Works Approval Application

Supporting Document

Copperhead Dewatering Evaporation Pond

Tenements: M 77/46; M 77/105; M 77/299; M 77/480; M 77/572; M 77/1026 and G 77/36.

Cygnet Gold Pty Ltd

[redacted]

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Attachment 1A: Proof of Occupier Status

Attachment 1B: ASIC Company Extract

Certificate of Registration of a Company

ASIC
Australian Securities & Investments Commission

This is to certify that

CYGNET GOLD PTY LTD

Australian Company Number 660 841 252

is a registered company under the Corporations Act 2001 and is taken to be registered in Western Australia.

The company **is limited by shares.**

The company is a **proprietary** company.

The day of commencement of registration is **the eighth day of July 2022.**

CERTIFICATE

Issued by the
Australian Securities and Investments Commission
on this eighth day of July, 2022.

[redacted]

Attachment 2: Premises Map

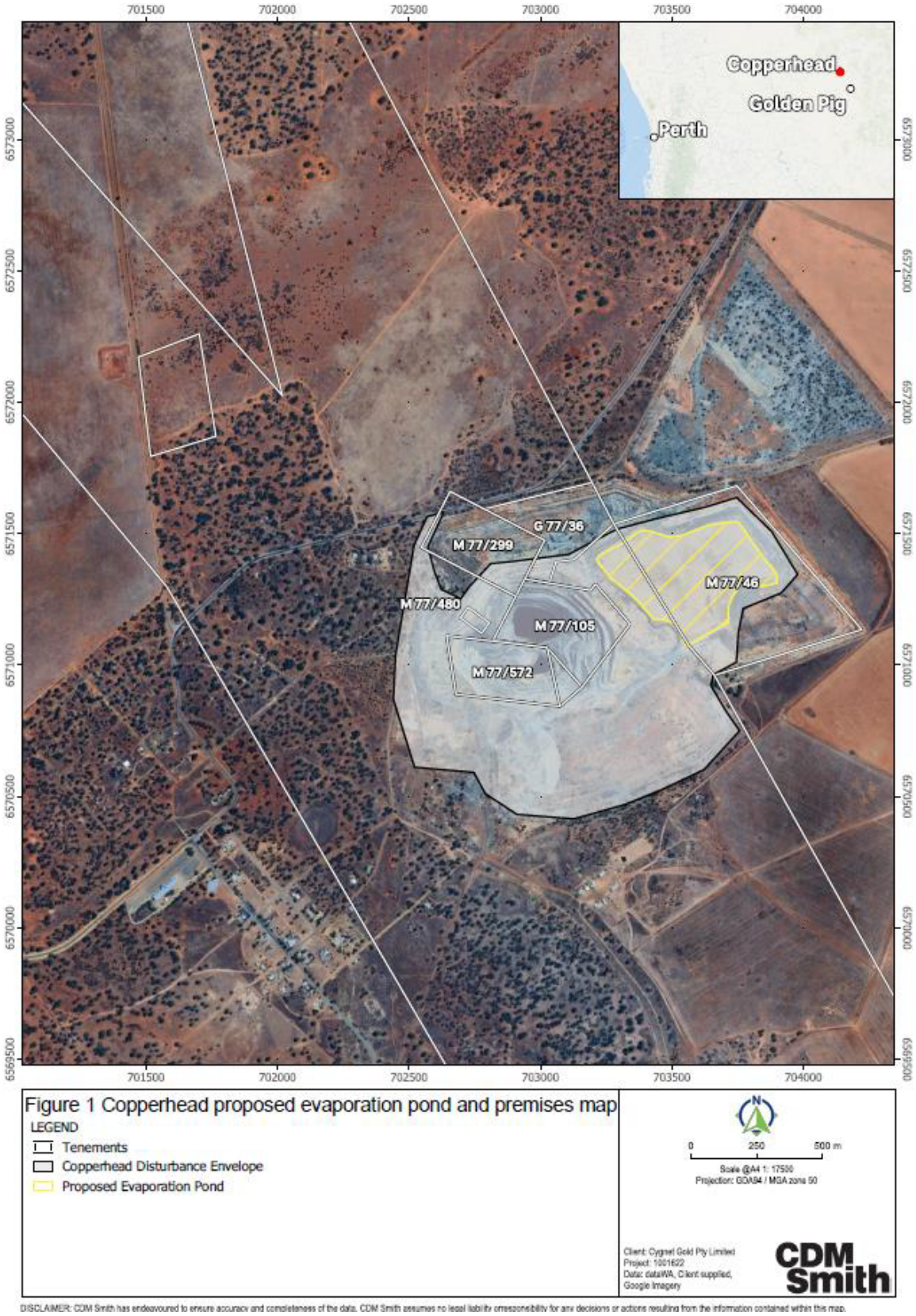

Figure 1 Copperhead proposed evaporation pond and premises map

Attachment 3B: Proposed Activities

Background

The Copperhead Underground Mining Project (Copperhead Project), owned by Cygnet Gold Pty Ltd (Cygnet Gold) is situated within the Shire of Yilgarn, near the township of Bullfinch where a rich history of gold mining operations from the late 1800's continue to this day.

The Copperhead Project incorporated both open cut and underground mining from 1952 to 1964 with onsite processing (amalgam). A second cycle of mining and processing of ore commenced in 1988 utilising the carbon in leach method and continued until 2001 when the processing plant was decommissioned. The Copperhead Project was then placed into care and maintenance.

Following decommissioning in 2001, all site infrastructure including supporting underground dewatering pump systems and underground mining areas became submerged by natural groundwater ingress. Groundwater quality from within previously mined underground areas is hypersaline (101,000 µS/cm and pH 7.76).

Currently, Copperhead remains under care and maintenance. Standing water levels and water quality are tested on an annual basis if water is present..

Project Summary

Cygnet Gold Pty Ltd (Cygnet Gold) is proposing to re-commence underground mining at Copperhead Project east of Perth, near the town of Bullfinch in Western Australia. It is estimated that operations would commence after approximately two years of dewatering. The location of the Copperhead Project in relation to the township of Bullfinch is presented in Figure 1.

Cygnet Gold is proposing to dewater the underground areas to support the recommencement of underground mining operations. Cygnet Gold is applying for a works approval to support the dewatering activities of underground areas. Groundwater will be discharged into a purpose-built surface evaporation pond.

An estimated volume of saline-hypersaline groundwater requiring extraction is approximately ~0.53 Gigalitre (GL), the equivalent of ~530,000,000 Litres or ~187,167.7 tonnes. To facilitate dewatering, Cygnet Gold is proposing to construct an evaporation pond (engineered structure) to aid passive removal (evaporation) of excess groundwater to avoid discharge to a natural creek or Salt Lake.

Groundwater around Lake Baladjie (approximately 11km west of the township of Bullfinch) is hypersaline. Salinity values fluctuate between 75,000µS/cm and 210,000µS/cm. Previous approvals and studies have concluded that the Copperhead Project is not connected to the nearby Baladjie aquifer, associated with the Baladjie Lakes system.

This works approval application is for the construction of the engineered evaporation pond, with an area of approximately 17.92 ha. The structure is located on top of the decommissioned Tailing Storage Facility (TSF). If the historical tailings materials is suitable for construction following geotechnical analysis is will be utilised. Following construction and engineering certification of the as built structure, commissioning and utilisation of the evaporation pond will commence. This facility is fully under Category 6 (Table 1).

Following the completion of initial dewatering activities, continued pumping at a lower volume will be required to enable underground entry for drive rehabilitation and preparations for recommencement of underground mining activities.

Approval will be sought under the *Mining Act* 1978 prior to commencement of underground activities.

Table 1 Application Categories

Classification of Premises	Prescribed Premises Description (Schedule 1, *Environmental Protection Regulations 1987*)	Production or Design Capacity (Schedule 1, *Environmental Protection Regulation 1987*)
Category 6	Mine dewatering: premises on which water is extracted and discharged into the environment to allow mining of ore	More than 100 000 but not more than 500 000 tonnes per year

Applicant and Premises Details

Copperhead Project tenements are held by Cygnet Gold Pty Ltd as presented in Table 2 and

Tenement Details – Copperhead Project:				
Tenement	**Holder**	**Grant Date**	**Area (ha)**	**Expiry**
M77/46	Cygnet Gold Pty Ltd	08/02/1984	36.335	22/10/2026
M 77/105	Cygnet Gold Pty Ltd	10/06/1986	11.59	11/09/2028
M 77/299	Cygnet Gold Pty Ltd	04/07/1988	9.713	15/11/2030
M 77/480	Cygnet Gold Pty Ltd	01/08/1990	961.85	14/05/2033
M 77/572	Cygnet Gold Pty Ltd	23/09/1992	8.495	04/02/2035
M 77/1026	Cygnet Gold Pty Ltd	05/09/2001	1.117	17/10/2044
G77/36	Cygnet Gold Pty Ltd	12/10/1989	8.5595	14/05/2033

Table 3.

Table 2 Tenements and Ownership

Tenement Details – Copperhead Project:				
Tenement	**Holder**	**Grant Date**	**Area (ha)**	**Expiry**
M77/46	Cygnet Gold Pty Ltd	08/02/1984	36.335	22/10/2026
M 77/105	Cygnet Gold Pty Ltd	10/06/1986	11.59	11/09/2028
M 77/299	Cygnet Gold Pty Ltd	04/07/1988	9.713	15/11/2030
M 77/480	Cygnet Gold Pty Ltd	01/08/1990	961.85	14/05/2033
M 77/572	Cygnet Gold Pty Ltd	23/09/1992	8.495	04/02/2035
M 77/1026	Cygnet Gold Pty Ltd	05/09/2001	1.117	17/10/2044
G77/36	Cygnet Gold Pty Ltd	12/10/1989	8.5595	14/05/2033

Table 3 Proponent Contact Details

Proponent Details:	
Company Name	Cygnet Gold Pty Ltd
ACN	660 841 252

Proposed Activities

Proposed works activities incorporated within this application includes construction of evaporation pond, utilising in-situ tailings materials (if geotechnically suitable). The most viable location is the tailings storage facility 5 (TSF5), operational from 1998-2001(TTC, 2024a). TSF5 was decommissioned and partly rehabilitated after 2001. Following construction and sign of by a registered engineer Cygnet will apply for a operational licence to allow dewatering of all underground mining areas prior to any re-commencement of underground mining activities.

Evaporation Pond

The evaporation pond design (above-ground paddock storage facility) has a total footprint area of approximately 17.3 ha with a final build crest height of RL 373.0 m AHD (maximum embankment height of 4 m) with an internal storage area of 12 ha.

The evaporation pond has an estimated holding capacity of 358,422 m^3 with an evaporation rate of 1.4 m per annum providing approximately 400,000 m^3 of passive evaporation potential. Current estimates indicate 528,274 m^3 of ground water requires removal from existing underground work areas. Therefore, it is estimated to require 1.3 years of evaporation prior to re-entry. Continued maintenance dewatering would then be required during all mining activities.

Engineered Design and Geotechnical Investigation

The geotechnical investigation of TSF5 has been used for development of the engineered design in accordance with the Australian National Committee on Large Dams Incorporated (ANCOLD) guidelines. Construction materials are to be excavated onsite from TSF 5.

The evaporation pond has been designed in line with ANCOLD (2012), 'Guidelines on Consequence Category Assessment' and a dam break analysis with a medium level of damage or loss, with a Potential Loss of Life (PLL) downstream as a result (unlikely event) of a dam break rating of < 0.1 (TTC, 2024).

The Dam Failure Consequence Category (DFCC) for the proposed evaporation pond design with a nominal 4.0 m crest height (RL 373.0 m AHD) is deemed 'low' (TTC, 2024).

Allowance for the temporary storage of a 1:100-year Annual Exceedance Probability (AEP), 72-hour storm event (ANCOLD, 2000, 'Guidelines on Selection of Acceptable Flood Capacity') has been incorporated.

Additional design elements include:

- Crest width of 10 m and design slopes of 1:10 (V:H) for downstream and 1:2 (V:H) for upstream, with 2% cross fall on embankments following capping to a nominal 0.5 m (tailings material).
- A riprap rock layer (0.5 m thick; utilising 100 - 250 mm rock) overlying a separate geotextile layer on the entire upstream embankment and spillway
- An emergency spillway (50 m wide x 0.5 m deep) on the eastern side of the evaporation pond to minimise potential impacts to mining operations. Spillway design to a 1:100-year (1%) AEP event for Probable Maximum Precipitation (PMP)

- A cut-off trench with a 3 m wide base. A toe drain and sump, with maintenance and upgrade to nominal depth of 1.0 m, a minimum base width of 1.5 m and side cut batters of 1:1 (V:H) (TTC, 2024b).

Proposed engineering parameters for the evaporation pond are presented in Table 4.

Table 4 Proposed Evaporation Pond Design Parameters

Item	Description	Engineering Comments
Required operating storage capacity	466.1 Megalitres (or 466,100 m^3)	As per concept design.
Footprint Area	17.3 Ha	As per concept design.
Dam Failure Consequence Category (DFCC)	Low	Based on ANCOLD (2012).
Spillway type	Overtopping embankment broad crested weir.	As per concept design.
Acceptable Flood Capacity (AFC)	1:100-year Annual Exceedance Probability (AEP)	Based on ANCOLD (2000 & 2019a) for DFCC of 'Low' and the PLL < 0.1
Spillway design flood capacity	1:100-year AEP storm event (minimum design criteria requirement). PMP event was also adopted for conservative analysis purposes.	Based on ANCOLD (2000 & 2019a) for DFCC of 'Low'
Wet freeboard = design storage allowance (DSA)	≈ 0.15 m derived from a 1:100-year AEP, 72-hour storm event (above the maximum operating water level (MOL)).	Based on ANCOLD (2000 & 2019a) for DFCC of 'Low'
Dry freeboard = wave run-up	≈ 0.35 m estimated from a 1:10-year AEP wind event (above the DSA storm water level).	Based on ANCOLD (2000 & 2019a) for DFCC of 'Low'
Additional freeboard	= 0.5 m (between the wave run-up and embankment crest level, and to be incorporated into spillway design).	As per concept design.
Total freeboard	= DSA plus wave run-up plus additional freeboard (between the MOL and embankment crest level) = 1.0 m	Based on ANCOLD (2000 & 2019a) for DFCC of 'Low'
Design earthquake loading	Operating Basic Earthquake (OBE): 1:500-year AEP (some damage to dam but no loss in operational integrity) Safety Evaluation Earthquake (SEE): 1:1,000-year AEP (damage to dam may cause operational interruption, but the dam will not fail – partial or catastrophic).	Based on ANCOLD (2000 & 2019a) for DFCC of 'Low'

The full engineering design, geotechnical report and studies have been included in Attachment 8.

Current Monitoring Analysis

A groundwater grab sample was collected from the Copperhead portal in September 2024 in line with Guidance from 2021 Groundwater Monitoring Summary (Barto 2021) and Groundwater Operating Strategy (Barto 2022).

Groundwater monitoring results as reported by a NATA accredited laboratory are presented in Table 5 demonstrating high salinity consistent with hypersaline groundwater across the general area.

Table 5 Copperhead Water Quality Results

Field ID	Sample Type	pH Units	EC (µS/cm)	TDS (mg/L)
UG Portal 2024 April	Water (grab sample)	7.76	101,000	76,000

Monitoring and annual reporting of the proposed dewatering activities is to be continued under the current Groundwater Operating Strategy (activities). Current monitoring and laboratory analysis includes the sample collected from the Copperhead Portal with sample analysis completed for the following analytes.

Current Groundwater Operating Strategy analysis parameters include:

- Metals (Al, As, Cd, Co, Cr, Cu, F, Fe, Hg, Mn, Ni, Pb, Se, Zn)
- Major ions and cations (Ca, Cl, K, Mg, Na, $CaCO_3$ (bicarbonate alkalinity, carbonate, hydroxide alkalinity), SO_4, SiO_2)
- Silica
- pH, EC, TDS, TSS; and
- Nutrients (Nitrate and Nitrite).

Discharge Volumes

The Copperhead portal is located within an existing open pit at approximately 370 mAHD. Due to the process used to calculate the volume, it is unclear whether this volume includes voids between 360-370 mAHD. Therefore, the estimate incorporates an uncertainty of around 8.8ML in the required discharge volume. An estimated total void discharge volume is presented in Table 6 as an estimate over a two-year dewatering campaign and consists entirely of groundwater from the void and potential groundwater recharge during this time.

Table 6 Estimated Discharge Volume from Copperhead Underground

Area	Volume (m^3)	Water (ML)
Open Pits and Underground	~528,274	~528.3
Potential recharge during dewatering activities	~86.4 m^3/ per day*	~0.0864 ML/per day*
Total Estimated Discharge Over Two Years	**~591,346**	**~591.3**

Note: calculation estimate as 1L/s, 60 seconds in a minute, 3,600 min in an hour, 24 hours in a day, 365 days a year for a two-year dewatering campaign.

Assuming ongoing dewatering rates of around 1 L/s, annual discharge is expected to be less than previous mining campaigns, particularly if groundwater inflows are partially used for mining operations. However, the initial volume of water required to be removed is ~591 ML.

Summary of Environmental Significance

The commencement of hypersaline water discharge activities is not considered to be of environmental significance due to the following factors:

- All hypersaline water will be captured in a dedicated evaporation pond and the evaporation pond is positioned on top of a decommissioned tailings storage facility.
- No Threatened Ecological Community (TEC) or Protected Ecological Community (PEC) is located near the discharge location.
- Vegetation has been previously disturbed at the generalised area of the discharge point, due to past land practices (urban, rural, mining and recreation).

Receiving Environment Management

The following Environment Management will be undertaken for the delivery of the proposed work activities:

- Monitor groundwater discharge rates using existing monitoring bores and accumulating volume from Copperhead underground (in line water meter).
- Leak detection systems, regular inspections during commissioning and operations.
- Following manufactures recommendations when constructing the pipeline between the underground areas and the discharge point into the evaporation pond
- Ensure scheduled maintenance is conducted of the dewatering pump throughout the program.
- Appropriate hydrocarbon bunding of the dewatering pump in-line with AS1940 requirements of a minimum 110% storage capacity availability in case of spills or mechanical failure of the dewater pump.
- Monthly groundwater standing water level monitoring, using existing groundwater monitoring locations around the existing TSF, proposed evaporation pond.
- Fauna egress mats and ramps located around all water storage infrastructures.

See Table 9 for further detailed management and mitigation actions.

Attachment 5: Other Approvals and Consultation Documentation

Other approvals are presented in Table 7.

Other Approvals

Table 7 Other Approvals

Legislation	Approval
Environment Protection and Biodiversity Conservation Act 1999	No impacts on MNES therefore not required
Environmental Protection Act 1986 (WA) (EP Act) (Part IV)	Not a significant impact therefore referral under Part IV not required
Mining Act 1978	Mining Proposal and supporting Mine Closure Plan was submitted to DEMIRS on 24th January 2025
Aboriginal Heritage Act 1972 (WA)	No heritage sites will be disturbed therefore a Section 18 is not required

Stakeholder Consultation

The Cygnet Gold stakeholder consultation strategy has identified key external stakeholders and determined how they would be impacted by the Project. The Cygnet stakeholder engagement register is provided in Table 8.

Government Stakeholders

State and Local Government authorities have been briefed on the Project to ensure any issues, concerns or suggestions are identified and, where appropriate, addressed or responded by Cygnet Gold. The following regulatory departments have been consulted:

- Department of Water and Environmental Regulation (DWER)
- Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)
- Department of Biodiversity, Conservation and Attractions (DBCA)
- Department of Planning, Lands and Heritage (DPLH).

A scoping meeting was held with DWER on 2 July 2024 to discuss the discharge licence. This application has considered the feedback and incorporated supporting information.

Corporate and Community Stakeholders

Cygnet Gold also recognises individuals, companies and communities have a vested interest in the Copperhead Project and its' possible impact on the environment. Cygnet is in the process of engagement with the following to inform them of the Copperhead Project and discuss any opportunities or concerns that the stakeholders would like to raise and resolve.

Table 8 Stakeholder Engagement Register

Date	Stakeholder and Name and Position	Method	Summary	Stakeholder Comments/Issues	Cygnet Gold Response/Resolution
21 January 2025	Shire of Yilgarn Nic Warren (CEO) and Cameron Watson (Executive Officer Corporate Services)	Meeting and Project update	Update on the project since Nov 2023, and approval progress.	Some issues raised over public road use, zone of instability (GP), water discharge to lake and noise and blast.	Additional meeting planned for Feb 21 for further discussion.
July 2024	DEMIRS	Phone	Allowance to provide a single MP & MCP for both projects.	Nil	Nil
2/07/2024	DWER	Meeting	Works approval application, requirement to amend Barto's licence L4597/1988/14. Prior to submitting this works approval application.	Licence update required.	Negotiations with Barto for licence amendment.
5/09/2024	Barto Gold	Meeting in Southern Cross	Barto licence L4597/1988/14 amendment request.	Barto agreed in principle to the request.	Progressing licence amendment application.
28-29 /11/20232023	Shire of Yilgarn [Shire CEO]	Introduction meeting with Shire of Yilgarn CEO.	Met with CEO of the Shire of Yilgarn.	Early engagement important, road use expectations, operations in close vicinity of town.	Once the Project development pipeline is prepared, arrange town hall meeting to inform community of mining plans and timing.
November 2023	Pastoralist neighbour	Meeting with local contractor in Bullfinch	Discussed previous mining operations at Copperhead, interaction with nearby farms and community.	N/A	Will arrange meeting with neighbouring properties once the Project development scope is prepared, provide introduction and updates on mining plans.

Attachment 6A: Emissions and Discharges

Discharge of Groundwater

The proposed activities include the dewatering of underground mining areas, construction and operation of an evaporation pond. For the Copperhead Project, groundwater is being relocated and discharged into a dedicated evaporation pond in close proximity to the existing open cut mine. No natural water systems will be altered as part of the discharge and evaporation of groundwater under this project as no surface water bodies are located near the proposed activities and the highly ephemeral nature of any rainfall. Therefore, it is considered highly unlikely that there will be any adverse impacts to surrounding surface water regimes. Emission or discharge controls are detailed in Table 9.

Table 9 Potential Emissions and Discharges from Project Activities

Source of Emission or Discharge	Emission or Discharge Type	Volume and Frequency	Proposed Controls
Vehicles movements, pumps, and construction machinery.	Noise	Noise emissions are not expected to be excessive given the simple process and small scale of the disturbance activities. Noise will not impact receptors as pump activities will be located below ground level within the existing open pit.	No specific controls are expected to be required.
Vehicles movements on unsealed roads, excavation, movement and storage of earth material and dust lift from cleared surfaces.	Dust	Initial excavation of the evaporation pond and earthworks to establish the embankments will require the implementation of dust suppression activities. However, dust emissions are not expected to be excessive given the scale of the activities.	Vehicle management and dust suppression.
Hydrocarbons or chemicals storage and use.	Leaks or spillage onto soils	Unintentional discharge only. Hydrocarbons and chemicals are not stored on site in large quantities.	Management & monitoring Bunding Pre-starts and regular scheduled maintenance will be required on equipment and the dewatering pump. Scheduled inspections of infrastructure will also occur on regular basis during active pumping. Spill kits will be available on all machinery for incidental spills.

Source of Emission or Discharge	Emission or Discharge Type	Volume and Frequency	Proposed Controls
Saline pipeline	Leak of saline water from pipeline onto land	Unintentional discharge only.	Mitigation measures include: ▪ Regular inspections during operation and utilisation of manufactures recommendations when constructing the pipeline. ▪ Adequate secondary containment and leak detection will be installed on all pipelines and pumping infrastructure. ▪ Scheduled inspections of infrastructure will also occur on regular basis during active pumping. ▪ Propose monthly discharge water sampling with parameters as per the Groundwater Operating Strategy.

Attachment 7: Siting and Location

Siting Context

The Copperhead Project is located approximately 2 km northeast of the Bullfinch township within the Eastern Goldfields Region of Western Australia (~405km east of Perth). Data from the 2021 Census the Bullfinch area has a population of 29 people.

The Copperhead Project is located within the Southern Cross (COO2) subregion of the Coolgardie Interim Biogeographic Regionalisation of Australia (IBRA) bioregion. The subregion is characterised by subdued relief, comprising of gently undulating uplands, which are dissected by broad valleys, with bands of low greenstone hills (Cowan et al., 2001).

Climate

Copperhead Project is located approximately 30 km from Southern Cross which experiences an arid to semi-arid, dry to warm Mediterranean climate. It is not uncommon for above ground temperatures to exceed 35°C during the summer months and dipping below 0°C during the winter months.

Climate data was sourced from Australian Bureau of Meteorology (BoM) climate station commissioned in 1996 as the Southern Cross Airfield (station number 012320). A review of all available data from this weather station (1996-2024) presents a highest recorded January mean maximum temperature of 37.3°C (ranging from 31-37°C) and a mean minimum temperature of 0.6°C in June (ranging between 0.6-7.5 °C) (BOM, 2024).

Seasonal mean temperature fluctuation recorded at Southern Cross Airfield is presented in Figure 2.

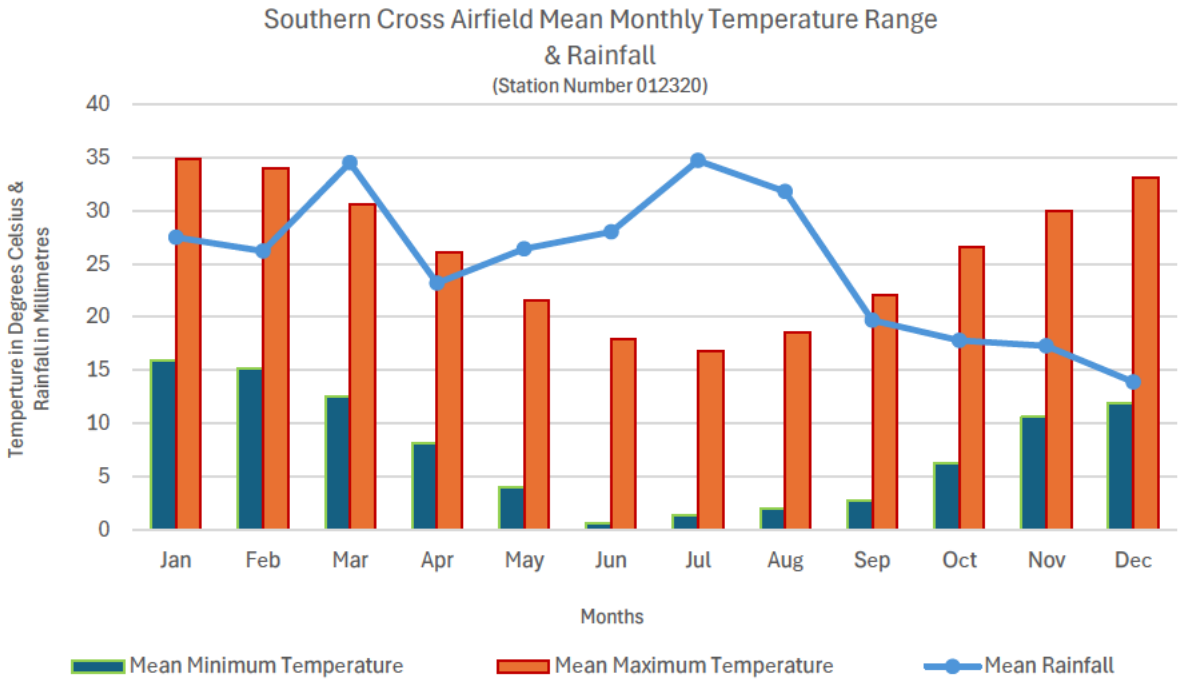

Figure 2 Mean Monthly Temperature Range and Rainfall

Historically, monthly rainfall recorded at the Southern Cross Airfield station fluctuates from between 0.0 mm – 154.4 mm; whilst annual recorded total rainfall fluctuates between 151.4 – 551.8 mm.

Typical for the Goldfields Region pan-evaporation rates generally exceed rainfall volumes by an order of magnitude, most notably over the summer months. Following a large rainfall event, intermittent surface water runoff flow or puddling can be observed within the generalised area, however these events are generally of a short duration.

Predominant wind directions are from the north-east during the winter months and trending south-easterly at all other times of the year.

Geology

The geology of the Copperhead mine is situated within the Bullfinch Greenstone Belt. The mine's geology is characterized by a mafic-ultramafic sequence, with mineralization occurring within 150 meters of the eastern contact with granitoids. The host rocks, altered to fine-grained tremolite-actinolite, chlorite, and talc-carbonate schist, are indicative of the region's dynamic geological processes. Notably, the banded iron formations (BIF) at Copperhead contain alternating bands of pyrite, pyrrhotite, ferromagnesian minerals, and quartzite, which are significant for understanding the area's mineral wealth.

The steeply dipping sequence has undergone intense shearing, resulting in the formation of extensive shear zones and high-strain corridors. These features, along with multiple generations of tight to isoclinal folds, some possibly sheath folds, have intricately shaped the belt's internal structure which are traceable for tens of kilometres.

Soils

Within the region of the Copperhead Project, two soil landscapes are present and were mapped and described during AECOM surveys completed in 2023, and summarised below:

- Wallambi System: Chains of salt lakes in the central Zone of Ancient Drainage with Salt Lake soil and calcareous loamy earth. Mallee, Morrel woodland and saltbush-bluebush- samphire flats.
- Baladjie System: Valley floors and lower slopes in the northern Zone of Ancient Drainage with calcareous loamy earth and alkaline red loamy duplex (mostly shallow) woodland.

Hydrology

The DWER water register identifies that the Copperhead Project operational areas encompass both palaeochannel and fractured rock aquifers present extending over two Groundwater Resource Areas (Westonia and Goldfields GRAs).

The palaeochannel sands or alluvium are the major aquifers in the region and are frequently targeted for mine water supply as they can provide stable, long-term sustainable yields due to ‘high’ permeability, large groundwater storage and significant leakage from the overlying clays and surrounding basement rock. The palaeochannel aquifer groundwater quality is generally poor, ranging from saline to hypersaline (10,000 - >35,000mg/L TDS). These aquifers have high reliability, having stable long-term sustainable yields (yield potential of up to 1,500 kL/day).

Fractured bedrock aquifers (fractured greenstones and granitoid basement rocks) may provide moderate water supplies and are utilised by some operations within the greater region. The fractured rock aquifers have tendency for limited water supplies, due to limited areas within fractures.

Surface water

Surface drainage systems are characterised by extensive palaeo-alluvium and chains of playa lakes. Lake Baladjie, a playa lake in the relict drainage of the Yilgarn River, represents the ultimate receptor of surface water drainage from the surrounding catchments (including Copperhead Project). Surface water management strategies include diversions and culverts to regulate the flow of surface water (when present), ensuring the protection and development of the town's infrastructure and mitigating potential water-related issues.

Highly ephemeral surface water systems are found around the Project area. Surface water flows occur only after rainfall events exceed loss rates to the atmosphere and to soil. These run-off events can be short in duration are localised and may not connect with downstream flows or larger water systems.

Surface water systems across the generalised region are highly ephemeral, with surface water flow only occurring briefly after rainfall exceed loss rates to soils and the environment. These runoff events may be localised and of relatively short duration and do not necessarily connect with downstream flow paths or larger surface water systems. Based on historic surface water responses and observations of regional playa and lake systems, surface runoff events in these environments, at the regional scale, typically occur once every two to five years.

Due to surface water being highly ephemeral and no systems will be altered as part of the proposed work it is unlikely that there will be any adverse impacts to surface water.

Groundwater

The DWER water register identifies that Cygnet operational areas encompass palaeochannel aquifers and fractured rock aquifers. The palaeochannel sands or alluvium are the major aquifers in the region and are frequently targeted for mine water supply as they can provide stable, long-term sustainable yields due to 'high' permeability (yield potential of up to 1,500 kL/day), large groundwater storage and significant leakage from the overlying clays and surrounding basement rock.

The groundwater quality in palaeochannel aquifers is generally poor, ranging from saline to hypersaline (10,000 - >35,000mg/L TDS) however, most of the groundwater salinity is much higher.

Within the region of Golden Pig three major groundwater aquifer systems have been identified:

- Superficial aquifers associated with, lacustrine and laterite deposits that are typically only partly saturated and dependent in intermittent rainfall.
- Palaeochannel sands that are major aquifers of the region and can provide stable, long-term yields from sands/gravels at the base of present-day drainage systems or just offset following palaeodrainage systems.
- Bedrock aquifers occurring in fractured bedrock, granite, or greenstone basement rock where the storage potential is related to the depth of weathering and zone of fracture development. Background on surface water quality.

Flora and Vegetation

Flora and Vegetation surveys completed around the Copperhead Project (AECOM, 2024) observed the following vegetation communities:

- *Dodonaea* Shrubland
- Mixed Shrubland
- Two *Eucalypt* Woodlands.

None of the vegetation communities represent a Threatened or Priority Ecological Community (TEC or PEC). The vegetation condition within the Copperhead Project varied from Completely Degraded to Very Good. The mixed shrubland community supports the Priority flora *Acacia haematites* (P1) population, representing 80 individuals located 2km south of the project, not to be disturbed as a result of this project (AECOM, 2024).

The full AECOM flora and fauna report has been included under Attachment 8 as additional reference.

Fauna

AECOM (2024) conducted a desktop assessment and reconnaissance survey to determine any occurrences of conservation significant fauna species.

Four significant fauna species are considered to occur within the habitat's greater region, these species include:

- Carnaby's Cockatoo (*Zanda latirostris*) listed under EPBC Act and BC Act (Endangered)
- Common Greenshank (*Tringia nebularia*) listed under EPBC Act and BC Act (Endangered)
- Western Quoll, Chuditch (*Dasyurus geoffroii*) listed under EPBC and BC Act (Vulnerable)
- Malleefowl (*Leipoa ocellata*) listed under EPBC and BC Act (Vulnerable).

Due to the location of the Copperhead Project (~2 km from the township of Bullfinch), the current mining activity nearby and level of remaining disturbance from approximately 100 years of mining activity, the Project site is not considered significant to these species (AECOM, 2024). However, it cannot be ruled out that any of these species may transverse the landscape whilst foraging.

There is low potential for localised fauna species to enter a work area during construction of the evaporation pond or other site preparation activities. However, conservation significant fauna species have not been observed within the Proposed Copperhead work areas or nearby. Preventing fauna access to open pipes or excavations at the end of each shift should be implemented.

The potential for impact on fauna species is expected to be negligible.

Social Environment

The areas surrounding the Copperhead Project have many different land uses which include historical mining, prospecting, exploration, and dry land agriculture cropping and pastoral stations are the main industries in the region. Other land uses include light industry, commercial retail and tourism.

A recent search in 2024 of the Aboriginal Cultural Heritage Inquiry System (Department of Planning, Lands and Heritage) found there were no registered cultural heritage sites in the vicinity of Copperhead or Golden Pig. The closest recorded cultural heritage sites is:

- Approximately 20km south-east from the Bullfinch townsite (ACHIS, 2024).

The general area has been subject to historical disturbance extending over the last 100 years, disturbances including mining and agricultural activities. Re-commencement of underground mining activities will occur on pre-existing disturbance only with no new risks expected to Aboriginal heritage sites which are located more than 20km from the Copperhead Project.

An online search of the Heritage Council of Western Australia databases identified European Heritage sites around the Copperhead Project, however none of these sites are located within the Project area.

- Nine identified heritage sites are located within the township of Bullfinch, approximately 2km east of the Copperhead Project

The area is subject to historical disturbance and mining activity will include the recommencement of underground mining. No threat to heritage values is expected due to the proposed Project activities.

Sensitive Receptors

Potential sensitive receptors have been reviewed with results in Table 10.

Table 10 Potential Sensitive Receptors and Aspects

Type / Classification	Description	Distance + direction to premises boundary	Proposed controls to prevent or mitigate adverse impacts (if applicable)
Environmentally Sensitive Areas	N/A	N/A	N/A – no impact from proposed works.

Type / Classification	Description	Distance + direction to premises boundary	Proposed controls to prevent or mitigate adverse impacts (if applicable)
Threatened Ecological Communities	Eucalypt Woodland	2.6km west	N/A – no impact from proposed works. Not located in proposed work area.
Threatened and/or priority fauna	N/A	N/A	N/A – no impact from proposed works. Not located in proposed work area.
Threatened and/or priority flora	*Acacia haematites* (Priority 1)	N/A	N/A – no impact from proposed works. Located in field survey, all records outside nominated mining activity footprint.
Aboriginal and other heritage sites	1 Record	20 km southeast of Bullfinch	N/A – no impact from proposed works. Not located in proposed work area.
Public drinking water source areas	N/A	N/A	N/A – no impact from proposed works.
Rivers, lakes, oceans, and other bodies of surface water, etc.	Lake Baladjie and connected drainage lines, creeks	~14.5 km	Continuation of the Water Sampling Program under Groundwater Operating Strategy. Aquifers are not linked.
Acid sulfate soils	N/A	N/A	N/A – no impact from proposed works.
Other	N/A	N/A	N/A – no impact from proposed works.

Attachment 8: Additional Information

[redacted]

References

ACHIS, 2024, Aboriginal Cultural Heritage Inquiry System (ACHIS), The Department of Planning, Lands and Heritage (DPLH), Available at: https://espatial.dplh.wa.gov.au/ACHIS/index.html?viewer=ACHIS, Accessed 6/12/2024.

AECOM. (2024). Copperhead Mine – Flora and Fauna Assessment. Prepared for Cygnet Gold Pty Ltd.

BoM. (2024). Climate Statistics for Southern Cross Airfield (012320). Accessed on 17/09/2024 at Climate statistics for Australian locations.

CDM Smith, (CDM), 2024a, Memorandum: Golden Pig and Bullfinch Groundwater.

Cowan M, Graham G & McKenzie N, 2001. Coolgardie 2 (COO2 – Southern Cross subregion). In CALM. https://library.dbca.wa.gov.au/static/FullTextFiles/021927.010.pdf.

Cygnet Gold Pty Ltd. (2023). Groundwater Operating Strategy.

Doublier MP, Thebaud N, Mole D, Wingate MTD, Kirkland CL, Romano SS, Wyche S & Duclaux G, 2012, New data on the geological evolution and gold mineralisation of the Southern Cross greenstone belt, Geological Survey of Western Australia extended abstracts.

Doublier, MP (compiled by), 2013, Geological setting of mineral deposits in the Southern Cross district — a field guide: Geological Survey of Western Australia, Record 2013/11, 55p.

GWA, 2024, The Government of Western Australia (GWA) Heritage Council inHerit database/register, Available at: https://inherit.dplh.wa.gov.au/Public/, Accessed 6/12/2024.

NNTT, 2019, National Native Title Tribunal (NNTT), Register of Native Title Claims (RNTC), Native Title Claim WC2017/007 filled 22/12/2017 and entered onto register 28/03/2019. Commonwealth of Australia, Available at: https://www.nntt.gov.au/searchRegApps/NativeTitleRegisters/Pages/RNTC_details.aspx?NNTT_Fileno=WC2017/007, Accessed 6/12/2024.

Rockwater Pty Ltd. (2006). Review of Groundwater Monitoring at Tailing Storages, Copperhead Mine, Bullfinch.

Tetra Tech Coffey, (TTC) 2024b, Copperhead Gold Mine, Bullfinch Evaporation Pond - Design Report (Draft, 15/11/2024), Tetra Tech Coffey, Level 1, Bishops See, 235 St Georges Terrace, Perth WA 6000. Report prepared for Cygnet Gold Pty Ltd.