the proponent has consulted with Aboriginal parties. Offences under the ACH Act in relation to unlawful harm to Aboriginal cultural heritage, and the excavation, relocation or taking away of Aboriginal cultural heritage by a corporation are not committed if the person is acting under an approved CHMP.

Any future agreement with a native title claimant would include the implementation of a CHMP. A CHMP has been developed for the project area over MLA100162 in accordance with Part 7 and section 87 of the ACH Act to detail how the proposed project activities would avoid or minimise potential impacts to Aboriginal cultural heritage. It is proposed to expand the area to include the three additional MLAs.

Assessment of previous studies concluded that the project area is likely to contain cultural heritage artefacts and possible sites. No field archaeological surveys were planned or undertaken for the project area for the EIS. However, the proponent has committed to undertaking a pre-disturbance survey report by a suitably qualified cultural heritage surveyor to identify cultural heritage items or places in areas of proposed significant ground disturbance. The proponent has also committed to undertaking a field archaeological investigation of the project area prior to the commencement of construction.

A qualitative risk assessment was provided on potential impacts and proposed mitigation measures. Potential impacts to Indigenous cultural heritage were identified including the damage or destruction of artefacts or cultural heritage items; and the loss of cultural heritage knowledge opportunities. These impacts were identified as resulting from construction activities such as the removal of topsoil and overburden; and the movement of heavy vehicles. Management procedures relating to finding cultural heritage artefacts include cessation of work, inspection and obtaining advice prior to recommencement of disturbance activities.

Non-Indigenous cultural heritage

The non-indigenous cultural heritage assessment was undertaken as a desktop assessment only. The department considered this limited the ability of results to be verified. Field surveys were recommended in the department's submission in order to identify any additional places or values of heritage significance such as the potential for a former coach and mail route to survive in the southern portions of the proposed project area. However, planned field surveys were interrupted by COVID-19 restrictions on travel.

The department agreed to the proponent's request to delay undertaking surveys until restrictions were lifted. The department also agreed to the proponent's commitment to undertake this work after submission of the amended EIS. A recommended condition is that the cultural heritage surveys are undertaken prior to the commencement of construction and the non-Indigenous Heritage Management Plan is submitted to the department for assessment and approval.

4.11.2 Conclusions and recommendations

The department determined that the EIS in conjunction with the amended EIS adequately addressed the TOR and submissions received on the EIS. An adequate assessment of the project's potential impacts on cultural heritage values and measures to minimise potential impacts on indigenous and non-Indigenous cultural heritage places was provided. The department supports the project's commitments in relation to cultural heritage matters and would require physical cultural heritage surveys to be undertaken prior to the commencement of construction.

Recommendations

- The Cultural Heritage Management Plan should be extended to cover all four MLAs of the proposed project and provided to the relevant department for assessment and approval prior to commencement of construction. The CHMP must make provision for managing the proposed project in a way that will avoid harm to Indigenous cultural heritage and to the extent that harm cannot reasonably be avoided, to minimise harm to Indigenous cultural heritage.

- Undertake a cultural heritage survey prior to commencement of construction by a suitably qualified cultural heritage surveyor through the implementation of the approved CHMP. Specific management measures must be recommended for any found cultural heritage items by the suitably qualified cultural heritage surveyor in a pre-disturbance survey report.
- A physical archaeological investigation of the proposed project area must be undertaken by suitably qualified personnel prior to commencement of construction. Findings of the field assessment will be incorporated into the non-Indigenous Heritage Management Plan to ensure relevant mitigation and management measures are in place to protect heritage.
- A non-Indigenous Heritage Management Plan must be developed in consultation with the Department of Environment and Science, as well as local history organisations and other relevant groups. This Plan will specifically address the results of the non-Indigenous Heritage assessment that is required to be undertaken prior to the commencement of construction. It must ensure the management of any non-Indigenous heritage places, landscapes and values are integrated into the proposed project's overall management.

4.12 Social

EIS Chapter 14 – Social and Appendix A7– Social Impact Assessment (SIA) of the EIS provided a detailed SIA for the project. The SIA described the potential social impacts (both positive and negative) of the proposed project and identified relevant impact mitigation and benefit enhancement measures.

The Coordinator-General required the SIA to address the requirements of the *Strong and Sustainable Resource Communities Act 2017* (SSRC Act) and the Coordinator-General's SIA Guideline (SIA Guideline) (DSDMIP, 2018) which outlines five key matters that must be addressed in the SIA:

- community and stakeholder engagement
- workforce management
- housing and accommodation
- local business and industry procurement
- health and community wellbeing.

The following social assessment does not report on all social matters identified in Chapter 14 of the EIS, rather it considers key social issues for the proposed project and identifies outstanding matters requiring further information and for which the Coordinator-General has stated conditions. The Coordinator-General completed a full evaluation of the proposed project's SIA under section 11 of the SSRC Act. It is available online at the DSDTI website.

4.12.1 Summary of key social issues and submissions

The SIA determined the proposed project is likely to have impacts and provide opportunities for the local community of Julia Creek (located approximately 16km west of the mine site main access) and the regional communities of Mount Isa, Cloncurry and Richmond. Employment and procurement opportunities are also likely to benefit the greater economic zone from Mount Isa to Townsville.

The proposed project would support local employment with the proponent committing to a recruitment strategy that would preferentially employ residents of Julia Creek for both the construction and operational phases of the project. The SIA identified the proposed project would contribute positively to population growth as up to 50 workers and their families would move to Julia Creek over the operational life of the project. The SIA also identified the proposed project presents opportunities for local, regional and Aboriginal and Torres Strait Islander businesses to benefit economically from increased procurement and trade generated by the proposed project.

A summary of the key social issues raised by submitters included:

- ongoing engagement and collaboration with stakeholders

- further information on the number of FIFO workers, where they would come from and how they would travel to work
- further information about the housing strategy for operational workers
- potential cumulative social impacts with the proposed CopperString project
- commitment to Aboriginal and Torres Strait Islander employment and business procurement targets
- potential road safety impacts and traffic disruption impacts on tourism
- further consultation with local service providers
- potential social impacts associated with the proposed OWSF

The proponent responded to the EIS submissions on social issues in the amended EIS.

4.12.2 Management measures

In the EIS, the proponent proposed suitable measures to avoid potential social impacts and enhance potential social benefits. These measures were collated in a draft social impact management plan (SIMP) as part of the SIA. The draft SIMP provides for the management of social impacts throughout the construction and operation of the project.

The Coordinator-General's proposed conditions to manage the potential social impacts of the proposed project are discussed below.

Housing strategy for new local workers

During the operational phase, the EIS confirms the proponent intends to integrate new local workers and their families who move to town (new locals) into the Julia Creek community using existing housing. The SIA investigated the number of unoccupied dwellings in Julia Creek and conservatively found that there could be enough unoccupied dwellings available to cater for 25 workers (30 per cent) and their families predicted to move to Julia Creek during the first five years of mining operations. The SIA did not confirm the habitability of the unoccupied dwellings and the true viability of unoccupied housing to accommodate the operational workforce remains unknown. Until a detailed assessment is completed, it is unknown whether the development of additional housing would be required to accommodate new locals.

The SIA acknowledged that there may be a need for the proponent to develop new housing in Julia Creek to ensure that new local workers and their families can be accommodated. However, the draft housing and accommodation plan proposed as part of the SIA did not confirm the proponent's commitment to invest in new housing development, particularly opportunities for the proponent to construct dwellings in McKinlay Shire Council's new residential subdivision in Julia Creek. McKinlay Shire Council's submission on the EIS noted the importance of collaboration with them to develop the housing strategy.

Aboriginal and Torres Strait Islander employment and business procurement targets

The Department of Aboriginal and Torres Strait Islander Partnerships (DATSIP) requested in their submission on the EIS that the proponent develop targets for Aboriginal and Torres Strait Islander employment and procurement. The Coordinator-General has stated a condition requiring the proponent to develop Aboriginal and Torres Strait Islander employment and procurement targets in consultation with DATSIP, noting an expectation that the proponent will use best endeavours to engage with other relevant Aboriginal and Torres Strait Islander stakeholders via measures such as public notification seeking input into the targets from the local and regional community.

Pressure on local social services in Julia Creek

Workers moving to Julia Creek with their families during the proposed project's operational phase may place increased pressure on local social services. Some services, such as childcare and the primary school, have additional capacity to support new enrolments but continued population growth may negatively impact the future capacity of these services without careful planning. The SIA considers that

an increase in new local workers during operations may also place increased pressure on existing local health care and emergency services within Julia Creek, particularly with respect to increasing wait times for existing residents.

4.12.3 Assessment and conclusions

The department has considered the evaluation of the SIA undertaken by the Coordinator-General and determined that the EIS adequately addressed the TOR by preparing an SIA that was consistent with the requirements of the SSRC Act and SIA Guideline (DSDMIP, 2018).

The effective implementation of the SIMP would address the potential negative social impacts identified in the SIA, such as impacts to local property values and housing accommodation affordability in Julia Creek, and enhance potential social benefits, such as Aboriginal and Torres Strait Islander employment and business procurement.

The Coordinator-General has stated conditions in Appendix 2 and listed the proponent commitments within the Coordinator-General's evaluation report to ensure that potential negative social impacts of the proposed project are avoided, minimised and/or mitigated, and social benefits are realised. The Coordinator-General requires that outstanding social matters are addressed by the proponent through the stated conditions prior to commencement of the project and that the proponent delivers on commitments made in the EIS.

4.12.4 Project approvals and recommended conditions

4.12.4.1 Nomination of the project's workforce

During the evaluation of an EIS for a resource project, the Coordinator-General is required to decide whether to nominate the project as a large resource project for which the 100 per cent FIFO prohibition (section 6 of the SSRC Act) and anti-discrimination provisions (section 8 of the SSRC Act and section 131C of the *Anti-Discrimination Act 1991*) also apply to the project's construction workforce.

A large resource project must have at least one nearby regional community for the SSRC Act provisions to apply to the project. A nearby regional community is defined by the SSRC Act as a town within a 125km radius of the main access to the project, with a population of more than 200 people. The Coordinator-General may however decide to include a town within a greater or lesser radius or with a population of less than 200 people.

Two towns, Julia Creek and Richmond, meet the definition of a nearby regional community for the proposed project under Schedule 1 of the SSRC Act. Julia Creek is located 16km from the main access to the project and has a population of approximately 400 people, while Richmond is located 124km from the project with a population of approximately 500 people.

On 27 July 2020, the Coordinator-General decided to nominate the proposed project as a large resource project for which the 100 per cent FIFO prohibition and anti-discrimination provisions of the SSRC Act apply to the proposed project's construction workforce.

In making this decision, the Coordinator-General considered the scale and duration of the proposed project's construction phase and the capacity of the local communities to provide workers for the proposed project's construction phase and determined that:

- the scale and duration of the proposed project's construction phases present significant employment opportunities for Julia Creek and Richmond residents. These towns have capacity to provide workers with relevant skills for the proposed project's construction phases
- given the proponent's strategy to accommodate non-local construction workers at the proposed workforce accommodation village, workers would be likely to utilise onsite services. As such accommodation and social services in Julia Creek and Richmond would not experience unsustainable demand from construction workers

- protecting locals in Julia Creek and Richmond from being discriminated against during recruitment for construction jobs at the project has the potential to reduce local unemployment rates and help offset population decline in the McKinlay and Richmond shires
- local employment opportunities offered by the proposed project would support regional Queensland's economic recovery following the COVID-19 pandemic.

Details of the proposed project and its nearby regional communities are published on the list of large resource projects on the DSDTI website.

4.13 Economic

An economic assessment for the project was provided in EIS Chapter 15 – Economic, and Appendix A8 – Economic Impact Assessment. A regional impact assessment and a cost-benefit analysis were undertaken to determine the economic benefits and impacts of the project.

Section 9.12 of the TOR required the EIS to identify the potential adverse and beneficial economic impacts of the proposed project on the local and regional area and the state; and to estimate the costs and benefits and economic impacts of the proposal using both regional impact analysis and cost-benefit analysis.

4.13.1 Assessment

The proponent is seeking to develop the proposed project in order to mine and process vanadium pentoxide (V_2O_5). The EIS estimated the MLA to contain an inferred, indicated and measured mineral resource of 493 Mt at 0.28 percent vanadium pentoxide. The maximum quantity of vanadium product over the 25 year LOM is 481,000 tonnes.

The EIS stated that vanadium is a valuable resource used in number of industrial applications, including high-strength steel alloy production, vanadium redox flow batteries (VRFB) and vanadium based compounds in new technologies. The benefits of the proposed project were stated to outweigh the costs with the project significantly assisting business, jobs and incomes in the regional catchment and Queensland.

In the EIS two assessment approaches were used to determine the economic benefits and costs of the proposed project: a computable general equilibrium (CGE) analysis and risk method for assessing regional impacts; and a cost-benefit analysis (CBA) to identify the costs and benefits of the proposed project.

The modelling inputs and assumptions for the CGE analysis are considered appropriate. It is noted that the base case economic growth assumptions used were prior to the COVID-19 pandemic and have not been updated. Major economic disruption has occurred as a result of the COVID-19 pandemic and economic growth prospects remain highly uncertain. The EIS stated that although this may impact the accuracy of modelled results in the near term it is expected that the modelling results would remain appropriate in the medium to longer term as the economy recovers.

The EIS presented a CBA using 'with project' and 'without project' scenarios to determine net benefits. The economic appraisal used Net Present Value (NPV) assuming a discount rate of seven percent and benefit-cost ratio as the primary decision criteria to determine whether the proposed project is deemed as desirable, neutral or undesirable.

Economic costs associated with the proposed project include an initial construction capital cost of developing the vanadium processing infrastructure of $400 million and an additional $250 million for expansion up to the 20,000t/year capacity. Operating costs are estimated to average approximately $200 million/year during peak production. Progressive rehabilitation is costed at approximately 1% of annual operating costs over the LOM.

The only stakeholder group identified as subject to negative economic impacts is the local graziers who would forego income from grazing on the project site. The loss of 8882ha of agricultural land from the development of MLA100162 was costed at $343,400 based on Australian Agricultural Census data. No

assessment of the loss of the OWSF and associated infrastructure was presented in the EIS. Undertaking progressive rehabilitation of the land over the 30 year mine life with the objective of returning it to a grazing land use was stated to mitigate this impact. The directly-affected landholders of Saint Elmo Station and Lindfield Station would be subject to compensation agreements with the proponent.

The EIS estimated the loss of ecosystem value for grass/rangelands on MLA100162 at approximately $37 million. The cost of GHG emissions was calculated to be approximately $100 million at peak production over the LOM.

Economic modelling appropriately incorporated the broader economic catchment to include economic impacts on the transport route, supply chain and service centres from Mount Isa to Townsville. The study area catchment includes the local government areas of Mount Isa, Cloncurry, McKinlay, Richmond, Flinders, Charters Towers and Townsville.

The CBA provided an impact assessment at the State of Queensland level, not specifically at the regional economy level. The CBA assessment estimated that the NPV of the proposed project to the Queensland economy would be $1.92 billion. This equates to a benefit-cost ratio of 1.66 or a return of $1.66 for every $1 of investment. The estimated average annual revenue from operations for the proponent is approximately $400 million.

Modelled impacts of the proposed project on gross regional product (GRP) and gross state product (GSP) presented in the EIS indicated significant economic benefits for the regional catchment and the Queensland economy. Catchment benefits are estimated at $212 million additional GRP/year on average during the first two years of ramp up and construction and an additional $252.7 million/year on average during steady state production in the operational phase. Queensland-wide benefits are estimated at $230.9 million additional GSP/year on average during ramp up and construction and an additional $306.7 million/year on average during steady state production.

The EIS stated the proposed project would generate important direct and flow-on employment opportunities for the regional catchment. A submission from MITEZ, the peak regional development organisation for the region, recognised the flow-on effects for local businesses through a proposed Buy Local Plan that is expected to contribute to business sustainability and growth, indirect employment and regional economic development.

The EIS states 15–25% of the operational workforce would be recruited from the vicinity of Julia Creek; 30% from Mount Isa, Cloncurry and Richmond; and 25–30% from Hughenden through to Townsville. A FIFO workforce of 25% is estimated to be sourced from the rest of Queensland. Mining industry occupations anticipated to be most in demand include machinery operators and drivers, technicians and trades workers.

The EIS estimated an additional catchment workforce of 140 full-time equivalents (FTE) per year during the first two years of ramp up and construction generating $21.8 million in additional income; and an additional 145 FTEs per year on average during steady state production generating $29 million in additional income.

The EIS stated additional employment for Queensland is estimated to be 229 FTEs per year during the first two years of ramp up and construction generating $46.5 million in additional income; and an additional 252 FTEs per year on average during steady state production generating $66 million in additional income.

According to the EIS sufficient housing for workforce accommodation is available in Julia Creek for the first five years of operations. A predicted shortage after this timeframe and consequential increased demand for housing is anticipated to increase housing prices. This is anticipated to result in construction of a workforce accommodation village within Julia Creek to house non-local construction workers. The housing strategy for new local workers is discussed in section 4.12.2.

The EIS predicted benefits to businesses would include increased demand in the mining supply chain with flow-on benefits to electricity and water, trade and business services in the catchment; increased demand for the Port of Townsville with the 20,000t/year export of V_2O_5 product as well as the transport

sector for transporting V_2O_5 product; and meeting the long-term energy needs of Queensland by developing efficient and cost-effective long-term storage capability in the form of VRFB technology.

The EIS estimated that if all V_2O_5 product is exported it would contribute $253 million on average per year to Queensland's exports and associated balance of payments. Furthermore, the EIS asserts that there may be future potential for domestic use of V_2O_5 in the production of VRFBs. Townsville City Council's submission noted that the proposed Lansdown Industrial Precinct would be a suitable location for processing vanadium and manufacturing vanadium batteries.

The EIS estimated government revenues for direct and flow-on activities associated with the proposed project using the 20,000t/year production scenario. The Australian Government is estimated to receive approximately $1,420 million in taxes and the Queensland Government would receive both payroll tax and royalties totalling approximately $379.4 million over the life of the project.

No projection was made about the future prospects of the vanadium production industry if competitors enter the Australian and global markets. Volatile prices on the international market may continue to be dependent on international economic and industrial policy. International renewable energy commitments may lead to an increase in demand for the commodity. Assumed average annual V_2O_5 prices were stated to fall from current highs to a long-term average price of US$7.00/lb from 2030.

4.13.2 Conclusions and recommendations

In general, the EIS has provided an adequate assessment of economic impacts raised in the TOR. The EIS stated that the proposed project would significantly contribute to the regional and Queensland economy, provide economic benefits and opportunities for direct and flow-on employment and export trade to Queensland and Australia. Economic benefits and impacts were determined using both a CBA and a regional impact assessment in accordance with the TOR.

The proposed project's construction phase would contribute directly to the local Queensland and Australian economies through the purchase of equipment, goods and services. The operational phase would bring positive flow-on effects to the local and regional economy.

Local residents, including those in Julia Creek, Cloncurry, Richmond and Mount Isa, would have access to employment opportunities based on availability and suitability. The remainder of the workforce would be sourced from Townsville and the rest of Queensland. The proponent would employ a full-time workforce of approximately 200 positions in the construction phase and a peak operational workforce of approximately 250.

In accordance with Queensland legislation the proponent would pay mineral royalties to the Queensland Government for the right to mine the State's resources. Project royalties of approximately $325 million are expected to be paid over the life of the project. The CBA assessment estimated that the NPV of the proposed project to the Queensland economy would be $1.92 billion.

The proposed project is seeking to take advantage of a supply gap in the use of vanadium in high-strength steel production, emerging new technologies, and in the potential growth in renewable energy demand for VRFB technology.

4.14 Transport

A transport assessment for the project was provided in EIS Chapter 16 – Transport, and Appendix A25 – Traffic Impact Assessment.

Section 9.12 of the TOR required that the EIS was to conduct the impact assessment in accordance with the department's *EIS information guideline –Transport*, undertake a road impact assessment in accordance with DTMR guidelines, and discuss how identified impacts will be mitigated for each transport mode.

4.14.1 Assessment

The EIS assessed the project's proposed methods to transport site personnel, materials, products and wastes to and from the project site. The proposed project area is remote from major population centres,

but is easily accessible by both road and rail with both the Flinders Highway and the Mount Isa Line adjacent to the southern boundary of MLA100162.

Various modes of transport for site personnel were discussed including air flights from regional centres or via bus or private vehicle from within a one hour commute of the project area. The project is estimated to comprise 75% drive-in-drive-out (DIDO) that includes bus-in-bus-out, and 25% fly-in-fly-out (FIFO).

The project proposes to use the existing state controlled road (the Flinders Highway) for worker transport and heavy vehicle movements for general service requirements to Townsville. The peak traffic scenario for the operational phase estimates an additional 134 vehicles entering and exiting the proposed project site in a 24 hour period. A pavement impact assessment stated that the traffic impacts are currently within permitted thresholds. However, if haulage tasks are reallocated from the proposed rail option to a road option this assessment would require amendment.

Local roads would be used for construction of the OWSF and associated pipeline and for operational access. Traffic generation on the Flinders Highway, Punchbowl Road and Old Nelia Road is not expected to have a significant impact on the existing road network. In the construction phase of approximately 18 months it is estimated that the project area would be serviced by a total of 1105 vehicles with an average of up to three truck deliveries per day.

A safety assessment identified some aspects of the project presenting as medium risks. Proposed mitigation measures including implementation of a Traffic Management Plan; a road safety assessment of local roads in Julia Creek; and a road safety audit of the Flinders Highway conducted by an independent auditor. As long as the road safety assessments are properly integrated into the Traffic Management Plan, this assessment considers that safety matters will be adequately managed. The transport of hazardous and dangerous goods, including mine processing reagents such as sulphuric acid and large volumes of diesel fuel, was identified as increasing the potential risk should there be spills and contaminated runoff from vehicles.

The EIS stated that flood impacts may close the local and regional road network or rail for up to several days at a time due to blockages or road wash out. The Department of Transport and Main Roads (DTMR) requested details on what contingencies would be made when rail and/or road transport is not available due to impacts from wet weather events and especially prolonged flooding. The amended EIS stated that risk management and contingency plans are proposed to be implemented within a Health and Safety Management Plan. DTMR considered that this response was not adequate as the response had not discussed alternative transport options should the rail line not be operational (e.g. due to flooding), or the impact of and mitigation strategies for those alternative transport options.

The nearest regional airport is Cloncurry, a two hour drive west of the project area. Further west is Mount Isa, a three hour drive from the proposed project. The Traffic Impact Assessment (TIA) modelled that all FIFO workers would use Mount Isa Airport. DTMR in its submission raised the viability of using Cloncurry Airport as the principal FIFO airport for the proposed project. The amended EIS highlighted that Mt Isa Airport is the main airport in the region with regular flights and hence has been used in the worst case scenario analysis to inform the TIA. The use of Cloncurry Airport would be considered and used for the workforce based on residential location of the FIFO workforce and shift rosters. The proponent proposes to bus all workers to the project site from Mount Isa and Cloncurry.

Rail option

The existing rail network was proposed to transport all chemical reagents, liquid fuels including gas and diesel fuel to the mine site, and transport the vanadium pentoxide product from the project site and approximately 667km to the Port of Townsville. Rail infrastructure to the project MIA would require construction of a new rail level crossing and a 7.3km rail spur from the existing Mount Isa Line. The EIS acknowledged that the rail transport proposal is still in the preliminary planning phase. No detailed design of the proposed at grade crossing or associated safety management measures were provided in the EIS. Additionally, no assessment of the proposal using the Australian Level Crossing Assessment Model was provided.

DTMR advised in its review of the amended EIS in June 2020 that the proposal to construct a new at

grade rail level crossing across the Flinders Highway does not meet strategic objectives or the intent of the *Queensland Level Crossing Safety Strategy 2012-2021* (DTMR 2012) which is to avoid adding any further at grade level crossings to the current network. In addition, the *State Development Assessment Provision Code 2 – Development in a rail environment* (DSDMIP 2019), only allows for new railway crossings to be grade separated.

DTMR recommended that the proponent provide an alternative transport option to that proposed in the EIS. These options could include the haulage of materials from Townsville to the project site via road only or via rail (using a new or existing rail siding) and then road.

DTMR further recommended that the proponent provide a revised TIA (and associated Road Safety Audit and Road Use Management Plan) to DTMR for assessment and approval in accordance with the requirements of the *Guide to Traffic Impact Assessment* (DTMR 2018).

Any proposed new transport options would require McKinlay Shire Council and local community consultation.

4.14.2 Conclusions and recommendations

The TIA considered all phases of the proposed project and concluded that the level of traffic generated by the project would not be expected to have a significant impact on the local, state or national road network. The EIS states that workforce traffic impacts are projected to be negligible due to roster and shift patterns combined with bus transport to and from the proposed project site. A Road Management Plan would be finalised prior to project commencement to manage all project vehicles travelling to and from the site.

All of the project's materials required for construction and transport of the vanadium pentoxide to the Port of Townsville would need to be delivered either by road or rail. With the decision by DTMR not to approve a new rail level crossing across the Flinders Highway to the proposed mine site, the rail transportation of hazardous substances directly on to the mine site via a rail spur will not occur. Alternative transport options will require further detailed assessment, including the safe transport of hazardous and dangerous goods on state controlled and local roads.

DTMR and the proponent have agreed to engage in post-EIS assessment of an alternative transport option. DTMR has requested the proponent provide a revised TIA and associated Road Safety Audit and Road Use Management Plan for assessment. DTMR also advised that the proponent may need to enter into a formal Infrastructure Agreement with DTMR and McKinlay Shire Council. Community consultation on proposed transport options is strongly recommended.

DTMR recommendations are provided in Appendix 6.

4.15 MNES

EIS documents used to assess matters of national environmental significance (MNES) included the 2019 EIS Chapter 17 – Matters of national environmental significance, and Appendices A1 Voluntary Ecological Enhancement Program (VEEP) and A25 Terrestrial ecology. The 2020 amended EIS submitted by the proponent in response to EIS submissions amended Chapter 17 and included the Appendix A1 Offset Strategy (replacing the former VEEP).

This section assesses the potential impacts of the proposed project on MNES protected under the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act). The department and DAWE have considered the information provided in the EIS and other relevant information to assess the likelihood of occurrence of threatened species and communities and potential impacts on MNES.

The assessment and recommendations in this Assessment Report have been made by the department in accordance with the bilateral agreement. DAWE will consider these recommendations and decide on the acceptability of identified and potential impacts on MNES, and the conditions that might apply to an approval under the EPBC Act 1999.

4.15.1 EPBC referral

On 9 August 2017 the proponent referred the project under the EPBC Act to the Commonwealth Minister for the former Department of Environment and Energy (DEE) for the mining activities on MLA100162.

On 6 September 2017 the project was determined to be a controlled action requiring assessment and approval under the EPBC Act. The Minister determined that the proposed action was likely to have a significant impact on one controlling provision:

- sections 18 and 18A (listed threatened species and communities).

The MNES appendix in the TOR stated that the proposed project would likely have a significant impact because the action would involve clearing of vegetation which may provide suitable habitat for listed threatened species including but not limited to the:

- Star Finch (eastern sub-species, *Neochmia ruficauda ruficauda*), listed as endangered, and;
- Julia Creek dunnart (*Sminthopsis douglasi*), listed as vulnerable.

On 6 December 2019 the proponent requested a variation to the referral to include additional areas relating to the OWSF and associated infrastructure in the controlled action. On 7 January 2020 DAWE made a decision to accept the variation to the original proposal.

4.15.2 Listed threatened species and communities

In assessing the project for the purposes of sections 18 and 18A of the EPBC Act, it is noted that the Commonwealth Minister for the Environment must not act inconsistently with Australia's obligations under a recovery plan or threat abatement plan (TAP).

The Minister must also, in deciding whether to approve the taking of the action, have regard to any approved conservation advice for the threatened species or ecological community that are likely to be or would be significantly impacted by the project.

This section assesses the project against the objectives and priority actions of conservation advices, recovery plans and TAPs for the relevant threatened species and communities. The significant impacts of the project on threatened fauna and threatened ecological communities (TEC) are also considered in this section.

4.15.3 Existing environmental values (MNES) identified in the EIS

The following section is a summary of the predicted occurrence of MNES relevant to the project based on database searches, field surveys and habitat assessments documented in the EIS.

4.15.3.1 Threatened ecological communities

The PMST indicated that no TECs occur in the project area and this was confirmed from field surveys. The closest mapped TEC 'likely to occur' is '*The community of native species dependent on natural discharge of groundwater from the Great Artesian Basin*', one is approximately 8km south-west of the site, and another is 15km north-west of the site.

4.15.3.2 Terrestrial Flora

No threatened flora species listed under the EPBC Act were found within the project area during the March and July 2017 field surveys. No records of MNES plant species were identified within a 50km buffer of the OWSF using the PMST.

4.15.3.3 Terrestrial Fauna

12 listed threatened species that are classified as endangered or vulnerable were predicted to occur within the project area based on database searches from Wildlife Online, ALA and the EPBC Protected Matters Report. Using results of field surveys and habitat suitability assessments, the EIS undertook a likelihood of occurrence assessment of the twelve threatened terrestrial vertebrate species for the project site. The yellow chat, *Epthianura crocea* is not listed under the EPBC Act and is not considered further in

this assessment.

Birds

- curlew sandpiper (*Calidris ferruginea*) – critically endangered
- Star Finch (*Neochmia ruficauda*) – critically endangered
- Australian painted snipe (*Rostratula australis*) – endangered
- Gouldian finch (*Erythrura gouldiae*) – endangered
- masked owl (northern) (*Tyto novaehollandiae kimberlii*) –vulnerable
- painted honeyeater (Grantiella picta) – vulnerable
- red goshawk (*Erythrotriorchis radiatus*) – vulnerable

Mammals

- Julia Creek dunnart (*Sminthopsis douglasi*) – vulnerable
- greater bilby (*Macrotis lagostis*) – endangered
- ghost bat (*Macroderma gigas*) – vulnerable

Reptiles

- plains death adder (*Acanthophis hawkei*) – vulnerable

No threatened terrestrial fauna species were recorded during field surveys. The Julia Creek dunnart, Australian painted snipe and curlew sandpiper, were considered to possibly occur within the project area on MLA100162. For the OWSF and associated infrastructure the Julia Creek dunnart was considered to possibly occur but the Australian painted snipe and curlew sandpiper were considered unlikely.

4.15.3.4 Aquatic fauna

No aquatic field surveys were conducted for the EIS. A desktop assessment was performed only.

The department notes that there are no records of MNES aquatic fauna near the project area. Only three threatened aquatic species listed under the EPBC Act have been recorded from the Flinders River Basin. The freshwater sawfish, *Pristis pristis*, and the saltwater crocodile, *Crocodylus porosus*, both listed as vulnerable and migratory species, have been recorded approximately 300km downstream. The freshwater crocodile, *Crocodylus johnstoni*, listed as marine, has been recorded approximately 80km downstream.

4.15.3.5 Conclusion on description of values

The department considers that the MNES in the project area have been adequately identified and described in the EIS. The EIS concluded that species that were unlikely to occur or had the potential to occur in the project site were not considered to be at risk of impacts from the project and were therefore not subject to impact assessment.

4.15.4 Potential impacts on MNES

The process of impact assessment used in the EIS was to initially establish likelihood of occurrence of threatened species based on desktop analysis, location of records and whether suitable habitat exists on site.

The following assessment includes fauna species that the department considers are likely to occur in the project area due to the presence of suitable habitat, modelled species habitat or nearby records. The department agrees with the EIS assessment that some threatened species are not expected to occur or unlikely to occur and these are not discussed further.

4.15.4.1 Threatened ecological communities

The department is satisfied that the project is unlikely to affect listed threatened ecological communities.

4.15.4.2 Threatened flora

The department is satisfied that the project is unlikely to affect listed threatened flora species. However, the EIS states that pre-clearing surveys will be undertaken to identify any listed flora species. The department supports this approach and recommends that the approval contain a condition that requires pre-clearing surveys at each stage of mine development.

4.15.4.3 Terrestrial fauna

The project will result in progressive clearing of 7419ha of Mitchell grasslands. The department considers that the grasslands and deep cracking clay soils on which they persist are likely to contain breeding and foraging resources for the threatened Julia Creek dunnart. The department considers that habitat is present in and around the project site for the Julia Creek dunnart.

The EIS concluded that the project will result in a significant residual impact to the Julia Creek dunnart. The EIS states that the aim of successful rehabilitation will be to improve the existing degraded habitat on the project site. This is mainly related to the removal of the invasive weed prickly acacia. The Julia Creek dunnart is discussed in section 4.16.4.4.

Five listed threatened bird species that are migratory were recorded in the project area. The department considers that there will be loss of existing artificial water storages in the construction clearing phase. These losses would likely be temporary until water is pumped to the mine site from the Flinders River to the new 61ha water storage dam. The potential impact to the five migratory bird species is not considered to be significant due to existing inland water storages throughout the wider region.

4.15.4.4 Julia Creek dunnart (Sminthopsis douglasi)

EPBC Act Listing Status: Vulnerable

Distribution and population

The Julia Creek dunnart occurs in the Mitchell grasslands of north-west Queensland in the Mitchell Grass Downs, Gulf Plains and Desert Uplands bioregions (Kutt, 2003). It has been recorded from at least 25 locations. There are two Atlas of Living Australia (ALA) records within three kilometres of the project area, both located on Garomna Station to the south.

The species has low abundance and a patchy occurrence. It has not been subject to comprehensive survey effort within its range. Its rarity and likely decline are presumed to be linked to the impacts of feral predators, invasive weeds, pastoralism and changes in land management (Kutt, 2003).

The EIS stated that an important population had not been identified for the project site and based the significant impact assessment on the assumption that even if the species occurs on the project site, it would not be an important population. However, the *National recovery plan for the Julia Creek dunnart (*Sminthopsis douglasi*) (2009)* (Recovery Plan) states in relation to important populations that to ensure the long-term persistence of this species in the wild, conserving all known populations is important. Given the Recovery Plan indicates that all populations are important, the Department considers that if the species occurs on the project site it is an important population.

Habitat

The species is found in treeless or sparsely treed *Astrebla* spp. tussock grasslands on cracking clay soils. Soil structure and its cracking behaviour is an important micro-habitat feature associated with the species' presence (Kutt, 2003).

Radio-tracking studies by Woolley (2017) indicate that the species may be nomadic finding a place to shelter at the end of their nocturnal foraging activities in any nearby crack or hole. Often the depth below the surface of sheltering dunnarts was only 10–50cm. Home range varied between approximately 140m^2

to 3900m^2. Other longer-term trapping studies show home range variance between 0.5ha to 8ha (Mifsud 1999 in Woolley 2017).

The EIS stated that habitat degradation due to livestock grazing, feral predators and exotic weeds limits the potential suitability of the area for the species. However, it is noted that these major threats to biodiversity also exist at all of the primary known sites for the species.

Surveys

The species was not recorded during EIS surveys. Surveys were carried out for the species based on the Survey guidelines for mammals (Commonwealth government, 2011). The EIS recognised that not all recommended survey methods were used due to the large project area and that survey effort (i.e. trap nights) was less than recommended. The EIS contended that the recommended survey effort would lead to an unrealistic number of individual trap nights.

Submission comments from the department and DAWE considered that there were limitations in the survey techniques employed. For instance, the species depends on significant microhabitats within a range of REs. Suitable microhabitat patches are considered to be smaller than the RE patch scale. The scale of site selection is therefore an important consideration in targeting survey effort into sites more likely to support the species. There is no evidence in the EIS that such fine scale targeting has occurred. Survey best practice is an important consideration in supporting the conclusions drawn in the MNES chapter.

The survey effort used general small mammal survey techniques and did not employ other survey techniques that have been used in determining the presence of the species. These include indirect methods such as analysis of owl pellets, predator scats and stomach contents (Woolley, 2010). These are productive techniques for this species with the species recorded in Barn owl, *Tyto alba*, pellets in a majority of sites surveyed over 8–9 years (Woolley, 2010). By contrast, traditional small mammal trapping surveys even in areas with known species populations return low captures per unit effort even in good seasons.

Survey season is important with targeted species research having shown that trapping success has been significantly better in April than November (Woolley, 2015; Woolley, 2017). The condition of field caught animals is best between the months of April and August that follows wet season rains and this period is thought to coincide with an increase in insect numbers (Woolley, 2015). It is noted for the project that only one targeted survey for the species has been undertaken in March.

Impacts of the proposed action

1. The main impact of the project would be clearing of 7419ha of Mitchell grass downs vegetation, which is potential foraging habitat and breeding habitat for the Julia Creek dunnart.
2. Loss of habitat from clearing can lead to injury or mortality of wildlife; modification of habitat can reduce the amount of prey habitat and displace species.
3. Altered fire regimes, from increasing development of remnant areas are known to lead to ecological impacts. The impact from altered fire regimes was considered by the EIS to be negligible but no justification for this conclusion was provided. Information from the Recovery Plan states that the alteration to fire regimes may result in reductions in species local population size and viability.
4. The proposed rehabilitation of Mitchell grass, grass species selection, sub-soil cracking habitat functionality and surface water regime are not known. The post-mined land use is to return the land to grazing purposes. It is considered unlikely that the rehabilitated land will provide suitable habitat features for the species in the short-term.

Mitigation of impacts

<u>Land clearing</u>

- Clearing areas would be delineated so operators avoid disturbance of adjacent areas

- A Significant Species Management Plan (SSMP) would be written and implemented before clearing for management of threatened species. This should ensure that targeted pre-clearing surveys for the species are undertaken prior to clearing
- Pre-clearing surveys would be conducted using a qualified spotter catcher. Capture and translocation protocols would be detailed in the SMP
- Appropriate speed limits would be in place to limit potential impacts with wildlife; education of employees/contractors to identify wildlife.

Site rehabilitation

The 2019 EIS contended that the mining and rehabilitation of the project area would likely result in an improvement in the quality of the habitat that could be available for the species. This conclusion was based on the assumption that the removal of current threatening processes such as prickly acacia and feral cats would improve the existing habitat. Weed and pest control measures were committed to but no detail on these measures was provided for review such as the CEMP, OEMP or Weed Management Plan.

In a submission comment DAWE requested more information on the likelihood of rehabilitation providing suitable habitat features for the species (including restoration of existing hydrology and soil cracking characteristics). DAWE also sought contingency measures should the rehabilitation be unsuccessful. The proponent did not address the rehabilitation of suitable Julia Creek dunnart habitat in the amended EIS. The amended EIS also did not provide any results from undertaking rehabilitation trials on the site. Instead, the amended EIS stated that the rehabilitation objectives were now to return the site to a grazing land use. This indicates that the removal of the species habitat will likely be permanent.

Assessment

The *Approved Conservation Advice for Sminthopsis douglasi (Julia Creek dunnart)* (Threatened Species Scientific Committee, 2016) lists predation by cats and foxes, habitat degradation from livestock and feral animals, habitat change due to weed invasion, and the interactive effects of fire and predators as the primary threats to the species ongoing population decline.

The *Survey guidelines for Australia's threatened mammals* (Commonwealth of Australia, 2011) provide a range of survey methods for locating the Julia Creek dunnart. Not all survey methods were employed such as the use of hair sampling devices. It is considered that a higher trapping effort combined with additional survey techniques such as predator scat analysis was warranted. It is also considered that the survey effort has not been sufficiently targeted and hence is not suitable to guide decision-making in relation to the likelihood of occurrence for this species within the project area.

The EIS provides a significant impact assessment that focusses on the presence of an 'important population' as defined in the Recovery Plan. The EIS states there is no evidence of a population of the species in the project area. The department disagrees with these conclusions and considers that regardless of the number of individuals caught during surveys or the presence or absence of an 'important' population, suitable habitat for the species is present in the project area.

It is noted that the major floods of March 2019 in the Julia Creek region did not inundate the Mitchell grass habitat across the higher areas of the site that correspond to the St Elmo Anticline. The potential for this area to act as a local refugia for the species was not discussed. However, it is known that dryland-dwelling fauna with irruptive population dynamics can contract to refuges following rain events (Pavey et al, 2017). The bust phase of their population cycle may not occur until after time lags of several months to a year. It is not known whether the species relies on refuges or what usage pattern it may employ.

The department notes that potential Julia Creek dunnart habitat in the project area is already subject to multiple environmental threats including grazing, prickly acacia invasion and feral animals. More extreme climatic events related to climate change such as bushfire, drought and flooding are likely to contribute additional threats to the species' persistence. The additional direct impact of clearing habitat due to mining is considered likely to lead to direct mortality of any Julia Creek dunnarts on site.

The EIS provides an assessment of project impacts against the EPBC significant impact criteria. Under eight of the nine criteria it concludes that the project is unlikely to significantly impact the species. It states that a significant residual impact will occur to the species from one criteria: 'modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline'. It is concluded that an offset will be required under the EPBC Act.

Conclusion

The species was not found during EIS surveys. However, the species is considered likely to be present as:

- there was insufficient survey effort to conclude absence
- the site is within the known range for the species
- there are nearby records; and
- suitable habitat exists on site.

Records of the species exist in the wider region and the nearest record is approximately three kilometres from the project site. The site is within the species distribution mapping in the SPRAT database and the department's habitat suitability modelling.

It is recognised from the literature that the patchy distribution and low population of this vulnerable species over a large region requires an extensive trapping effort, making field surveys time consuming and expensive. Degradation of habitat due to grazing and prickly acacia infestation is recognised but it is considered that this applies equally to the wider landscape and to the primary known sites for the species.

The department considers that there is a high likelihood that the Mitchell grass community subject to clearing would contain suitable shelter, breeding and foraging resources for the species. This is based on departmental habitat suitability mapping; existing records; expert opinion; and assessment of material provided in the EIS.

The department agrees with the proponent's conclusion that a significant residual impact will occur to the species as a result of the action. The department recommends that an offset is provided for a maximum clearing limit of 7419ha to compensate for the loss of this habitat. Recognising that clearing of 7419ha of Mitchell grassland will be a permanent loss of habitat will require that an offset be in place for the duration of the impact. Staged offsets aligning with proposed staged clearing will be considered for any condition of approval. The Offset Strategy is considered in more detail in section 4.16.6.4.

4.15.4.5 Star Finch (eastern subspecies, Neochmia ruficauda ruficauda)

EPBC Act Listing Status: Endangered

Distribution and population

In Queensland, the Star Finch occurs as far north as Bowen, south to Wowan near Rockhampton, and west to beyond Winton (DEWHA, 2008). The nearest record to the site is Cloncurry, approximately 140km west, dating from 1976. There are no recent records of the nominate species within 200km of the site.

The population and distribution of the species has rapidly declined over the last century and the decline is suspected to be ongoing (DotE, 2020).

Habitat

The species habitat includes damp grasslands, sedgelands or grassy woodlands near permanent water or areas of regular inundation. The grassland community of RE 4.9.1c/4.9.2b was considered the most suitable foraging habitat type on site. A small area of potentially suitable habitat mapped as RE 4.3.4f with *Eucalyptus coolabah* exists on the fringes of Horse Creek. The EIS described the site as heavily degraded with few Coolabah trees and provided representative photos.

Assessment

DAWE identified the species in the TOR as likely to be subject to a significant impact from the proposed action.

Surveys

The EIS survey methods used for the species included the recommended transect surveys on foot; call playback (broadcast) and; waterhole watching based on the EPBC Act guidelines (DEWHA, 2010).

The department provided advice prior to planned surveys to improve the proposed survey effort. This advice required targeted surveys of RE 4.9.1c/ 4.9.2b which includes the grasses *Panicum*, *Chrysopogon* and *Sorghum*, known food sources for the species, which may be food sources required for the continued survival of finches in the local area. As finches are known to move several kilometres to locate and access a food or water source, a wider survey area was recommended that included suitable habitat areas adjacent to the project area. One survey transect of the ten was subsequently undertaken adjacent to the mine site.

Surveys were conducted in early April 2018, a period that coincided with recent heavy rainfall and was considered suitable for post-wet season grass growth.

No targeted surveys for the species were conducted in the OWSF or associated pipeline area. Subsequent fauna surveys for the OWSF and associated pipeline including bird surveys were conducted in November 2019 and March 2020.

Although suitable foraging habitat is present on site, the species was considered unlikely to be present. As the species was not detected in studies for the Project or for the OWSF, the EIS concluded that the project would not impact on the species and therefore no avoidance, mitigation measures or offsets were proposed.

Conclusion

The department is satisfied that the project site where clearing would occur is not likely to contain important habitat for the species. It is noted that surveys found no evidence of the species and it is not expected that the species is present on the site or in the local area. It is also noted that there are no recent records of the nominate species close to the site and that ongoing population decline has led to local extinctions (DotE, 2020).

The department accepts the EIS conclusion that there is unlikely to be a potential significant impact on the Star Finch as a result of the project. However, it is noted that broadly suitable habitat along the Flinders River and Alick Creek would be subject to minor, short-term impacts. A condition is recommended that any future sightings of the Star Finch in the project area lead to an impact assessment.

4.15.4.6 Threatened bird species

There are several sites in the project area that contain habitat for threatened birds that are also migratory, including the large artificial water bodies ‘dam 1’ and ‘dam 2’ in the centre of the project area, the Flinders River, Alick Creek and portions of Horse Creek.

The Australian painted snipe, *Rostratula australis*, (endangered) and the curlew sandpiper, *Calidris ferruginea*, (critically endangered) were considered to use the project area sporadically, if at all. The species was not recorded during EIS surveys. The likelihood of occurrence was considered possible but the potential impact to the species from the clearing of habitat was considered negligible.

The EIS concluded that the project is unlikely to have a significant residual impact on the Australian painted snipe and curlew sandpiper and no offsets were proposed. No mitigation measures are proposed for migratory species as impacts are expected to be absent or minor.

The department accepts the EIS conclusion that there is no evidence of a significant impact to the Australian painted snipe and curlew sandpiper as a result of the project. It is recognised that a new water storage area of 61ha will be constructed prior to mining. The main existing waterbody will not be cleared

until year 10 and 11 of the proposed mine schedule leading to the loss of some potential foraging habitat.

4.15.4.7 Aquatic fauna

The EIS stated that the harvesting of flood water in the wet season from the Flinders River would not significantly reduce flows or significantly impact on downstream aquatic ecosystems. It is noted that the water allocation provided by DNRME will detail the required flow scenarios before water can be harvested from the Flinders River and diverted to the OWSF.

4.15.5 Cumulative impacts

In considering cumulative impacts, the MNES section identified a range of mining developments in the region. It is noted that there are only six mining operations within 200km of the project. The nearest operating mine, Eloise Copper Mine, is located approximately 100km south-west of the project.

Current mineral EPMs were not considered in the cumulative impact assessment due to the early stage of these developments. DNRME data indicates that EPMs occur over approximately 300,000ha or 30% of the total land within a 50km buffer of the project. These mineral EPMs are predominately located in Mitchell grass communities, areas that are also mapped as suitable habitat for the Julia Creek dunnart.

It is unknown how resilient this vegetation community is to cumulative impacts. The EIS noted that the Mitchell grass communities have shown little to no resilience to the invasion by prickly acacia. The EIS considers that the removal of prickly acacia on the project area due to mining activities and the subsequent rehabilitation of that land may create suitable habitat for Julia Creek dunnart. No evidence was provided to substantiate that claim.

The long-term, cumulative impact of mining on this vegetation type, and habitat for several threatened species, is likely significant if mining projects are progressed. The potential cumulative impact of the future development of these mines emphasises the need for considering offsets for each project.

4.15.6 Conclusion and recommendations

This report provides assessments for species that the department considered were likely to occur in the project area due to both the presence of suitable habitat and the proximity of nearby records. All recovery plans, threat abatement plans and approved conservation advices relevant to these species were considered in the assessment process.

4.15.6.1 Terrestrial flora

The EIS concluded that the project would not impact on EPBC Act threatened flora because most listed flora species have a low likelihood of occurrence in the project area that would be disturbed.

The department is satisfied that the project is unlikely to have unacceptable impacts on listed threatened flora species. Nevertheless, as committed to in the EIS, the department recommends that pre-clearing surveys should be carried out at each stage of mine and infrastructure development to identify and manage threatened species that may be present in the clearing footprint.

The department further recommends that the proponent be required to provide an offset if residual significant impacts to listed threatened flora species are determined likely to occur.

4.15.6.2 Terrestrial fauna

The EIS provides significant impact assessments for the two threatened fauna species listed in Appendix 3 of the TOR that were considered likely to occur in the project area. Based on the impact assessments, the EIS concluded that the project would be unlikely to impact on the Star Finch and likely to impact on the Julia Creek dunnart.

The department agrees with the conclusion of no significant residual impact to the Star Finch. The department also agrees with the conclusion that the project would impact the Julia Creek dunnart. It is considered that the areas to be cleared for the project contain suitable breeding and foraging habitat for the species.

The department recommends the following conditions of approval regarding the Julia Creek dunnart:

- undertake pre-clearance surveys consistent with relevant guidelines prior to clearing
- submit an offset strategy consistent with the EPBC Act EOP for significant residual impacts
- develop a SSMP for the Julia Creek dunnart.

A species management program under the Queensland NC Act would be required for interfering with the breeding place of any species in the project area. The development of the significant species management plan must be in accordance with both the EPBC Act and the NC Act.

4.15.6.3 Aquatic species

No threatened aquatic fauna have been recorded from the vicinity of the OWSF water diversion. The department is satisfied that the project is unlikely to have unacceptable impacts on listed aquatic species.

4.15.6.4 EPBC offset requirements

The department considers that the clearing of Mitchell grass vegetation and disturbing the associated deep cracking soils in the mine footprint, OWSF and associated pipeline would result in a significant residual impact on the Julia Creek dunnart. This extensive proposed clearing of approximately 7419ha of remnant vegetation has the potential to remove foraging and breeding habitat for the species or their prey, or both.

The 2019 EIS concluded that there would be no significant residual impact to the species from the project and no offsets for the controlling provisions were proposed. Instead, a VEEP was provided with the purpose of improving the conservation outcome for the species and its habitat.

Submission comments from the department and DAWE advised that they considered a significant residual impact to the species would likely occur. Both the department and DAWE recommended an offset strategy be submitted in the amended EIS, in accordance with the *EPBC Act Environmental Offsets Policy* (2012) (EPBC EOP).

The amended EIS reassessed the potential impacts to the species in response to submission comments. It now recognises a significant residual impact to the species based on the significant impact criterion ‘modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline’ (DoE, 2013).

An Offset Strategy for the Julia Creek dunnart was provided in the amended EIS. The strategy detailed a range of offset options identified as direct compensatory measures to meet offset principles under the EPBC EOP. This included a five-year offset research program to confirm the existence of the species in the project area. It was unclear what would happen to the program if the species was confirmed or not confirmed within the project area.

A Project Action Plan in the Offset Strategy outlines a range of tasks, many of which are considered to be research based including conducting field surveys and publishing research findings. It was unclear as to how implementing a habitat monitoring program across five sites outside of the project area was considered to provide a direct conservation gain. Similarly, resuming a citizen science program and consulting the community about the realignment of the stock route were also stated to provide a direct conservation gain by improving existing habitat and reducing threats.

Securing direct land-based offsets for the action was not committed to. Instead the proponent sought only to negotiate voluntary conservation agreements and it is noted that landholders may not wish to protect and manage sites. Only one potential offset property was identified in the Offset Strategy and this was the unmined area of the project site on MLA100162. It is considered by the department that offset areas proposed within an active mine site would be subject to indirect impacts.

The Offset Strategy was considered by DAWE not to have adequately addressed the MNES appendix of the TOR that provides detailed requirements concerning residual significant impacts and providing offsets consistent with the EPBC EOP. In particular, the Offset Strategy was considered not to

adequately compensate for the significant residual impact to the Julia Creek dunnart.

In order to align with the EPBC EOP, proposed offsets will need to comprise a minimum of 90% direct offsets. Currently, DAWE has concerns about the proponent's ability to provide adequate offsets to compensate for the residual impacts on the Julia Creek dunnart.

The proponent must provide an environmental offset strategy that fully complies with the EPBC EOP. The offset strategy must be submitted to DAWE for assessment and approval by the Minister for the Environment prior to commencement of the project. The resulting offset must be provided prior to the commencement of the action.

Staged offsets should be provided in accordance with mine sequencing stages and as refined in the subsequent PRCP and EA conditions of approval.

4.15.6.5 Other recommendations

Management of impacts on threatened species and communities

The proponent must implement measures to avoid, mitigate and manage impacts on EPBC listed species and their habitat during vegetation clearing, construction, operation, and decommissioning of the project. The proponent should undertake vegetation clearing for each project phase in a manner that avoids or minimises the potential for impacts on EPBC listed fauna species. The proponent must ensure that management actions are carried out in a manner that takes into consideration approved conservation advices and is consistent with relevant recovery plans and threat abatement plans.

The department recommends that the proponent undertake pre-clearance survey of grassland areas to capture any Julia Creek dunnarts. Spotter catchers must be in residence for clearance activities and salvage and translocation of any Julia Creek dunnarts must follow protocols stipulated in the Julia Creek dunnart SMP.

Disturbance limits

The EPBC approval should set limits on the disturbance of habitat for EPBC Act listed Julia Creek dunnart based on the significant residual impact totals presented in the EIS. The EIS calculated that the total species habitat subject to clearing is 7418.5ha. For MLA100162 this is 7204ha; and for MLA100244, MLA100245 and MLA100246 it is 214.5ha.

Commitments

Where the proponent's commitments outlined in the amended EIS do not conflict with any subsequent approval conditions and any recommendations of this assessment report, the proponent must implement the commitments as stated. For instance, the commitment to manage prickly acacia within a Project Weed Management Plan, and the commitment to prepare an aquatic weed and pest management strategy is recommended to be included as a condition of approval. Terrestrial and aquatic ecology mitigation measures are committed to within the CEMP and OEMP. These include the provision of an SMP for the Julia Creek dunnart, undertaking aquatic field surveys prior to the commencement of construction, and surface water monitoring to inform appropriate mitigation and management measures.

5 Recommendation on the suitability of the project

The proponent has met the statutory requirements of Chapter 3 of the EP Act for the EIS process.

The information provided by the proponent for the proposed project has been assessed using the EIS process under the EP Act. Public notification of the TOR and EIS stages of the project were advertised and submissions on the proposed project were accepted through an open, public review process. Potential impacts on identified environmental, social and economic values have been assessed by representatives of the Australian, state and local governments and other interested stakeholders and organisations. Recommended changes to the proposed project were presented to the proponent in the EIS submission stage and responded to in an amended EIS. Government submitters with regulatory powers reviewed the amended EIS and assessed the changes as broadly adequate allowing the department to proceed to complete the assessment.

This assessment acknowledges that the implementation of the project will result in immediate impacts on the local environment that will need to be managed and the longer-term changes would need to provide for a sustainable regional landscape.

The department has considered the submitted material and concludes that the project would significantly contribute to the regional and Queensland economy, provide social and economic benefits and opportunities for direct and flow-on employment and export trade to Queensland and Australia. Impacts to land, water resources, flora and fauna, air, noise, waste, cultural heritage, social, economic and transport were identified. Key impacts are summarised in Table 6.

Table 6. Key known and potential impacts of the project

Matter	Key impacts
Land and waste	• Direct disturbance of 7672 ha of land • Rehabilitation of mining pits and decommissioning of the site is proposed but there are unknown ecosystem impacts for rehabilitated habitat for the Julia Creek dunnart • The maximum height of the capped TSF and evaporation pond will not achieve pre-mine contours with implications for re-establishing the final hydrologic system • The TSF cell sizing is insufficient to accommodate the MIA waste stream over the LOM • The proposed rehabilitation strategy would need to be subsequently developed and applied for under a PRC plan • The geochemical and physical sampling program of waste rock, tailings and spoil is incomplete • The waste characterisation studies including static and kinetic testing and modelling is incomplete.
Water	• Potential changes to surface water and groundwater quantity and quality • Potential impacts on watercourses and groundwater quality from mining activities • The post-EIS approval of surface water harvested from the Flinders River would require the meeting of environmental flow objectives and the assessment of potential impacts to downstream users.

Ecology	• Impacts on MNES and MSES including threatened flora and fauna, vegetation communities and other ecological values particularly clearing of 7419ha of Julia Creek dunnart habitat.
	• Impact on habitat for threatened species:
	  • MNES listed threatened species - Julia Creek dunnart
	  • MSES protected wildlife habitat - Julia Creek dunnart
	  • MSES regulated vegetation – watercourse
	  • MSES waterway barriers
	• Potential impact on the ecological function of riparian vegetation and aquatic flora and fauna including barriers to fish passage.

Social and economic	• Contribution to the local, regional, state and national economies through royalties, taxes, charges and wages • Potential opportunities and flow-on effects for local businesses, regional development and investment • The value of the project to the Queensland economy would be approximately $1.92 billion • Creation of an estimated 200 construction jobs and 250 operational jobs required over the 30 year life of the mine • Increased opportunities for employment in the local and regional area • Project workforce is estimated to be sourced predominantly from the regional catchment with an increasing local population residing in the Julia Creek vicinity • There is a likely increased pressure on local social services • Impacts to local property values and housing accommodation affordability in Julia Creek • Adverse dust and noise impacts to the Saint Elmo homestead • No significant cumulative impacts.
Other impacts:	• Potential impacts on existing roads and rail utilised for the project based on the final transport option would require post-EIS assessment and approval by DTMR • Realignment of the Stock Route for 14 years.

Proposed measures to avoid and minimise adverse social and environmental impacts were considered adequate. The department is satisfied that with the implementation of appropriate and effective

avoidance, mitigation, management measures (called commitments in the EIS), the potential impacts to environmental values can be minimised to the greatest possible extent consistent with State and Commonwealth legislation and policy.

The EIS has broadly addressed the TOR but is deficient in detail in some important aspects needed to provide a sound basis for project implementation, within the framework of a final site-specific Environmental Authority (*Environmental Protection Act 1994*) and other Commonwealth, State and local government approvals. A number of actions, including those committed to by the proponent are required to be completed before all approvals can be issued. Key actions the proponent would need to address in the planning, detailed design and implementation of the proposed project are:

1. The proponent must:
    a. finalise the waste characterisation studies (particularly of mine overburden) prior to the commencement of the mining program;
    b. complete the design and development of a Receiving Environment Monitoring Program by providing additional surface water and groundwater quality monitoring based on targeted baseline water quality monitoring
    c. provide potential water quality characteristics and flow rates of any planned or modelled surface water discharges from the mine site during all phases of the proposed project, under varying seasonal and climatic conditions, as well as proposed management strategies and their likely effectiveness
    d. complete outstanding aquatic ecology and cultural heritage surveys
    e. provide a final Groundwater Monitoring Plan; and
    f. provide certified CCAs for each of the six regulated structures.

2. Note: there is a risk that the final landform heights for the TSF and evaporation pond would not be returned to existing pre-mined levels. Further, the current design of the TSF is not sufficiently sized to fully capture the MIA waste stream over the LOM and it is unclear whether sufficient suitable land is be available on MLA100162 to accommodate the additional waste material, without requiring an EA amendment. Much of the information required to assess rehabilitation, mine closure and decommissioning, as detailed in the department's PRCP Guideline, has not been included in the EIS, including completed waste characterisation, block modelling and final landform designs. The requirement to develop a PRC plan is a critical element of the recent Queensland Government's Mined Land Rehabilitation reforms. The EP Act now requires the proponent to develop and submit a suitable PRC plan which addresses a number of statutory information requirements as part of their application for a site-specific EA. These requirements are outlined in the department's PRCP Guideline. The proposed PRC plan will be considered concurrently as part of the EA application and will be subject to the information and notification stages under the EP Act. The PRCP schedule and EA will be assessed with separate decision considerations, however, the application, as a whole, will have only one decision.

3. A number of the proposed EA conditions included in Chapter 22 of the amended EIS are not considered adequate, based on the department's review of the amended EIS. Variants of the proposed conditions and/or different conditions will need to be applied to suit the specific circumstances of the proposed mining project.

4. The Offset Strategy for the Julia Creek dunnart was not considered to adequately compensate for the significant residual impact to the Julia Creek dunnart or meet the requirements of the EPBC EOP. A revised Offset Strategy must be submitted to DAWE for assessment and approval by the Minister for the Environment prior to commencement of the project.

5. With the decision by DTMR not to support a new private at grade rail level crossing on the Flinders Highway due to safety concerns, the rail transportation of hazardous substances directly on to the mine site via a rail spur would not occur. Any such crossing would require approval from DTMR under the *Transport Infrastructure Act 1994* (TI Act) and the connection agreement would

require approval from Queensland Rail. DTMR has recommended that the proponent consider and propose through a separate TI Act process an option that does not create a level crossing after finalisation of the assessment report for the EIS. Alternative transport options would require assessment by DTMR in relation to safe transport of hazardous or dangerous goods to the mine. DTMR has requested that the proponent provides a Traffic Impact Assessment and associated Road Safety Audit and Road Use Management Plan for DTMR assessment and approval. After finalisation of the assessment report the proponent will be required to further consider viable and appropriate alternative transport options for the proposed project.

6. Other matters that require attention by the proponent, includes provision of a CHMP that incorporates all four MLAs stated in section 4 of this report.

7. Where other government agencies have specifically recommended actions to be undertaken or noted, these have been discussed in section 4 and also listed in relevant Appendices 2, 3, 4, and 5. The proponent has committed in the EIS to undertaking this work and presenting it for assessment prior to the disturbance of land.

Despite the matters raised in this assessment, no issues of sufficient magnitude have been identified that are contrary to Queensland government legislation or policy that would prevent the project from proceeding. The outstanding matters are proposed to be resolved by recommending conditions on subsequent approvals that would require the proponent to meet required levels of environmental and social performance and to take any necessary actions.

In determining the suitability of the project the department considered all commitments made by the proponent in the EIS including, but not limited to, Chapter 21 Commitments of the EIS. A substantial number of these commitments would be regulated through the recommended conditions in an EA and other State, Commonwealth legislation and Australian Standards. If the project proceeds, the department expects all commitments made by the proponent to be delivered where they do not conflict with any subsequent regulatory approval conditions.

Consequently, the proposed project has been determined to be suitable to proceed to obtaining all necessary approvals including those required under the EP Act as per Table 7.

6 Project approvals and recommended conditions

Throughout this EIS process a number of environmental impacts and relevant mitigation measures have been identified. Where the EIS has shown that such impacts are likely and where legislation, policy or guidelines dictate, some activities associated with the proposed project would need to be constrained to ensure acceptable environmental outcomes through conditions of approval. In the absence of detail about a particular matter, the proponent, in the EIS, has made certain commitments to achieve suitable outcomes.

Following the release of this report, the proponent would be required to obtain statutory approvals from Commonwealth, state and local government agencies before the project can proceed. An overview of the approvals required for the project are summarised in Table 7. Key approvals required for the project include an Environmental Authority under the EP Act and approval by the Australian Government under the EPBC Act. The EIS process has sought to identify and provide an assessment of matters relevant to all approvals and where possible, provide advice and recommendations concerning key matters regulated by these approvals.

6.1 Environmental authority (EP Act)

Obligations under the *Environmental Protection Act 1994*

In addition to the requirements found in the conditions of a subsequent EA approval for the proposed project, the holder must also meet their obligations under the EP Act and the regulations made under the EP Act. This includes that the holder of the EA must comply with the following provisions of the Act:

- general environmental duty (section 319)

- duty to notify environmental harm (section 320-320G)
- offence of causing serious or material environmental harm (sections 437-439)
- offence of causing environmental nuisance (section 440)
- offence of depositing prescribed water contaminants in waters and related matters (section 440ZG)
- offence to place contaminant where environmental harm or nuisance may be caused (section 443).

Recommended conditions of an environmental authority

In Chapter 4 of this report, comments and recommendations have been made concerning the relevant conditions that would be required to ensure the project was delivered in a manner that would meet the statutory requirements of the *Environmental Protection Act 1994* and other approvals. The findings of this report will be used to develop relevant, site-specific EA conditions of approval specifically tailored for the project to regulate risks to environmental values and capture key commitments made by the proponent in the EIS. EA conditions are considered necessary to achieve the environmental objectives and performance outcomes of the EP Regulation and desirable for the regulation of identified and potential environmental impacts identified in this assessment. The subsequent EA application and PRCP application would need to address all the outstanding matters identified in this Assessment Report.

6.2 Australian Government approval (EPBC Act)

The EIS provided an assessment of the likelihood of occurrence of MNES and significant residual impacts. These matters have been assessed in this report and recommendations have been made for the Commonwealth Minister for the Environment to consider when making a decision about the action and any conditions that might be placed on such an approval.

6.3 Approvals

A number of approvals other than those under the *Environmental Protection Act 1994* and the EPBC Act are required for the proposed project, these have been identified in Table 7. Where possible, advice and recommendations have been made concerning key matters regulated by these approvals. Specific conditions for these approvals would be developed during the application and assessment processes under the relevant legislation.

Table 7. Approvals required for the proposed Saint Elmo Vanadium Project

Approval	Legislation (administering authority)	Detail
Key state approvals		
Granting of MLs	*Mineral Resources Act 1989* (DNRME)	Resource tenure is sought in the form of four MLs (MLA 100162, MLA 100244, MLA 100245 and MLA 100246) for minerals and infrastructure including the OSWF, aqueduct and associated pipeline pursuant to the MR Act.
Environmental authority (mining activities) (EA)	*Environmental Protection Act 1994* (the department)	A granted EA for the proposed project would allow the proponent to mine vanadium under schedule 2A (ERA 19, mining metal ore) of the Environmental Protection Regulation 2008 (EP Regulation). The EA would also cover the following activities that are directly associated with, or facilitate or support, the mining activities, and which would otherwise require approval under the EP Act as 'prescribed ERAs', listed under schedule 2 of

Approval	Legislation (administering authority)	Detail
		the EP Regulation: • ERA 8 – Chemical Storage – storing more than 500 m^3 of chemicals of class C1 or C2 combustible liquids under AS 1940 or dangerous goods class 3 under subsection (1)(c). • ERA 14 – Electricity Generation – Power station (fuel other than gas) with a rated capacity of 10 MW – 150 MW electrical (2)(a). • ERA 31 – Mineral processing – consists of processing, in a year, 1000t to 100,000t of mineral products, other than coke (2)(a). • ERA 33 – Crushing, Milling, Grinding or Screening – consists of crushing, milling, grinding or screening more than 5000t in a year. • ERA 63 – Sewage Treatment – Sewage treatment for more than 100 but not more than 1500EP equivalent persons with treated effluent discharges to an infiltration trench or irrigated (1)(b)(i).
Commonwealth approvals		
Approval to undertake an action that may impact on MNES (Controlled Action)	*Environment Protection and Biodiversity Conservation Act 1999* (DAWE): • assessment of listed threatened species and communities	The Project was referred on 9 August 2017 (EPBC 2017/8007) and on 8 September 2017, DAWE declared the Project a controlled action under the EPBC Act. This assessment report includes an assessment of impacts on MNES as a result of the proposed action. This assessment would be provided to the Commonwealth Environment Minister to inform decision-making about whether or not to approve the proposed action and any conditions that should be applied under part 9 of the EPBC Act. This assessment report also includes the department's recommended conditions of approval for the project to manage and offset impacts to MNES (not addressed through state imposed conditions).
Indigenous heritage	*Aboriginal and Torres Strait Islander Heritage Protection Act 1984 (Commonwealth)*	Notification to the Commonwealth Department as soon as practical and to include location and description of discovery.
Native title	*Native Title Act 1993 (Commonwealth)*	The proponent may enter a future Ancillary Agreement with Native Title Parties. The ancillary agreement would include a Cultural Heritage Management Agreement (CHMA) which covers the protection and management of all Aboriginal Cultural Heritage in the CHMA area for the purposes of the proposed mining activities.

Approval	Legislation (administering authority)	Detail
Offsets (State and Commonwealth)		
Offset requirements for MNES and MSES	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999;* EPBC Act Environmental Offsets Policy 2012 (DAWE) - assessment of MNES Queensland *Environmental Offsets Act 2014 (EO Act)*, Environmental Offsets Regulation 2014, Queensland Environmental Offsets Policy (the department) - assessment of MSES	Offsets would be required under State and Commonwealth legislation (refer to sections 4.6 and 4.15 of this report). However, under the EO Act an offset condition cannot be required by the state if the Commonwealth has imposed a condition for the same, or substantially the same, impact on the same matter OR if the Commonwealth has decided an offset is not required.
Other State Approvals		
Social impacts	*Strong and Sustainable Resource Communities Act 2017*	Conditions stated by the Coordinator-General under section 11(2) of the *Strong and Sustainable Resource Communities Act 2017* (SSRC Act)
Species management program for tampering with animal breeding places	*Nature Conservation Act 1994*	If pre-clearing surveys indicate the presence of breeding places then a SMP for tampering with a breeding place is required.
Protected Plants permit	*Nature Conservation Act 1994*	A flora survey is required prior to clearing, and if the flora survey identifies the presence of protected plants in the clearing impact area then a clearing permit is required. A clearing permit is not required if impacts to protected plants can be avoided (i.e. there is no clearing to take place within 100m of the protected plants).
Water licence – to take or interfere with water Water permit to take water (surface water or groundwater) for a activity with a reasonably foreseeable conclusion date Riverine protection permit – for the excavation or placement of fill in a watercourse (applies to non-tidal watercourses, lakes and springs)	*Water Act 2000* (DNRME) Water Resource Gulf Plan 2007	The proponent would need to consult with DNRME on: • Approvals that may be required prior to the take of water including water permits to take surface water or groundwater and/or a water licence for dewatering groundwater. • Depending on the location of any proposed bores, development approval in addition to water licences may also be necessary. • A riverine protection permit under the *Water Act 2000* may be required to excavate or place fill in a watercourse.
Licence to take water from the Flinders River	*Water Act 2000* (DNRME) Water Resource Gulf Plan 2007	The project has been declared 'regionally significant' by DNRME and an application for a water allocation is in progress.
Waterway barrier permit Code for Self-assessable Development – Minor	*Fisheries Act 1959* (DAF)	Waterway barrier works approvals are associated with waterway crossing outside of the MLA. As all waterway crossings would be within the MLAs and managed under the

Approval	Legislation (administering authority)	Detail
Waterway Barrier Works		conditions of an EA, separate waterway barrier works approvals are not required to be obtained. Water barriers and MSES offsets for significant residual impacts would be managed through a condition on the EA.
Biosecurity management strategies, e.g. weed and pest, diseases (such as foot-and-mouth disease) and contaminants (such as lead on grazing land)	*The Biosecurity Act 2014* (DAF)	The proponent would have an obligation to undertake all reasonable steps to ensure no spread of pest, disease or contaminants. There are seven categories of restricted matters listed under the Biosecurity Act. Each category places restrictions on the biosecurity matter or requires actions to be taken to minimise the spread and adverse impact of the matter.
Cultural heritage management plan	*Aboriginal Cultural Heritage Act 2003* (Department of Aboriginal and Torres Strait Islander Partnerships - DATSIP)	The proponent has a duty of care by which all reasonable and practicable measures must be implemented to ensure the activity does not harm Aboriginal cultural heritage.
Assessment reporting of previously unrecorded sites of non–Indigenous cultural heritage significance	*Queensland Heritage Act 1992* (the department)	No areas have been identified on the site that are listed on the Queensland Heritage Register. If non–Indigenous cultural heritage artefacts are found then notification to the department is required as soon as practical and must include location and description of discovery.
Licence for operating a Major Hazard Facility	*Work Health and Safety Regulation 2011*	The amount of LNG to be stored onsite exceeds threshold limits outlined in Schedule 15; Table 15.1 and Table 15.2 of the Act.

7 Approved by

ORIGINAL SIGNED	25 August 2020
Signature	**Date**

Christopher Loveday
Director, Technical and Assessment Services
Department of Environment and Science
Delegate of the chief executive
Environmental Protection Act 1994

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Appendix 1 - Recommended conditions for the environmental authority (resource activity)

Obligations under the *Environmental Protection Act 1994*

In addition to the requirements found in the conditions of an environmental authority for the project, the holder must also meet their obligations under the EP Act and the regulations made under the EP Act. This includes that the holder of the EA must comply with the following provisions of the Act:

- general environmental duty (section 319)
- duty to notify environmental harm (section 320-320G)
- offence of causing serious or material environmental harm (sections 437-439)
- offence of causing environmental nuisance (section 440)
- offence of depositing prescribed water contaminants in waters and related matters (section 440ZG)
- offence to place contaminant where environmental harm or nuisance may be caused (section 443).

Recommended conditions of an environmental authority

The environmentally relevant activity(ies) described in Table 7 of this report must be conducted in accordance with the site specific conditions of approval that would be assessed and approved under Chapter 5 of the EP Act. Subsequent EA conditions of approval would be tailored for the project to regulate risks to environmental values and capture key commitments made by the proponent in the EIS. EA conditions are considered necessary to achieve the environmental objectives and performance outcomes of the EP Regulation and desirable for the regulation of identified and potential environmental impacts identified in this assessment. The subsequent EA application and PRCP application would need to address all the outstanding matters identified in this Assessment Report.

Appendix 2 - Coordinator-General's stated conditions under the SSRC Act

This appendix includes conditions stated by the Coordinator-General under section 11(2) of the *Strong and Sustainable Resource Communities Act 2017* (SSRC Act). In accordance with section 11(3)(a) of the SSRC Act, these conditions are enforceable conditions under the *State Development and Public Works Organisation Act 1971* (SDPWO Act). The entity with jurisdiction for conditions in this Appendix is the Coordinator-General.

All the conditions stated in this appendix take effect from the date the Department of Environment and Science completes the EIS assessment report for the Saint Elmo Vanadium project.

Condition 1. General conditions – construction

(a) The proponent must advise the Coordinator-General in writing within five (5) business days of whichever of the following occurs first:

(i) commencement of construction activities for the workforce accommodation village

(ii) commencement of construction activities for the off-site water storage facility and associated infrastructure

(iii) commencement of construction activities on MLA100162 for construction phase 1.

The advice must include the date that the construction activities commenced. This date will be taken as the commencement of construction of the project for reporting purposes.

Condition 2. General conditions – operation

(a) The proponent must advise the Coordinator-General in writing that operation of the project has commenced within five (5) business days of commencing operation.

Condition 3. General conditions – expanding production

(a) The proponent must advise the Coordinator-General in writing that construction phase 2 has commenced, within five (5) business days of commencing construction phase 2.

(b) The proponent must advise the Coordinator-General in writing that construction phase 2 has been completed, within five (5) business days of commissioning the processing facility to produce up to 20,000 tonnes per annum (tpa) of vanadium pentoxide product.

Condition 4. Social impact management plan

(a) The proponent must submit to the Coordinator-General for approval a social impact management plan (SIMP) at least three (3) months prior to commencing construction.

(b) The SIMP must include the following updated plans:

(i) community and stakeholder engagement plan in accordance with Condition 5

(ii) workforce management plan

(iii) housing and accommodation plan in accordance with Condition 6

(iv) local business and industry procurement plan

(v) health and community wellbeing plan.

(c) The SIMP must be made publicly available on the proponent's website within thirty (30) business days of the Coordinator-General's approval of the SIMP.

(d) The proponent must notify the Coordinator-General within five (5) business days of the SIMP being published on the proponent's website.

Condition 5. Community and stakeholder engagement plan

(a) The updated community and stakeholder engagement plan must not be inconsistent with the community and stakeholder engagement plan described in Section 8.3 of Appendix A7 – Social Impact Assessment of the Saint Elmo Vanadium project amended EIS (June 2020).

(b) The community and stakeholder engagement plan must provide an updated program of stakeholder engagement that includes processes for providing advanced notice to relevant stakeholders of construction and operational activities with potential for disturbance, including: any works which may occur outside of standard working hours; interruptions to utility services; changed traffic, access and parking conditions; or periods of predicted high noise, vibration or traffic activities.

Condition 6. Housing and accommodation plan

(a) The updated housing and accommodation plan must not be inconsistent with the housing and accommodation plan described in Section 8.5 of Appendix A7 – Social Impact Assessment of the Saint Elmo Vanadium project amended EIS (June 2020).

(b) The updated housing and accommodation plan must address the construction and operational phases of the project, and include:

(i) the detailed plan for the Workforce Accommodation Village to be developed in consultation with McKinlay Shire Council, including:

(A) planned size, capacity, layout and location

(B) details of recreational facilities, health and social services for workers

(ii) the housing strategy to be developed in consultation with McKinlay Shire Council that describes where operational workers who move to Julia Creek would be accommodated, including:

(A) the number of unoccupied dwellings in Julia Creek that will be used to accommodate operational workers who move to Julia Creek

(B) the number of new houses to be developed in Julia Creek to accommodate operational workers who move to Julia Creek, and a proposed development schedule

(C) details of any strategies or policies to encourage new local operational workers to build, purchase or rent in the local or regional communities.

Condition 7. Maximising Aboriginal and Torres Strait Islander outcomes

(a) Prior to commencing construction of the workforce accommodation village, the proponent must consult with the Department of Aboriginal and Torres Strait Islander Partnerships to develop:

(i) a target for Aboriginal and Torres Strait Islander employment on the project

(ii) a target for Aboriginal and Torres Strait Islander business procurement on the project

(iii) a detailed Aboriginal and Torres Strait Islander training and employment plan

(iv) a detailed Buy Local Plan which includes actions to maximise Aboriginal and Torres Strait Islander business opportunities.

(b) The Aboriginal and Torres Strait Islander employment target, including justification for the target, and detailed Aboriginal and Torres Strait Islander training and employment plan must be included within the workforce management plan (Condition 4(b)(ii)) as part of the SIMP.

(c) The Aboriginal and Torres Strait Islander business procurement target, including justification for the target, and detailed Buy Local Plan must be included within the local business and industry procurement plan (Condition 4(b)(iv)) as part of the SIMP.

Condition 8. Reporting on the implementation and effectiveness of social impact management measures

(a) The proponent must prepare an annual social impact management report (SIMR) for each year of

construction and for the first five (5) years of operation.

(b) The annual SIMR must be submitted to the Coordinator-General for approval within twenty (20) business days after the end of the relevant twelve (12) month period from the commencement of construction of the project.

(c) If construction phase 2 does not occur within the first (5) years of operation, the proponent must submit an SIMR to the Coordinator-General for approval within thirty (30) business days of commissioning the processing facility to produce up to 20,000 tpa of product.

(d) Using the monitoring protocol described in the SIMP, the SIMR must detail:

  (i) an assessment of the social impacts of the project against the potential social impacts identified in the SIA including consideration of impacts of other proposed developments in the local communities

  (ii) the progress and effectiveness of the social impact management measures detailed in the SIMP

  (iii) how social impact management measures have been modified, where monitoring indicates measures have not been effective or in response to changed circumstances or greater knowledge of potential social impacts

  (iv) the actions taken to implement commitments made by the proponent listed in Section 21.4.12 and Section 21.4.13 of Chapter 21 – Commitments of the Saint Elmo Vanadium project amended EIS (June 2020).

(e) The SIMR must present the workforce profile of the project including:

  (i) total number of workers employed

  (ii) proportion of local workers, new local workers and FIFO workers.

(f) Each SIMR must be made publicly available on the proponent's website within thirty (30) business days of the Coordinator-General's approval of the relevant SIMR.

(g) The proponent must notify the Coordinator-General within five (5) business days of the SIMR being published on the proponent's website.

Definitions

'**construction activities**' includes pre-construction activities such as clearing and grubbing, topsoil and subsoil removal, earthworks, grading works, establishment of site offices and installing temporary amenities

'**construction phase 1**' is the first phase of construction that involves construction of the mine infrastructure area and processing facility able to produce 10,000 tpa of product

'**construction phase 2**' is the second phase of construction that involves expanding the processing facility to enable production of 20,000 tpa of product

'**EIS assessment report**' is the assessment report prepared by the Department of the Environment and Science on the project's environmental impact statement in accordance with Chapter 3, Part 1, Division 5 of the *Environmental Protection Act 1994*

'**FIFO worker**' is a worker for the Saint Elmo Vanadium project who does not live in one of the local communities and must commute to work (could be DIDO, BIBO or FIFO) and stay at the workforce accommodation village while on shift

'**local communities**' is either Julia Creek or Richmond

'**local worker**' is a worker for the Saint Elmo Vanadium project who lives in one of the local communities

'**new local worker**' is a worker for the Saint Elmo Vanadium project who moves to Julia Creek

'**off-site water storage facility and associated pipeline**' is the water storage facility and associated

infrastructure on MLA100244, MLA100245 and MLA100246

‘**operation**’ is mining and processing of vanadium pentoxide

‘**regional communities**’ is either Mount Isa or Cloncurry

‘**short-term accommodation providers**’ are the Townsville Enterprise short term accommodation providers listed in Table 8-1 of Appendix A7 of the Saint Elmo Vanadium project amended EIS (June 2020).

‘**unoccupied dwellings**’ are dwellings in Julia Creek identified as unoccupied in the ABS Census 2016

‘**worker**’, for a large resource project, means a person employed, or to be employed, to perform work—

(a) during the operational phase of the project; or

(b) for a large resource project nominated by the Coordinator-General under section 12 and the name of which is published on the department’s website under section 13 —during the construction phase of the project.

‘**workforce accommodation village**’ is the accommodation village to be constructed in Julia Creek for the construction workforce and FIFO operational workforce.

Appendix 3 - DNRME recommendations

Stock route

The Department of Natural Resources, Mines and Energy (DNRME) requests the following:

- All signage erected at the entrance to the mining lease from the stock route is to include contact details of both the site manager and McKinlay Shire Council
- Contact with McKinlay Shire Council and Department of Natural Resources, Mines and Energy will be made two years prior to the realignment of the stock route. This lead time is required to process an application and prevent delays or disruption to the mine's operation.
- Installation of suitable stock proof, four barbed wire fence on either side of the stock route.

Watercourse diversion

The Department of Natural Resources, Mines and Energy does not have a record of a watercourse determination being requested or completed for MLA100162. The proponent is requested to provide evidence of the stated determination via email to waterinfonorth@dnrme.qld.gov.au

If a tributary is determined to not be a watercourse it is mapped as a drainage feature. Water within a drainage feature is considered as overland flow water and is subject to the requirements of overland flow.

Under section 97 of the *Water Act 2000*, a person may take overland flow water and a person may also interfere with the flow of water by impoundment, provided it is not more than is necessary to satisfy the requirements of an environmental authority (EA) or development permit (DP) and provided the impacts of the take or interference were assessed as part of a grant of an EA or DP and the EA or DP was granted with a condition about the take of water or interference with flow.

Section 98 of the *Water Act 2000* does not refer to "impoundment" and "take". Section 98 relates to interference with water by diversion. Diversion is changing the course of a watercourse but the water always returns to the watercourse. To be exempt from the *Water Act 2000*, the diversion must be assessed as part of the EA and the EA must be granted with a condition about the diversion of the watercourse.

OWSF Failure Impact Assessment (FIA)

General considerations:

Given the dimensions of the dam are below the height and storage capacity threshold specified in s343 of the *Water Supply (Safety and Reliability) Act 2008* (the Act), the Dam Safety Regulator has not required a formal submission of an FIA at this stage. The Dam Safety Regulator will not be requiring any further action under the Act at this stage. However, it would be prudent for the dam owner to exercise caution about the potential for PAR to exist downstream of the dam now and in the future.

If any changes are made to the dam which increases its dimensions above the specified height and storage capacity threshold, the owner of the dam should contact the Dam Safety Regulator.

In the case that the Dam Safety Regulator develops reasonable belief that the failure of the dam would impact the safety of downstream residents, the Dam Safety Regulator would likely issue a Referable Dam Notice. This notice would make the works a referable dam unless the dam owner submitted a certified failure impact assessment demonstrating otherwise within 60 business days of receiving the notice.

Appendix 4 - DAF recommendations

Biosecurity

Recommendation: Develop a monitoring program to gauge the success of biosecurity measures, identify whether objectives have been met, and describe corrective actions to be used if monitoring indicates objectives are not being met.

Recommendation: DAF requests that the proponent submits a detailed pest management plan as per comment in the ToR.

Waterway barriers

Recommendation 1:

Where the offsite water storage pipeline crosses waterways, as defined in the *Fisheries Act 1994*, crossings must be designed, sited, and constructed to provide adequate fish passage for all species.

Recommendation 2:

Where trenching the offsite water storage pipeline under any waterway, as per the *Fisheries Act 1994* definition of a waterway, for any part of the waterway bed or banks that has been altered by the works within ML100245, the site is promptly restored and/or rehabilitated so that as a minimum:

- Stability and land profiles of the bed and banks are re-instated to natural pre-works waterway profiles and stability
- The waterway bed is retained with natural substrate or reconstructed with substrate comparable to the natural substrate size and consistency.
- The waterway is restored to contain natural variation with regards to pools, riffle sections and meanders.
- Site conditions allow the rapid re-establishment of native vegetation and cover or native species are replanted to re-establish the natural plant community.

Recommendation 3:

The offsite water storage facility diversion channel, dams and pipeline are to be designed, constructed, maintained and at the end of the mine life, decommissioned, to avoid fish injury, mortality and entrapment. Including but not limited to:

- Hydrological connectivity along the channel to allow fish movement either back to the Flinders River or to the OWSF
- Refuge pools 2m or greater in depth
- Artificial habitat elements
- Fish exclusion grate at inlet of water pipeline along with <0.1m/s ‘approach velocity’ for water
- Development of an OWSF Water Quality Monitoring and Fish Salvage Plan
- Development of a decommissioning/ rehabilitation Fish Salvage plan.

Offset Recommendation:

Enter into an agreed delivery arrangement to deliver an environmental offset in accordance with the Environmental Offsets Act 2014 to counterbalance the significant residual impacts on the matter/s of state environmental significance being [7.6ha] of waterways providing for fish passage.

Important note on offset condition: The supplied calculation for the area of MSES being impacted only takes into account, known mapped waterways at present on MLA100162. Further on–ground investigation work is required to correctly identify and quantify all waterways (as defined by the *Fisheries Act 1994*) within the project area. This is likely to lead to an increase in the significant residual impacts to

the MSES Waterways providing for fish passage. Once all onsite and offsite waterways that are going to be impacted have been identified, a total area requiring to be offset will need to be calculated.

Recommendation 5:

For any part of a waterway (as per the *Fisheries Act 1994* definition) bed or banks that has been altered by the works as a result of mining and ancillary activities within ML100162, ML100244 and ML100246 are to be restored and/or rehabilitated to pre-work profiles and flow paths.

The site is to be restored and/or rehabilitated so that as a minimum:

- Stability and land profiles of the bed and banks are re-instated to natural pre-works waterway profiles and stability
- The waterway bed is retained with natural substrate or reconstructed with substrate comparable to the natural substrate size and consistency.
- The waterway is restored to contain natural variation with regards to pools, riffle sections and meanders.
- Site conditions allow the rapid re-establishment of native vegetation and cover or native species are replanted to re-establish the natural plant community.

Recommendation 6:

If fish are trapped by the works, fish salvage activities in accordance with Fisheries Queensland Guidelines for Fish Salvage are to be implemented immediately.

Recommendation 7:

Fish kills must be reported to the Department of Environment and Science on 1300 130 372.

Recommendation 8:

Provisions are made to minimise the risk of fish kills arising from the works e.g. through entrapment of fish upstream or between the works.

Recommendation 9:

A Surface Water Monitoring Program and Receiving Environment Monitoring Program is to be prepared and implemented. This should include an alert to action component and relevant fish salvage actions should water quality decrease to a point incompatible with sustaining fish.

Recommendation 10:

Impacts on water quality are to be minimised by undertaking works to the standard set out in the current version of the Best Practise Erosion and Sediment Control, published by the International Erosion Control Association, Australasia.

Aquatic surveys:

Recommendations:

- The aquatic surveys should aim to determine and identify all waterways within the four mining lease areas associated with the proposal.
- Should seek to determine which species would access the upstream habitat outside the mining lease area. This habitat would be impacted, in terms of fish passage, during the mine life as a result of the mine dam, removal of tributaries while mining activities are undertaken and diverting flow
- Should be undertaken at an ecologically relevant time (i.e. during the wet season or when flow is present in the system).
- Refine the applicable significant residual impact to waterways providing for fish passage.

Appendix 5 - DTMR recommendations

TMR RECOMMENDED CONDITIONS		
No.	**Condition**	**Condition Timing**
Proposed level railway crossing		
01	The project (/development) must not propose or result in the construction of one or more level railway crossings on a State-controlled road.	At all times
Updated Traffic Impact Assessment		
02	The project (/development) works must not commence until (a), (b) and (c) as follows have been completed: (a) the proponent (/applicant) has redesigned the project (/development) so that it does not propose or result in the construction of one or more level railway crossings on a State-controlled road; and (b) the proponent (/applicant) has provided an updated Traffic Impact Assessment (and associated Road Safety Audit and Road Use Management Plan) prepared and certified by a Registered Professional Engineer of Queensland that, among other things, assess the impact and proposed mitigation measures for the redesigned project (/development) in accordance with the requirements of the Department of Transport and Main Roads' *Guide Traffic Impact Assessment* to the Department of Transport and Main Roads; and (c) the Department of Transport and Main Roads is satisfied with the contents of the before mentioned Traffic Impact Assessment (and associated Road Safety Audit and Road Use Management Plan).	(a), (b) and (c) prior to the commencement of works
Existing railway level crossings		
03	(a) The project (/development) must ensure that there is no disruption to the safety and operational integrity of railway level crossings. (b) The project (/development) works must not commence until (i) and (ii) as follows have been completed. i. Registered Professional Engineer Queensland (RPEQ) certification must be provided to the Program Delivery and Operations Unit, North Queensland Region within the Department of Transport and Main Roads (North.Queensland.IDAS@tmr.qld.gov.au), confirming that the development has been designed in accordance with part (a) of this condition. In particular, the RPEQ certification must include supporting documentation addressing the following: • a swept path analysis of the maximum design vehicle demonstrating adequate queuing distance between impacted railway level crossing/s and relevant intersections/access points. The minimum clearance must be 5m from the edge running rail (of the closest railway track) as per Section 5.4 – Short Stacking and Figure 3.2 – Yellow Box Marking of AS1742.7:2016 *Manual of Uniform Traffic Control Devices, Part 7: Railway* plus the length of the maximum design vehicle; • written evidence that comparative Australian Level Crossing Assessment Model assessments demonstrate the development will not worsen the safety	(a) at all times. (b) prior to the commencement of works (c) prior to the commencement of use

	risk at impacted railway level crossing/s or RPEQ certified detailed design drawings showing mitigation measures in accordance with AS1742.7:2016 *Manual of Uniform Traffic Control Devices, Part 7: Railway*, railway manager standards and other applicable requirements to mitigate the identified risks; and ii. the Department of Transport and Main Roads is satisfied with the contents of the certification/s provided as per condition (b) (i). (c) Provide RPEQ certification to the Program Delivery and Operations Unit, North Queensland Region within the Department of Transport and Main Roads (North. Queensland.IDAS@tmr.qld.gov.au) confirming that the development has been constructed generally in accordance with the design certified in part (b) of this condition.	
New rail siding		
04	(a) If the project (/development) proposes to create a new rail siding, the proponent (/applicant) must provide a RPEQ certified design of the before mentioned rail siding connecting to the Great Northern Line to the Program Delivery and Operations Unit, North Queensland Region within the Department of Transport and Main Roads (North.Queensland.IDAS@tmr.qld.gov.au). (b) The railway siding design in part (a) of this condition must demonstrate that there will be no disruption to the safety and operational integrity of the railway corridor (Great Northern Line) and must adhere to the following, amongst other applicable standards and requirements: • The State Development Assessment Provisions, State Code 2: Development in a Railway Environment; • Queensland Rail Civil Engineering Technical Requirements and other applicable standards; and • Guide to Development in a Transport Environment: Rail. (c) Provide RPEQ certification to the Program Delivery and Operations Unit, North Queensland Region within the Department of Transport and Main Roads (North. Queensland.IDAS@tmr.qld.gov.au) confirming that the development has been constructed in accordance with parts (a) and (b) of this condition.	(a) & (b) prior to the commencement of works (c) prior to the commencement of use
Stormwater		
05	(a) Stormwater and flooding management of the development must ensure no worsening or actionable nuisance to the railway corridor. (b) Any works associated with the project (/development) must not: i. create any new discharge points for stormwater runoff onto the railway corridor; ii. interfere with and/or cause damage to the existing stormwater drainage on the railway corridor; iii. surcharge any existing culvert or drain on the railway corridor; reduce the quality of stormwater discharge onto the railway corridor; iv. reduce the flood storage capacity of the site;	(a) and (b) prior to the commencement of use and at all times

	v. impede or interfere with overland flow paths and/or hydraulic conveyance on the site.	
TMR ADVICE		
1	(a) The proponent (applicant) must obtain permits for any excess mass or over-dimensional loads for all phases of the project (development) from the Department of Transport and Main Roads' Heavy Vehicles Road Operation Program Office, and the relevant local government(s), as required by the *Transport Operations (Road Use Management) Act 1995*; and (b) The project (development) must not be carried out in contravention of the *Transport Operations (Road Use Management) Act 1995* or its subordinate legislation as amended and/or replaced from time to time, and any successor legislation to the same general intent and effect.	
2	(a) The proponent (applicant) must obtain permission to take over-dimensional loads across Queensland Rail infrastructure from the railway manager (Queensland Rail), as required by the *Transport Infrastructure (Rail) Regulation 2006;* and (b) The project (development) must not be carried out in contravention of the *Transport Infrastructure (Rail) Regulation 2006* or its subordinate legislation as amended and/or replaced from time to time, and any successor legislation to the same general intent and effect. Further information can be obtained from Queensland Rail's website at: http://www.queenslandrail.com.au/forbusiness/overdimensionalloads	
3	(a) The proponent (applicant) must obtain permits for any proposed access to the State-controlled road and access works in the State-controlled road corridor from the Department of Transport and Main Roads' Program Delivery and Operations Unit, North Queensland Region (North. Queensland.IDAS@tmr.qld.gov.au) within the Department of Transport and Main Roads, as required by the *Transport Infrastructure Act 1994;* and (b) The project (development) must not be carried out in contravention of the *Transport Infrastructure Act 1994* or its subordinate legislation as amended and/or replaced from time to time, and any successor legislation to the same general intent and effect.	
4	The project (development) must not be carried out in contravention of the *Mineral and Energy Resources (Common Provisions) (MERCP) Act 2014* or their subordinate legislation as amended and/or replaced from time to time, and any successor legislation to the same general intent and effect. For example, the proponent (/applicant) must obtain permits for Notifiable Road Uses in accordance with the act.	
5	The proponent (applicant) should consult with the Department of Transport and Main Roads in relation to compliance with the railway level crossing conditions. Please contact RAPTTA@tmr.qld.gov.au to gain assistance with any requirements for Australian Level Crossing Assessment Model (ALCAM) assessments. The proponent (applicant) will be required to prepare RPEQ certified traffic information for these assessments and the ALCAM assessments will be undertaken by the railway manager, if required. The Guide to development in a transport environment: Rail is available at: http://www.tmr.qld.gov.au/business-industry/Technical-standards-publications/Guide-to-development-in-a-transport-environment-rail.aspx.	
6	The railway manager's written approval is required to carry out works in or on a railway corridor or otherwise interfere with the railway or its operations as required by section 255 of the *Transport Infrastructure Act 1994.* The proponent (applicant) must obtain the following agreements/approvals, amongst others, from the railway manager (Queensland Rail) in relation to any proposed rail siding connecting to the Great Northern Line: • Design Services Agreement; • Rail Infrastructure Construction Deed; • Rail Connection Agreement; • Access Agreement & Train Operations Deed;	

	• Transfer Facilities Licence (TFL); and • Relevant approvals for works associated with the development in the railway corridor such as the installation of boundary fencing, load out facility, earthworks, service connections, stormwater drainage works and the like. These are likely to require approvals such as a licence to enter and construct, licence to discharge and/or wayleave agreement, amongst other relevant approvals/agreements. Any proposed use of an existing or proposed rail siding may alter the operational circumstances of the Great Northern Line and therefore may require approvals/agreements to be obtained from the railway manager. The EIS assessment report does not constitute an approval under section 255 of the *Transport Infrastructure Act 1994* and such approvals need to be obtained separately from the relevant railway manager. The proponent (applicant) should contact the Queensland Rail property team at developmentenquiries@qr.com.au in relation to obtaining the necessary approvals.
7	A private siding must be registered if the owner wishes for it to be connected to an accredited railway as required by section 83 of the *Rail Safety National Law (Queensland).* The proponent (applicant) should contact the Office of the National Rail Safety Regulator to enter into preliminary discussions on the process associated with registration of their rail infrastructure at operations@onrsr.com.au or telephone 08 8406 1500.
8	To formalise arrangements about transport infrastructure works, contributions and road-use management strategies detailed and required under the impact mitigation program, the proponent may enter into infrastructure agreement(s) with TMR and/or the relevant local government(s). • The infrastructure agreement/s should incorporate the following: • Project-specific works and contributions required to upgrade impacted road infrastructure and vehicular access to project sites as a result of the Proponent's use of state-controlled and local roads by project traffic • Project-specific contributions towards the cost of maintenance and rehabilitation, to mitigate impacts on state-controlled and/or local road pavements or other infrastructure • Infrastructure works and contributions associated with shared (cumulative) use of state-controlled and local road/rail infrastructure by other projects subject to an EIS • Performance criteria that detail protocols for consultation about reviewing and updating project-related traffic assessments and impact mitigation measures that are based on actual traffic volume and impacts, should previously advised traffic volumes and/or impacts change • The proponent's undertaking to fulfil all commitments as detailed in the 'Table for listing RMP commitments'. Any infrastructure agreement between the proponent, the department and the relevant local government(s) should be in place three (3) months prior to commencement of project construction, or as otherwise agreed in writing between the proponent, the department and the relevant local government(s).

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