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Chapter Fourteen

Conclusion of Predicted Impacts

Winchelsea Island (Akwamburrkba) Manganese Mine: Draft Environmental Impact Statement

PREPARED FOR:

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Key Project Terms

Term	Definition or Elaboration
Adaptive Management	Systematic process for incrementally improving management practices by learning from the outcomes of past and current practices.
AUS China International Mining	AUS China International Mining Pty Ltd
CDM Smith	CDM Smith Australia Pty Ltd
Disturbance Envelope	Defined as the maximum area within which the Project disturbance could occur. The disturbance envelope for the Project encompasses 739 ha, inclusive of the terrestrial mining area and infrastructure, marine infrastructure, dredge spoil disposal area and transhipment area.
Environmental Aspect	An element of the Winchelsea Minings activities, products or services that can interact with the environment.
Environmental Impact	Change to the environment whether adverse or beneficial, wholly or partially resulting from Winchelsea Mining's environmental aspects. Environmental impacts can be caused directly or indirectly from a Project activity or cumulatively with other non-Project related activities in a set area.
Environmental Factor	The NT EPA listed environmental objectives to identify environmental matters that have value to the Northern Territory and that need to be protected; and to state the objective to be achieved for each matter. The NT EPA has prepared these environmental objectives and organised these in structured divisions of the environment, called environmental factors.
GHAC	Groote Holdings Aboriginal Corporation
Infrastructure Footprint	Defined as the area subject to direct placement of infrastructure and material inclusive of the terrestrial and wharf components. This area excludes the dredge spoil disposal area and transhipment area as no permanent physical infrastructure will be placed in these areas. The infrastructure footprint encompasses 339 ha within the Project area.
Project	The Project refers to the Winchelsea Island Manganese Mine Project. The Project includes establishment of a manganese mine extracting from nine separate extraction areas covering, associated terrestrial infrastructure, wharf and barge loading facility, dredged access channel, dredge spoil disposal, transhipment and cyclone moorings. The Project is inclusive of all infrastructure within the nominated Project area and directly associated activities occurring outside that area.
Project Area	The Project area is defined as wholly including mineral lease for exploration activities 32704, coastal and marine areas adjacent and connecting to mineral lease 32704, the dredge spoil disposal area and transhipment area. The entire Project area covers 1,680 ha.
Significant Impact	A significant impact of an action is an impact of major consequence having regard to: (a) the context and intensity of the impact; and (b) the sensitivity, value and quality of the environment impacted on and the duration, magnitude and geographic extent of the impact.
Sitzler	Sitzler Pty Ltd
Study Area	Refers to the area of survey or investigation for a specific study. This area may be beyond the Project area or disturbance envelope.
Tailings Storage Facility	A specially engineered and constructed impoundment into which tailings (residue) from the ore processing plant are deposited for placement in perpetuity. The storage facility is constructed with confining embankments consisting of earthen material (e.g., rock and soil) and capped following closure.
Winchelsea Island	Akwamburrkba

Term	Definition or Elaboration
Winchelsea Mining	Winchelsea Mining Pty Ltd
Xenith	Xenith Consulting Pty Ltd

Acronyms, Abbreviations and Units

Abbreviation, Acronym or Unit	Definition
AAAC	Anindilyakwa Advancement Aboriginal Corporation
AAPA	Aboriginal Areas Protection Authority
ABS	Australian Bureau of Statistics
AFANT	Armature Fisherman's Association Northern Territory
ALARP	As Low As Reasonably Practicable
Al_2O_3	Aluminium Oxide
ANC	Acid Neutralising Capacity
ARC	Arnhem Coast
ASRIS	Australian Soil Resource Information System
ASS	Acid Sulfate Soils
CAN	Australian Company Numbers
ADT	Articulated Dump Truck
ALC	Anindilyakwa Land Council
Al_2O_3	Aluminium Oxide
ALRA	*Aboriginal Land Rights (Northern Territory) Act 1976*
Bcm	Bank Cubic Meter
BLF	Barge Loading Facility
BLM	Blue Mud Land System
BoM	Bureau of Meteorology
BWM	International Convention for the Control and Management of Ships' Ballast Water and Sediments
CD	Chart Datum
CEO	Chief Executive Officer
CP	Cemented Pisolite
CNZ	Central North Mineralisation Zone
CMZ	Central Main Mineralisation Zone
Cth	Commonwealth
CSD	Cutter Suction Dredge
CSZ	Central South Mineralisation Zone
DAFF	Department of Agriculture, Fisheries and Forestry
DAWE	Department of Agriculture, Water and the Environment
DCCEEW	Department of Climate Change, Energy, the Environment and Water

Abbreviation, Acronym or Unit	Definition
DEPWS	Department of Environment, Parks and Water Security
DIPL	Department of Infrastructure, Planning and Logistics
DITT	Department of Industry, Tourism and Trade
Dmt	Dry Metric Tonne
DWCD	Declared Water Control District
DWT	Dead Weight Tonne
EIS	Environmental Impact Statement
EIL	Ecological Investigation Level
EL	Exploration Licence
EMP	Environmental Management Plan
EMS	Environmental Management System
EP Act	*Environmental Protection Act 2019*
EPBC Act	*Environmental Protection and Biosecurity Conservation Act 1999*
EPL	Environment Protection Licence
ERA	Environmentally Restricted Area
EV	Electric Vehicle
ESC	Erosion and Sediment Control
ESCP	Erosion and Sediment Control Plan
Fe	Iron
FIFO	Fly-In Fly-Out
g/cc	Gram per Cubic Centimetre
GDE	Groundwater Dependant Ecosystem
GEMCO	Groote Eylandt Mining Company
GHG	Greenhouse Gas
Grt	Groote land
ha	Hectares
HDPE	High Density Polyethylene
hp	Horsepower
HVAS	High-Volume Air Sampler
IAP2	International Association for Public Participation
IBRA	Interim Biogeographic Regionalisation for Australia
IEA	International Energy Agency
IECA	International Erosion Control Association

Abbreviation, Acronym or Unit	Definition
ILUA	Indigenous Land Use Agreement
IPA	Indigenous Protection Area
IUCN	International Union for Conservation of Nature
JORC	Joint Ore Reserve Committee
Kfh	Keefers Hut Land System
kg	Kilogram
km	Kilometres
ktpa	Kilo tonnes per annum
kW	KiloWatt
LA	Los Angeles
LAT	Lowest astronomical tide
LDMA	Local Decision-Making Agreements
Lit1	Littoral 1 Land System
LOM	Life of Mine
LWM	Low Water Mark
m	Metre
m^3	Cubic meter
m^3/hr	Cubic meter per hour
MagL	Manganiferous Laterite
mbgl	metres below ground level
MIA	Mine Infrastructure Area
ML	Megalitres
MLWM	Mean Low Water Mark
ML/yr	Megalitres per year
MMP	Mining Management Plans
MMZ	Main Mineralised Zone
MN	Mangcrete
Mn	Manganese
MNES	Matters of National Environmental Significance
MP	Member of Parliament
MRCP	Mine Rehabilitation and Closure Plan
MSL	Mean Sea Level
Mt	Million Tonnes

Abbreviation, Acronym or Unit	Definition
mtpa	Million Tonnes per Annum
MW	Megawatt
NAF	Non-Acid Forming
NAGD	National Assessment Guidelines for Dredging
NEZ	North East Mineralised Zone
NEPM	Nation Environment Protection Measure
NLC	Northern Land Council
NT	Northern Territory
NT EPA	Northern Territory Environment Protection Authority
NW	North West
OGV	Ocean going vessel
P	Phosphorus
P_2O_5	Phosphorus Pentoxide
PC	Personal Computer
PCS	Process Control System
PID	Proportional-Integral-Derivative
PLT	Point Load Result
ppt	Parts per Thousand
PM	Pisolitic Manganese
PMLU	Post-Mining Land use
$PM_{2.5}$	Particulate Matter 2.5 micrometres or less
PM_{10}	Particulate Matter 10 micrometres or less
PSU	Practical Salinity Units
Pty Ltd	Propriety Limited
Que	Queue Land System
RC	Reverse Circulation
RMP	Risk Management Plan
ROM	Run of Mine
RDU	Royalties Development Unit
RORO	Roll-on Roll-off
RUSLE	Revised Universal Soil Loss Equation
Sea Dumping Act	*Environmental Protection (Sea Dumping) Act 1981*
SEP	Stakeholder Engagement Plan

Abbreviation, Acronym or Unit	Definition
SiO_2	Silicon Dioxide
SOP	Standard Operating Procedures
SM	Silicious Manganese
SSC	Suspended Sediment Concentration
SSTV	Site-Specific Trigger Values
TEC	Threatened Ecological Communities
t	Tonnes
ToR	Terms of Reference
TPWC Act	*Territory Parks and Wildlife Conservation Act 2000*
TSF	Tailings storage facility
TSP	Total Suspended Particulates
USGS	United States Geological Survey
WA	Western Australia
WMP	Water Management Plan
WDL	Waste Discharge Licence

ACKNOWLEDGEMENT

CDM Smith and Winchelsea Mining acknowledges the traditional owners and custodians of country throughout Australia and acknowledges their continuing connection to land, waters and community. We pay our respects to the people, the cultures and the elders past, present and emerging.

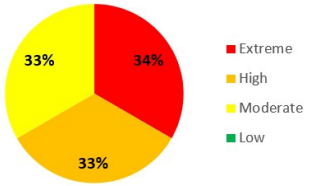
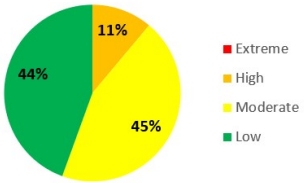
We acknowledge and thank the Anindilyakwa Land Council and the Traditional Owners of Winchelsea Island, for providing permission to access survey areas and collect data for the Winchelsea Island (Akwanburrkba) Manganese Mine Project Environmental Impact Statement and supporting studies.

Section 14 Conclusion of Predicted Impacts

In accordance with the NT EPA Guidance on preparing in Environmental Impact Statement (NT EPA, 2021), each of the key environmental factor sub-sections within Section 8- Risk Assessment of Env Factors provides details of the predicted outcome. Table 13.2-1 provides a summary of the predicted outcome for each of the environmental factors relevant based on the analysis completed and studies prepared to support the Draft EIS. Table 13.2-1 does not provide further detail of the potential impacts or the avoidance and mitigation measures as these are already presented in Section 8- Risk Assessment of Env Factors, Section 14- Conclusion of Predicted Impacts, Appendix B (Risk Assessment).

Table 13.2-1 Assessment of Project Against NT EPA Environmental Factor Objective

Factor	NT EPA Objective	Predicted Outcome and Significant Residual Impact (if relevant)
Landforms	Conserve the variety and integrity of distinctive physical landforms.	**Summary** Winchelsea Island includes five distinct landforms and the Project will directly disturb 530 ha of two landforms that predominately occur centrally within the island. Each of these landforms are classed as having high integrity due to their intact condition, high ecological importance due to the habitats contained within the landform and low to moderate importance for social values based on cultural heritage surveys and understanding of Traditional Owner usage through anthropological studies. They are considered to have low rarity due to their widespread occurrence regionally and the Project disturbance will impact a minor portion of the landform within the Groote Archipelago. The clearing of native vegetation for the development of the Project is unavoidable. Land clearing is known to have the potential to expose soils and landforms to erosion and sedimentation. Sources of potential impacts exhibiting moderate residual risk include those associated with erosion of site infrastructure, unsuccessful rehabilitation, the impact of fires triggered by the Project, and the introduction of new weed species. These are acknowledged as risks to be closely managed through best practice design, management and monitoring. The disturbance envelope is limited to the lateritic plains and rises on deeply weathered rocks in the north and lateritic plains and rises on gently undulating sandplains in the south. Both are dominated by generally homogonous Eucalyptus/Corymbia forest with a reasonably dense mid-canopy of monsoon forest species. Each landform is considered moderately robust with vegetation types and soils that are somewhat resilient to damage and degradation, with a landform condition that can be rehabilitated with appropriate measures. Therefore, the final landform is expected to be visually consistent with the current landforms for the disturbance envelope. Despite the known and potential disturbances, impacts will be limited to two non-distinctive landform types, impacts would be temporary with progressive landform rehabilitation throughout operation and the impacted area will be minor when considering the spatial extent of the landform types in the Groote Archipelago. The landform conditions can be rehabilitated with appropriate measures as presented in the risk assessment and draft Mine Rehabilitation and Closure Plan (MRCP). Thus, the Project will maintain the variety and integrity of distinctive physical landforms. The environmental objective identified in the ToR for landforms is to conserve the variety and integrity of distinctive physical landforms. Considering the assessment of residual impacts, and the implementation of mitigation and monitoring committed to by Winchelsea Mining, it is concluded that impacts on landforms are manageable, such that the ToR objective for this factor can be met. **Risk Assessment** The results of the risk assessment for landforms are summarised below. The full risk assessment is provided in Appendix B.

Factor	NT EPA Objective	Predicted Outcome and Significant Residual Impact (if relevant)
		Inherent Risk   **Residual Risk**

Extreme	High	Moderate	Low
3	3	3	0

Total	9

Extreme	High	Moderate	Low
0	1	4	4

Total	9

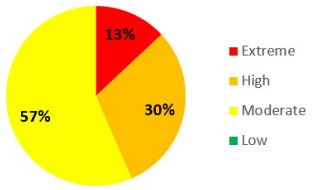
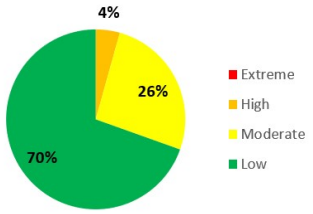
Significant Residual Risk

Following the implementation of relevant controls, residual impacts to environmental values of landforms were all assessed as being moderate to low, except for vegetation clearing which has a residual risk classified as high. To gain access to ore reserves and for the construction of supporting mine infrastructure, clearing of native vegetation will be required. The clearing of native vegetation has been conservatively classified as extreme inherent (unmitigated) risk for the entire land theme during the risk assessment process due to the potential erosion, loss of topsoil and sedimentation. However, with the implementation of the proposed mitigation measures as described in the risk register, the residual risk vegetation clearing has lowered to a high level. However, the Project does not present a significant residual risk to landforms.

Offsets

No offsets are proposed for this factor.

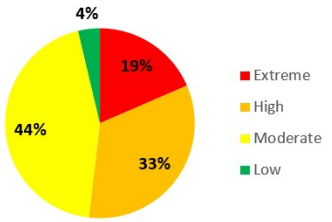
Terrestrial Environmental Quality	To protect the quality and integrity of land and soils so that environmental values are supported and maintained.	**Summary** The majority of the Project area is mapped as Kandosols and Tenosols. Tenosols cover the southern portion of the Project area where the main pit is located. Hydrosols are present in small portions in the eastern side of the MMZ. Kandosols cover most of the northern half of the Project area where Rudosols are also present in smaller patches on the eastern and northern boundaries of the Project. Soil sampling results are consistent with the predominant Keffers Hut and Queue land system and soil mapping, in that the soils are dominated by Tenosols (soils with weak profile development) and Kandosols in areas with a heavy sandy loam subsoil texture or heavier. They are predominantly sandy with some clay and silt content and varying amounts of gravel. An ESCP has been developed for the Project. The ESCP identifies the erosion risk within the Project area and provides appropriate guidance to support planning, design, construction, operations, monitoring and maintenance for water management structures. Four soil classifications were identified based on the field texture classification of the soil samples. The four soil classifications identified within the Project area have informed site soil erodibility factors. A geochemical assessment to characterise overburden (soils and rock), ore and tailings was completed for the Project. The geochemical characterisation results show that all samples assessed are low in sulfur, the sulfur is present as sulfate. Carbon in the samples is generally present as organic carbon with little

Factor	NT EPA Objective	Predicted Outcome and Significant Residual Impact (if relevant)
		inorganic carbon. Consequently, there is little acid neutralising capacity present in the horizons and even less in their respective tailings. Given the low sulfur content, although the acid neutralising capacity is low, all samples are classified as non-acid forming. From the preliminary risk assessment completed as part of the geochemical characterisation, the leachates from the tailings (fines) contain concentrations of aluminium which could pose a threat to the surrounding environment. Assuming the coarse tailings, waste, ore and low-grade ore leach similar elements to the tailings (fines), seepage and run off from these materials could also pose a similar threat. However, the TSF will be lined with a high density polyethylene to limit infiltration and therefore, seepage from the TSF will be minimal. The preliminary risk assessment concluded that the highest risk source of chemicals which could be present at concentrations deemed to pose a threat to the environment is the process water. Mined and processing water management and controls to prevent impacts to the surrounding environment are provided. **Risk Assessment** The results of the risk assessment for terrestrial environmental quality are summarised below. The full risk assessment is provided in Appendix B. **Inherent Risk**  | Extreme	High	Moderate	Low
---	---	---	---
3	7	13	0 | | Total	23
---	---	 **Residual Risk**  	Extreme	High	Moderate	Low
---	---	---	---
0	1	6	16 | | Total	23
---	---	 **Significant Residual Risk** The clearing of native vegetation for the development of the Project is unavoidable. Land clearing is known to have the potential to expose soils to erosion and sedimentation. Another potential risk is the contamination of soils through chemical spills. Inappropriate rehabilitation or failure to rehabilitate the site could result in ongoing land instability with erosion of material and soils beyond mining closure. While each of these outcomes are significant, the terrestrial environmental quality risk assessment has demonstrated that impacts on the quality and composition of soils and condition of lands are manageable through avoidance, management and mitigation measures. Considering the assessment of the residual impacts for terrestrial environmental quality, and the application of avoidance, mitigation and management measures committed by Winchelsea Mining, it is concluded that impacts on the key environmental factor from the Project are manageable, such that the there will not be significant residual impacts.

Factor	NT EPA Objective	Predicted Outcome and Significant Residual Impact (if relevant)
Terrestrial Ecosystems	Protect terrestrial habitats to maintain environmental values including biodiversity, ecological integrity and ecological functioning.	**Summary** Implementation of the Project will directly impact terrestrial ecosystems primarily through the direct, but progressive clearing of native vegetation and habitat loss. After the application of mitigation measures, the Project will result in the direct loss of approximately 530 ha (worst case scenario) of native vegetation and subsequently, associated fauna habitat. Groundwater modelling predicts there may be a potential indirect loss of a further 15.9 ha of vegetation outside the disturbance envelope due to groundwater level and salinity changes (totalling 545.9 ha). This predicted maximum extent of direct and indirect residual terrestrial impacts constitutes 11.3% of Winchelsea Island. This constitutes potential habitat for the following conservation significant species recorded in terrestrial habitats within the Project area and/or surrounds; the Northern Quoll (Endangered, EPBC Act; Critically Endangered, TPWC Act), Northern Masked Owl (Vulnerable, EPBC Act and TPWC Act), Ghost Bat (Vulnerable, EPBC Act; Near Threatened, TPWC Act) and the Northern Blue-tongue Lizard which is currently under assessment for listing as threatened under the EPBC Act. Due to the scale of the Project and its operations, it is anticipated that the level of impact from clearing will be localised and the proposed management measures and closure rehabilitation outcomes will limit potential impacts to terrestrial ecosystem as a result of vegetation clearing. The extent to which fauna will be impacted is expected to be at a local scale and is not considered to result in a significant impact to the available habitat or population of any of conservation significant species. Additionally, Winchelsea Mining will undertake progressive rehabilitation to restore fauna habitat and vegetation community structure. Other potential risks to the terrestrial ecosystem values associated with the Project have been identified, along with the consideration of mitigation measures and assessment of residual impacts. The Project presents opportunities to gain a better understanding of the little known terrestrial ecological values that are on Winchelsea Island. Risks to the terrestrial biodiversity and ecological values through clearing of native vegetation, adverse impacts to fauna and reduced air quality will remain. These impacts will be unavoidable during the construction and operation of the Project. It is the intention of Winchelsea Mining to carry out activities that relate to these impacts in an approved and controlled manner, through the issuance of environmental approvals under the EP Act and EPBC Act and associated conditions. The potential risks from poor quality water discharges, introduction of pests and weeds, change to fire regime, increased emissions, hazardous chemical spills, contamination from waste and poor unsuccessful rehabilitation will remain throughout the Project. However, the likelihood and/or consequence of these risks are considered to be sufficiently low through the application of the controls applied in accordance with the environmental decision-making framework **Risk Assessment** The results of the risk assessment for terrestrial ecosystems are summarised below. The full risk assessment is provided in Appendix B.

Factor	NT EPA Objective	Predicted Outcome and Significant Residual Impact (if relevant)

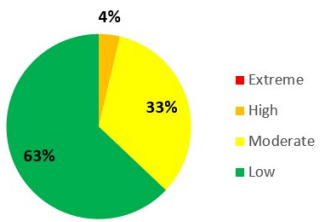
Inherent Risk



Extreme	High	Moderate	Low
5	9	12	1

Total	27

Residual Risk



Extreme	High	Moderate	Low
0	1	9	17

Total	27

Significant Residual Risk

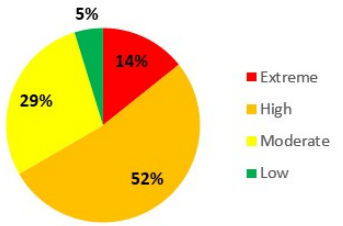
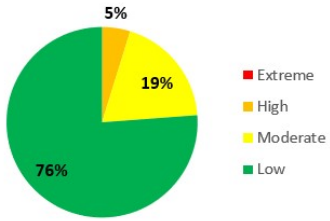
Following the implementation of relevant controls, residual risk of impacts to environmental values of terrestrial ecosystems were all assessed as being moderate to low, with the exception of impacts related to the clearing of vegetation which was assessed as being high. The Project acknowledges that despite the efforts to reduce the consequence of potential impacts from vegetation clearing the likelihood of occurrence remains unchanged, as do many of the direct impacts. The Project will require the clearing of 530 ha of native vegetation to gain access to ore reserves and to assist with the construction of supporting infrastructure. However, clearing and rehabilitation of closed areas will be undertaken progressively. Coupled with the potential adjacent loss of GDEs through groundwater drawdown and salinity changes (15.9 ha) the total residual impact is estimated at 545.9 ha. The entirety of the 545.9 ha is considered habitat for several threatened species listed under the EPBC Act and the TPWC Act (Masked Owl, Northern Quoll and Ghost Bat).

The application of mitigation measures reduced the risk profile such that there are no residual extreme risks and 17 risk factors have been reduced to low. The majority identified residual terrestrial ecological risks associated with the Project have a low probability of occurrence and in the unlikely event that they do occur, are predicted to have either a negligible or local impact on the environmental values for terrestrial ecology.

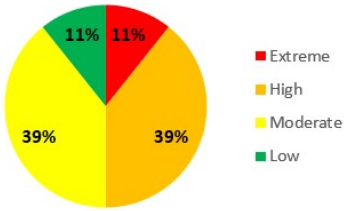
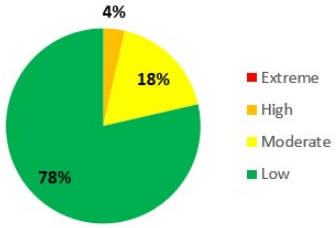
Offsets

Where a project cannot avoid or mitigate, or where measures have been applied, yet a significant residual impact remains, it may require offsetting. The following offsets are proposed.

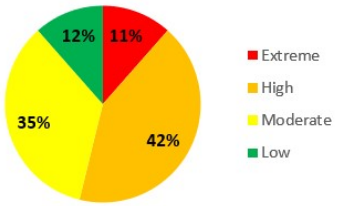
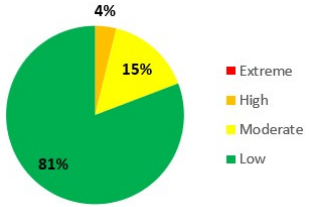
Winchelsea Mining will prepare a Biodiversity Offset Plan that utilises management benchmarks for the identified habitat threats for the monsoonal north biome. Additional threats are also relevant to the Groote Archipelago and will be incorporated into the Biodiversity Offset Plan. Based on the Draft Biodiversity Offsets Technical Guidelines (DEPWS, 2022), the total potential loss is taken to be 545.9 ha, or equivalent to 545.9 ecological units. Further details of the proposed offset are provided in Section 12- Offsets.

Factor	NT EPA Objective	Predicted Outcome and Significant Residual Impact (if relevant)
Hydrological Processes	Protect the hydrological regimes of groundwater and surface water so that environmental values including ecological health, land uses and the welfare and amenity of people are maintained.	**Summary** The construction of the Project will likely have a minor impact on the flow of surface water and the natural catchment, however it is not expected that this will have a significant impact on the hydrological cycle for Winchelsea Island and the broader region. There is likely to be localised, short term impacts to the quality of the groundwater with the abstraction of water for Project activities and pit dewatering, however, with the exception of the MMZ, these are expected to return to pre-mining levels within a few years. The aquifer below the MMZ, is predicted to return to pre-mining levels, however, due to the nature of activities at this area, i.e., mining at deeper levels which will require dewatering, the normalisation of the groundwater quality at this location, is predicted to take longer than other areas that have been disturbed as part of Project activities. The change in the water quality and groundwater levels at this location may have adverse impacts on the potential GDEs in this location. Winchelsea Mining will consider the restorations of GDEs in this location when decommissioning and undertaking their closure objectives. Considering the assessment of the residual impacts for hydrological processes, and the application of mitigation measures committed by Winchelsea Mining, it is concluded that impacts on hydrological processes for the Project are manageable, such that the objective for this factor is able to be met. **Risk Assessment** The results of the risk assessment for hydrological processes are summarised below. The full risk assessment is provided in Appendix B. **Inherent Risk**  **Residual Risk**  | Extreme	High	Moderate	Low
---	---	---	---
3	11	6	1 | | Total	21
---	---	 	Extreme	High	Moderate	Low
---	---	---	---
0	1	4	16 | | Total	21
---	---	 **Significant Residual Risk** The residual risk assessment indicated that there is a Moderate to Low risk of impacts upon hydrological processes from the impacts identified during this assessment. For these potential impacts, the mitigation, monitoring and management measure proposed are considered sufficient to reduce potential impacts to hydrological processes to a level where they do not pose a risk of significant impact to the environment. The level of certainty of the Low residual risks is considered strong as they are based on the results of studies by technical specialists, controlled through industry standards and/or are easily implemented. **Offsets**

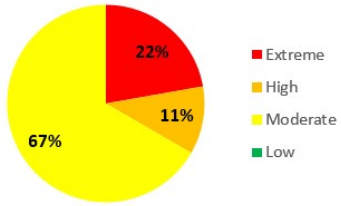
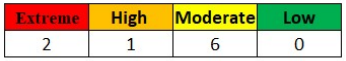
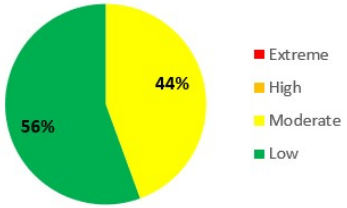
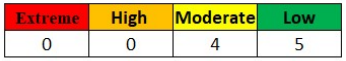
Factor	NT EPA Objective	Predicted Outcome and Significant Residual Impact (if relevant)
		No offsets are proposed for this factor.
Inland Water Environmental Quality	Protect the quality of groundwater and surface water so that environmental values including ecological health, land uses and the welfare and amenity of people are maintained.	**Summary** There is no permanent surface water resource on Winchelsea Island and all drainage lines are heavily dependent on rainfall, only flowing for a short period of time after each rain event. Baseline surface water, sediment and groundwater quality sampling was completed to characterise the existing inland water quality and sediment conditions. No exceedances of the Australian and New Zealand guidelines for fresh and marine water quality (ANZG) (2018) freshwater 95% toxicant default guideline values were recorded in surface water samples. Sediment samples exhibited no exceedances of adopted trigger values based on the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC & ARMCANZ, 2000) sediment low default values. For groundwater, manganese, nickel, zinc, ammonia and copper all recorded exceedances against the ANZG freshwater 95% toxicant default guideline values. Elevated concentrations of manganese, above the adopted trigger values, were recorded in every monitoring event at most sites, consistent with the extensive occurrence of manganese deposits on Winchelsea Island. The elevated levels of nickel, zinc, ammonia and copper recorded during groundwater monitoring events are considered naturally occurring in the environment. Sedimentation within drainage lines downstream of the Project area may be increased by mobilised sediments at exposed surfaces from land clearing for mining and infrastructure. Dewatering and discharge of mine water off site has also been identified as a potential driver for increased surface water erosion and subsequent sedimentation of drainage lines. However, the potential for erosion within the mine site will be minimised by adopting appropriate design criteria for the construction and operation of Project components. Increased salinity is considered the major potential impact to surface and groundwater quality. The surface water discharge locations are adjacent to coastal areas and salinity is not expected to have an adverse impact on a coastal environment. Also, discharges will only be required during the wet season and consequently, water within the mine water management system will be diluted with freshwater inflows and potentially further diluted by catchment runoff. Water quality monitoring will occur prior to water discharges and, if required water will be treated to meet the discharge criteria prior to being released. Dewatering of an active mining area will only be required in the MMZ and will be kept to a minimum spatially and temporally so as limit the potential for salt-water ingress. Pumping water supply bores is expected to have low risk of increased salinity in freshwater lens. However, frequently monitoring of groundwater level and salinity (electrical conductivity) is proposed to be undertaken to assess any potential intrusion of seawater. Although tailings are expected to be inert, there is limited potential for contamination of heavy metals from the ore (i.e., aluminium and manganese). Disturbance in the lower elevation areas of the Project (e.g., the MIA, process plant and wharf) may result in risk of oxidation of acid sulfate soils and subsequent mobilisation of heavy metals and acidification products, with potential impact to groundwater and surface water (acidification and release of metals). However, the likelihood is considered low due to there being no identified acid sulfate soils in field investigations and no significant inland water features in the area of low elevation disturbance. The potential risks from uncontrolled discharge, spills and poor closure will remain throughout the Project. Hydrocarbon contamination of surface water or groundwater could be caused by leaks and spills from bulk diesel fuel storages or run-off from workshop/parking areas. All hydrocarbons and chemicals will be stored in accordance with Australian Standard 1940:2017, the NT *Dangerous Goods Act 1998* and the NT *Work Health and Safety (National Uniform Legislation) Act 2011*. During closure, all hydrocarbons and chemicals will be removed from site.

Factor	NT EPA Objective	Predicted Outcome and Significant Residual Impact (if relevant)
		Considering the assessment of residual impacts, and the application of mitigation and monitoring committed to by Winchelsea Mining, it is concluded that impacts on inland water environmental quality are manageable, such that the objective for this factor can be met. **Risk Assessment** The results of the risk assessment for inland water environmental quality are summarised below. The full risk assessment is provided in Appendix B. **Inherent Risk**  **Residual Risk**  | Extreme | High | Moderate | Low | | --- | --- | --- | --- | | 3 | 11 | 11 | 3 | | Total | 28 | | Extreme | High | Moderate | Low | | --- | --- | --- | --- | | 0 | 1 | 5 | 22 | | Total | 28 | **Significant Residual Risk** While mining can pose risks to surface and groundwater, the risk assessment process has demonstrated that the risks can be managed in accordance with legislative requirements by relevant management plans and licences. Furthermore, unlike the tailings from some metals mining operations, the tailings from the processing of manganese, especially that on Winchelsea Island, are generally inert and will be free of hazardous reagents and materials. Therefore, taking into consideration the remoteness of the Project area, the controls proposed and the low potential of hazardous reagents and materials, Winchelsea Mining understands that potential impacts to inland water quality are mostly localised and with the application of the committed management and monitoring controls, risk of impacts outside of the Project area is negligible. Considering the assessment of the residual impacts for inland water environmental quality, and the application of avoidance, mitigation and management measures committed by Winchelsea Mining, it is concluded that impacts on the key environmental factor from the Project are manageable, such that the there will not be significant residual impacts. **Offsets** No offsets are proposed for this factor.
Aquatic Ecosystems	Protect aquatic habitats to maintain environmental	**Summary**

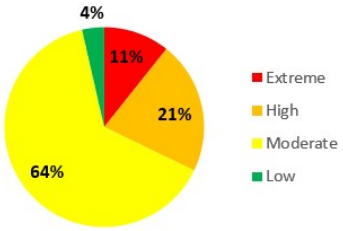
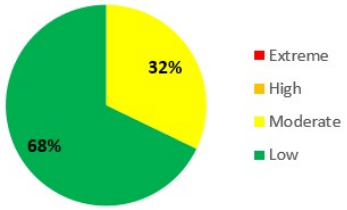
Factor	NT EPA Objective	Predicted Outcome and Significant Residual Impact (if relevant)
	values including biodiversity, ecological integrity and ecological functioning.	Winchelsea Island is contained within a catchment of its own with no permanent water features. There are no wetlands within or intersecting the Project area, with the closest being is a brackish coastal wetland on the western side of Winchelsea Island, approximately 800 m west of the Project area. Drainage features intersecting the Project area, and within surrounding portions of Winchelsea Island, area highly ephemeral. Rainwater channels off the upper bare sandstone outcropping in the north and north-west, then quickly drains into the porous soils. Aquatic ecosystems are highly constrained spatially and temporally due to the porous soil conditions preventing surface pooling for any extended periods of time. Several brackish water bodies are located on the coastal margins. Field assessments were undertaken in 2022 to determine the potential presence of listed threatened species, significant habitats and Matters of National Environmental Significance (MNES) values within the Project area and surrounds. Freshwater ecology surveys were conducted at several locations on Winchelsea Island. It was found that surface water and hence freshwater aquatic ecosystems are highly constrained with limited aquatic ecosystem values. Aquatic fauna surveys in streams draining the Project area did not record any freshwater vertebrate species (e.g., fish and turtles), as freshwater bodies were too shallow to apply appropriate aquatic ecosystem survey methodology. Bankside surveys and creek surveys during the wet season did not identify fish species above coastal brackish and marine tidal habitats (EMS, 2023). The Mertens' Water Monitor typically inhabits freshwater habitats and was recorded during field surveys, however, the species was recorded in atypical marine coastal habitat on the northern coastline of Winchelsea Island. Additionally, macroinvertebrate samples could not be collected due to the lack of suitable sites or stable substrates (EMS, 2023). Desktop analysis and field surveys were completed to identify and map potential GDE vegetation communities. While desktop mapping indicated a freshwater spring on the eastern coast of Winchelsea Island the field surveys confirmed mangrove stands of *Avicennia* and *Ceriops* sp. at this location and there were no features suggesting freshwater discharge. The desktop analysis and field surveys determined there are no riparian GDEs on Winchelsea Island and therefore potential GDEs on the island are best defined as 'terrestrial' not 'aquatic'. Therefore, while impacts to GDEs may occur from changes to groundwater salinity, these are not considered aquatic GDEs and therefore there are unlikely to be significant impacts to aquatic GDEs on Winchelsea Island. The Project will disturb land within four catchments of Winchelsea Island and will intersect two mapped drainage lines; one in the north draining to the brackish coastal swamp on the western side of the island will be intersected by an access track and the second being a drainage line through the western portion of the MMZ pit flowing towards the south-eastern intertidal depression. Surface water sampling events at both features failed to locate standing water, including after rain. Thus, these are highly ephemeral features and are likely to contain minimal to no aquatic ecosystem value. Therefore, the management of runoff quality and quantity towards the coastal brackish surface water features in the west, south and south-east of the island is considered the highest priority for the protection of any spatially constrained aquatic features on the coastal fringes. The Project will implement various management and mitigation measures focused on preventing impacts from altered runoff. With appropriate implementation of these measures significant impact to discrete aquatic ecosystem features are unlikely. The environmental objective identified in the ToR for the environmental factor of aquatic ecosystems is to protect aquatic habitats to ensure biodiversity, ecological integrity and ecological functioning are maintained. Considering the assessment of residual impacts, and the application of mitigation measures committed to by Winchelsea Mining, it is concluded that impacts on aquatic ecosystems are manageable, such that the objective for this factor is able to be met.

Factor	NT EPA Objective	Predicted Outcome and Significant Residual Impact (if relevant)
		Risk Assessment The results of the risk assessment for aquatic ecosystems are summarised below. The full risk assessment is provided in Appendix B. **Inherent Risk**  **Residual Risk**  Extreme: 3; High: 11; Moderate: 9; Low: 3; Total: 26 Extreme: 0; High: 1; Moderate: 4; Low: 21; Total: 26 **Significant Residual Risk** The residual risk assessment indicated that there is a Low risk of impacts upon aquatic ecosystems from most of the impacts identified during this assessment. For these potential impacts, the mitigation, monitoring and management procedures proposed are considered sufficient to reduce potential impacts to a level where they do not pose a risk of significant impact to aquatic ecosystems. The level of certainty of the Low residual risks is considered strong as they are based on the results of studies by technical specialists, controlled through industry standards and/or are easily implemented. There are some potential impacts that were assessed to have a Moderate or High residual risk upon aquatic ecosystems. These are acknowledged as risks to be closely managed through best practice management and monitoring. However, considering the lack of aquatic ecosystems on Winchelsea Island, the assessment of the residual impacts and the application of avoidance, mitigation and management measures committed by Winchelsea Mining, it is concluded that impacts on the key environmental factor from the Project are manageable, such that the there will not be significant residual impacts. **Offsets** No offsets are proposed for this factor.
Coastal Processes	Protect the geophysical and hydrological processes that shape coastal morphology so that the environmental	**Summary** The potential significant impacts and risks on coastal processes associated with the Project marine infrastructure has been informed by hydrodynamic modelling. The modelling considered wave and current sheltering, bed stress changes, and potential conditions contributing to transport of seabed material adjacent to the Project. The models simulated a base scenario (without structure), as well as two different options for the wharf and BLF structure. The two marine structure options were selected to demonstrate effects of plausible 'largest' structure extent or the plausible 'largest' dredging extent, with a

Factor	NT EPA Objective	Predicted Outcome and Significant Residual Impact (if relevant)
	values of the coast are maintained.	consequentially small structural footprint. The structures and dredged areas have been represented within the model bathymetry as hard, non-permeable structure layers. The metocean analysis shows scouring and accretion from the wharf are almost certain and will impact the surrounding benthic environments but will be highly localised. Wave sheltering will locally reduce the potential for transport of sediments above the rock platform along the coast of Winchelsea Island, particularly on southern side of the wharf. On the northern side, accumulation in a submerged beach at the platform edge due to interruption of bed transport may locally enhance transport onto the platform, particularly if accumulation approaches the height of the rock platform (SeaShore Engineering, 2023). The potential impacts from wave sheltering are highly localised and are anticipated to predominately occur within the nominated Project area. The observed potential changes to tidal currents are also localised immediately adjacent to the structures; however, could contribute to actions of scouring and accretion. Modelling demonstrates bed shear stress is likely to be small and current dominated for areas offshore from the embankment, beyond the structure extent, while inshore areas extending from the embankment to the platform has increasing stress, mainly due to waves. Overall, the modelled bed stress, together with interruption of dominant southward transport by the structure and/or channel is expected to lead to sediment capture on the northern side of the wharf and in the dredge channel (although sediment accumulation estimates are low). On the southern side, limited supply is expected to lead to very slow change inside the sheltered area, with potential erosion further south due to a localised imbalance in sediment transport caused by transition outside the sheltered area. Sediment transport analysis indicates that shear stresses are not expected to increase significantly following dredging and disposal. Shear stresses within the dredge footprint are somewhat smaller after dredging as compared to the current bathymetry, whereas shear stresses within the spoil disposal footprint are somewhat greater following disposal, both of which are consistent with conceptual expectations. Therefore, the shear stress results do not indicate the potential for erosion of the disposed spoil sediments under typical tidal conditions. Impacts to the benthic environment from the physical wharf structure and modelled coastal process changes represent approximately 0.2% of the benthic habitat in Bartalumba Bay. The viability of these communities in the bay is not considered at threat from the Project and thus coastal process impacts from altered benthos are highly unlikely. Potential changes to the benthos are unlikely to have a consequential impact on the coastal processes (e.g., geomorphic or physical impacts), particularly in comparison to the physical effects of the wharf structure. The environmental objective identified in the ToR for the environmental factor of coastal process is to protect the geophysical and hydrological processes that shape coastal morphology so that the environmental values of the coast are maintained. Considering the assessment of residual impacts, and the application of mitigation measures committed to by Winchelsea Mining, it is concluded that impacts on coastal processes will be sufficiently managed to ensure that the objective for this factor is met. **Risk Assessment** The results of the risk assessment for coastal processes are summarised below. The full risk assessment is provided in Appendix B.

Factor	NT EPA Objective	Predicted Outcome and Significant Residual Impact (if relevant)
		Inherent Risk    **Residual Risk**    **Significant Residual Risk** The main impact of the proposed marine facility on coastal processes is the updrift capture slow sediment transfer further southward. However, as the existing shore has demonstrated stability for almost 50 years during a period of low sediment supply, it is considered that sediment trapping by the wharf will cause negligible downdrift instability. Most potential impacts identified in the residual risk assessment (see Section 8) for coastal process are considered Low risk. For these impacts, the mitigation, monitoring and management procedures proposed are deemed sufficient in minimising potential impacts to marine sediment and water quality to a level where they do not pose a risk of significant impact to the marine environment. The residual risk assessment indicated that there is a no significant residual impacts upon environmental values related to changes to coastal processes, therefore no consideration has subsequently been given to offsets under the NT Offsets Framework (as published) and EPBC Act environmental offsets policy. Where there are potential risks, the mitigation, monitoring and management procedures proposed are considered sufficient in reducing impacts to a level whereby it is concluded that impacts on the key environmental factor from the Project are manageable, such that the there will not be significant residual impacts. **Offsets** No offsets are proposed for this factor.
Marine Environmental Quality	Protect the quality and productivity of water, sediment and biota so that environmental	**Summary** Project activities have the potential to release various contaminants to the marine environment, such as ore, sediment (including acid sulfate bearing sediments) hydrocarbons, hazardous chemicals or materials, hazardous or non-hazardous waste and objects dropped from vessels. With increased vessel activity due to Project activities in Bartalumba Bay, as well as the introduction of vehicles and heavy machinery into the intertidal zone during construction

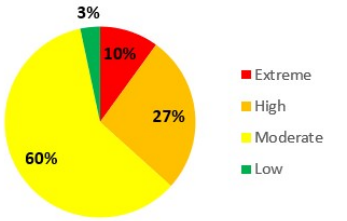
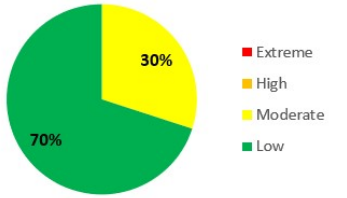
Factor	NT EPA Objective	Predicted Outcome and Significant Residual Impact (if relevant)
	values are maintained.	activities, there will be an increased potential for unplanned release of chemicals, hydrocarbons and waste to the marine environment. A range of retailed control measures have been included in the Draft EIS to prevent contaminant releases to the marine environment. Marine water quality will be temporarily impacted by the suspension of sediments during dredging and construction activities in the marine environment. Sedimentation is a key pathway to causing mortality of corals and other benthic life during dredging. Distance decay relationships suggest that sediment related impacts on corals generally tend to occur relatively near to dredging sites, approximately 3 – 4 km from dredging activities (Fisher et al., 2019). A sediment transport model was developed for the Project to analyse dredge plume dispersion and the manganese ore loss during loading and transhipment activities. Overall, suspended sediment concentration (SSC) impacts due to dredging and disposal are relatively minor, with SSC impacts in excess of 10 mg/L in only a small area immediately adjacent to the dredging and disposal footprint. The relatively low SSC impacts are a function of the low energy setting within Bartalumba Bay, with the majority of the suspended sediments depositing in the vicinity of the release location (CDM Smith, 2023). Regarding manganese ore spillage, the modelling indicates that should ore spillage occur at the BLF or transhipment area, it will be spatially restricted and, based on studies commissioned by GEMCO, not expected to be bioavailable to marine flora and fauna. Therefore, a significant impact to marine environmental quality is considered unlikely. Survey events recorded all chemical constituents within proposed dredge sediments to be below the screening levels in the National Assessment Guidelines for Dredging (NAGD) (Commonwealth of Australia, 2009). Based on the remote and undisturbed nature of the proposed dredge location, along with sediment sampling in both 2022 and 2023, there is high confidence that the sediments are 'clean' and free of contaminants. Sediment may also be transported to the marine environment from terrestrial activities during construction and operation of terrestrial Project infrastructure and from ore released to the marine environment during handling and transport (dust and larger solids). This has the ability to increase turbidity of intertidal and coastal areas and sedimentation of intertidal environments, such as mangroves and seagrass meadows. Marine fauna that rely on impacted ecosystems may be affected by habitat modification, lifecycle disruption resulting in the changes to population sizes. However, ESCP has been developed for the Project that identifies the erosion risk within the Project area and provides appropriate guidance to support planning, design, construction, operations, monitoring and maintenance to prevent impacts from offsite sediment transport. The existing underwater noise environment nearby the Project area is influenced primarily by noise from commercial and recreational vessel traffic. Large commercial vessels utilise shipping channels within Bartalumba Bay on a regular basis and tend to be concentrated along designated shipping channels between Groote Eylandt and Bickerton Island and along the channel within Bartalumba Bay. During the construction phase of the Project, it is expected an increase of vessel movement to support relevant activities, however, this will be temporary. Construction and operation of the Project is not expected to significantly increase vessel traffic in the region and the impact on marine fauna is not projected to significantly increase from existing conditions in the region. Based on review of similar marine projects, as the proposed dredging for the Project will occur on fine sand, the dredge noise level is expected to be low. Piling noise is unlikely to be above the threshold which could injure marine mammals, but it is likely that noise levels will remain above thresholds for behavioural and acoustic disturbance for extended distances from the activity source (URS, 2011). However, potential disturbance from underwater noise will be localised, temporary and the marine fauna impact potential limited through control measures included in documentation such as the Dredge Environmental Management Plan.

Factor	NT EPA Objective	Predicted Outcome and Significant Residual Impact (if relevant)
		The environmental objective identified in the ToR for the environmental factor of marine environmental quality is to protect the quality and productivity of water, sediment and biota so that environmental values are maintained. Considering the assessment of residual impacts, and the application of mitigation measures committed to by Winchelsea Mining, it is concluded that impacts on marine environmental quality are manageable, such that the objective for this factor is able to be met. **Risk Assessment** The results of the risk assessment for marine environmental quality are summarised below. The full risk assessment is provided in Appendix B. **Inherent Risk**  **Residual Risk**  Extreme / High / Moderate / Low: 3 / 6 / 18 / 1 — Total 28 Extreme / High / Moderate / Low: 0 / 0 / 9 / 19 — Total 28 **Significant Residual Risk** The residual risk assessment indicated that there is a Low risk of impacts upon marine environmental quality from most of the impacts identified during this assessment. For these potential impacts, the mitigation, monitoring and management procedures proposed are considered sufficient to reduce potential impacts to marine sediment and water quality to a level where they do not pose a risk of significant impact to the marine environment. The level of certainty of the Low residual risks is considered strong as they are based on the results of studies by technical specialists, controlled through industry standards and/or are easily implemented. There are nine potential impacts that were assessed to have a Moderate residual risk upon the marine environment. These are acknowledged as risks to be closely managed through best practice management and monitoring. As the likelihood, consequence and/or overall risk ratings for the residual risks were reduced as low as reasonably practicable, and the controls implemented are considered adequate to reduce and mitigate the potential impacts, such that the there will not be significant residual impacts. **Offsets** No offsets are proposed for this factor.

Factor	NT EPA Objective	Predicted Outcome and Significant Residual Impact (if relevant)
Marine Ecosystems	Protect marine habitats to maintain environmental values including biodiversity, ecological integrity and ecological functioning and flora and fauna so that biological and functional diversity and ecological integrity are maintained.	**Summary** The Project construction and operation has the potential to affect the biological marine environment through benthic and intertidal habitat loss and degradation, displacement, injury or mortality of marine fauna and modified coastal processes. These impacts would be caused from vessel movements, dredging and spoil disposal and the presence of physical structures such as the wharf. Marine habitats around the Project area include mangroves, coral reefs, seagrass communities and other benthic environments. Mangroves are common in the south of Bartalumba Bay; however, their diversity is usually low and they tend to be restricted to a narrow coastal fringe. The intertidal zone adjacent to the Project area is dominated by a nearly horizontal rock platform. For the lower intertidal zone, there is bare rock with a thin layer of sand present as sand bars. Coral cover tends to be within the intertidal zone in the Project area with the majority of the benthic habitat at Bartalumba Bay being bioturbated sand/silt. Analysis found that coral consisted of small colonies intermittently distributed and were not considered to be complex reef systems. Due to the shallow nature (<3 m deep) of the fringing reef system surrounding Winchelsea Island, much of the fringing reef is highly exposed to intertidal water movement and wet season storm events. Soft coral and sponge communities identified within the Project area are productive ecosystems, providing habitat, food and shelter for a range of epifauna, invertebrates and fish species. Seagrass is important for a range of marine fauna, in particular, the EPBC listed threatened species Dugongs (Dugong dugong) and Green Turtles (Chelodina mydas) require seagrass as their primary food source. Additionally, mud crabs depend on the seagrass meadows for feeding and breeding, and juvenile prawn communities are closely related with seagrasses (O2M, 2022). However, no conservation significant marine fauna populations or habitats are restricted to the Project area. The habitats surrounding the Project area are widespread and well represented throughout the region (O2M, 2023a). Benthic habitats in Bartalumba Bay will be disturbed by dredging and spoil disposal activities, construction of the wharf and BLF, anchoring by Project vessels and impacts from objects dropped from vessels. Analysis indicates approximately 16.01 ha of benthic habitat will be disturbed for the construction of the wharf and BLF. This disturbance is expected to have irreversible loss implications for BCH within the infrastructure footprint. Studies undertaken of the benthic environment at the wharf site determined that no significant coral assemblages or seagrass species were present. The habitat type on the fringing rock platform is dominated by hard bottom rocky corals with some overlying shell and grit. Rock placement may disturb the seabed, resulting in the loss of benthic habitat and impact the infauna/epifauna and primary producers. This would reduce the available food resources for marine fauna using the area. The presence of the wharf structure will also affect coastal processes. It is also acknowledged that the proposed rock wharf structure has the potential to generate new habitat for marine organisms, which would partially offset the benthic habitat impacts (Seashore Engineering, 2023). Potential impacts to coastal and benthic habitats due to changes in coastal processes at the site are considered low due to widespread occurrence of similar habitat both locally and regionally. Dredging and spoil disposal for the construction of the wharf and BLF are also expected to affect benthic habitat through direct loss during dredging activities and smothering from settling sediments. A total irreversible loss of 3.86 ha of BCH was predicted to result from indirect dredge plume impacts. Recoverable impacts of 18.5 ha of BCH are expected to occur (O2M, 2023b). The dredging operation may also disturb threatened fauna utilising Bartalumba Bay through reduced water quality (e.g., increased turbidity), sedimentation/increased sediment load, vessel strike and entrainment (specifically relating to marine turtles).

Factor	NT EPA Objective	Predicted Outcome and Significant Residual Impact (if relevant)
		However, the area of disturbance does not contain habitat critical to the survival of listed threatened species62, particularly given the species of relevance to the Project are all highly mobile, transient and have typically wide-ranging movement patterns. Impacts from vessel anchoring and objects dropped from vessels during the operations phase is expected to be minimal and localised to the seabed and benthic habitats near the anchor or dropped object. There is potential for disturbances to the seabed to result in loss of habitat and impacts to infauna/epifauna and primary producers. Surveys identified that the transhipment area partially overlies a relatively unique boulder field/sponge garden BCH. As such, an anchorage exclusion area of 100 m has been implemented to eliminate potential direct impacts on this sensitive BCH type. Lighting from vessels and marine infrastructure will be necessary during both construction and operation phases in order to maintain a safe working environment for Project personnel, and to maintain public safety. Light emissions from vessels and marine infrastructure have the potential to disrupt natural behaviours and lifecycle processes of marine fauna. Project vessel movements are not expected to significantly increase the amount of marine traffic in the region. As such, impacts from light emission and vessel interaction in the region are likely to be minimal. Individuals are likely to be affected, however, impacts are not expected at the population level and lighting from marine infrastructure will not be directly visible from the known marine turtle nesting beaches. As such, light emissions are unlikely to pose a significant risk to the marine ecosystem and management measures included in Project documentation such as the Dredge Environmental Management Plan and risk assessment are considered appropriate to prevent significant impacts to threatened marine fauna that may be transiting through or foraging within the area of Project marine activities. The environmental objective identified in the ToR for the environmental factor of marine ecosystems is to protect marine habitats to maintain environmental values including biodiversity, ecological integrity and ecological functioning and flora and fauna so that biological and functional diversity and ecological integrity are maintained. Considering the assessment of residual impacts, and the application of mitigation measures committed to by Winchelsea Mining, it is concluded that impacts on marine ecosystems are manageable, such that the objective for this factor is able to be met. **Risk Assessment** The results of the risk assessment for marine ecosystems are summarised below. The full risk assessment is provided in Appendix B.

[62] While the Recovery Plan for Marine turtles in Australian 2017-2027 (Commonwealth of Australia, 2017) identifies nesting habitat critical for the survival of Flatback, Green and Hawksbill Turtles over the Project area, these are broad areas covering the entire Groote Archipelago and the Project marine turtle nesting surveys indicate actual 'critical' nesting habitat is restricted to the northern shoreline of Winchelsea Island.

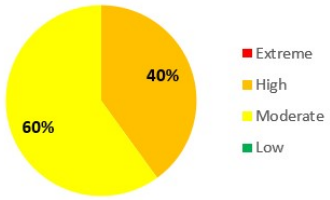
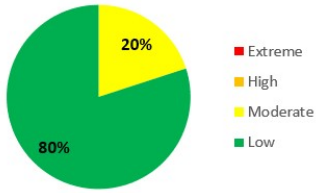
Factor	NT EPA Objective	Predicted Outcome and Significant Residual Impact (if relevant)
		Inherent Risk  **Residual Risk**  **Significant Residual Risk** The residual risk assessment indicated that there is a Low risk of impacts upon marine ecosystems from most of the impacts identified during this assessment. For these potential impacts, the mitigation, monitoring and management procedures proposed are considered sufficient to reduce potential impacts to marine ecosystems to a level where they do not pose a risk of significant impact to the marine environment. The level of certainty of the Low residual risks is considered strong as they are based on the results of studies by technical specialists, controlled through industry standards and/or are easily implemented. There are nine potential impacts that were assessed to have a Moderate residual risk upon the marine environment. These are acknowledged as risks to be closely managed through best practice management and monitoring. As the likelihood, consequence and/or overall risk ratings for the residual risks were reduced as low as reasonably practicable, and the controls implemented are considered adequate to reduce and mitigate the potential impacts, such that the there will not be significant residual impacts. **Offsets** No offsets are proposed for this factor.
Air Quality	Protect air quality and minimise emissions and their impact so that environmental values are maintained.	**Summary** An air quality assessment involving modelling was completed for the Project and considered locations categorised as sensitive receptors, sensitive receptor zones, Indigenous sites of importance and turtle nesting areas. The closest existing sensitive receptor zone consists of the residential premises of Little Paradise, and this is located approximately 6.2 km south-west of Winchelsea Island. The modelling accounted for those air quality emissions that may be generated solely from Project related activities, and also those accounted for in the current background air quality emissions, thus providing cumulative calculations at each sensitive receptor and receptor zone. The assessment analysed air quality at an additional 38 locations which represent Indigenous sites of importance and four turtle nesting areas to the north of the Project area.

Extreme	High	Moderate	Low
3	8	18	1

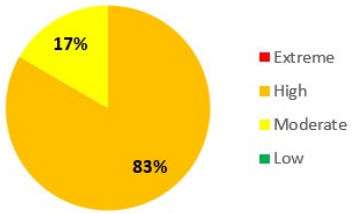
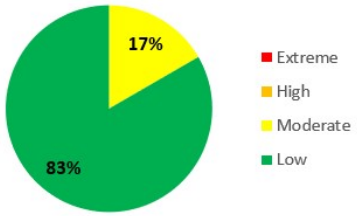
Total	30

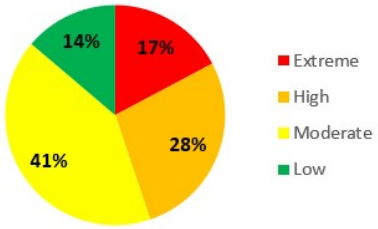
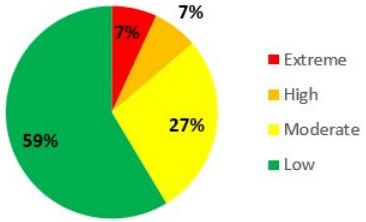
Extreme	High	Moderate	Low
0	0	9	21

Total	30

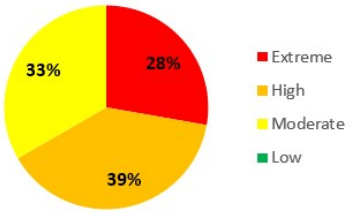
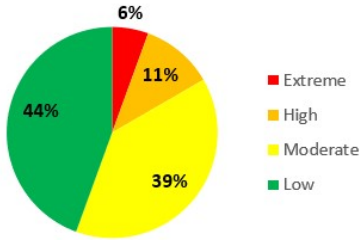
Factor	NT EPA Objective	Predicted Outcome and Significant Residual Impact (if relevant)
		The modelling indicates that implementation of the Project is unlikely to present adverse air quality impacts to those communities on Groote Eylandt or the turtle nesting areas that are located to the north of the Project area (i.e., the Project is predicted to comply with air quality objectives at all sites). There will be higher levels of particulate matter present across six of the identified cultural heritage sites. All six cultural heritage sites are physical sites containing evidence of historical use (e.g., shell middens and scatters) and the potential impacts from dust deposition is considered minimal. Winchelsea Mining will continue its close engagement with Traditional Owners in relation to the potential impacts to these sites and if necessary, will establish appropriate mitigation measures to protect these values. As the surrogate for manganese has been assessed using the distribution of particulate matter as its indicator, it is inferred that the Project's compliance with the dust guidelines will act as a control measure and therefore manganese levels will not pose a threat to the health and wellbeing of residential receptors. The environmental objective identified in the ToR for the environmental factor of air quality is to protect air quality and minimise emissions and their impact so that environmental values are maintained. Considering the assessment of residual impacts, and the application of mitigation committed by Winchelsea Mining, it is concluded that impacts on air quality are manageable, such that the objective for this factor is able to be met. **Risk Assessment** The results of the risk assessment for air quality are summarised below. The full risk assessment is provided in Appendix B. **Inherent Risks**  | Extreme	High	Moderate	Low
---	---	---	---
0	2	3	0 | | Total	5
---	---	 **Residual Risks**  	Extreme	High	Moderate	Low
---	---	---	---
0	0	1	4 | | Total	5
---	---	 **Significant Residual Risk** All potential residual impacts associated with impacts from air quality were assessed as low, with the exception for use of machinery that triggers a fire. This is partially due to location of the communities within the vicinity of the Project being at a significant distance from the emission sources. The majority identified residual air quality risks associated with the Project have a low probability of occurrence and in the unlikely event that they do occur, are predicted to have either a minor or low impact on the environmental values for air quality that can recover within 12 months.

Factor	NT EPA Objective	Predicted Outcome and Significant Residual Impact (if relevant)
		The impacts to air quality and the risks associated with the Project are able to be managed through the mitigation measures such that the there will not be significant residual impacts. Winchelsea Mining will develop relevant management plans in consultation with and stakeholders, if required, to ensure the sustainable protection of the biodiversity and cultural values for the Project area and surrounding environment are maintained. **Offsets** No offsets are proposed for this factor.
Atmospheric Processes	Minimise greenhouse gas emissions so as to contribute to the NT Government's goal of achieving net zero greenhouse gas emissions by 2050.	**Summary** The GHG assessment of the Project found the average annual Scope 1 and Scope 2 GHG emissions, including emissions from land clearing, over the life of the Project are estimated to be 35,485 tCO_2-e and total GHG emissions for the life of mine, including emissions from land clearing, are 602,231 tCO_2-e. Electricity consumption for the administration office on Groote Eylandt contributed approximately 76% of total GHG emissions including land clearing and diesel combustion contributes approximately 11% of total GHG emissions, including land clearing. The Project will contribute approximately 0.006% and 0.181% to the national and NT inventories, respectively (excluding land clearing). The GHG emissions from the Project mean that Winchelsea Mining will be required to report under the NGER Act. However, the Project does not trigger the Scope 1 threshold as part of the Greenhouse Gas Emissions Management for New and Expanding Large Emitters Policy, hence a Greenhouse Gas Abatement Plan is not required. Winchelsea Mining is aiming to fully offset GHG emissions produced by the Project to prevent a net contribution to the national and NT GHG inventories. The environmental objective identified in the ToR for the environmental factor of atmospheric processes is to minimise greenhouse gas emissions so as to contribute to the NT Government's goal of achieving net zero greenhouse gas emissions by 2050. Considering the assessment of residual impacts, and the application of mitigation committed by Winchelsea Mining, it is concluded that impacts on atmospheric processes are manageable, such that the objective for this factor is able to be met. **Risk Assessment** The results of the risk assessment for atmospheric processes are summarised below. The full risk assessment is provided in Appendix B.

Factor	NT EPA Objective	Predicted Outcome and Significant Residual Impact (if relevant)
		Inherent Risks  Extreme | High | Moderate | Low: 0 | 5 | 1 | 0 Total: 6 **Residual Risks**  Extreme | High | Moderate | Low: 0 | 0 | 1 | 5 Total: 6 **Significant Residual Risk** Carbon offset units are used to compensate for GHG emissions a business produces, to help reduce their carbon footprint. Carbon offset units are generated by projects that reduce, remove or capture emissions from the atmosphere such as reforestation, renewable energy or energy efficiencies. Winchelsea Mining is aiming to offset GHG emissions produced by the Project, with the aim of preventing a net contribution of Scope 1 and Scope 2 GHG emissions. Therefore, the potential residual impacts of the proposal for atmospheric process are considered to be low with no significant residual impact. **Offsets** No offsets are proposed for this factor.
Community and Economy	Enhance communities and the economy for the welfare, amenity, and benefit of current and future generations of Territorians.	**Summary** The Project presents economic and community opportunities at a scale that is not problematic for services, existing infrastructure or social fabric and are expected to have on balance an overall positive socio-economic impact. The Project represents a key initiative to achieve the vision and mission of the ALC and thus the long-term sustainability and development of the Groote Archipelago. In addition to direct royalty payments, the Project provides a unique opportunity for direct training/upskilling of local Aboriginal residents and provision of economic stability through direct employment. There will be local employment opportunities for operations, contractor support and construction for 20% local Indigenous personnel. The residual economic benefits of the Project are potentially transformational for the Groote Archipelago and Indigenous residents. A key residual impact from the Project will be establishment of sufficient funds in the ALC Aboriginal trust account to create a sustainable post-mining economy with ongoing non-mining related employment and training opportunities for Groote Archipelago residents. Moreover, the sustainable economic development opportunities associated with the Project will provide a more certain future for Anindilyakwa people, a sense of purpose and ability to build a self-sufficient future. Risks to the community from transport related interactions (road vehicles or vessels), spills or releases (affecting surrounding recreational uses), the general amenity of Winchelsea Island and adjacent Bartalumba Bay, introduction of pests impacting recreational fishing and the risk of unexpected closure resulting in legacy issues that affect the community will remain. However, both the likelihood and consequence of such risks are sufficiently low through the application of

Factor	NT EPA Objective	Predicted Outcome and Significant Residual Impact (if relevant)
		controls applied in accordance with the environmental decision-making framework. Furthermore, there are significant potential positive community and economic benefits likely to be realised including increased local and Indigenous personnel employment, upskilling and training of the local workforce, direct royalty payments to the NT Government, allocation of funds to ALC Aboriginal trust account, development of a sustainable post-mining economy for Groote Archipelago residents and less reliance on the NT Government for essential service provision. The environmental objective identified in the ToR for community and economy risk is to enhance communities and the economy for the welfare, amenity, and benefit of current and future generations of Territorians. Considering the assessment of residual impacts, and the application of management and mitigation measures committed by Winchelsea Mining, it is concluded that impacts on community and economy are manageable, such that the objective for this factor is able to be met. **Risk Assessment** The results of the risk assessment for community and economy are summarised below. The full risk assessment is provided in Appendix B. **Inherent Risks**  **Residual Risks**  | Extreme	High	Moderate	Low
---	---	---	---
5	8	12	4 | | Total	29
---	---	 	Extreme	High	Moderate	Low
---	---	---	---
2	2	8	17 | | Total	29
---	---	 **Significant Residual Risk** The inherent risks are categorised as ranging from moderate to extreme. The application of mitigation measures broadly reduces the risk profile for all identified sources of potential impact, with exception of positive impacts. Of the 29 sources of risk and potential associated consequences included in the risk assessment for community and economy, 25 were assessed to have a residual risk of low or moderate, two have a residual risk of high and two an extreme residual rating. The two extreme ratings are associated with the positive impacts of the Project for suppliers and businesses in the NT region and funding ALC community related activities and services in the Groote Archipelago. Potential negative community and economic impacts associated with the Project are generally able to be avoided or managed through mitigation measures that make good business sense and hence are considered unlikely to require any statutory process to mandate implementation. Considering the assessment of

Factor	NT EPA Objective	Predicted Outcome and Significant Residual Impact (if relevant)
		residual impacts, and the application of mitigation measures committed to by Winchelsea Mining, it is concluded that impacts on the community and economy are manageable, such that the there will not be significant residual impacts. **Offsets** No offsets are proposed for this factor.
Culture and Heritage	Protect culture and heritage.	**Summary** Two separate cultural heritage survey programs have been completed on Winchelsea Island and the adjacent coastal areas. The first program was conducted from 13 to 24 November 2017 on behalf of the ALC who coordinated permissions to access Winchelsea Island from Traditional Owners and arranged for Traditional Owners to accompany the survey (SHIM, 2018). Initial community consultations were conducted by ALC anthropologists in July 2017. A total of 29 Traditional Owner custodians were consulted prior to undertaking the 2017 field surveys. During the 2017 survey a total of 38 sites were located across Winchelsea Island including a range of site types, with the most common sites being shell scatters or middens, and rock shelters (SHIM, 2018). Twenty-three sites (or 62%) were found to be either entirely composed of shellfish remains or to contain a significant proportion of shell in their structure. A small number of other site types were also identified including one knapping floor and a burial. A total of eight sites containing rock art were recorded in the north and east of the island (outside the Project area). The subsequent field surveys completed by ALC anthropologists (accompanied by Traditional Owner custodians) identified an additional 22 archaeological sites, significant features or sacred locations, resulting in a total of 60 identified sites on Winchelsea Island, the surrounding intertidal and nearshore environment. Based on the survey findings there are no identified sites within the direct disturbance envelope for the Project. There are two sites within the Project area. Surveys have confirmed that the vast majority of heritage sites occur in the Blue Mud and Groote land systems; whereas the Project area is predominately located in the Queue and Keffers Hut land systems. This corresponds to the lack of cultural heritage sites in the Project area, with no identified sites within the direct disturbance envelope and only two occurring within the Project area boundary. This is consistent with surveys of the GEMCO Eastern Leases and Southern Leases on Groote Eylandt (Sutton, 2014; Martin Stone, 2016). Direct physical impacts in the marine environment will occur from wharf construction, dredging, spoil disposal, and anchoring within the transhipment area and at the cyclone moorings. For each aspect there is potential for the direct impact to undiscovered underwater cultural heritage and/or marine species that are culturally significant or are a traditional food source. There are no known underwater cultural heritage sites in the Project footprint and the total loss of subtidal benthic habitat has been calculated at 141.75 ha, which equates to roughly 1.8% of the subtidal habitat in Bartalumba Bay. The potential for physical disturbance to significantly impact cultural heritage sites or related activities is therefore considered low. The environmental objective identified in the ToR for the environmental factor is to protect culture and heritage. Considering the assessment of potential residual impacts, and the application of avoidance and mitigation measures committed by Winchelsea Mining, it is concluded that direct adverse impacts to sacred sites and sites of cultural significance are unlikely and indirect or cumulative impacts will be temporary and largely insignificant. As such, it is considered that the objective for this factor is able to be met.

Factor	NT EPA Objective	Predicted Outcome and Significant Residual Impact (if relevant)
		Risk Assessment The results of the risk assessment for culture and heritage are summarised below. The full risk assessment is provided in Appendix B. **Inherent Risks**  **Residual Risks**  **Significant Residual Risk** Of the 18 sources of risk and potential associated consequences included in the risk assessment for culture and heritage, 15 were assessed to have a residual risk of low or moderate, two have a residual risk of high and one an extreme residual rating. The single extreme (transformational) rating is associated with the positive impacts of the Project funding ALC cultural and heritage related activities and services in the Groote Archipelago. The residual impact of the Project on culture and heritage includes the exclusion of culture-related activities such as foraging from 1,484 ha of the terrestrial and wharf area of Winchelsea Island and a further 148 ha of the offshore marine area within Bartalumba Bay (i.e., the Project area). However, based on consultations with Traditional Owners from 2017 through to 2023, it has been determined that areas of cultural heritage value and significance are predominately in the coastal areas of Winchelsea Island. A range of measures will be employed to prevent general impacts to flora and fauna, as well as the introduction of weeds and pests which could degrade the environment. It is anticipated that portions of Winchelsea Island outside the Project area, and the surrounding marine environment, will retain suitable values for traditional food gathering and knowledge transfer with limited residual impacts. With implementation of the nominated avoidance, mitigation and management measures, residual impacts to identified cultural heritage sites and associated values are unlikely. The key residual impact of the Project to culture and heritage is anticipated to be the activities and services facilitated by the economic contribution and direct profits from the Project. Central to the ALC's economic development strategy is the distribution of funds for Indigenous social, cultural and job-creation programs across the archipelago for the benefit of Traditional Owners, to be sufficiently supported through profits from the proposed Winchelsea Island Manganese Mine. The financial support to cultural heritage related initiatives from the Project is potentially transformational for the Groote Archipelago and Indigenous residents.

Extreme	High	Moderate	Low
5	7	6	0

Total	18

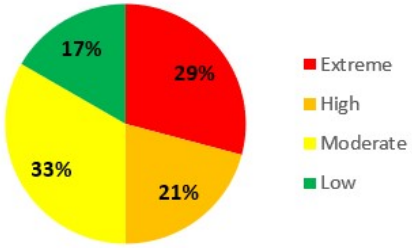
Extreme	High	Moderate	Low
1	2	7	8

Total	18

Factor	NT EPA Objective	Predicted Outcome and Significant Residual Impact (if relevant)
		The culture and heritage impacts and risks associated with the Project are able to be managed through the nominated mitigation measures, such that the there will not be significant residual impacts. **Offsets** No offsets are proposed for this factor.
Human Health	Protect the health of the Northern Territory population.	**Summary** Risks to human health from implementation of the Project are predicted to be negligible. There may be temporary high levels of particulate matter present within and immediately surrounding the Project area; however, this is not predicted to extent to the closest sensitive human receptors. The proposed Project will be on the uninhabited Winchelsea Island, a significant distance to the nearest residential sensitive receptors and with limited potential for direct adverse health effects. The residents of Little Paradise, Groote Eylandt, are the closest sensitive receptors and are located approximately 6.2 km south-west of Winchelsea Island. Given the relatively small scale of the mine, distance from this nearest settlement, and results of air quality modelling, it is considered unlikely that the health of Little Paradise residents' would be negatively affected by the proposed mine. The peak workforce of 88 full-time equivalent personnel during operation is small compared to the GEMCO workforce (~860), Alyangula township population (~751) or the Anindilyakwa statistical area population (~2,534). The population of the Groote Archipelago is stable with sufficient infrastructure and services (health, transportation, waste etc.) available to adequately support the Project. The baseline community health data indicates there have been improvements, particularly with child mortality and availability of carers; however, with changes in population demographics, prevalence of chronic diseases increasing with age, and the expected increase in Machado-Joseph Disease cases, there will be a greater need for both elderly care and general medical support in the Groote Archipelago. The Project is part of a comprehensive economic strategy to enhance Groote's Future Fund to maintain important social services, including health-related programs for the Anindilyakwa people permanently into the future. As such, the Project provides an opportunity to reinvest in social and human health infrastructure and services such that the health of Groote Archipelago residents are directly impacted in a positive manner. Due to the proximity of tidal mangroves and localised wetlands, it is likely that the Project area will be affected by pest and disease carrying insects. Mosquitos are potential transmitters of disease to humans. A site-specific Biting Insect Management Plan (BIMP) has been developed for the Project where potential impacts, monitoring and control measures to biting insects are addressed. With implementation of the BIMP, the risk of spreading mosquito-borne diseases from Project personnel is considered low. The environmental objective identified in the ToR for the environmental factor of human health is to protect the health of the NT population. Considering the assessment of residual impacts, and the application of mitigation committed by Winchelsea Mining, it is concluded that impacts on human health are manageable, such that the objective for this factor is able to be met. **Risk Assessment** The results of the risk assessment for Human Health are summarised below. The full risk assessment is provided in Appendix B.

Factor	NT EPA Objective	Predicted Outcome and Significant Residual Impact (if relevant)

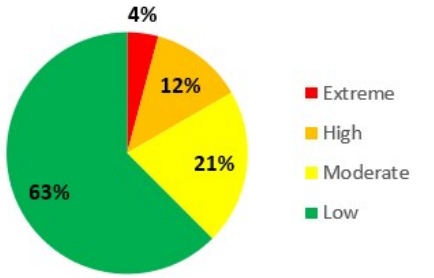
Inherent Risks



Extreme	High	Moderate	Low
7	5	8	4

Total	24

Residual Risks



Extreme	High	Moderate	Low
1	3	5	15

Total	24

Significant Residual Risk

The application of mitigation measures broadly reduces the risk profile for all identified sources of potential impact, with exception of positive impacts. The majority identified residual human health risks have a low probability of occurrence, with all but two rated as either 'Rare' or 'Unlikely' (excluding positive impacts). Three sources of impact retain a residual risk of high: Lightning strike to personnel or infrastructure; activities result in introduction of new weeds or pests and spread of existing weeds into new areas; and use of project machinery, equipment, vehicles and activities causing fire through sparks or heat ignition source.

While the likelihood of lightning strikes to personnel and fires from machinery can be reduced through Project controls, the consequence are still rated as major or significant in accordance with the risk assessment framework, as it could still result in serious injury or fatality to onsite Project personnel. With regard to the residual rating for the introduction or spread of weeds, this is driven by the potential impact to culture and heritage which is coupled with the human health factors in the people theme assessment. While the introduction of IMS could pose a risk to human health (predominately traditional food gathering activities) this would not be classified as a major hazard under the risk assessment framework if only assessing for human health.

The potential impacts and risks to human health associated with the Project are able to be managed through the nominated mitigation measures, such that the there will not be significant residual impacts.

Offsets

No offsets are proposed for this factor.

Section 15 References

15.1 Sections 1 to 6

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