Carouse Dam TSF Cell 4 Project

Construction Environmental Management Plan

EPBC Act Referral: 2021/9026

11 November 2022

Version No. 5

Proponent Details		
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Document Control

This Construction Environmental Management Plan will be reviewed over the life of the project to ensure new knowledge on Malleefowl populations in and around the project area are incorporated into the plan to ensure the effectiveness of the implemented management measures.

Version	Details of review or changes	Prepared by	Date	Document Reference
Draft	Draft prepared	Larissa Byrne	18 April 2022	Draft
1.0	Draft prepared	Larissa Byrne	02 June 2022	Draft
2.0	Final amended	Larissa Byrne	15 July 2022	Final
3.0	Updated for DCCEEW comment	Kiera Mews	25 October 2022	Draft
4.0	Updated for DCCEEW comment	Kiera Mews	04 November 2022	Draft
5.0	Final amended	Hayden Lindsay	11 November 2022	Final

Declaration of Accuracy

In making this declaration, I am aware that section 491 of the *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) makes it an offence in certain circumstances to knowingly provide false or misleading information or documents to specified persons who are known to be performing a duty or carrying out a function under the EPBC Act or the Environment Protection and Biodiversity Conservation Regulations 2000 (Cth). The offence is punishable on conviction by imprisonment or a fine, or both.

I am authorised to bind the approval holder to this declaration, and I have no knowledge of that authorisation being revoked at the time of making this declaration.

Signed:_____

Full Name: John Albrecht_____

Position: Site Senior Executive_____

Organisation: Northern Star (Carosue Dam) Pty Ltd_____

Date: 11 November 2022_____

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1.0 Introduction

1.1 Background

Northern Star (Carosue Dam) Pty Ltd (Northern Star) proposes to expand the Tailings Storage Facility (TSF) at its Carosue Dam Operations with the construction of TSF Cell 4 and associated infrastructure (the Project).

Targeted surveys surrounding the Project have identified the area supports suitable habitat for Malleefowl. The Project will require the clearing of 217.3 ha of native vegetation of which 152.6 ha is suitable habitat for Malleefowl. Inactive mounds (those unlikely to support active Malleefowl populations) have been identified within the Project footprint and will be impacted by project activities.

This Construction Environmental Management Plan (CEMP) has been prepared to support the assessment of the Project under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and accompanies the Preliminary Documentation. It outlines the impacts posed to Matters of National Environmental Significance namely the Malleefowl (*Leipoa ocellata*) (Malleefowl), and how impacts will be managed to acceptable risk levels. It also describes the performance criteria and corrective actions, as well as roles and responsibilities.

1.2 Purpose

The purpose of this CEMP is to:

- provide a framework for the implementation, monitoring and management actions required, to ensure that potential impacts to Malleefowl and their habitat attributable to the expansion of the Carosue Dam TSF are minimised
- to avoid and mitigate any impacts to Malleefowl and Malleefowl habitat
- ensure there is no mortality or injury of Malleefowl as a result of clearing or construction of TSF Cell 4.

1.3 Key construction activities with potential impacts to the Malleefowl & Primary Management Strategies

The Project involves the construction of a new TSF Cell adjacent to and abutting the existing facility as shown in Figure 1. The following key aspects of the Project have been identified as having the potential to impact Malleefowl:

- Native vegetation clearing during construction;
- Vehicle/equipment movement;

These key construction activities for the Project and their associated primary management strategies have been discussed in Table 1.

All works will be undertaken in accordance with statutory approvals, this CEMP, and relevant site-specific procedures. Employees and contractors are provided with environmental education sessions (inductions, toolbox meetings) prior to commencing work on site and are required to adhere to site procedures.

Table 1: Key construction activities with potential impacts to Malleefowl

Source / Activity	Potential Impact	Primary Strategies for Management	Relevant Document / procedure
Native Vegetation Clearing			
Key Activity - A total of 217.3 ha of Native Vegetation will be cleared for construction activities. 152.6 ha is considered suitable habitat for Malleefowl. A total of 7 mounds within the development envelope will require removal.	Potential loss of suitable habitat for Malleefowl.	Surveys have been undertaken to determine baseline habitat information and record mounds. Clearing undertaken in line with statutory approvals. Northern Star Clearing Activity Permit approved by Carosue Dam Environment department.	CDO-ENV-023-SWP Clearing Management and CDO-ENV-001-FOR-Clearing Activity Permit – CDO TSF Cell 4
	Loss of Malleefowl breeding mounds	All Malleefowl, active, recently active and inactive mounds have been, and will continue to be recorded in the Malleefowl Monitoring Database which includes date, observer, status of mound/Malleefowl and a GPS/location description. Clearing activities will preferentially occur outside of breeding season. Clearing may however, only occur during breeding season if mounds have been confirmed to be inactive by a suitably qualified person. All known active mounds will be avoided and flagged with 50m buffers. Clearing will only commence after positive confirmation that there are no active mounds, which are not to be removed under any circumstances.	Construction Environmental Management Plan (CEMP) and CDO-ENV-001-FOR-Clearing Activity Permit – CDO TSF Cell 4
	Fauna unable to escape during clearing	Clearing boundary is marked using GPS and cleared first to prevent over-clearing. Vegetation is then cleared in a systematic pattern allowing fauna to move into adjacent	CDO-ENV-023-SWP Clearing Management and CDO-ENV-001-FOR-Clearing Activity Permit – CDO TSF Cell 4

		undisturbed vegetation to the north and west of the disturbance footprint (Section 8). Fauna spotter present during clearing. Works cease should fauna require relocation during clearing.	
	Open areas may result in increased predation on Malleefowl.	Sightings of feral animals will be reported to Carosue Dam Environment Department and managed in accordance with site procedures.	CDO-ENV-024-SWP Weed and Feral Animal Control
	Dust impacting surrounding vegetation.	Water carts with dribble bars will be used to manage dust in line with normal Carosue Dam site procedures.	Construction Environmental Management Plan (CEMP)
Vehicle/equipment movement			
Key Activity - Increased equipment and vehicle movements for clearing and construction activities.	Increased vehicle strikes causing injury/death to fauna including Malleefowl.	The following speed limits will apply: • Dozer limited to 10km/hr during clearing activities. • 60km/hr for vehicles travelling on haul road Suitably qualified fauna spotter to walk ahead of dozer during clearing.	CDO-ENV-035-SWP Haul Road Management CDO-ENV-024-SWP Weed and Feral Animal Control
	Minimise entrapment leading to injury or death of terrestrial fauna, including the Malleefowl at the catchment dam.	All operators to report sightings of Malleefowl (live or dead) during clearing and construction. Daily visual inspection will be undertaken to check for trapped fauna.	NSR-ENV-002-STA-Environmental Incident Reporting Standard
	Increased occurrence of weeds, reducing quality of adjacent habitat.	Weed hygiene procedure implemented and Weed Hygiene certificate approved	CDO-ENV-024-SWP Weed and Feral Animal Control
	Increased risk of fire resulting in death/injury and displacement of Malleefowl and/or destruction of Malleefowl habitat and mounds	Emergency Response Team is trained in fire response. Maintain fire breaks and implementation of Northern Star fire management procedures	Construction Environmental Management Plan (CEMP)

2.0 Project Description

2.1 Carosue Dam TSF Expansion Cell 4

Northern Star operates the Carosue Dam Gold Mine, located 110km north-east of Kalgoorlie. Carosue Dam includes four open pits, Karari, Whirling Dervish, Monty's, and Twin Peaks. Karari and Whirling Dervish have been developed into underground mining operations while Luvironza pit, a fifth pit, was used for in-pit tails deposition and completed in 2014.

The Carosue Dam mine site consists of a carbon in leach processing plant, paddock style tailings storage facilities, waste rock dumps, a paste plant, workshops, core farms, turkeys nest dams, laydown areas, roadways, stores, borefields, administration facilities and a dual power station. Other infrastructure includes an aerodrome, solar farm, and accommodation village (Figure 1).

To support ongoing mining operations at Carosue Dam, Northern Star Resources propose to expand the existing Tailings Storage Facility (TSF) by constructing a new TSF cell (Cell 4), and associated infrastructure which involves clearing a total of 217.3ha of Native Vegetation within a development envelope of approximately 229ha. The location of the proposed development envelope for the expansion of the TSF is provided in Figure 2.

The proposed expansion of the TSF was declared a controlled action under section 95A(2) of the EPBC Act requiring further information to assess the relevant impacts of the proposed action.

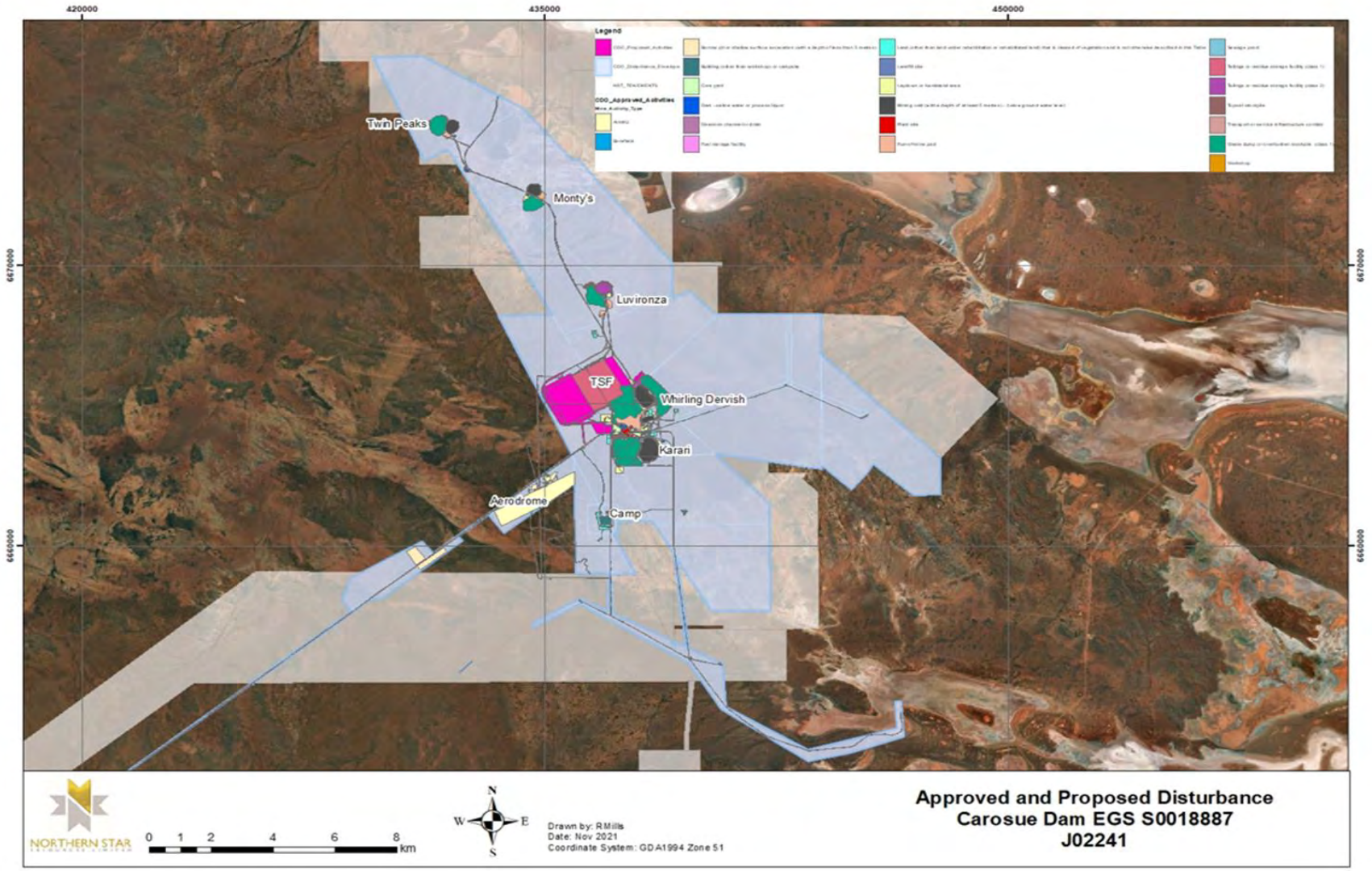

Figure 1: Location of the Project in relation to the Carosue Dam Operations

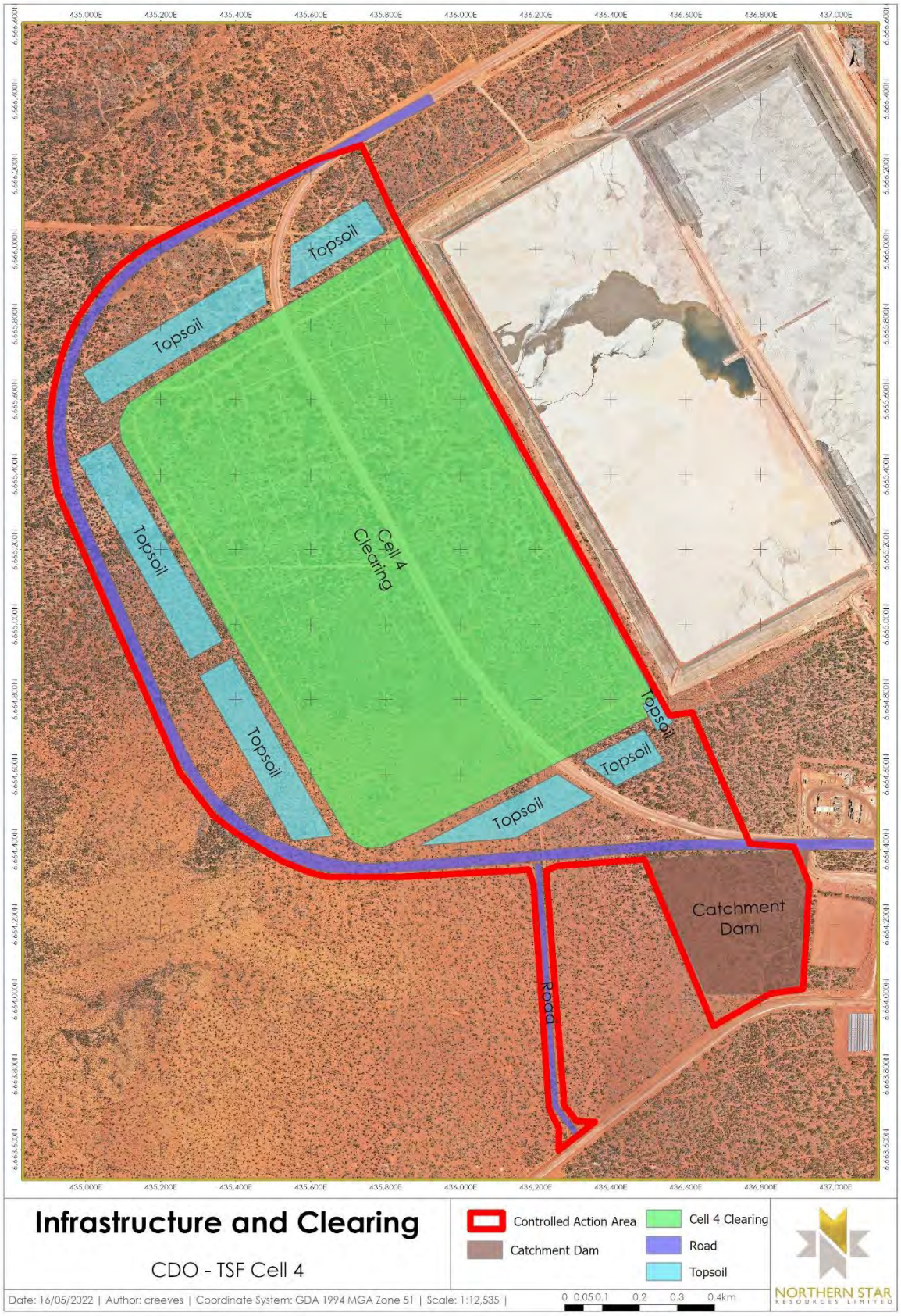

Figure 2: Layout of TSF Cell 4

2.3 Schedule for Construction Activities

Northern Star prioritises clearing activities outside of Malleefowl breeding season, between April and August, inclusive, wherever possible. This is to ensure mounds are not active during clearing activities and individuals can move into adjacent suitable habitat. Due to timing of the EPBC approval and limited TSF capacity, clearing for the construction of TSF Cell 4 and associated infrastructure will be undertaken as soon as this approval is received. Clearing will be conducted with controls in place to ensure no impact to any Malleefowl.

Clearing is currently scheduled to occur no later than November 2022 to allow construction to commence immediately following clearing. Construction of Cell 4 is expected to take seven months (plus an additional 2 months to install miscellaneous items such as pipework, power, fencing, etc), with deposition of tailings material scheduled for January 2024. Operation of the facility will continue for the current life of mine (7+ years).

Table 2 provides a summary and timing of the proposed action including clearing and construction. Additional information has been included regarding operations and decommissioning/rehabilitation, outlining the activities associated with each phase, the anticipated timing and duration of each component as well as potential impacts during each phase.

Table 2: Schedule of all phases of the proposed action

Phase	Activity Description	Start Date	Completion Date	Duration
Clearing & Construction	Clearing of impact area	November 2022	November 2022	Up to 1 month
	Construction of embankments	December 2022	June 2023	7 months
	Compaction & construction of roads	December 2022	January 2022	2 months
	Redirection of surface water flows through construction of drainage channels	December 2022	January 2022	2 months
Operations	Commence deposition of tailings into Cell 4	April 2024	April 2031	7 years
	Maintenance of infrastructure	April 2024	April 2031	7 years
	Twice daily inspections of pipelines during operation	April 2024	April 2031	7 years
	Road maintenance including dust suppression and surface grading	November 2022	April 2031	9 years
Decommissioning & Rehabilitation	Cease deposition and allow consolidation and drying of tailings material	April 2031	October 2031	6 months
	Reshape and batter slopes to <18◦;	November 2031	April 2032	6 months
	Cap top surface with competent rock;	April 2032	June 2032	3 months
	Respread topsoil;	June 2032	July 2032	2 months
	Rip on the contour	July 2032	July 2032	1 month
	Seed with local native species	July 2032	July 2032	1 month
	Rehabilitation monitoring	December 2032	December 2042	10 years

2.4 Climate

The Goldfields region is arid to semi-arid with average annual rainfall decreasing from about 250mm in the south-west to 200mm in the north-east. The area experiences hot summers and mild winters with cold nights. Rainfall varies widely between years and droughts are common. Remnants of tropical cyclones occasionally bring heavy summer rain and can cause flooding to the area. The area transitions between desert summer and winter dominated rainfall and desert: non-seasonal bioclimatic (Alex Holm and Associates 2022). As Malleefowl have been recorded within the area of the surrounding Carosue Dam Gold Mine, it suggests that the climate supports Malleefowl occurrence.

2.5 Soils

The Carosue Dam is located within the Murchison IBRA region, in the East Murchison subregion. The East Murchison area is characterised as having internal drainage with soils that are typically shallow earthy loam overlaying red-brown hardpan, shallow stony loams on hills and red sand on sand plains (*Alexander Holm & Associates 2022*).

2.6 Regional Flora

The region lies within the Eremaean botanical province near the southern boundary of the Austin botanical district (Beard, 1990). The Eremaean Botanical Province is typified by plants from the families Fabaceae (*Acacia* spp., *Senna* spp.), Scrophulariaceae (*Eremophila* spp.), Chenopodiaceae (Samphires, Bluebushes, Saltbushes), Asteraceae (Daisies) and Poaceae (grasses). The Austin Botanical District is essentially the Mulga (*Acacia aneura*) region of Western Australia. *Acacia aneura* is a dominant or a significant component in most plant communities in this District. The region is often rich in ephemerals, which reduce to scrub on hills. The Austin Botanical District is also characterised by hummock grasslands, saltbush shrublands and *Tecticornia* shrublands (*Alexander Holm & Associates 2022*).

Lake Rebecca forms a major vegetation divide with characteristic *Acacia aneura* (mulga) low woodlands associated with red loams over siliceous hard pan to the north and low woodlands of mixed mulga and *Casuarina pauper* (black oak) and *Eucalyptus* species on alkaline and calcareous soils to the south. Spinifex hummock grassland with eucalypt overstory on sand plain is common. Halophytic vegetation occurs throughout the region on palaeodrainage systems, breakaways and on some stony and alluvial plains. Highly saline soils support *Atriplex* (saltbush), *Maireana* (bluebush) and *Tecticornia* (samphire) shrublands, while less saline soils support mulga with saltbush or bluebush understories.

2.7 Local Flora

Vegetation of the Carosue Dam Gold Mine consists of low open *Eucalyptus* woodland over *Acacia* and other mixed shrubs to *Casuarina* and *Acacia* woodland. Toward Lake Rebecca the vegetation becomes more halophytic and the overstorey disappears, leaving low halophytic shrubs with occasional sandy banks and drainage zones which support a wide range of species. Numerous flora surveys have been conducted in and around Carosue Dam.

A total of 534 flora taxa have been recorded across the Carosue Dam Project, including the occurrence of five species of conservation significance. These species represent 52 families, and 187 genera. The most common families represented throughout the project include Chenopodiaceae (78 taxa), Fabaceae (59 taxa), Asteraceae (49 taxa), Poaceae (48 taxa), Myrtaceae (43 taxa) and Scrophulariaceae (40 taxa).

Flora surveys across the Carosue Dam Project have highlighted that species composition and vegetation communities are typical of the area and not considered to be unusually diverse.

2.8 Malleefowl (*Leipoa ocellata*)

Malleefowl (*Leipoa ocellata*) are a stocky ground-dwelling bird, that rarely flies, belonging to the family Megopodiidae that build distinctive nests comprised of larger mounds built from soil and leaf litter to incubate their eggs. Breeding season usually begins in September when egg laying begins and ends in late January. During this time the male bird remains at the mound constantly re-working it. Breeding pairs are monogamous, will pair for life and will breed in the same area using existing mounds. Chicks typically begin hatching in November, with most chicks emerging from mounds by January, however it has been noted that in some seasons hatching may continue until March (Benshemesh, 2007). Malleefowl (eggs and chicks) are threatened by predation, habitat clearing, isolation due to habitat fragmentation and increased wildfires.

2.9 Distribution and Habitat

Historically, Malleefowl have been found in semi-arid mallee shrublands and woodlands across southern Australia, however although the species is still found across its range, its remaining populations are highly fragmented due to extensive land clearing (Department of Parks and Wildlife, 2016). Malleefowl habitat is generally found in shrublands and low woodlands dominated by mallee. In Western Australia habitat generally consists of Acacia dominated shrublands and occasionally woodlands dominated by eucalypts. Habitat areas require a sandy substrate and abundance of leaf litter for the construction of mounds. Studies have

found density of birds is greater in areas of higher rainfall, on more fertile soils and where shrub diversity is greatest. Habitats characterised by numerous food plants (especially leguminous shrubs and herbs), a dense canopy cover and open ground layer are generally associated with high breeding densities. Malleefowl also prefer long unburnt country (Benshemesh, 2007). Thick vegetative corridors are beneficial to Malleefowl that predominantly disperse on foot.

The surrounding area of the Carosue Dam has been surveyed and is considered to contain suitable habitat to support Malleefowl. A total of 152.6ha of suitable habitat for Malleefowl will be removed, however, the 4,276ha surrounding Carosue Dam operations, which includes the disturbance envelope, is covered by a unified land unit map, 368ha is considered to be habitat suitable for forage and cover and 2,143ha is considered to be critical habitat used for breeding and forage (Alexander Holm and Associates 2022).

At the broader land system scale, most nesting mounds are within Deadman land system characterised by level to gently undulating plains with casuarina-acacia shrublands which include the Malleefowl-favoured acacia shrublands of land units 4a and 4b Nesting mounds occur on footslopes of Lawrence and Leopold land systems characterised by low hills with eucalypt or acacia woodlands with halophytic under-shrubs which include basalt hill footslopes of land unit 2b. Nesting mounds also occur in favoured locations within the extensive Kirgella land system characterised by sandplain supporting spinifex and acacia/eucalypt shrublands which is dominated by spinifex sandplain of land unit 4d (Alexander Holm and Associates 2022).

Deadman, Kirgella, Lawrence and Leonora land systems occupy approximately 18,000ha within 10km of the disturbance envelope and provide potential habitat for Malleefowl. Kirgella land system, which extends up to 40km to the west and is contiguous with the disturbance envelope, occupies two thirds of the potential habitat (Alexander Holm and Associates 2022).

2.10 Conservation Status

The Malleefowl is one of three mound – building birds species is Australia and is recognized as a threatened species under State and Commonwealth legislation. The Malleefowl is listed as Vulnerable fauna under the EPBC Act. The species is also listed as Vulnerable under the *Biodiversity Conservation Act 2016* (WA).

3.0 Objective

The objective of the CEMP is to ensure there is no mortality or injury of Malleefowl, from the expansion of the Carosue Dam Tailings Storage Facility Project. The key objectives and performance criteria have been detailed in Section 9 in Table 9.

4.0 Environmental Roles and Responsibilities

Table 3 identifies the roles and responsibilities relating to the implementation of this CEMP.

Table 3: Environmental roles and responsibilities

Role	Responsibility
Site General Manager	• Implementation and maintenance of the plan. • Undertake the assessment and review of the effectiveness of this management as required.
Site Environmental Advisors	• Maintain site records of surveys and any other relevant environmental data and implement monitoring programs. • Deliver fauna education and induction awareness training to field personnel. • Ensure pre-clearing surveys are conducted to ensure no Malleefowl are breeding in the disturbance area. • Ensure a 'spotter' is present during clearing activities. • Sign off on Clearing Activity Permit, which will include a summary of conditions outlined in this CEMP listed as "Other special management conditions" • Liaise with stakeholders regarding feral animal control and fire management. • Record any incidents associated with construction activities and provide direction for remedial actions.
Project Managers/Supervisors	• Ensure the plan is being adhered to by all staff and contractors • Participate in compliance audits and inspections.
All Northern Star employees and Sub-contractors/temporary workers	• Adhere to the requirements in this management plan. • Report all incidents that involve impacts to fauna including Malleefowl.

5.0 Reporting

The reporting requirements for the CEMP are outlined in Section 9 Table 9 and Section 10.

6.0 Environmental Training

Environmental training will be provided to all relevant staff including temporary contractors prior to the commencement of clearing to ensure they understand the requirements of the plan. Training will be aimed at minimising impacts on the species and site environmental controls, understanding the roles and responsibilities of all personal in adhering to the requirements of the Management Plan and ensuring objectives are being achieved.

Training will be provided but not limited to the following formats:

- Site inductions
- Pre-start meetings

Records of staff and contractors completing site inductions will be maintained as per site training protocols. Training and awareness material is included in Appendix B.

7.0 Emergency Contacts and Procedures

During clearing and construction activities, if an emergency arises where objectives are not going to be met, or direct impacts to the Malleefowl/fauna or active mounds are likely then the Carosue Dam Environmental team will be notified and corrective actions will be implemented.

7.1 Stop Work Procedure

Stop work procedures including corrective actions and procedures to return to work are detailed in Table 44 for the various scenarios.

Table 44: Stop Work Procedures

Scenario	Corrective Action	Return to work
Malleefowl Sighting during clearing	• Cease work immediately • Report to supervisor and Carosue Dam Environment Team • Maintain sight of Malleefowl where possible and safe to do so, allowing it to move away of its own volition • Fauna spotter, Carosue Dam Environment Team and Work Area Supervisor to investigate surrounding work area for Malleefowl activity and mounds	• Work area supervisor in consultation with Fauna spotter and Carosue Dam Environment Team to release return to work following confirmation of no Malleefowl presence within the work area
Malleefowl sighting during construction	• Cease work immediately • Report to supervisor and Carosue Dam Environment Team • Maintain sight of Malleefowl where possible and safe to do so, allowing it to move away of its own volition • Carosue Dam Environment Team and Work area supervisor to investigate surrounding work area for Malleefowl activity and mounds	• Work area supervisor in conjunction Carosue Dam Environment Team to release return to work following confirmation of no Malleefowl presence within the work area
Active mound located during clearing	• Cease work immediately • Report to supervisor and Carosue Dam Environment Team • Fauna Spotter and/or Carosue Dam Environment team to inspect the mound to verify status • 50m buffer to be established surrounding Active mound as well	• Carosue Dam Environment team to release return to work following establishment of 50m buffers surrounding the Active mound and corridor to surrounding vegetation and risk assessment deeming

	as a vegetation corridor to surrounding vegetation • Buffer to be loaded into dozer GPS and Carosue Dam Environment Team to supervise clearing around buffer	activities are appropriate to recommence • Post breeding season, Suitably Qualified Expert to confirm malleefowl mound not active, then the clearing of mound, buffer and corridor can occur • DCCEEW notified
Malleefowl strike or entrapment during clearing and/or construction	• Cease work immediately • Report to supervisor and Carosue Dam Environment Team • Incident reported internally through INX InControl and investigation undertaken.	• Fauna spotter and Carosue Dam Environment team to confirm the area is all clear for recommencement of works.

8.0 Environmental Risks

A risk assessment for the construction activities identifies the key risks and potential impacts of the proposed activity on Malleefowl. This process allows identified risks to be evaluated and outlines mitigation measures and effectiveness of these measures. The Risk Assessment has been completed in accordance with the Australian/New Zealand standard 4360:1999 Risk Management. The risk assessment considers the likelihood of an impact event and the relative consequence of that event. The risk assessment is detailed in Table 8.

Table 5: Qualitative measures used for the determination of an event likelihood rating

Likelihood		Description
A	Almost Certain	Common or Frequent occurrence (e.g. once per day)
B	Likely	Is known to occur or "it's happened" (e.g. >once per month, but <once per day)
C	Possible	Could occur or "I've heard of it happening" (e.g. >once per year, but <once per month)
D	Unlikely	Not Likely to occur (e.g. <once per year)
E	Rare	Rare / practically impossible (e.g. very unlikely to ever occur)

Table 6: Qualitative measures used for the determination of an event consequence

Consequence		Description
1	Very Low	None or insignificant impact to MNES (Malleefowl) with no effect on ecosystem function.
2	Minor	Moderate to minor impact to MNES (Malleefowl) resulting in a minor, recoverable impact.
3	Moderate	Minor and short-term impact to MNES expected, resulting in a moderate, recoverable impact.
4	Major	Long-term impact to MNES expected, resulting in a major, recoverable impact.

5	Catastrophic	Irreversible impact to MNES expected.

Table 7: Risk Rating Matrix

		CONSEQUENCES				
LIKELIHOOD		Very Low 1	Minor 2	Moderate 3	Major 4	Catastrophic 5
A	Almost Certain	H (11)	H (16)	E (20)	E (23)	E (25)
B	Likely	M (7)	H (12)	H (17)	E (21)	E (24)
C	Possible	L (4)	M (8)	H (13)	E (18)	E (22)
D	Unlikely	L (2)	L (5)	M (9)	H (14)	E (19)
E	Rare	L (1)	L (3)	M (6)	M (10)	H (15)

Matrix Legend:

E:	Extreme risk	Immediate action required, further reduction needed. If not possible, Country Manager or COO approval required
H:	High risk	Senior management attention needed
M:	Moderate risk	Management responsibility must be specified
L:	Low risk	Manage by routine procedure

Table 8: Identification and Management of risks associated with the proposed action

	Risk Pathway/Impact	Likelihood	Consequence	Risk	Actions to be implemented/Mitigation Measures	Likelihood	Consequence	Residual Risk	Justification for Residual Risk ranking	Document incorporating risk treatment
Direct Impact	Impacts on habitat use due to fragmentation	C	3	H13	The infrastructure to be constructed within the proposed impact area has been designed to directly abut existing TSF infrastructure, without gaps or creating satellite facilities, therefore fragmentation of habitat is unlikely. Malleefowl habitat and surrounding native vegetation is extensive and generally continuous throughout the region, therefore any potential impacts due to fragmentation is rated as low.	D	2	L5	The impact site is not located in a satellite location where it could potentially break a linkage between favourable habitat plots. It is located directly adjacent to existing infrastructure to minimise fragmentation of habitat.	CDO-ENV-023-SWP Clearing Management
	Reduction in habitat size due to clearing	C	3	H13	Disturbance will be limited to only what is necessary for safe construction and operation of the TSF and associated infrastructure. The facility has been designed to adjoin to abut the existing TSF facility which allows NSR to utilise the existing western wall of the paddock TSF and associated existing cleared areas (11.8ha) within the proposed development envelope, reducing disturbance footprints as far as practically possible. An internal Clearing Activity Permit will be issued by site Environmental personnel and signed off by operators and supervisors involved in the clearing. Disturbed areas will be rehabilitated progressively where possible and upon closure in line with the approved Mine Closure Plan. Implementation of Northern Star internal Clearing Management Safe Work Procedure. Total footprints of new TSF and miscellaneous infrastructure have been minimised wherever practical to reduce overall disturbance and minimise impacts to Malleefowl habitat. The reduction of habitat size from the proposal is rated as Low.	D	2	L5	Within the immediate 4,276ha surrounding Carosue Dam operations, which includes the disturbance envelope and is covered by a unified land unit map (Alexander Holm & Associates 2019), 368ha is considered to be habitat 'suitable' for forage and cover and 2,143 ha is considered to be 'critical' habitat used for breeding and forage. This habitat extends well beyond this confined area and highlights the limited impact footprint of this proposal. The proposed location of the TSF directly adjacent to the existing facility ensures that disturbance is minimised as far as practically possible.	CDO-ENV-023-SWP Clearing Management CDO-ENV-001-FOR-Clearing Activity Permit – CDO TSF Cell 4
	Reduction in population numbers due to removal of breeding mounds	D	3	M9	The most recent targeted survey conducted in December 2021 determined that the were no active mounds during the 2021 breeding season. It is unlikely there will be a reduction in Malleefowl population due to the removal of breeding mounds. The risk has been rated as Low. Pre-clearance surveys will be undertaken to identify the presence of Malleefowl and mounds in proposed clearing areas. Clearing activities will preferentially occur outside of breeding season. Clearing may however, only occur during breeding season if mounds have been confirmed to be non-active by a suitably qualified expert. All known active mounds will be avoided and flagged with appropriately sized buffers (50m). If Active mounds are found in the area prior to clearing they will be monitored during breeding season, to ensure no impacts are sustained by individuals or their young. Clearing within 50m of the mound will only commence after positive confirmation that the mound is no longer active. Annual monitoring of the Malleefowl population across Carosue Dam Operations and EEL55 in accordance with the National Malleefowl Monitoring Manual and in consultation with the DBCA and other best practice organisations in order to contribute to regional Malleefowl population data.	D	2	L5	Malleefowl demonstrate resilience to disturbance in many examples, including at Carosue Dam where nesting mounds have been previously located <10m away from roadways and other infrastructure (outside of the proposed impact site). Proposed buffer zones of 50m are deemed sufficient by DMIRS in the recently approved Purpose Permit (CPS8000/2) amendment to minimise impacts to breeding mounds.	Clearing Permit CPS8000/2 CDO-ENV-051-Pla - Biodiversity Management CDO-ENV-001-FOR-Clearing Activity Permit – CDO TSF Cell 4
	Fauna injury or mortality due to vehicle strike	C	3	H13	Northern Star will continue to implement the following mitigation measures to prevent injury/mortality of Malleefowl at the site: Reduction in vehicle speed limits within the area. Fauna spotter present with the ability to stop clearing works if Malleefowl at risk of injury or mortality;	D	3	M9	No Malleefowl have been hit by vehicles around the current TSF Haul Road or TSF area during Saracen or Northern Star's ownership of the project, therefore providing evidence that the likelihood of	CDO-OHS-SA-003-PLA Carosue Dam Traffic Management Plan

	Risk Pathway/Impact	Likelihood	Consequence	Risk	Actions to be implemented/Mitigation Measures	Likelihood	Consequence	Residual Risk	Justification for Residual Risk ranking	Document incorporating risk treatment
					Where a Malleefowl is sighted, Stop Work Procedure will be implemented (Section 7.1, Table 4). Fauna within the impact area will be allowed to move into adjacent habitat areas of their own volition prior to clearing recommencing; Additional Warning signs will be erected on transport corridors and around the construction site informing of Malleefowl potentially in the area. Implementation of the Haul Road Management Safe Work Procedure to reduce the incidence of vehicle strikes. All operators to report sightings of Malleefowl (live or dead) including mounds. All personnel will complete an environmental induction prior to commencing work to ensure procedures and management measures are understood. Clearing will only be conducted during daylight hours.				fauna strike is extremely low. Reduced speed limits during the construction phase of the project will further decrease this risk.	CDO-ENV-051-Pla - Biodiversity Management CDO-Site-Specific-Induction-Nov-2022
	Displacement of adult birds due to habitat clearing	C	2	M8	Clearing will be conducted in accordance with the CEMP, which outlines procedures to allow birds and other fauna to move into adjacent areas of habitat. A total of 2500 ha of suitable Malleefowl habitat surrounds the impact area to support displaced birds. Within the immediate area an additional 4,276ha surrounding the impact site is over 2,500ha of suitable habitat to support displaced birds. Suitable habitat also extends far beyond this.	D	2	L5	Malleefowl are currently not reliant on the mounds within the development footprint which has been confirmed by the various Malleefowl surveys over the area- all mounds are inactive.	Construction Environmental Management Plan (CEMP) CDO-ENV-051-Pla - Biodiversity Management
	Potential entrapment leading to injury or death of terrestrial fauna, including the Malleefowl at the catchment dam.	C	3	H13	All operators to report sightings of Malleefowl (live or dead) during construction. Daily visual inspection will be undertaken to check for trapped fauna. Stop Work Procedure (Section 7.1, Table 4) will be implemented.	D	3	M9	The earthen dam will be constructed to capture any potential surface water flows. Standing water is not expected to be present within the dam and any surface water collected will be pumped out.	Construction Environmental Management Plan (CEMP)
	Increase risk from feral species through predation or competition with Malleefowl	C	3	H13	Northern Star will continue to implement the following mitigation measures to prevent predation on Malleefowl at the site: Predator control program implemented. Monitoring of feral animal activity. Staff training of feral animal and waste Management Avoid attraction of feral animals by implementing domestic waste management procedures. Waste and water sources fenced not available to feral animals. Putrescible rubbish (including food scraps) and other materials are disposed of into sealed 1 tonne bulka bags prior to burial to prevent feral animals and vermin from accessing the waste, allowing them to breed and increase in numbers. Carosue Dam has existing procedures for feral animal control on site and work closely with neighbouring pastoralists to undertake feral animal control in the surrounding area. It is unlikely there will be an increased risk in predation from the controlled action on Malleefowl.	D	3	M9	Evidence through sightings, scats and tracks suggest feral animal numbers in the area are low. Recent annual Malleefowl Monitoring to the east of the mine area showed no evidence of cats, little evidence of dogs and some evidence of rabbits. Baiting is carried out by neighbouring pastoralists frequently throughout each year.	CDO-ENV-024-SWP Weed and Feral Animal Control CDO-ENV-051-Pla - Biodiversity Management Plan
Indirect Impacts	Noise from construction, vehicles, and general mine operations impacting Malleefowl movements in the area	C	2	M8	The proposed TSF Cell 4 and associated infrastructure is located within an active mining and processing area. The total footprints of new TSF and miscellaneous infrastructure have been minimised wherever practical to reduce overall disturbance and minimise impacts to Malleefowl. All mounds within the proposed development footprint are not active, therefore risks of mine operations impacting individuals of the species is negligible. It is unlikely that the addition of the controlled	D	2	L5	Studies have demonstrated Malleefowl are extremely resilient to activity and disturbance near their habitat. An active Malleefowl population is present directly east of the mine area (outside of any potential impact area). There are many examples at Carosue Dam where	Construction Environmental Management Plan (CEMP)

	Risk Pathway/Impact	Likelihood	Consequence	Risk	Actions to be implemented/Mitigation Measures	Likelihood	Consequence	Residual Risk	Justification for Residual Risk ranking	Document incorporating risk treatment
					action is going to result in Noise/Light impacts to the Malleefowl. The following mitigation measures will be implemented: Project travel between dusk and dawn will be limited to essential travel only. Lights will be strategically placed and designed to shine towards plant operations and minimise light exposure to the surrounding environment. Equipment design will specify compliance with Australian Standard noise limits				Malleefowl have nested directly adjacent to roads and other mining infrastructure.	
	Increased occurrence of weeds, reducing quality of adjacent habitat suitable for Malleefowl.	D	1	L2	A Weed Management Procedure has been implemented on site which includes recording and mapping infestations in a database. All vehicles entering site must be cleaned prior to arrival and checked before they commence work. A Weed Hygiene Certificate is issued to confirm they are free of vegetative and soil material. It is unlikely that the occurrence of weeds will impact adjacent Malleefowl habitat. The risk has been rated as Low.	E	1	L1	The majority of the proposed disturbance will not be susceptible to weed infestations as the haul road will be compacted and trafficked consistently and the entire TSF footprint is not conducive to vegetation growth due to the hypersaline nature of the tailings. Topsoil stockpiles will be monitored in line with the remainder of Carosue Dam and weeds managed as required.	CDO-ENV-024-SWP Weed and Feral Animal Control CDO-ENV-002-FOR-Weed Hygiene Certificate
	Dust impacting surrounding vegetation suitable for Malleefowl.	D	2	L5	Dust generation from clearing activities and vehicle movement will be mitigated using water suppression via water cart as required during clearing and construction. The construction/clearing activities will only occur for a period of 9 months. It is unlikely that dust generated from the short-term project will impact surrounding vegetation suitable for Malleefowl. Therefore, the risk has been rated as Low. Dusting events are mitigated through clearing procedures, for example clearing must not be undertaken during high wind events.	E	2	L3	Dust suppression once applied is extremely effective due to the hypersaline nature of the water at Carosue Dam. The dust suppression forms a crust over the areas watered, therefore minimising dust generation to an acceptable standard.	CDO-ENV-035-SWP Haul Road Management
	Altered surface water flow impacting vegetation suitable for Malleefowl (e.g. water starvation or flooding)	D	2	L5	Intensive surface water studies have been conducted and appropriate water management infrastructure has been designed to ensure altered surface water flows do not negatively impact on vegetation suitable for Malleefowl. Therefore, it is unlikely that altered water resources will impact on vegetation suitable for Malleefowl. The risk is rated as Low.	E	2	L3	Surface water risks have been assessed and appropriate controls put in place through the design phase to ensure no issues occur during and after construction.	Surface and Groundwater Hydrological Studies for Life of Mine TSF Expansion Project
	Hypersaline water from dust suppression affecting vegetation suitable for Malleefowl.	D	2	L5	Water carts are fitted with dribble bars rather than spray bars to ensure dust suppression is only applied to immediate area in need of suppression, therefore minimising risk of hypersaline water affecting surrounding vegetation. Sumps are dug in runoff v-drains to capture incidental hypersaline runoff from road watering activities. It is unlikely that hypersaline water will impact suitable Malleefowl habitat. The risk is rated Low.	E	2	L3	Frequent inspections are completed of roadside sumps to ensure they do not need to be dug out and for evidence of salt movement. This is regulated via Tenement Conditions under the Mining Act 1978.	CDO-ENV-035-SWP Haul Road Management
	An increased risk of fire due to construction equipment and activities impacting fauna and Malleefowl habitat.	C	4	E18	Various fire management practices and controls are implemented at the Carosue Dam minesite which contribute to the overall protection of the site and surrounding areas, these include: • Maintain fire breaks and implementation of NSR fire management procedures • Firefighting and suppression equipment located at site and on construction equipment/vehicles • All equipment and vehicles restricted to designated cleared access tracks/roads. • Staff training and awareness in the prevention and management of fires. • Consultation with relevant agencies (FESA, DBCA) in relation to prescribed burns and fire management.	D	3	M9	Bushfires are becoming more prevalent across the arid region.	Construction Environmental Management Plan (CEMP)

9.0 Environmental Management

Environmental management measures have been outlined in Table 9. These objectives and management measures are applicable during the clearing and construction phase of the project.

Table 9: Environmental Management Objectives, Controls and Reporting

Objectives	Performance Criteria	Management Measures	Reporting
Minimise the potential of vehicle strike causing injury or death to terrestrial fauna, including the Malleefowl.	No deaths of fauna/Malleefowl attributable to vehicle strike.	Malleefowl road traffic warning signs are erected on project specific transport corridors and around the construction site informing of Malleefowl in the area. Restricted vehicle speeds will be applied on clearing equipment. Pre-clearance survey to be completed prior to clearing commencing by a suitably qualified expert to ensure no active mounds are present or within 50m of the clearing footprint. Suitably qualified fauna spotter to walk ahead of dozer during clearing. Spotter, dozer driver or any person sighting a Malleefowl to follow Stop Work Procedure outlined in Section 7.1. Clearing will only be conducted during daylight hours. Dozer speed limited to 10km/hr.	A suitably qualified expert will provide a report on the pre-clearance survey. This will be provided to DCCEEW prior to clearing commencing. Fauna spotter will provide a report on all fauna spotted or relocated during clearing, which will be included in the Annual Compliance Report to DCCEEW. During construction, incidents and near misses (including sightings) are reported through INX InControl and will be included in the Annual Compliance Report to DCCEEW. All incidents and/or potential non-compliance and/or actual non-compliances should be reported to the Department electronically within 2 business days.
Minimise entrapment leading to injury or death of terrestrial fauna, including the Malleefowl.	No Malleefowl (adult or chick) death due to entrapment in water holding facilities.	All operators to report sightings of Malleefowl (live or dead) during construction. Daily visual inspection will be undertaken to check for trapped fauna.	Visual Inspection Incident Reporting

Objectives	Performance Criteria	Management Measures	Reporting
Minimise requirements for clearing which results in habitat loss and fragmentation.	No unauthorised clearing and/or clearing outside approved clearing areas. No unauthorised clearing of active Malleefowl mounds.	Clearing activities will be kept to a minimum, with all native vegetation clearing to be undertaken in accordance with Clearing Permit CPS8000/2 and EPBC Approval 2021/9026. Pre-clearance surveys will be undertaken prior to clearing to identify and record the presence of Malleefowl and mounds in proposed clearing areas. A fauna spotter will be present during clearing and will stop work if Malleefowl are spotted in, or adjacent to, the disturbance area, Clearing activities will preferentially occur outside of breeding season. Clearing may however, only occur during breeding season if mounds have been confirmed to be inactive by a suitably qualified expert. All known active mounds will be avoided and flagged with 50m buffers. If Active mounds are found in the area prior to clearing they will be monitored during breeding season to ensure no impacts are sustained by individuals or their young. Clearing will only commence after positive confirmation that the mound is inactive. Staff training and awareness including an induction and Toolbox sessions.	An annual Clearing Permit Report is submitted to DMIRS as required under CPS8000/2. Information will also be included in the Annual Compliance Report to DCCEEW.
Minimise increases to predator abundance.	No increase in predator abundance No fauna/Malleefowl deaths due to predation.	Predator control program implemented if required Waste and water sources fenced not available to feral animals. Avoid attraction of both feral and native species to the project footprint by: • Implementing appropriate waste management procedures as per CDO-ENV-048-SWP-Recyclable and General Waste Management	

Objectives	Performance Criteria	Management Measures	Reporting
		• Feral animal control for the Project and coordination with regional programs in accordance with Northern Star Weed and Feral Animal Control Procedure CDO-ENV-024-SWP-Weed and Feal Animal Control. Staff training on waste and water management, including information on feral species.	
No increase in fire frequency or intensity.	No fires attributed to construction/mining and associated activities.	Maintain Carosue Dam Operation fire breaks (Figure 3) and implementation of Northern Star fire management procedures Firefighting and suppression equipment located at site and on construction equipment/vehicles All equipment and vehicles restricted to designated cleared access tracks/roads Staff training and awareness in the prevention and management of fires. Consultation with relevant agencies (FESA, DBCA) in relation to prescribed burns and fire management.	Incidents are reported through INX InControl as per NSR-ENV-002-STA – Environmental Incident Reporting Standard.
Minimise potential impacts to terrestrial fauna, including the Malleefowl by training staff to increase awareness on the Identification, monitoring and management of Malleefowl.	All relevant staff and contractors to be trained through inductions/pre-start meetings on Malleefowl/fauna Management.	Staff training and awareness will be rolled out prior to construction to provide information on the Malleefowl (e.g. how to identify adults, chicks and mounds, conservation status, the importance of minimising impacts on the species and adherence to the CEMP to ensure impacts are minimised).	Records kept of training programs and participants.

Figure 3: Carosue Dam Operations Firebreak

10.0 Environmental Reporting

Northern Star will provide an Annual Compliance Report to DCCEEW as required by approval conditions. This report will include a summary of activities related to the controlled action conducted and will include shapefiles showing all clearing of any protected matters, and/or their habitat, undertaken within the 12-month period at the end of which that compliance report is prepared.

All reporting will be conducted in accordance with the conditions outlined in the final approval. Any monitoring data (including sensitive ecological data), surveys, maps, and other spatial and metadata required under the conditions of this approval will be prepared in accordance with the Department's Guidelines for biological survey and mapped data (2018), or any subsequent official version or as otherwise specified by the Minister in writing.

Each compliance report must be consistent with DCCEEW's Annual Compliance Report Guidelines (2014), or any subsequent official version. Notification to the Department in writing of the locations and numbers of each type of nesting mounds (i.e., active mounds, recently active mounds, and inactive mounds) identified during each pre-clearance survey will occur prior to clearing.

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