



**Supporting Information for an Application
to Amend CPS 8152/3 (8152/4)
Higginsville Gold Operation
October 2022**

Karora Resources

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Attachment C:	Tenement Reports
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1 BACKGROUND INFORMATION

1.1 INTRODUCTION

Higginsville is a historical gold mining centre located approximately 110km south of Kalgoorlie in the Southern Goldfields region of Western Australia. In June 2019, Karora Resources (previously RNC Minerals) acquired the Higginsville Gold Operation (HGO) and associated companies from Westgold Resources Limited (Westgold). The Karora associated companies are:

- Avoca Mining Pty Ltd (ACN 108 547 217);
- Avoca Resources Pty Ltd (ACN 097 083 282); and
- Polar Metals Pty Ltd (ACN 149 543 448).

The regional location of HGO is displayed in Figure 1. Avoca Mining Pty Ltd (Avoca) is the site operator of the HGO gold processing plant and various associated mine sites that occur in the Lake Cowan locality. The locality map for the HGO mine sites is provided as Figure 2. The HGO consists of the gold processing area at Higginsville and various pits and ore bodies that extend up to 22km from the gold processing plant. This includes Aphrodite, Baloo, Challenger, Fairplay, Fairplay East, Graveyard, Higginsville, Mitchell, Eundynie, Two Boys, Aphrodite, Vine and the proposed development at Pioneer. The Higginsville area also contains the processing mill and tailings storage facilities (TSF), office, accommodation camp and other ancillary infrastructure. The mill at HGO also processes ore that is transported from other Karora owned operations in the region such as Beta Hunt underground mine in Kambalda and the Spargos open-pit located 60 km north of HGO.

Prior to August 2020, five separate NVCPs covered the wider Higginsville area including:

- CPS 6644/1;
- CPS 7673/1;
- CPS 7674/2;
- CPS 8062/1; and
- CPS 8152/2.

To improve the management and reporting of clearing activities at HGO these mining areas were amalgamated under a single NVCP (CPS 8152-3). CPS 8152-3 remains valid until the 31 July 2025. Information on CPS 8152/3 and the proposed amendment area is provided in Table 1 and Figure 3.

The proposed amendment is specifically related to an extension to the clearing footprint on G15/26 and M15/665 for the purpose of building tailings storage facility 5 (TSF5) adjacent to the existing facility (TSF1-4). The proposed amendment is to increase the clearing permit area by 82.81 ha from the approved 1000 ha. The additional clearing would be confined to G15/26 and M15/665, of which G15/26 is already a listed tenement for CPS 8152/3 (Figure 4). The preliminary site layout for TSF5 is displayed in Figure 5 . While this layout is still being considered, the final location will seek to reduce the amount of clearing required and avoid adjacent drainage lines to the north of the site.

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Table 1. Information on CPS 8152/3 and the proposed amendment

CPS No:	CPS 8152/3	Proposed Amendment (CPS 8152/4)
Permit holder:	Avoca Mining Pty Ltd	Avoca Mining Pty Ltd
Permit type:	Purpose permit	Purpose Permit
Affected mining tenements:	General Purpose Leases 15/19, 15/26, 15/27, 15/29 Mining Leases 15/31, 15/231, 15/338, 15/348, 15/352, 15/375, 15/506, M15/507, 15/512, 15/528, 15/580, 15/581, 15/597, 15/610, 15/639, 15/640, 15/642, 15/681, 15/748, 15/817, 15/1790, 15/1814. Miscellaneous Licences 15/347, 15/368, 15/382, 15/386, 15/389	Inclusion of General Purpose Lease G15/26 and Mineral Lease M15/665
Duration:	27 October 2018 to 31 July 2025	27 October 2018 to 31 July 2027
Purpose:	Clearing for the purpose of mineral production	Clearing for the purpose of mineral production
Area of clearing:	1000ha	1082.81 (increase of 82.81 ha)

The amendment is accompanied by shapefile “CPS_8152-4_Z51.shp” that includes the amended clearing permit area.

The proposed NVCP amendment area for TSF5 has been partially covered by a vegetation survey in 2008 (GHD 2008) and fully covered with a broadscale vegetation survey in 2010 (GHD 2010). The wider Higginsville area has also been covered by extensive flora and fauna surveys conducted by Terrestrial Ecosystems and Native Vegetation Solutions since 2011 which encompass the general HGO area and provide significant baseline information for the region (Figure 6 and Figure 7).

The flora, fauna and heritage assessments are discussed further in Section 2 along with other relevant baseline information.

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1.2 OVERVIEW OF OPERATIONS

The main tailings storage facility at HGO, known as TSF1-4, is located on M15/348 and G15/19 approximately 1 km east of the Higginsville processing plant (see Figure 3 and Figure 4). Gold bearing ore is treated via the Carbon-in-Leach (CIL)/ Carbon-in-Pulp (CIP) method, cyanide leach process to recover gold from oxide and primary ores. The process involves crushing, milling, leaching and absorption, as well as tailings disposal and gold recovery. Associated infrastructure includes tailings pipeline and TSF monitoring bores. With cell 1 of the TSF at capacity, and cells 2-4 approaching capacity in the next 3 years, TSF5 is being proposed to ensure continued gold processing capacity at HGO.

At current fill rates (1.6Mtpa) the existing TSF will reach capacity by October 2025, in just over 3 years. The timeframe for approval of a new TSF is approaching approximately two years with a construction duration of up to six months for the starter embankment. The proposed TSF5 facility is therefore being proposed now and is in the study and design phase which is being conducted by Tetra Tech Coffey. The proposed TSF5 will be paddock style and include two decant cells which would cover an area of approximately 80 ha directly to the east of the existing facility. The facility is proposed to have a storage capacity of 9.4 MT and a life of approximately 6 years and would operate between early 2027 to 2033 (Figure 8).

The proposed TSF5 will be subject to the mine closure framework provided under the Higginsville Gold Operations Mine Closure Plan (MCP) Reg ID: 88901 which was approved on 05th July 2021. The HGO MCP includes closure plans for the existing TSF facilities at HGO and is due to be updated in 2023 which would include updated closure information on the proposed TSF5.

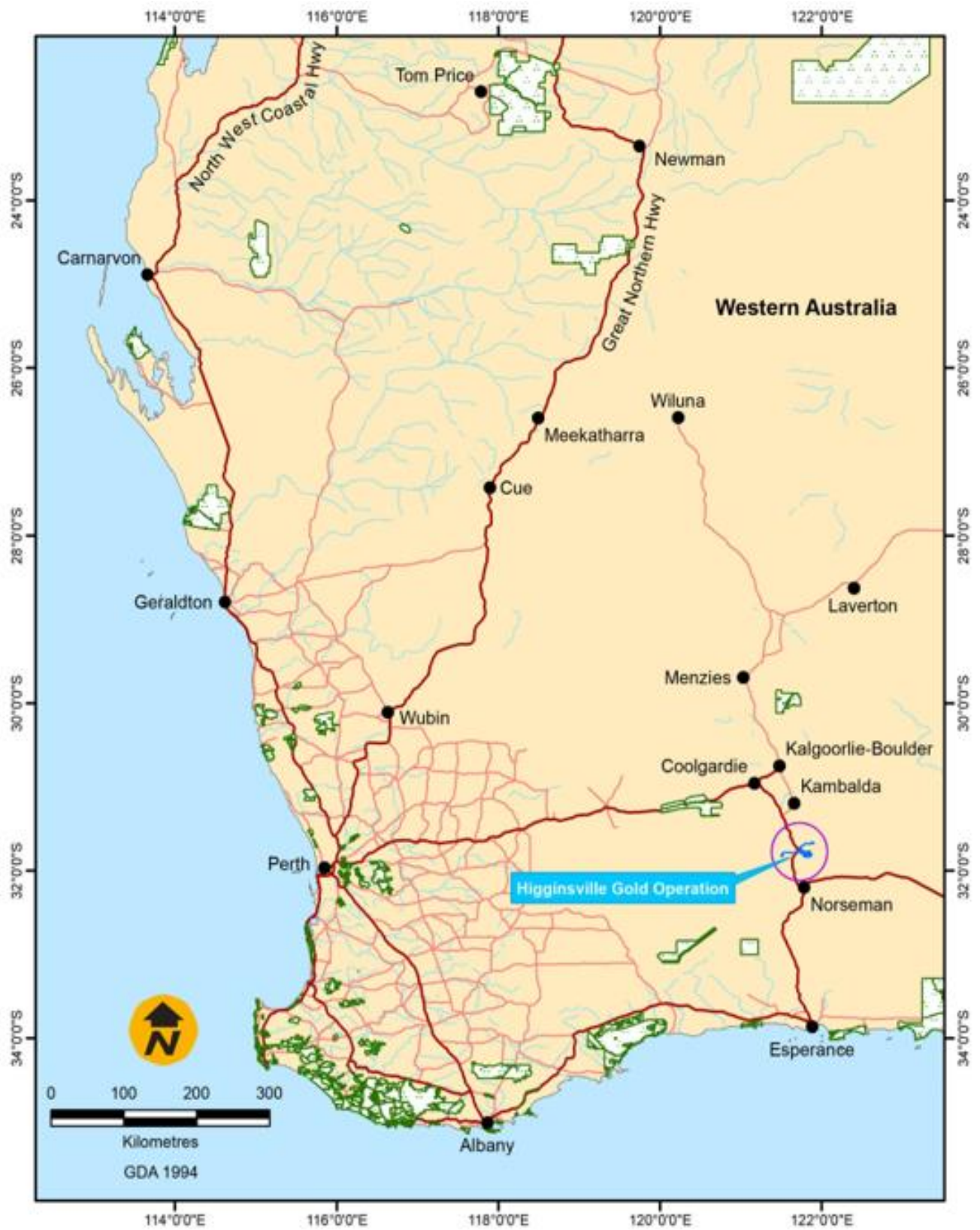


Figure 1. Regional Location of the Higginsville Gold Operation

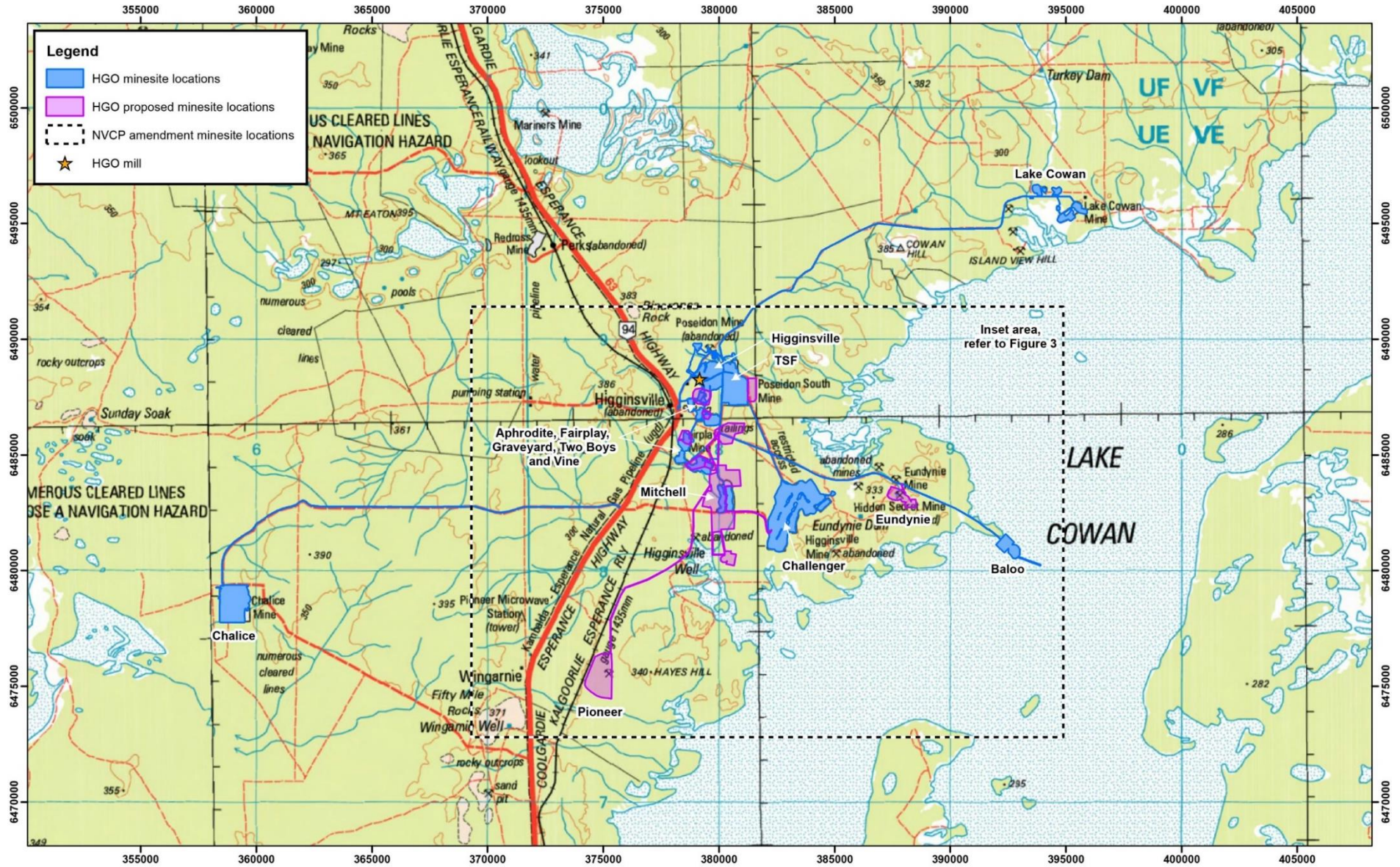


Figure 2. Locality map for mines at the Higginsville Gold Operation

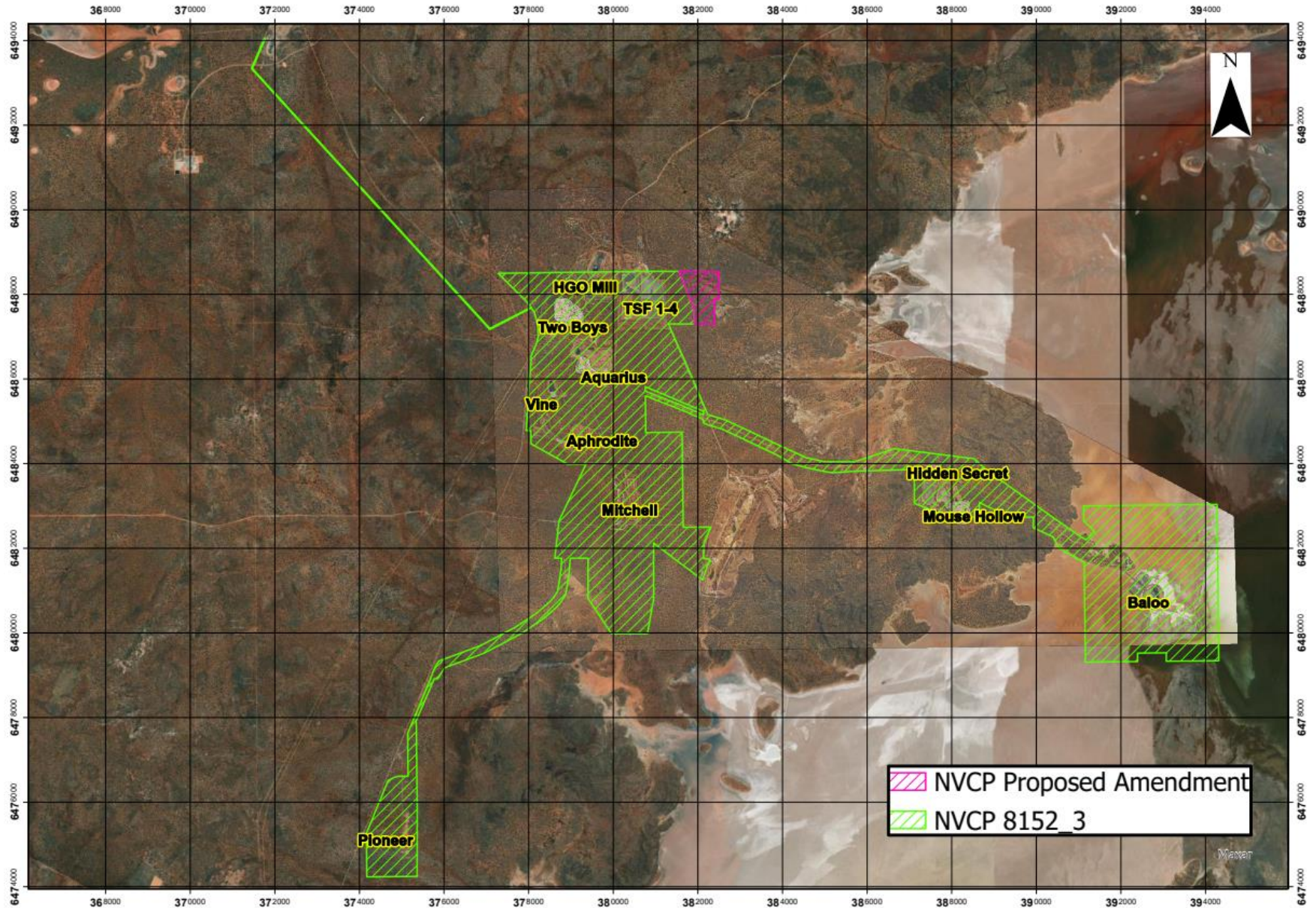


Figure 3: Location of the Clearing Permit Amendment at the HGO relative to existing NVCP 8152/3

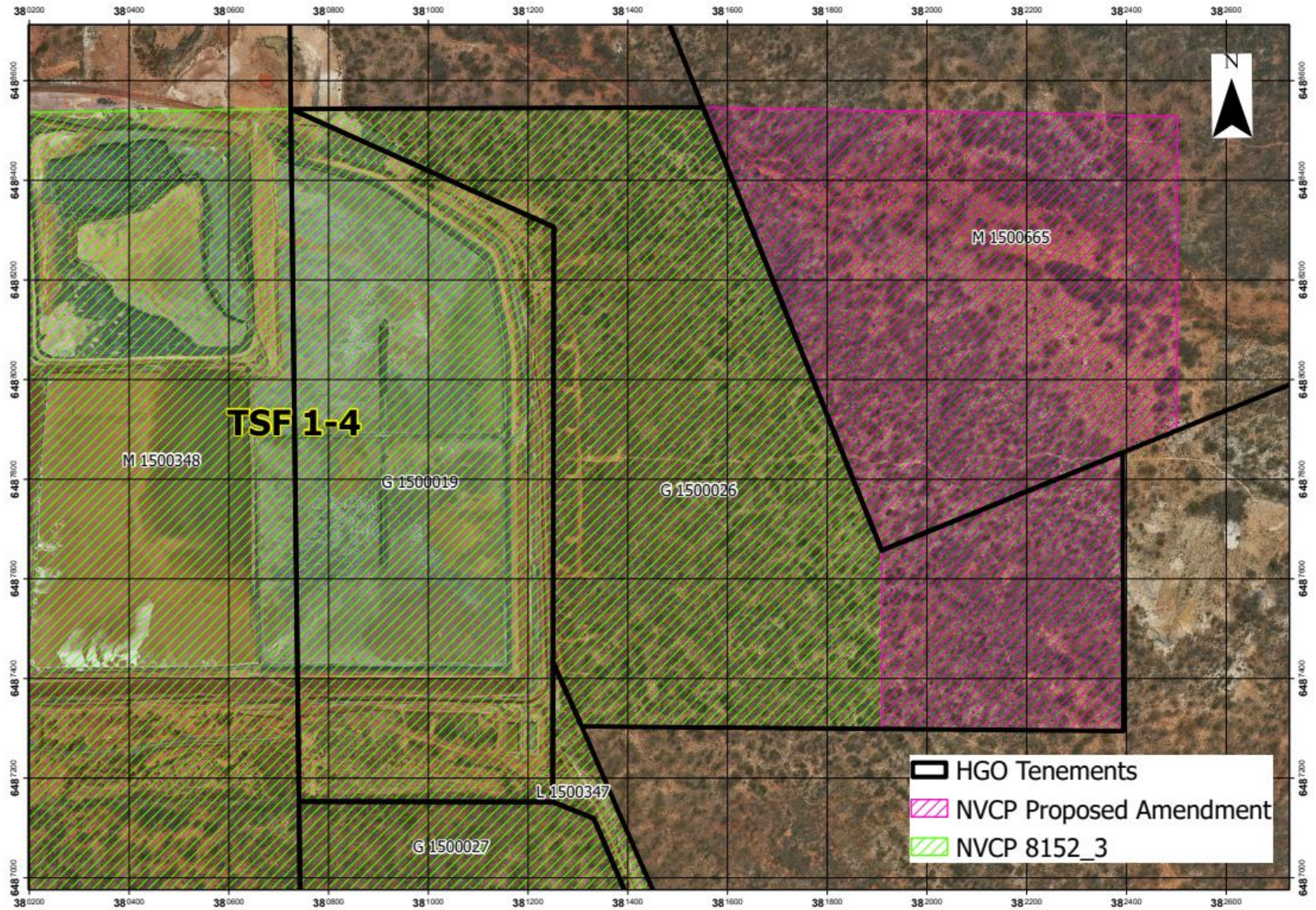


Figure 4: NVCP amendment area and tenements

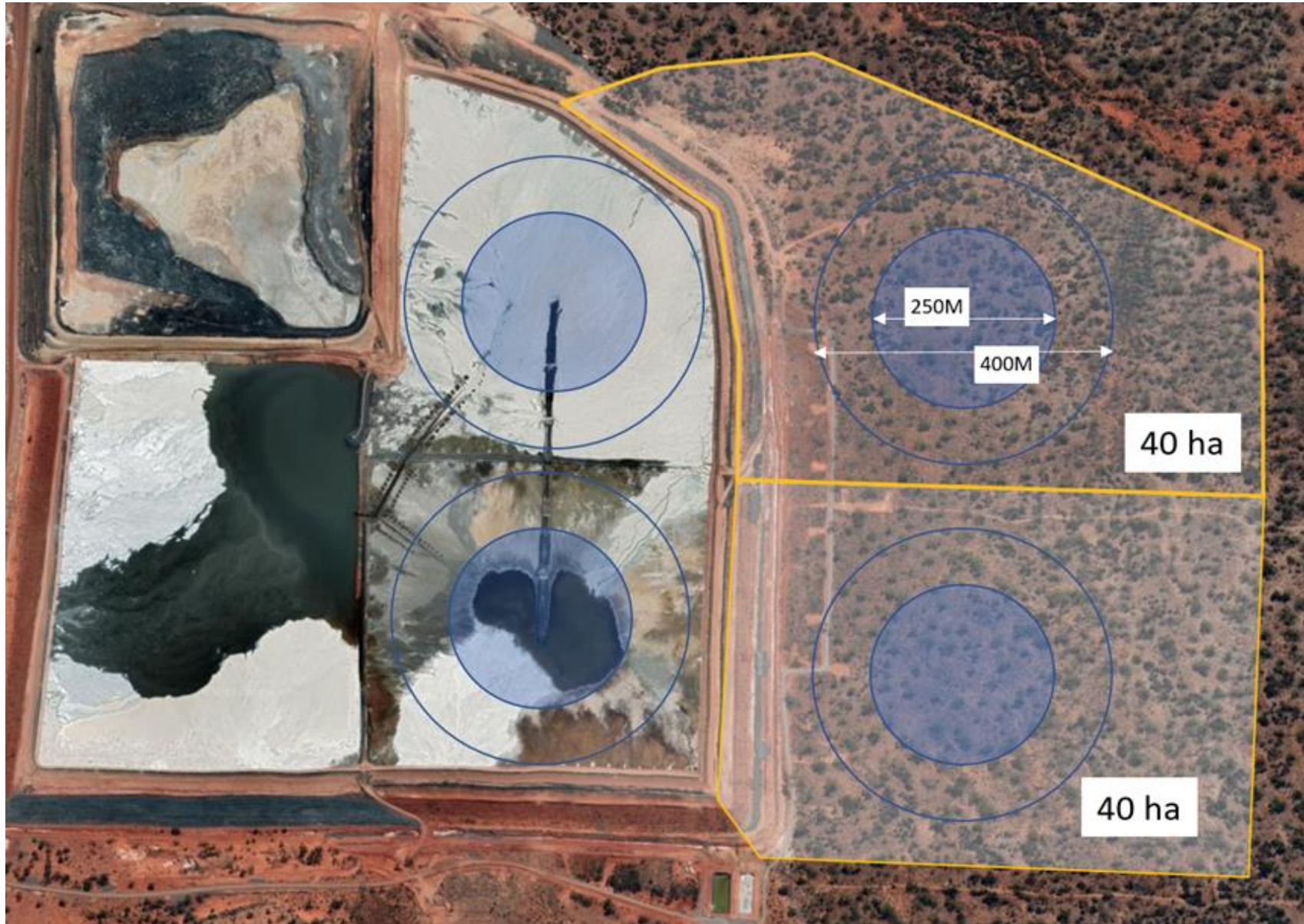


Figure 5: Preliminary site layout for decant ponds

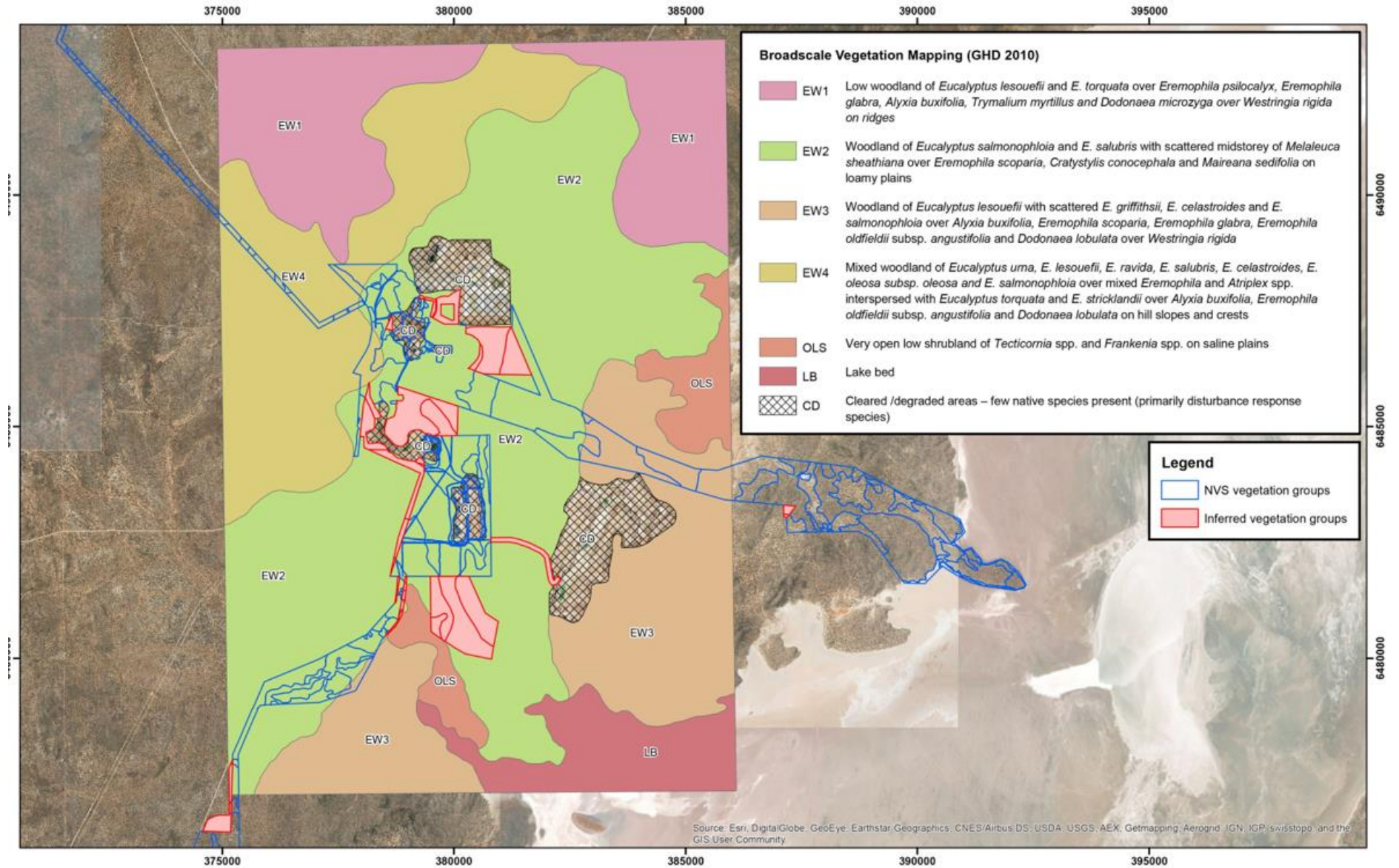


Figure 6: Broad-scale vegetation mapping of HGO

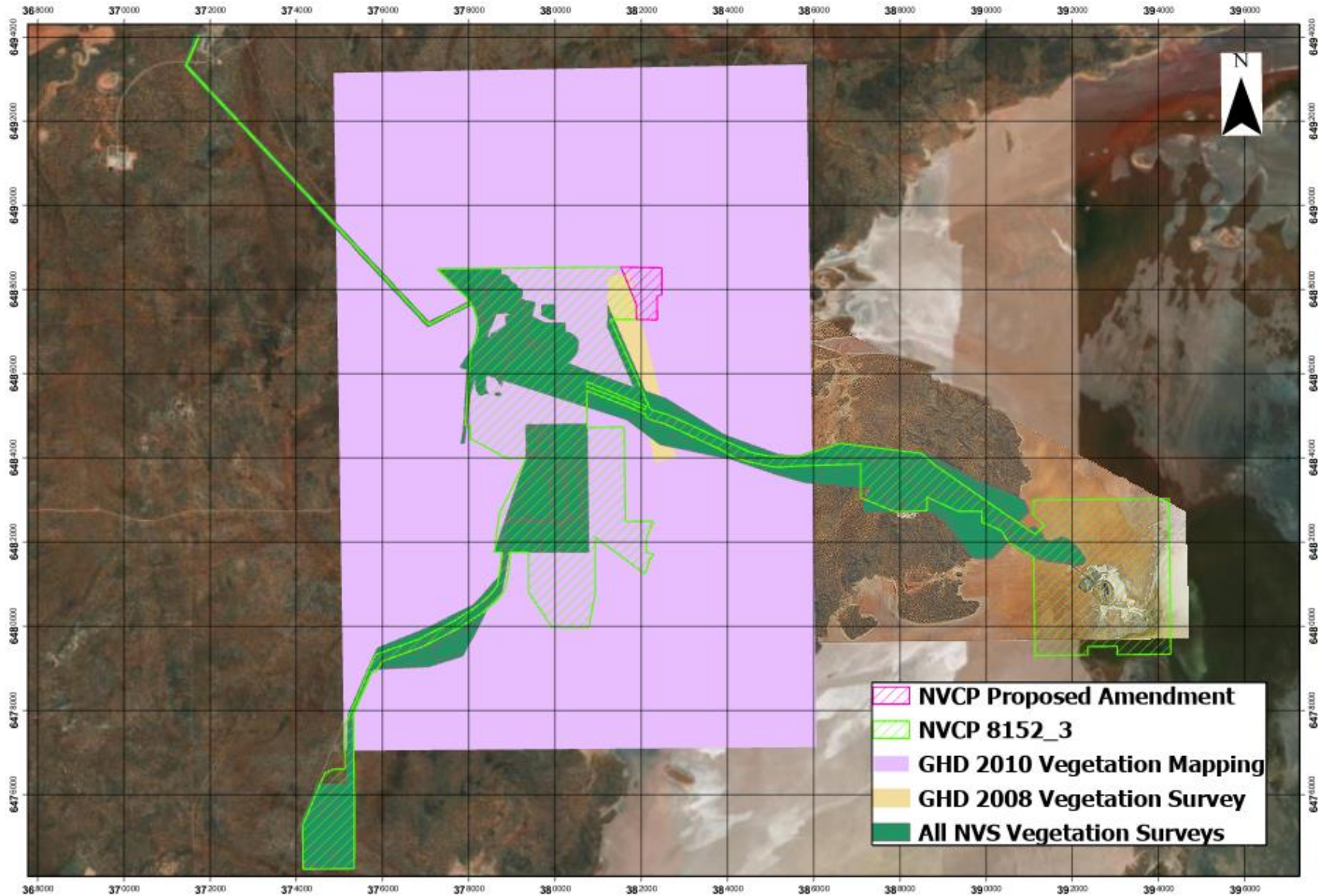


Figure 7: Vegetation surveys covering the HGO region and proposed amendment area

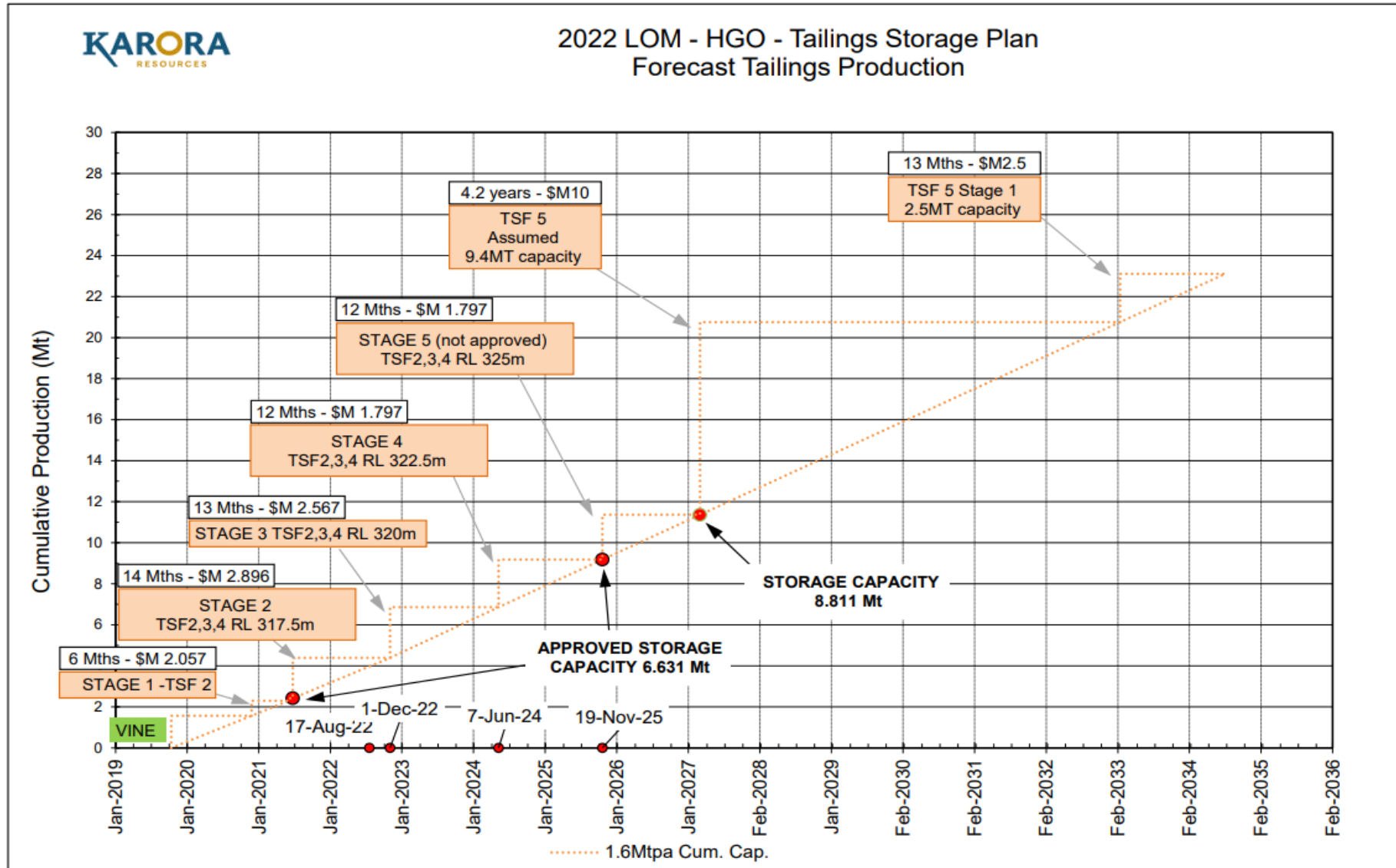


Figure 8: Tailings storage plan

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2 BASELINE ENVIRONMENTAL AND HERITAGE INFORMATION

2.1 CLIMATE

The nearest Bureau of Meteorology ('BOM') weather recording station is Norseman Aero Site 12009 which is located approximately 50 km south of HGO (BOM 2020). BOM Site 12009 has been in operation since 1999 and replaced BOM Site 12065 that commenced in 1897 and closed in 2012. Climate data from both sites is provided in Table 2 (BOM 2020). In general terms, the two data streams are similar. Data from the active BOM Site 12009 is deferred to in this discussion given its currency. Figure 9 displays the temperature and rainfall data from current BOM Site 12009.

Norseman has a dry climate with hot summers and cool winters. The climate is strongly influenced by a band of high pressure known as the sub-tropical ridge. For much of the year this ridge is located to the south, allowing east to southeast winds to prevail. The ridge moves north during winter allowing the occasional cold front to pass over the Goldfields.

January is the hottest month with a mean maximum temperature of 32.6°C and the highest temperatures of >46°C. High summer temperatures can extend for many days that can then be followed by a cool change from the south and occasionally with thunderstorms.

July is the coolest month with a mean maximum temperature of 17.3°C and a mean minimum temperature of 4.1°C. Overnight temperatures fall below freezing about four times in a typical winter. Such events occur on clear nights following a day of cold southerly winds. The coldest recorded temperature was -6.0°C in June.

The annual mean rainfall is 298 mm with January being the wettest month with a mean of 36.5mm. The rainfall pattern is for the current BOM Site 12009 shows a general trend of a mid-year trough (Figure 9) although the historical data from BOM Site 012065 has the opposite trend with a winter rainfall peak. Site observations have been that the most reliable rains occur in winter from cold fronts arriving from the west, and cloud bands from the northwest. Thunderstorms provide most of the summer rainfall, often producing heavy localised falls in short periods. Although rare, decaying tropical cyclones, originating off the northwest coast can move through the Goldfields, producing heavy rains and sometimes flooding.

Evaporation data is not available for Norseman so has been sourced from BoM monitoring site No. 012038 (Kalgoorlie-Boulder Airport) located approximately 110km from the Higginsville monitoring site. Average annual evaporation rate of between 2,400 and 2,500mm. The annual mean daily evaporation at Kalgoorlie-Boulder Airport (1966 to 2016) is 7.2mm, ranging from 2.6mm (June) to 12.5mm (January).

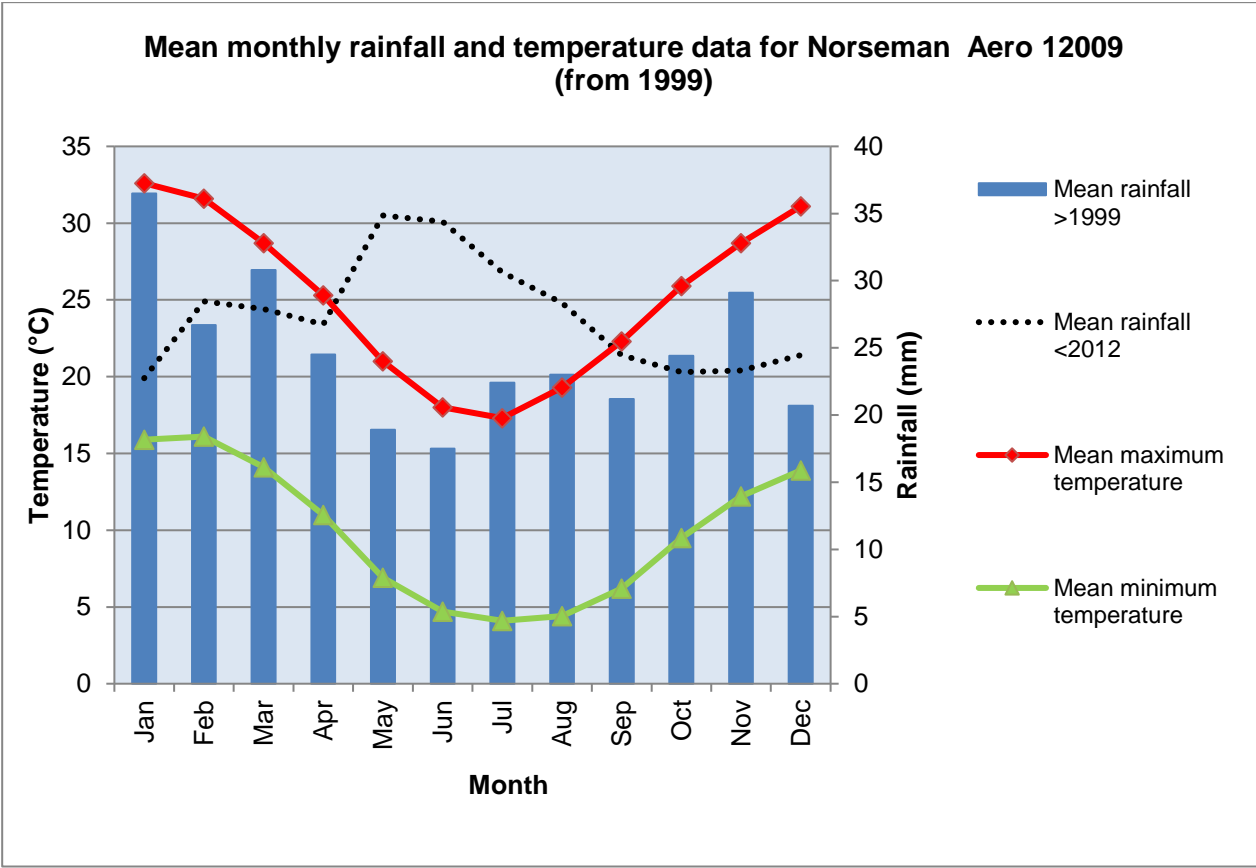


Figure 9: Temperature and rainfall data Norseman (BOM Site 12009)

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Table 2: BOM Climate data from Norseman (Station 12065) and Norseman Aero (Station 12009)

BOM Station 12065: 1897 to 2012, BOM Station 12009: 1999 to present

Statistic Element	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean maximum temperature - end 2012 (°C)	32.6	31.3	28.8	24.6	20.4	17.5	16.8	18.5	21.6	25	28.1	30.7	24.7
Mean maximum temperature - start 1999 (°C)	32.6	31.6	28.7	25.3	21	18	17.3	19.3	22.3	25.9	28.7	31.1	25.2
Highest temperature - end 2012 (°C)	46	44.9	43.8	37	33.3	27.8	27.7	32.5	35.6	40	41.1	44.9	46
Highest temperature - start 1999 (°C)	46.5	44.8	43.5	37.7	32	28.2	25.1	32.9	36	39.6	42.4	45.1	46.5
Mean minimum temperature - end 2012 (°C)	15.8	15.9	14.5	11.6	8.5	6.3	5.1	5.4	7.3	9.7	12.3	14.1	10.5
Mean minimum temperature - start 1999 (°C)	15.9	16.1	14.1	11	6.9	4.7	4.1	4.4	6.2	9.5	12.2	13.9	9.9
Lowest temperature - end 2012 (°C)	6	6.3	3.3	0.6	-2.3	-4.6	-3.1	-2.2	-3	-0.7	2.2	3.6	-4.6
Lowest temperature - start 1999 (°C)	5.7	5.9	1.7	0.8	-2.1	-6	-4.4	-3.7	-4.3	-1.9	0.9	3	-6
Mean rainfall - end 2012 (mm)	19.9	24.9	24.4	23.4	30.5	30.1	26.8	24.8	21.4	20.3	20.4	21.4	288.9
Mean rainfall - start 1999 (mm)	36.5	26.7	30.8	24.5	18.9	17.5	22.4	23	21.2	24.4	29.1	20.7	298
Highest rainfall - end 2012 (mm)	116.4	202.6	188.7	111.8	136.6	104.4	80	94.9	75.2	87.2	86.9	150.8	623.6
Highest rainfall - start 1999 (mm)	93.6	136.8	149.8	71	47.6	54.8	55.2	48	71.8	82.8	92.2	79.8	454.2
Lowest rainfall - end 2012 (mm)	0	0	0	0	0	2.2	2.5	0.8	0.4	0	0	0	137.9
Lowest rainfall - start 1999 (mm)	0	0	0	0	1.2	1.4	6.2	7.4	0.4	1	0.6	0.8	183.4
Highest daily rainfall - end 2012 (mm)	67.4	163.6	86	66.3	42.4	43.8	32.8	38.6	58.8	45	48.3	54.1	163.6
Highest daily rainfall - start 1999 (mm)	53	50	76	39	30.4	17	21	23	55	43.8	42	71	76
Mean number of days of rain - end 2012	3.5	3.7	4.5	5.3	7.3	8.7	9.4	8.5	7	5.3	4.6	3.9	71.7
Mean number of days of rain - start 1999	5.8	5.3	5.8	6.6	7.2	8.7	10.9	10.5	7.8	6.6	6.9	4.5	86.6

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2.2 REGIONAL SETTING

The HGO area is located in the Interim Biogeographic Regionalisation of Australia ('IBRA') Coolgardie 3 Eastern Goldfields subregion, described by Cowan (2001) as gently undulating plains on the Yilgarn Craton with calcareous soil being dominant. The subregion supports a diverse eucalypt woodland around the salt lakes, on the low ranges and in the broad valleys and mallee and Acacia thickets and shrub heaths on the plains (Cowan 2001). The sub-region is rich in endemic Acacias. The subregional area is 5,102,428ha (Cowan 2001).

The HGO locality is situated on a large peninsular on the western edge of Lake Cowan from the lakebed to the Goldfields to Esperance Highway, refer to Figure 2. The landforms range from extensive pediplains and stony plains, basalt and greenstone undulating rises and low hills, salt lakes with fringing sand plains and sand or gypsum dunes.

The NVCP amendment area is contained within the Great Western Woodlands, an internationally significant area of biological diversity and the largest remaining area of intact Mediterranean climate woodland on Earth, covering almost 16 million hectares (DEC 2010). It forms a continuous band of native vegetation that extends from the edge of the Wheatbelt through the Goldfields to the Nullarbor Plain. Notwithstanding its biological importance, the Great Western Woodlands occurrence at the HGO area and immediate surrounds has been the subject of significant levels of mining and exploration disturbance for >100 years. It is not considered as being a good representation of intact Great Western Woodlands at the Higginsville locality. There are extensive areas of the Great Western Woodlands under DBCA managed lands that in the 2010 report totalled 2,569,728ha or 16.1%, and with the potential to increase to 3,650,028ha or 22.9% (DEC 2010). The proposed clearing under this NVCP amendment is considered unlikely to have any impact on the overall conservation status of Great Western Woodlands.

From an examination of spatial data available from Data WA (2020):

- There are no Environmentally Sensitive Areas within 34km of NVCP amendment area (*ClearingRegulations_EnvironmentallySensitiveAreasDWER_046.shp*).
- There are two Schedule 1 "Non-permitted area" pursuant to Schedule 1 of the Environmental Protection (Clearing of Native Vegetation) Regulations 2004 (*ClearingRegulations_EnvironmentallySensitiveAreasDWER_046.shp*). These two non-permitted areas are the corridors for the Coolgardie Esperance Highway and the Kalgoorlie Esperance Railway. The NVCP amendment area does not impact this area.
- There are no DBCA managed lands (National Parks, Nature Reserves, proposed conservation areas) occurring within the NVCP amendment area (*DBCA_LegislatedLandsandWatersDBCA_011.shp*). The closest DBCA managed land is the Binaronca Nature Reserve (Reserve 32552), located approximately 2.6km to the northwest of the main HGO NVCP area and within 1.7km of the Redcross powerline easement (Figure 9). The proposed developments under this NVCP amendment will not impact in any way on the Binaronca Nature Reserve.
- From the "data.wa" WMS Server there are no Threatened Ecological Communities ('TEC's) or Priority Ecological Communities ('PEC's) within 49km of NVCP amendment area (*Threatened Ecological Communities DBCA-038.shp*).

2.3 SOILS

Soils in the goldfields region are typically alkaline with a pH range of 7.0 to 9, low soil fertility and electrical conductivity of 14mS/cm, indicating moderate soil salinity. Soils in the Higginsville mining area are typically characterised by red loamy earths and calcareous loamy

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earths on the plains, calcareous shallow loams and stony soils on low hills and rises and saline soils on and near playa lakes. Soil fertility is generally low and soil salinity is locally higher. Various soil testing has taken place throughout the mining precinct including problematic areas such as the Palaeochannel mining area. Even when soil testing indicated saline, sodic and dispersive characteristics - monitoring, investigations and observational evidence has shown that topsoil and subsoil recovered during mining and clearing to be suitable for rehabilitation efforts, as vegetation has established within previously rehabilitated areas. This being considered, there appears to be no major limiting factors for plant growth from soils harvested at the proposed TSF5 area.

2.4 GEOLOGY

The Higginsville Gold Operation is situated between the gold mining centres of Norseman and St Ives. It lies to the west of the Zuleika Shear, towards the southern end of the Norseman-Wiluna Greenstone Belt of the Archaean Yilgarn Craton.

The geology comprises fault-bounded, thrust repeated north-northwest trending mafic-ultramafic and sedimentary packages up to 5km in width. The mafic-ultramafic rocks comprise upper greenschist to middle amphibolite facies metamorphosed high magnesium basalt, minor komatiite units and interflow clastic sedimentary rocks intruded by dolerite and gabbro. The sedimentary rocks to the east comprise felsic metasedimentary and felsic volcanoclastic rocks. This stratigraphic sequence has been affected by several regional deformation events. The regional metamorphic regime comprises of upper greenschist to middle amphibolites facies.

2.5 HYDROLOGY

Surface hydrology for the NVCP amendment area is displayed in Figure 10. The NVCP amendment area is contained within the 3,483,400ha Balladonia Catchment of the Salt Lake Basin (DWER 2020).

The Balladonia Catchment includes the Lake Cowan and Lake Dundas salt lake systems. Drainage lines in the NVCP amendment area flow to Lake Cowan (Figure 10). Drainage lines within the north of the NVCP amendment area are poorly defined and are only likely to flow following major rainfall events. Sheetflow may also occur on the alluvial plains adjacent to the salt lake system following periods of heavy rainfall. The incidence or intensity of flooding is not considered as being a high risk event due to the low rainfall (298mm annually), relatively flat land that is surrounded by woodlands and shrublands, no major watercourses, no lower lying flood plains associated with major water courses and mine runoff managed through containment.

Lake Cowan is one of the larger lakes in the Goldfields bioregion with an area of approximately 96,929ha. Although not recognised nationally or internationally as a wetland of conservation significance, it is listed as a wetland of subregional significance in the DBCA biodiversity audit for the Coolgardie 3 Eastern Goldfields subregion (Cowan 2001).

The lake represents part of a former palaeodrainage channel and is predominately dry for most of the year but may contain water following heavy rain. Water ponded in the lake is then rapidly lost to evaporation and seepage.

The groundwater in the HGO locality is hypersaline (typically 200,000 to 230,000mg/L TDS), as recorded by Karora as part of their monitoring programs. Monitoring bores surrounding the TSF record lower TDS readings ranging from 50,000 to 100,000 mg/L with groundwater levels ranging from 7 – 13 m below ground level.

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There are no Public Drinking Water Source Areas ('PDWSA's) within 120km of NVCP amendment area (DWER 2020).

In summary:

- A drainage lines sits in the northern section of the NVCP amendment area (Figure 10). This drainage line may flow towards Lake Cowan after heavy rainfall and may be impacted depending on the final footprint of TSF5. Preliminary design of the TSF will avoid the watercourse but any disruption to the drainage line will be managed with qualified engineering consultation and appropriate controls which will be considered during design and construction of the facility and through the DMIRS and DWER approvals process.
- The groundwater quality at HGO is hypersaline with groundwater surrounding the existing TSF within the 50,000 to 100,000 mg/L TDS range.
- The standing water level of groundwater surrounding the existing TSF facility sits at around 7 – 13 m below ground level.

2.6 FLORA AND VEGETATION

The general HGO locality has been covered by 13 flora and vegetation surveys that were conducted between 2006 to 2019. The HGO flora survey coverage map is provided in Figure 7 which includes the NVCP amendment footprint. A table summarising all flora and vegetation surveys in the HGO locality has been provided in Table 3.

Two studies directly cover the proposed NVCP amendment area. The first includes the broadscale vegetation mapping that was undertaken by GHD in 2010 which includes the inferred vegetation groups. With the exception of gaps at Pioneer and Eundynie which have since been covered by subsequent Native Vegetation Solutions (NVS) surveys, all central HGO mapping gaps were covered by the GHD 2010 broadscale vegetation survey including the NVCP amendment area.

A summary of the key findings from the GHD 2010 Biological Assessment and Broad Scale Vegetation Mapping is provided below:

- Five broad scale communities and one degraded landform were recorded. The inferred community specific to the NVCP amendment area is Woodland of *Eucalyptus salmonophloia* and *E. salubris* with scattered midstorey of *Melaleuca sheathiana* over *Eremophila scoparia*, *Cratystylis conocephala* and *Maireana sedifolia* on loamy plains).
- No TECs or PECs were reported in the survey area.
- The total species count was a composite from previous surveys and consisted of 136 taxa from 45 genera and 23 families.
- Conservation significant taxa were not specifically searched for and none were listed from the review of previous surveys

The second study that covers a portion of the proposed NVCP amendment area was completed by GHD in 2008 and included a baseline flora and fauna assessment comprised of a desktop review and field survey. A summary of the key findings from the GHD 2008 report is provided below:

- Two vegetation groups were recorded in the survey area including Transitional *Eucalyptus* Woodland Community; and *Acacia acuminata* and *Eremophila dempsteri* shrubland over *Dodonaea microzyga*, *Stenanthemum* sp. and *Prostanthera* sp.

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- A total of 66 taxa from 25 genera and 19 families were recorded
- No Conservation listed taxa were recorded (*Eremophila parvifolia* subsp. *auricampa* (ex-P1) was observed but was subsequently delisted as a priority species).
- No introduced species were recorded in the survey area, although *Carrichtera annua* (Ward's Weed) was observed in a rehabilitation area. *Carrichtera annua* is not a declared pest.

Since 2011, Native Vegetation Solutions has been conducting surveys in the HGO locality. As discussed in these NVS vegetation reports, no PECs or TECs were recorded in the HGO survey area. The DBCA PEC/TEC search conducted by NVS in 2011 did reveal that some survey areas are within the buffer zone of the Fraser Range Vegetation Complex (Priority 1).

- "Plant assemblages of the Fraser Range Vegetation Complex: *Allocasuarina huegeliana* and *Pittosporum angustifolia* open woodland over *Beyeria lechenaultii* and *Dodonaea microzyga* Scrub and *Aristida contorta* bunch grasses (granite complex), on the slopes and summits of hills; *Acacia acuminata* Tall Shrubland dominated by *Melaleuca uncinata* and *Triodia scariosa* on uplands with shallow loamy sands; *Eucalyptus aff. uncinata* (KRN 7854) over *Senna artemisioides* subsp. *helmsii*, *Cryptandra miliaris*, *Dodonaea boroniifolia*, *D. stenozyga* and *Triodia scariosa* (*Eucalyptus effusa* Mallee) on colluvial flats with loamy clay sands, and; *E. oleosa*, *E. transcontinentalis*, *E. flocktoniae* Woodland on flats."

Vegetation groups within the HGO survey areas did not compare to this description of the Fraser Range Vegetation Complex. NVS concluded that the Fraser Range PEC is not present in the HGO locality.

The lack of PECs and TECs was confirmed by viewing the "data.wa" WMS Server shapefile *Threatened_Ecological_Communities_DBCA-038.shp*. There are no PECs or TECs within 49km of the NVCP amendment area.

As reported in the NVS reports, no unique or restricted vegetation communities were identified, and all vegetation types/communities are common, widespread and well represented in the Eastern Goldfields subregion.

On the basis of the lack of PECs, TECs and unique or restricted vegetation groups as discussed in the 13 flora and vegetation surveys, it is considered that there is sufficient vegetation community knowledge in the HGO locality to predict that clearing under this amendment will not have any impact on any ecologically significant communities.

Conservation listed flora has been plotted in relation to the NVCP amendment and is provided in Figure 11. The spatial data was sourced from DBCA and from the various NVS surveys in which conservation listed flora were recorded.

Three conservation listed flora were recorded in the general HGO area:

- *Calandrinia lefroyensis* (P1).
- *Allocasuarina eriochlamys* subsp. *grossa* (P3)
- *Diocirea acutifolia* (P3) reclassified as *Eremophila acutifolia* (P3).

Three conservation listed flora were recorded within several kilometres of the NVCP amendment area:

- *Pterostylis xerampelina* (P1).
- *Senecio microbasis* (P1).
- *Pityrodia scabra* subsp. *dendrotricha* (P3).

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***Calandrinia lefroyensis* (P1)**

There is one Atlas of Living Australia ('ALA') reported location of *Calandrinia lefroyensis* within the Baloo haul road section of the NVCP amendment area. The location was recorded in 2014 by the *Calandrinia* authority Frank Obbens (ALA 2020). The reported location occurs in close proximity to the now constructed Baloo haul road that was approved for clearing under CPS 8152/1. Assuming this plant was accurately plotted in the field by GPS, it is possible that it is no longer present due to the haul road construction. The ALA (2020) Site description is "Extensive saline flats, some 0.5 km from Lake Cowan incursion area. Brown silty loam with some scattered quartz". The plotted location is 2.5km from Lake Cowan and this suggest a possible location issues. The Baloo haul road is already constructed so no further clearing is required at the location where the plant was recorded. The ALA distribution for *Calandrinia lefroyensis* follows a linear path 140km long from Lake Cowan to White Flag Lake that is northwest of Kalgoorlie (ALA 2020). The 9 records in ALA are on or near shores of salt lakes. The above location near the Baloo haul road is the southernmost recorded location.

The habitat description in the Nuytsia article describing this species is salt-lake flats among samphire communities on the outer edges of samphire communities including within the ecotone of adjacent communities where there are open assemblages of taller open woodland species (Obbens 2018). Soils are brown silty loams or brown-grey sandy clays (Obbens 2018).

The majority of the NVCP amendment area is well away from salt lake fringing / ecotone vegetation and so is considered unlikely to provide suitable habitat for *Calandrinia lefroyensis*. The proposed Pioneer haul road partially intersects chenopod shrublands at two small locations, albeit these areas are >4km in from the Lake Cowan shoreline. This species was not recorded in the Pioneer vegetation survey in 2019 that was conducted by a goldfields specialist and experienced botanist; Eren Reid.

In consideration of the above, it is unlikely that clearing within the NVCP amendment area will impact on the conservation status of *Calandrinia lefroyensis*, given that its known distribution extends 140km north of Lake Cowan, this species was not recorded in the vegetation surveys conducted by NVS and that the associated habitat (salt-lake flats among samphire communities) is not contained within the mining development footprint (with the exception of two small areas at the Pioneer haul road that were subject to flora survey and it as not recorded at these locations).

***Allocasuarina eriochlamys* subsp. *grossa* (P3)**

Allocasuarina eriochlamys subsp. *grossa* has a known distribution from Salmon Gums (95km north of Esperance) and extending 230km north to near Coolgardie (ALA 2020).

There are also outlying single records 270km to the west in the Wheatbelt and 280km east on the Nullarbor Plain. This species was recorded extensively in surveys conducted for the Mt Henry Mine development, surrounding Norseman. The FloraBase habitat description is "stony loam, laterite clay, granite outcrops".

Two small populations (~ 30 plants each) were recorded by NVS in the Two Boys Fairplay survey (NVS 2017b) and the Redcross Powerline survey (NVS 2018).

Given its regional distribution and occurrence at only two locations in the NVCP amendment area, it is unlikely that clearing within the NVCP amendment area will impact on the overall conservation status of *Allocasuarina eriochlamys* subsp. *grossa*. Any loss of individual plants will be confined to a local level and this is highly unlikely to have impact on this species on a regional level.

***Diocirea acutifolia* – reclassified as *Eremophila acutifolia* (P3)**

Eremophila acutifolia is both widespread and in large numbers throughout the local and regional area, and is well documented by previous flora surveys. It has been recorded extensively and in large populations by NVS in various surveys (Table 9). NVS has

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recorded > 40,000 plants in numerous populations in the HGO area. *Eremophila acutifolia* is particularly abundant in the Mitchell area (NVS 2017a). The ALA distribution occurs as a rectangle approximately 160km by 50km that extends from the Eyre Highway to south of Coolgardie (ALA 2020). The FloraBase habitat description is “Clay loam, gravelly loam, undulating flats.” At HGO it is associated with the vegetation group “*Eucalyptus salmonophloia* woodland over sclerophyll shrubland”.

Given its regional distribution and large numbers in the HGO locality that also occur outside of the proposed development footprint, it is considered unlikely that clearing within the NVCP amendment area will impact on the overall conservation status of *Eremophila acutifolia*. Any loss of plants will be confined to a local level.

***Pterostylis xerampelina* (P1)**

The orchard *Pterostylis xerampelina* was recorded in the DBCA search at one location approximately 3.2km southwest of Pioneer. The ALA distribution is approximately 400km by 200km, however, with a paucity of records in this area (ALA 2020). There is no habitat description in FloraBase, however, ALA has records associating *Pterostylis xerampelina* to rocky upland areas such as ironstone hill, low granite area and large granite domes (ALA 2020).

On the basis of recorded habitat types, it is considered unlikely that *Pterostylis xerampelina* would occur in the NVCP amendment area (mixed and transitional woodlands on low relief topography with soil substrates).

Given its regional distribution and unlikely occurrence on site due to lack of associated habitat, it is considered unlikely that clearing within the NVCP amendment area will impact on the overall conservation status of *Pterostylis xerampelina*.

***Senecio microbasis* (P1)**

Senecio microbasis was recorded in the DBCA search at one location approximately 2.5km southwest of Pioneer (ALA 2020). The ALA distribution had this plant occurring extensively and commonly in the Eastern States from Tasmania to northern New South Wales, with several occurrences near Higginsville (ALA 2020). The FloraBase habitat description is “Schist soils. Low hills, disturbed areas in woodland.”

Given its massive Eastern States distribution and no recorded occurrence in the NVS flora surveys, it is considered unlikely that clearing within the NVCP amendment area will impact on either individual plants or on the overall conservation status of *Senecio microbasis*.

***Pityrodia scabra* subsp. *dendrotricha* (P3)**

Pityrodia scabra subsp. *dendrotricha* was recorded in the DBCA search approximately 4.5km west of northern end of the Redcross powerline. The ALA distribution extends from the Kambalda locality approximately 200km in a south-southwestly direction to the edge of the Wheatbelt (ALA 2020).

The DBCA habitat descriptions are typically low plains on the upslope edge of Lake Lefroy with yellow sand, flats on lake edge with moist orange-yellow sand, sand dune or gypsum dunes on lake edge. Phoenix Environmental (2017) describes the habitat as *Eucalyptus* woodland on sand dunes on the lake edge for the St Ives area.

Given its regional distribution that extends to the Wheatbelt and no recorded occurrence in the NVS flora surveys, it is considered unlikely that clearing within the NVCP amendment area will impact on either individual plants or on the overall conservation status of *Pityrodia scabra* subsp. *dendrotricha*.

Pityrodia scabra (Wyalkatchem Foxglove) appears in the Protected Matters Search under the EPBC Act 1999 as an Endangered species. However, DBCA has no listing for a Threatened *Pityrodia scabra* species in the HGO locality. DBCA does list a Threatened subspecies of *Pityrodia scabra* (*Pityrodia scabra* subsp. *scabra*) that occurs in the mid-Wheatbelt, >600km west of HGO. It is thought that *Pityrodia scabra* subsp. *scabra* is the

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plant referred to as the Wyalkatchem Foxglove under the Protected Matters Search and this species therefore does not occur in the HGO locality.

2.7 STATE LEVEL VEGETATION ASSOCIATIONS

Mapping of the pre-European vegetation within Western Australia was conducted at a 1:250,000 scale by J S Beard from 1964 to 1981 (Beard *et al.* 2013). The type, status, pre-European area (based on Beard’s mapping) and remaining extent of native vegetation for the entire state has been assessed by the Department of Biodiversity, Conservation and Attractions (‘DBCAs’) and DPIRD using remote sensing techniques and GIS analysis to produce a statistical compendium called the ‘Comprehensive, Adequate and Representative’ (‘CAR’) Reserves system (Shepherd *et al.* 2002). Data has been updated on a regular basis with the information from the latest update being the “2018 Statewide Vegetation Statistics” (Government of Western Australia 2019). Information on the extent of vegetation sub-associations occurring in the NVCP amendment area is provided in Table 4. There is one vegetation sub-association occurring in the NVCP amendment area:

- Binneringe 8.6 - Medium woodland; salmon gum & gimlet.

Under the previous amendment application for CPS 8152/3 which amalgamated five existing NVCP permits at HGO, vegetation sub-association 8.6 was calculated as having a current extent of 29,804 ha and was revised to 29,011.34 post clearing which equals a percentage of 94.36% remaining from the pre-european area. This figure assumes all the vegetation under CPS 8152/3 would be cleared which is unlikely given the extent and buffer zones built into the permit.

Under this amendment, there would be a maximum additional 82.81 ha cleared with 28,928.53 ha remaining which is equal to a further 0.27% reduction. Sub-association 8.6 has a final revised percentage of 94.09% from 94.36% (Table).

Pursuant to Environmental Protection Authority’s (‘EPA’) “*Environmental Protection of Native Vegetation in Western Australia, Clearing of Native Vegetation, Position Statement No. 2*” (EPA 2000), a vegetation type is considered underrepresented if there is less than 30% percent of its original distribution remaining. Position Statement No. 2 states that from a purely biodiversity perspective, and not taking into account any other land degradation issues, there are several key criteria applied to vegetation clearing.

- The “threshold level” below which species loss appears to accelerate exponentially at an ecosystem level is regarded as being at 30% of the pre-European / pre-1750 extent for the vegetation type.
- A level of 10% of the original extent is regarded as being a level representing Endangered.

Sub-association 8.6 vegetation located in the NVCP amendment area, post-clearing, is considered minimal and would be well above the 30% risk threshold.

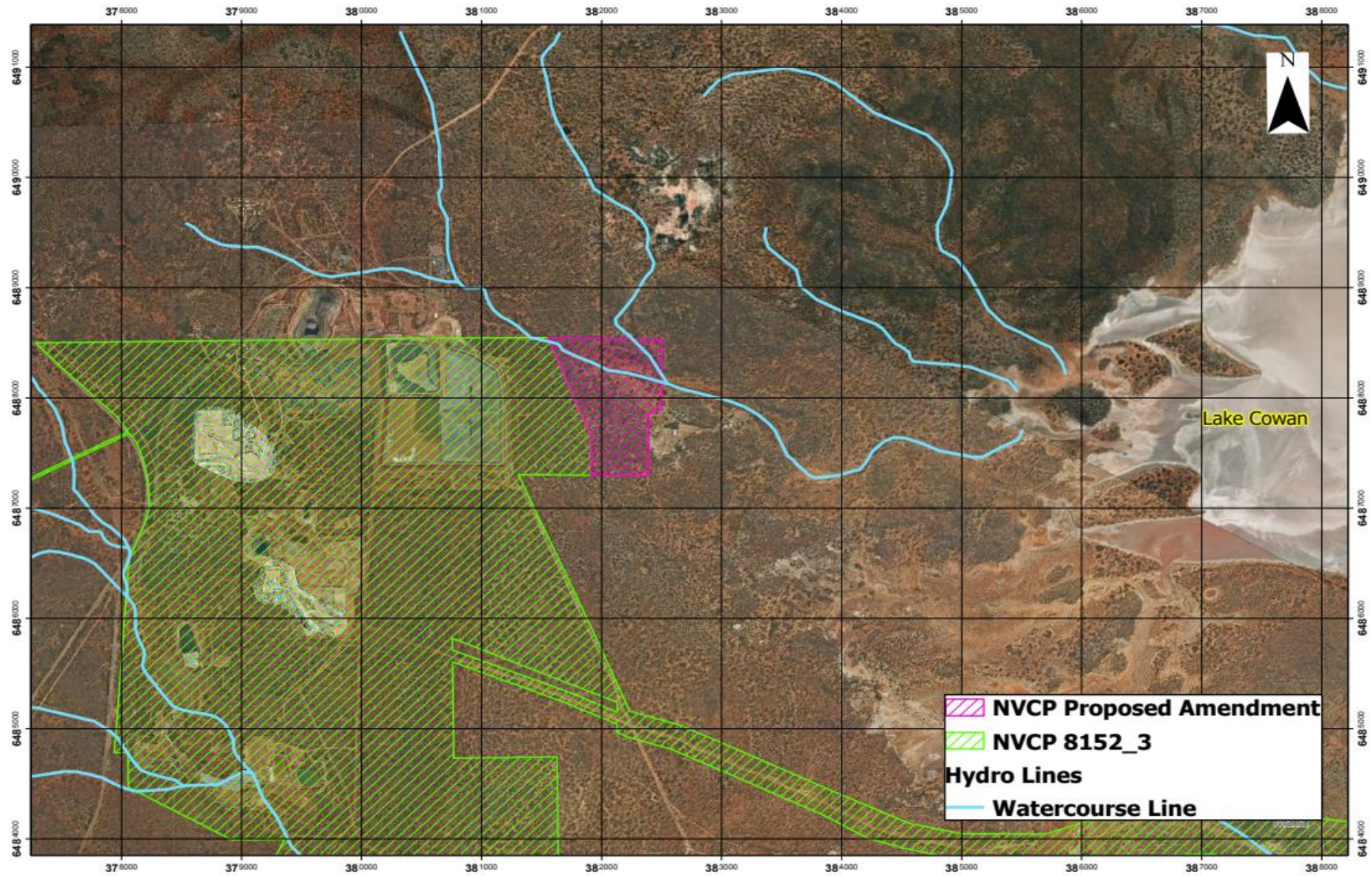


Figure 10: Surface hydrology of HGO area

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Table 3: Summary information for the flora and vegetation surveys conducted at HGO

Year	Report Title	Company	Summary
2006	Vegetation survey of Avoca Resources Limited Tenements M15/351, M15/289, M15/225, M15/325 & P15/4786. Prepared for Avoca Resources Limited, August 2006, Final. JSWT (2006)	Jim's Seeds, Weeds and Trees Pty Ltd	Two vegetation groups were recorded: <ul style="list-style-type: none"> • Transitional <i>Eucalyptus</i> woodland. • Eucalyptus over Rocky breakaway. Both vegetation groups were in "Very Good" condition. A total of 65 taxa from 33 genera and 22 families were recorded. No conservation listed taxa were recorded. One introduced species (not a declared pest) was recorded: <ul style="list-style-type: none"> • <i>Solanum hystrix</i> (Afghan Thistle).
2007	Flora and Vegetation survey of an area within Tenement M15/348. Prepared for Avoca Resources Limited, February 2007, Final. JSWT (2007)	Jim's Seeds, Weeds and Trees Pty Ltd	Two vegetation groups were recorded: <ul style="list-style-type: none"> • Transitional <i>Eucalyptus</i> woodland. • <i>Acacia acuminata</i> shrubland. Both vegetation groups were in "Very Good" condition. A total of 59 taxa from 25 genera and 15 families were recorded. No conservation listed taxa were recorded. No introduced species were recorded.
2008	Biological Survey of Proposed Aerodrome Site at Higginsville Mine Site. Unpublished report prepared for Avoca Resources Limited. GHD (2008)	GHD	Two vegetation groups were recorded: <ul style="list-style-type: none"> • Transitional <i>Eucalyptus</i> Woodland Community. • <i>Acacia acuminata</i> and <i>Eremophila dempsteri</i> shrubland over <i>Dodonaea microzyga</i>, <i>Stenanthemum</i> sp. and <i>Prostanthera</i> sp. A total of 66 taxa from 25 genera and 19 families were recorded. No Conservation listed taxa were recorded (<i>Eremophila parvifolia</i> subsp. <i>auricampa</i> (ex-P1) was observed but was subsequently delisted as a priority species). No introduced species were recorded in the survey area, although <i>Carrichtera annua</i> (Ward's Weed) was observed in a rehabilitation area. <i>Carrichtera annua</i> is not a declared pest.
2010	Avoca Resources Limited, Report for Higginsville Project Area, Desktop Biological	GHD	Five broad scale communities and one degraded landform were recorded:

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Year	Report Title	Company	Summary
	<p>Assessment and Broad Scale Vegetation Mapping, February 2010. Unpublished report prepared for Avoca Resources Limited.</p> <p>GHD (2010)</p>		<ul style="list-style-type: none"> • Low woodland of <i>Eucalyptus lesouefii</i> and <i>E. torquata</i> over <i>Eremophila psilocalyx</i>, <i>Eremophila glabra</i>, <i>Alyxia buxifolia</i>, <i>Trymalium myrtillus</i> and <i>Dodonaea microzyga</i> over <i>Westringia rigida</i> on ridges. • Woodland of <i>Eucalyptus salmonophloia</i> and <i>E. salubris</i> with scattered midstorey of <i>Melaleuca sheathiana</i> over <i>Eremophila scoparia</i>, <i>Cratystylis conocephala</i> and <i>Maireana sedifolia</i> on loamy plains. • Woodland of <i>Eucalyptus lesouefii</i> with scattered <i>E. griffithsii</i>, <i>E. celastroides</i> and <i>E. salmonophloia</i> over <i>Alyxia buxifolia</i>, <i>Eremophila scoparia</i>, <i>Eremophila glabra</i>, <i>Eremophila oldfieldii</i> subsp. <i>angustifolia</i> and <i>Dodonaea lobulata</i> over <i>Westringia rigida</i>. • Mixed woodland of <i>Eucalyptus urna</i>, <i>E. lesouefii</i>, <i>E. ravida</i>, <i>E. salubris</i>, <i>E. celastroides</i>, <i>E. oleosa</i> subsp. <i>oleosa</i> and <i>E. salmonophloia</i> over mixed <i>Eremophila</i> and <i>Atriplex</i> spp. interspersed with <i>Eucalyptus torquata</i> and <i>E. stricklandii</i> over <i>Alyxia buxifolia</i>, <i>Eremophila oldfieldii</i> subsp. <i>angustifolia</i> and <i>Dodonaea lobulata</i> on hill slopes and crests. • Very open low shrubland of <i>Tecticornia</i> spp. and <i>Frankenia</i> spp. on saline plains. • Cleared /degraded areas – few native species present (primarily disturbance response species). <p>No TECs or PECs were reported.</p> <p>The total species count was a composite from previous surveys and consisted of 136 taxa from 45 genera and 23 families.</p> <p>Conservation significant taxa were not specifically searched for and none were listed from the review of previous surveys.</p>
2011	<p>Level 1 Flora and Vegetation Survey of the Proposed Fairplay Pit and Waste Landform Expansion and Development Higginsville (M15/031, M15/348, M15/375, M15/610 and M15/748), Final, December 2011. Unpublished report for Alacer Gold.</p> <p>NVS (2011a)</p>	Native Vegetation Solutions	<p>Five major vegetation groups were recorded:</p> <ul style="list-style-type: none"> • Salmon Gum (<i>Eucalyptus salmonophloia</i>) woodland. • <i>Eucalyptus ravida</i> woodland. • <i>Eucalyptus flocktoniae</i> over <i>Melaleuca sheathiana</i>. • <i>Melaleuca sheathiana</i> thicket. • Disturbed Vegetation. <p>No TECs or PECs were recorded.</p>

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Year	Report Title	Company	Summary
			<p>Overall, the condition of the vegetation was determined to be “Very Good” with areas that were affected by historic exploration in either “Good” or “Degraded” condition.</p> <p>A total of 63 taxa from 31 genera and 16 families were recorded.</p> <p>No Declared Rare Flora (now called Threatened Species) were recorded.</p> <p><i>Diocirea acutifolia</i> (P3) was recorded at 18 locations (4587 plants).</p> <p>There introduced species (not declared pests) were recorded:</p> <ul style="list-style-type: none"> • <i>Carrichtera annua</i> (Ward’s Weed). • <i>Centaurea melitensis</i> (Maltese Cockspur). • <i>Sonchus oleraceus</i> (Milk Weed).
2011	<p>Level 1 Flora and Vegetation Survey of the Proposed Vine Waste Landform Expansion Higginsville (M15/610), Final, November 2011. Unpublished report for Alacer Gold.</p> <p>NVS (2011b)</p>	Native Vegetation Solutions	<p>One major vegetation group was recorded:</p> <ul style="list-style-type: none"> • Salmon Gum (<i>Eucalyptus salmonophloia</i>) woodland. <p>No TECs or PECs were recorded.</p> <p>Overall, the condition of the vegetation was determined to be “Good” with areas that were affected by historic exploration in “Degraded” condition.</p> <p>A total of 49 taxa from 28 genera and 15 families were recorded.</p> <p>No Declared Rare Flora (now called Threatened Species) were recorded.</p> <p><i>Diocirea acutifolia</i> (P3) was recorded at one location (50 plants).</p> <p>One introduced species (not declared a pest) was recorded:</p> <ul style="list-style-type: none"> • <i>Carrichtera annua</i> (Ward’s Weed)
2015	<p>Level 1 Flora and Vegetation Survey of the Baloo Gold Prospect Proposed Access Corridor, August 2015. Unpublished report for Polar Metals Pty Ltd.</p> <p>NVS (2015a)</p>	Native Vegetation Solutions	<p>Fifteen major vegetation group were recorded:</p> <ul style="list-style-type: none"> • <i>Eucalyptus lesouefii</i> and <i>E. flocktoniae</i> woodland over <i>Melaleuca sheathiana</i> • <i>Melaleuca sheathiana</i> thicket. • <i>Eucalyptus salmonophloia</i> woodland over sclerophyll shrubland. • <i>Eucalyptus ravida</i> woodland. • Mixed <i>Eucalyptus</i> woodland over mixed shrubland. • Open <i>Eucalyptus salmonophloia</i> woodland. • Open mixed <i>Eucalyptus</i> woodland over Chenopod shrubland. • <i>Acacia quadrimarginea</i> shrubland.

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			<ul style="list-style-type: none"> • <i>Tecticornia</i> shrubland. • <i>Eucalyptus oleosa</i> and <i>E. lesouefii</i> over <i>Melaleuca sheathiana</i> and mixed shrubland on undulating hills. • Mixed <i>Eucalyptus</i> woodland over <i>Melaleuca sheathiana</i> and <i>Cratystylis Conocephala</i>. • <i>Acacia acuminata</i> thicket with emergent <i>Eucalyptus griffithsii</i>. • Mixed sclerophyll shrubland. • Sclerophyll shrubland with emergent <i>Bossiaea walkeri</i>. • <i>Eucalyptus torquata</i> and <i>Eucalyptus lesouefii</i> over mixed sclerophyll shrubland on undulating hills. <p>No TECs or PECs were recorded. The buffer zone for the Fraser Range vegetation complex Priority 1 PEC was found in the DBCA search to overlap the eastern half of the survey area. The definition of this PEC did not reflect the vegetation groups recorded the survey area by NVS. NVS concluded that the Fraser Range PEC did not occur in the survey area.</p> <p>Overall, the condition of the vegetation was determined to be “Very Good” with areas that were affected by historic exploration in “Good” condition.</p> <p>A total of 136 taxa from 62 genera and 29 families were recorded.</p> <p>No conservation listed flora were recorded in the survey area.</p> <p>Two introduced species (not declared pests) was recorded:</p> <ul style="list-style-type: none"> • <i>Carrichtera annua</i> (Ward’s Weed). • <i>Medicago polymorpha</i> (Burr Medic).
2015	Level 1 Flora and Vegetation Survey of the Proposed Fairplay Pit and Waste Landform Expansion and Development Higginsville (M15/031, M15/231, M15/348, M15/352, M15/375, M15/610 and M15/748), Final, July 2015. Unpublished report for Avoca Mining Pty Ltd.	Native Vegetation Solutions	<p>Six major vegetation group were recorded:</p> <ul style="list-style-type: none"> • Salmon Gum (<i>Eucalyptus salmonophloia</i>) woodland. • <i>Eucalyptus ravida</i> woodland. • <i>Eucalyptus flocktoniae</i> over <i>Melaleuca sheathiana</i>. • <i>Melaleuca sheathiana</i> thicket. • Disturbed vegetation. • Mixed <i>Eucalyptus</i> woodland over mixed shrubland. <p>No TECs or PECs were recorded.</p>

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Year	Report Title	Company	Summary
	NVS (2015b)		<p>Overall, the condition of the vegetation was determined to be “Very Good” with areas which were affected by historic exploration in “Good” condition.</p> <p>A total of 73 taxa from 37 genera and 19 families were recorded.</p> <p>No Declared Rare Flora (now called Threatened Species) were recorded.</p> <p><i>Diocirea acutifolia</i> (P3) was recorded at 19 locations (4607 plants).</p> <p>There introduced species (not declared pests) were recorded:</p> <ul style="list-style-type: none"> • <i>Carrichtera annua</i> (Ward’s Weed). • <i>Centaurea melitensis</i> (Maltese Cockspur). • <i>Sonchus oleraceus</i> (Milk Weed).
2017	<p>Level 1 Flora and Vegetation Survey of the Mitchell Project Area, Higginsville (M15/338, M15/639, M15/640, M15/1790 and G15/29), Final V2.0, June 2017. Unpublished report for Avoca Mining Pty Ltd.</p> <p>NVS (2017a)</p>	Native Vegetation Solutions	<p>Four major vegetation group were recorded:</p> <ul style="list-style-type: none"> • <i>Eucalyptus lesouefii</i> over <i>Cratystylis conocephala</i> and sclerophyll shrubland. • <i>Eucalyptus salmonophloia</i> woodland over sclerophyll shrubland. • <i>Eucalyptus salubris</i> over <i>Melaleuca sheathiana</i> woodland. • Mixed <i>Eucalyptus</i> woodland over mixed sclerophyll shrubland. <p>No TECs or PECs were recorded.</p> <p>Overall, the condition of the vegetation was determined to be “Very Good” with areas that were affected by historic exploration in “Good” condition, and other areas not affected by exploration or previous mining activities in “Excellent” condition. “Degraded” areas included previous mining activities such as waste dumps and open pits as well as haul roads and access corridors</p> <p>A total of 94 taxa from 42 genera and 19 families were recorded.</p> <p>No Threatened Species were recorded.</p> <p><i>Diocirea acutifolia</i> (P3) was recorded at 8 locations inside the survey area (8,725 plants) and one location outside (5,028 plants).</p> <p>There introduced species (not declared pests) were recorded:</p> <ul style="list-style-type: none"> • <i>Carrichtera annua</i> (Ward’s Weed). • <i>Centaurea melitensis</i> (Maltese Cockspur). • <i>Sonchus oleraceus</i> (Milk Weed).

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Year	Report Title	Company	Summary
2017	Level 1 Flora and Vegetation Survey of the Two Boys and Fairplay Project area, and Proposed Infrastructure Corridors Development Higginsville (M15/348, M15/352, M15/375, M15/512, M15/528, M15/610, M15/642 and P15/5429), Final V2.2, July 2017. Unpublished report for Avoca Mining Pty Ltd. NVS (2017b)	Native Vegetation Solutions	<p>Four major vegetation group were recorded:</p> <ul style="list-style-type: none"> • <i>Eucalyptus griffithsii</i> over <i>Acacia acuminata</i> over sclerophyll shrubland. • <i>Eucalyptus salmonophloia</i> woodland over sclerophyll shrubland. • <i>Eucalyptus torquata</i> woodland over mixed sclerophyll shrubland. • Mixed <i>Eucalyptus</i> woodland over mixed sclerophyll shrubland. <p>No TECs or PECs were recorded.</p> <p>Overall, the condition of the vegetation was determined to be “Very Good” with areas that were affected by historic exploration in “Good” condition, and other areas not affected by exploration or previous mining activities in “Excellent” condition. “Degraded” areas included haul roads and railway corridors. Evidence some grazing was observed.</p> <p>A total of 106 taxa from 48 genera and 21 families were recorded.</p> <p>No Threatened Species were recorded.</p> <p>Two priority flora were recorded. <i>Diocirea acutifolia</i> (P3) was recorded at 13 locations (451 plants). <i>Allocasuarina eriochlamys</i> subsp. <i>grossa</i> (P3) was recorded at one location (30 plants).</p> <p>Four introduced species (not declared pests) were recorded:</p> <ul style="list-style-type: none"> • <i>Carrichtera annua</i> (Ward’s Weed). • <i>Centaurea melitensis</i> (Maltese Cockspur). • <i>Salvia verbenaca</i> (Wild Sage). • <i>Cenchrus ciliaris</i> (Buffel Grass).
2018	Reconnaissance Flora and Vegetation Survey of the Redross-Higginsville Poweline Corridor, Higginsville (L15/368 and L15/377), Final V2.0, January 2018. Unpublished report for Avoca Mining Pty Ltd. NVS (2018)	Native Vegetation Solutions	<p>Nine major vegetation group were recorded:</p> <ul style="list-style-type: none"> • <i>Eucalyptus torquata</i> woodland over mixed sclerophyll shrubland. • <i>Eucalyptus salmonophloia</i> woodland over sclerophyll shrubland. • <i>Eucalyptus salmonophloia</i> and <i>E. transcontinentalis</i> woodland over <i>Eucalyptus yilgarnensis</i> over <i>Melaleuca sheathiana</i> over <i>Maireana sedifolia</i> and <i>Tecticornia disarticulata</i> shrubland. • Mixed <i>Eucalyptus</i> woodland over sclerophyll and chenopod shrubland. • <i>Eucalyptus lesouefii</i> and <i>E. salmonophloia</i> over chenopod shrubland. • <i>Eucalyptus griffithsii</i> woodland.

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			<ul style="list-style-type: none"> • <i>Eucalyptus lesouefii</i> over <i>Melaleuca sheathiana</i> woodland. • <i>Eucalyptus oleosa</i> over <i>Melaleuca sheathiana</i> over sclerophyll shrubland. • <i>Eucalyptus salubris</i> over sclerophyll shrubland. <p>No TECs or PECs were recorded.</p> <p>Overall, the condition of the vegetation was determined to be “Very Good” with areas that were affected by historic exploration and grazing in “Good” condition. Degraded areas included haul roads and railway corridors.</p> <p>A total of 111 taxa from 49 genera and 23 families were recorded.</p> <p>No Threatened Species were recorded.</p> <p>Two priority flora were recorded. <i>Diocirea acutifolia</i> (P3) was recorded at 13 locations (6,450 plants). <i>Allocasuarina eriochlamys</i> subsp. <i>grossa</i> (P3) was recorded in one location (30 plants). Both priority flora were recorded in large numbers outside of the survey area; 40,451 plants for <i>Diocirea acutifolia</i> and 230 plants for <i>Allocasuarina eriochlamys</i> subsp. <i>grossa</i>.</p> <p>There introduced species (not declared pests) were recorded:</p> <ul style="list-style-type: none"> • <i>Carrichtera annua</i> (Ward’s Weed). • <i>Salvia verbenaca</i> (Wild Sage).
2019	Reconnaissance Flora and Vegetation Survey of the Eundynie Gold Project, Higginsville, June 2019, Final V2,0, July 2019. Unpublished report for Avoca Mining Pty Ltd. NVS (2019a)	Native Vegetation Solutions	<p>Four major vegetation group were recorded:</p> <ul style="list-style-type: none"> • Mixed <i>Eucalyptus</i> woodland over mixed shrubland. • Open <i>Eucalyptus salmonophloia</i> woodland. • Mixed sclerophyll shrubland. • <i>Eucalyptus torquata</i> and <i>Eucalyptus lesouefii</i> over mixed sclerophyll shrubland on undulating hills. <p>No TECs or PECs were recorded. As mentioned previously by NVS, the buffer zone for the Fraser Range vegetation complex Priority 1 PEC overlaps the eastern half of the survey area. The vegetation groups recorded within the survey area do not match the DBCA description of the Fraser Range Vegetation Complex PEC.</p> <p>Overall, the condition of the vegetation was determined to be “Very Good” with areas that were affected by historic exploration and grazing in “Good” or “Degraded” condition.</p>

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			<p>A total of 80 taxa from 37 genera and 20 families were recorded.</p> <p>No conservation listed flora were recorded.</p> <p>No introduced species were recorded.</p>
2019	<p>Reconnaissance Flora and Vegetation Survey of the Pioneer Gold Project, Higginsville, April 2019, Final V2,2, June 2019. Unpublished report for Avoca Mining Pty Ltd.</p> <p>NVS (2019b)</p>	<p>Native Vegetation Solutions</p>	<p>Seven major vegetation group were recorded:</p> <ul style="list-style-type: none"> • <i>Eucalyptus lesouefii</i> over <i>Melaleuca sheathiana</i> shrubland. • <i>Eucalyptus salmonophloia</i> woodland over sclerophyll shrubland. • <i>Eucalyptus oleosa</i> and <i>Eucalyptus lesouefii</i> woodland over sclerophyll shrubland. • <i>Eucalyptus torquata</i> over sclerophyll shrubland. • Mixed <i>Eucalyptus</i> woodland over mixed sclerophyll shrubland. • <i>Eucalyptus salubris</i> over sclerophyll shrubland over <i>Tecticornia disarticulata</i>. • Chenopod shrubland. <p>No TECs or PECs were recorded.</p> <p>Overall, the condition of the vegetation was determined to be “Very Good” with areas that were affected by historic exploration in “Good” condition.</p> <p>A total of 64 taxa from 31 genera and 19 families were recorded.</p> <p>No conservation listed flora were recorded.</p> <p>No introduced species were recorded.</p>

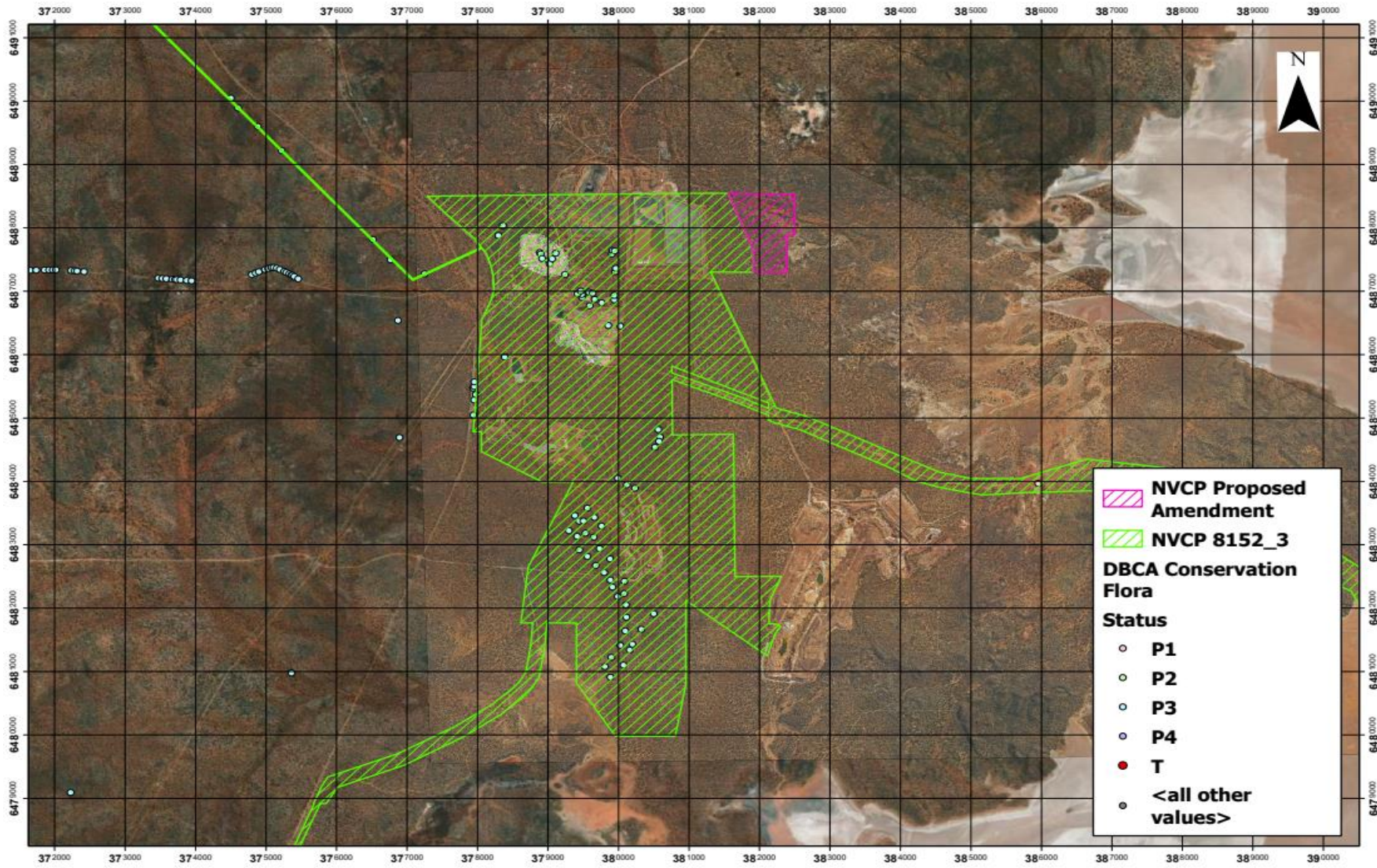


Figure 11: Conservation listed flora in the HGO region

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Table 4: Revised areas and percentages of vegetation association Benneringe 8.6 for the NVCP amendment area

	Minesite or proposed development	NVCP amendment area (ha)	NVCP amendment area by sub-association (ha)	Sub-association code	Coolgardie IBRA Region					
					Pre-European area (ha)	Current extent (ha)	Revised extent post-clearing (ha)	Current percentage remaining (%)	Revised percentage post-clearing (%)	Difference (%)
CPS 8152/3 Previously approved amendment	Aproditie TSF rehabilitation	40	792.69	8.6	30,744.20	29,804.03	29,011.34	96.94	94.36	- 2.58
	Corona	100								
	Fairplay East TSF rehabilitation	15								
	Mitchell	300								
	Pioneer	180								
	TSF laydown	40								
	Two Boys	45								
	Vine TSF rehabilitation	25								
	Mine roads (including Redross powerline)	47.69								
CPS 8152/4 Proposed amendment	TSF5	82.81	82.81	8.6	30,744.20	29,011.34	28,928.53	94.36	94.09	- 0.27

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2.8 TERRESTRIAL FAUNA

The HGO locality has been covered by nine fauna surveys that have been conducted over a 14 year period. The combined fauna survey coverage approximates the vegetation survey areas (Figure 6) with the exception that Pioneer has not had a specific fauna survey.

The results of the previous surveys are summarised in Table 5. In summary:

- As reviewed in Terrestrial Ecosystems for in the Eundynie report (Terrestrial Ecosystems 2019), 46 fauna surveys have been conducted in the HGO locality and regionally. The accumulated data is considered as being adequate to assess which vertebrate fauna would occur in the HGO area and the potential impacts on fauna from mining.
- The large number of local and regional surveys provides an accurate representation of the assemblages of conservation significant species that could occur in the HGO area.
- Most of the regionally listed conservation significant species that appear in database searches have a low probability of occurring in the HGO area based on a lack of local and/or recent occurrence records, and poor habitat suitability.
- As the potential impact area is small relative to the undisturbed similar habitat in the adjacent areas and the broader region, the probability of significantly impacting on conservation listed species is low.
- Most of the conservation significant species are mobile and have to ability to move away from areas being cleared.

On the basis of the above dot points and the many surveys conducted nearby, clearing associated with the TSF5 project is likewise considered as having a low probability of significantly impacting on conservation significant species.

1.1.1 Vertebrate Conservation Significant Fauna

As can be seen in Table 10, many species are no longer conservation listed by DBCA. From the remaining species and as discussed in the Terrestrial Ecosystems reports, the following taxa could potentially occur in the NVCP amendment area:

- Malleefowl – *BC Act 2016* and *EPBC Act 1999* Threatened (Vulnerable).
- Western Rosella (inland) - Priority 3 DBCA. Not *EPBC Act 1999* listed.
- Central Long-eared Bat - Priority 3 DBCA. Not *EPBC Act 1999* listed.
- Oriental Plover - *BC Act 2016* Migratory. *EPBC Act 1999* Marine and Migratory.
- Fork-tailed Swift - *BC Act 2016* Migratory. *EPBC Act 1999* Marine and Migratory.

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- Peregrine Falcon – Other specially protected fauna *BC Act 2016*. Not *EPBC Act 1999* listed.
- Southern Death Adder – Priority 3 DBCA. Not *EPBC Act 1999* listed.

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Table 5: Summary information for the fauna surveys conducted at the Higginsville Gold Operation

* = no longer conservation listed by DBCA.

Year	Report Title	Company	Summary
2006	Vertebrate Fauna Assessment Avoca Resources, Version 1. October 2006, Report No: 2006/209. Prepared for Avoca Resources / Jim's Seeds, Weeds and Trees by ATA Environmental, October 2006. ATA Environmental (2006)	ATA Environmental	<p>Same area as vegetation survey "HGO North JWST 2006", refer to Figure 6. A Level 1 survey was undertaken that drew upon numerous other regional surveys. The survey area is just north of the NVCP amendment.</p> <p>A single fauna habitat was reported that was described as "open Eucalypt Woodland with a chenopod and acacia shrubland understorey.</p> <p>The desktop review listed a possible 154 bird species, 39 mammal species and 49 species of reptiles.</p> <p>No conservation listed fauna were recorded during the survey although the following species were considered as having possibility of using the project area:</p> <ul style="list-style-type: none"> • Malleefowl – <i>BC Act 2016</i> and <i>EPBC Act 1999</i> Threatened (Vulnerable). • Slender-billed Thornbill* – Currently not conservation listed by DBCA. Not <i>EPBC Act 1999</i> listed. • Rainbow Bee-eater* - Currently not conservation listed by DBCA. <i>EPBC Act 1999</i> Marine. • Bush Stone Curlew* - Currently not conservation listed by DBCA. Not <i>EPBC Act 1999</i> listed. • Australian Bustard* - Currently not conservation listed by DBCA. Not <i>EPBC Act 1999</i> listed. • Crested bellbird* - Currently not conservation listed by DBCA. Not <i>EPBC Act 1999</i> listed. • Peregrine Falcon – Other specially protected fauna <i>BC Act 2016</i>. Not <i>EPBC Act 1999</i> listed. • Shy Heathwren* - Currently not conservation listed by DBCA. Not <i>EPBC Act 1999</i> listed. • White-browed Babbler* - Currently not conservation listed by DBCA. Not <i>EPBC Act 1999</i> listed. • Fork-tailed Swift - <i>BC Act 2016</i> Migratory. <i>EPBC Act 1999</i> Marine and Migratory.

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Year	Report Title	Company	Summary
			<ul style="list-style-type: none"> • Carpet Python* - Currently not conservation listed by DBCA. Not <i>EPBC Act 1999</i> listed. • Greater Long-eared Bat* - Not listed under NatureMap for WA. <i>EPBC Act 1999</i> Threatened (Vulnerable) (occurs in the Eastern States). <p>It should be noted that many of the above species from 2006 denoted by the asterisk (*) are no longer conservation listed by DBCA in 2020.</p> <p>ATA Environmental's assessment is that the proposed clearing of this site is unlikely to have any significant impact on the overall conservation status of these species due to individual mobility and many square kilometres of similar habitat in the adjacent area. This ecosystem was considered a having no special conservation significance as it common locally (on the presumption and subject to no Malleefowl occurring in the area).</p>
2010	Avoca Resources Limited, Report for Higginsville Project Area, Desktop Biological Assessment and Broad Scale Vegetation Mapping, February 2010. Unpublished report prepared for Avoca Resources Limited. GHD (2010)	GHD	<p>The broadscale survey area is displayed in Figure 19.</p> <p>No threatened fauna species were recorded in the survey area (1 day on site).</p> <p>The vegetation structure within the survey area was largely intact, giving it good habitat value.</p> <p>Habitats present within the survey area were consistent with those recorded for similar eucalypt woodlands in the region. The majority of the project area is surrounded by relatively unaltered vegetation and is not considered to contain any significant breaks to habitat linkages.</p>
2012	Honey Possum (<i>Tarsipes rostratus</i>) Habitat Assessment, Version 2. Unpublished report prepared for Alacer Gold Corporation, March 2012. Harewood (2012)	Greg Harewood	<p>The objective was to determine the likelihood of honey possums (<i>Tarsipes rostratus</i>) actually being present in the HGO area and to identify any issues relating to potential impacts on its conservation status from mining and exploration activities.</p> <p>The results suggest that the species is unlikely to be found in the HGO area despite previous reports of its presence. This conclusion was based on:</p> <ul style="list-style-type: none"> • HGO is 136km north of the closest "official" documented location. • The HGO vegetation and landforms do not match the documented habitat requirements of the Honey Possum. • Previous reports of its occurrence in the area could well have been due to misidentification with the Pygmy Possum.
2015	Level 1 Vertebrate Fauna Risk Assessment for the	Terrestrial Ecosystems	A Level 1 survey was undertaken over the same area as the NVS Baloo flora and vegetation survey (NVS 2015a), refer to Figure 6.

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Year	Report Title	Company	Summary
	<p>Baloo Project Area. Unpublished report for Polar Metals Pty Ltd, June 2015.</p> <p>Terrestrial Ecosystems (2015a)</p>		<p>The Baloo fauna survey data was assessed in conjunction with 15 other surveys in the bioregion with the conclusion that there is sufficient information to provide an adequate indication of the fauna assemblages likely to be encountered in the project area. These datasets were considered as being adequate to assess potential impacts on the vertebrate fauna potentially found in the project area.</p> <p>There were four broad fauna habitats in the project area:</p> <ul style="list-style-type: none"> • <i>Tecticornia</i> low dense shrubland. • Sclerophyll shrubland. • Mixed <i>Eucalyptus</i> woodland over mixed sclerophyll shrubland with a sparse understory. • Sclerophyll and chenopod shrubland <p>Fauna habitat condition for most of the project area is good to very good. The project area currently does not provide any important ecological linkages or fauna movement corridors. The desktop review listed a possible 127 bird species, 37 mammal species, 94 species of reptiles and 9 amphibian species.</p> <p>No conservation significant vertebrate fauna were assessed as likely to be significantly impacted by the potential development on the basis of:</p> <ul style="list-style-type: none"> • As the potential impact area is small relative to the available similar habitat in the adjacent areas and the broader region, therefore the probability of significantly impacting on any of these species is low. • Low probability of many conservation significant species occurring in the project area. • Ability of conservation significant species that could occur in the project area of moving away from areas being cleared. <p>There was a very low possibility that the area supports the following conservation significant species (conservation listed in 2015):</p> <ul style="list-style-type: none"> • Carpet Python*. • Southern Death Adder – Priority 3 DBCA. Not <i>EPBC Act 1999</i> listed. • Major Mitchell’s Cockatoo*. • Western Rosella (inland) - Priority 3 DBCA. Not <i>EPBC Act 1999</i> listed. • Peregrine Falcon.

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Year	Report Title	Company	Summary
			<ul style="list-style-type: none"> • Bush Stone-curlew*. • Australian Bustard*. • Malleefowl. • Fork-tailed Swift. • Great Egret* - Currently not conservation listed by DBCA. <i>EPBC Act 1999</i> Marine. • Cattle Egret* - Currently not conservation listed by DBCA. <i>EPBC Act 1999</i> Marine. <p>The potential impact on any of these species was assessed as low on the basis of their unlikely occurrence in the project area.</p> <p>The following conservation significant species could occur in the project area but are likely to readily move once vegetation clearing commences, so any impacts would be insignificant:</p> <ul style="list-style-type: none"> • Crested Bellbird*. • Shy Heathwren*. • Rainbow Bee-eater. <p>The Hooded Plover (Priority 4 DBCA, <i>EPBC Act 1999</i> Marine) may potentially inhabit the shore of Lake Cowan during flood events, so appropriate management strategies would need to be implemented during these periods. All other avian species potentially found in the project area are mobile and will readily move to adjacent areas if disturbed.</p> <p>An impact summary was provided in the report that stated:</p> <ul style="list-style-type: none"> • “Based on the available information, it is Terrestrial Ecosystems’ view that clearing of the vegetation to establish a small mine site and upgrade existing access tracks, and construct a haul road will not significantly impact on conservation significant species listed under the Commonwealth <i>EPBC Act 1999</i> or WA <i>Wildlife Conservation Act 1950</i>. Fauna will be lost during the clearing process, but this impact is unlikely to be significant, as similar fauna habitat supporting similar fauna assemblages are abundant in adjacent areas.”
2015	Level 1 Vertebrate Fauna Risk Assessment for the Fairplay Pit and Waste Landform Expansion and Development. Unpublished report for Native Vegetation	Terrestrial Ecosystems	<p>A Level 1 survey was undertaken over the same area as the NVS Fairplay flora and vegetation survey (NVS 2015b), refer to Figure 6. The results were similar to the Baloo fauna survey, see above.</p> <p>Fauna survey data from other projects in the bioregion were reviewed and provided an adequate indication of the fauna assemblages likely to be encountered in the project area.</p>

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	<p>Solutions on behalf of Metals X limited, July 2015.</p> <p>Terrestrial Ecosystems (2015b)</p>		<p>These datasets were considered adequate to assess potential impacts on the vertebrate fauna potentially found in the project area.</p> <p>The project area has been degraded by previous exploration and mining activity and has numerous exploration tracks. The project area had a single fauna habitat of mixed eucalyptus woodland over mixed sclerophyll shrubland with or without chenopods with a sparse understory that was assessed as in poor to good condition. The project area currently does not provide any important ecological linkages or fauna movement corridors.</p> <p>The desktop review listed a similar assemble to that of the Baloo (127 birds, 37 mammal, 92 reptiles and 9 amphibians).</p> <p>No conservation significant vertebrate fauna were assessed as likely to be significantly impacted by vegetation clearing within the project area.</p> <p>There is a very low possibility that the project area supports:</p> <ul style="list-style-type: none"> • Carpet Python*. • Southern Death Adder. • Major Mitchell's Cockatoo*. • Western Rosella (inland). • Peregrine Falcon. • Bush Stone-curlew* • Australian Bustard*. • Malleefowl. • Fork-tailed Swift. • Great Egret*. • Cattle Egret*. <p>The following conservation significant species could occur in the project area but are likely to readily move once vegetation clearing commences, so any impacts would be insignificant:</p> <ul style="list-style-type: none"> • Crested Bellbird*. • Shy Heathwren*. • Rainbow Bee-eater*.

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			<p>All other conservation listed avian species potentially found in the project area are mobile and will readily move to adjacent areas if disturbed.</p> <p>As the proposed impact area is small relative to the available similar habitat in the adjacent areas and the broader region, the probability of significantly impacting on any conservation significant species is low</p> <p>The same impact summary as for Baloo was given:</p> <ul style="list-style-type: none"> “Based on the available information, it is Terrestrial Ecosystems’ view that clearing of the vegetation for exploration or development will not significantly impact on conservation significant species listed under the Commonwealth <i>EPBC Act 1999</i> or WA <i>Wildlife Conservation Act 1950</i>. Fauna will be lost during the clearing process, but this impact is unlikely to be significant, as similar fauna habitat supporting similar fauna assemblages are abundant in adjacent areas.”
2017	<p>Level 1 Vertebrate Fauna Risk Assessment for the proposed Higginsville infrastructure corridor development. Unpublished report for Native Vegetation Solutions on behalf of Westgold Resources Limited, Version 3, July 2017.</p> <p>Terrestrial Ecosystems (2017a)</p>	Terrestrial Ecosystems	<p>A Level 1 survey was undertaken over the same area as the NVS Two Boys Fairplay flora and vegetation survey (NVS 2017b), refer to Figure 6. The results were similar to the previous two Terrestrial Ecosystems surveys (Baloo and Fairplay, see above).</p> <p>Fauna survey data from other projects in the bioregion provided an adequate indication of the fauna assemblages likely to be encountered in the project area. These datasets were adequate to assess potential impacts on the vertebrate fauna potentially found in the project area and a Level 2 vertebrate fauna survey was not considered as being required.</p> <p>The project area had two broad fauna habitat types:</p> <ul style="list-style-type: none"> Mixed <i>Eucalyptus</i> woodland over mixed chenopod and sclerophyll scrubland. Low <i>Eucalyptus</i> woodland over dense sclerophyll scrubland. <p>Fauna habitats in the project area are rated as degraded to good. The project area currently does not provide any important ecological linkages or fauna movement corridors. The desktop review listed a possible 117 bird species, 36 mammal species, 95 species of reptiles and 9 amphibian species</p> <p>No conservation significant vertebrate fauna were assessed as likely to be significantly impacted by the proposed development.</p> <p>There is a very low possibility that the project area supports:</p> <ul style="list-style-type: none"> Southern Death Adder. Western Rosella (inland). Peregrine Falcon.

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			<ul style="list-style-type: none"> • Malleefowl. • Fork-tailed Swift. • Great Egret*. <p>The Rainbow Bee-eater may potentially inhabit the project area on a seasonal basis but are unlikely to be significantly impacted by further vegetation clearing. All other conservation listed avian species potentially found in the project area are mobile and will readily move to adjacent areas if disturbed. As the proposed impact area is small relative to the available similar habitat in the adjacent areas and the broader region, the probability of significantly impacting on any of these species is low.</p> <p>The same impact summary as for Baloo and Fairplay (above) was given:</p> <ul style="list-style-type: none"> • “Based on the available information, it is Terrestrial Ecosystems’ view that clearing of the vegetation for exploration or development will not significantly impact on conservation significant species listed under the Commonwealth <i>EPBC Act 1999</i> or WA <i>Wildlife Conservation Act 1950</i>. Fauna will be lost during the clearing process, but this impact is unlikely to be significant, as similar fauna habitat supporting similar fauna assemblages are abundant in adjacent areas.”
2017	Level 1 Vertebrate Fauna Risk Assessment for the proposed Mitchell project area. Unpublished report for Native Vegetation Solutions on behalf of Westgold Resources Limited, Version 2, May 2017. Terrestrial Ecosystems (2017b)	Terrestrial Ecosystems	<p>A Level 1 survey was undertaken over the same area as the NVS Mitchell flora and vegetation survey (NVS 2017a), refer to Figure 6. The results were similar to the previous Terrestrial Ecosystems surveys (Baloo, Fairplay and Two Boys, see above).</p> <p>Fauna survey data from other projects in the bioregion provided an adequate indication of the fauna assemblages likely to be encountered in the project area. These datasets were adequate to assess potential impacts on the vertebrate fauna potentially found in the project area and a Level 2 vertebrate fauna survey was not considered as being required.</p> <p>The project area had two broad fauna habitat types:</p> <ul style="list-style-type: none"> • Mixed <i>Eucalyptus</i> woodland over mixed chenopod and sclerophyll scrubland. • Low <i>Eucalyptus</i> woodland over dense sclerophyll scrubland. <p>Fauna habitats in the project area are rated as degraded to good. The project area currently does not provide any important ecological linkages or fauna movement corridors with the exception that mining pits and waste dumps provide a movement barrier for small vertebrates.</p> <p>The desktop review listed a possible 126 bird species, 36 mammal species, 91 species of reptiles and 9 amphibian species</p>

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			<p>No conservation significant vertebrate fauna were assessed as likely to be significantly impacted by the proposed development.</p> <p>There is a very low possibility that the project area supports:</p> <ul style="list-style-type: none"> • Southern Death Adder. • Western Rosella (inland). • Peregrine Falcon. • Malleefowl. • Fork-tailed Swift. <p>The Rainbow Bee-eater may potentially inhabit the project area on a seasonal basis but are unlikely to be significantly impacted by further vegetation clearing.</p> <p>Terrestrial Ecosystems concluded that there is a very low possibility that the area supports Southern Death Adder, Western Rosella, Peregrine Falcon, Malleefowl and the Fork-tailed Swift. The Rainbow Bee-eater* is probably in the area on a seasonal basis. All avian species potentially found in the project area are mobile and will readily move to adjacent areas if disturbed. As the proposed impact area is small relative to the available similar habitat in the adjacent areas and the broader region, the probability of significantly impacting on any of these species is low.</p> <p>The same impact summary as with the previous Terrestrial Ecosystems reports was provided</p> <ul style="list-style-type: none"> • “Based on the available information, it is Terrestrial Ecosystems’ view that clearing of the vegetation for exploration or development will not significantly impact on conservation significant species listed under the Commonwealth <i>EPBC Act 1999</i> or WA <i>Wildlife Conservation Act 1950</i>. Fauna will be lost during the clearing process, but this impact is unlikely to be significant, as similar fauna habitat supporting similar fauna assemblages are abundant in adjacent areas.”
2018	Level 1 Vertebrate Fauna Risk Assessment for the proposed Higginsville powerline. Unpublished report for Native Vegetation Solutions on behalf of Westgold Resources Limited, Version 1, January 2018.	Terrestrial Ecosystems	<p>A Level 1 survey was undertaken over the same area as the NVS Redcross Powerline flora and vegetation survey (NVS 2018), refer to Figure 6. The results were similar to the previous Terrestrial Ecosystems surveys (see above).</p> <p>Fauna survey data from other projects in the bioregion provided an adequate indication of the fauna assemblages likely to be encountered in the project area. These datasets were adequate to assess potential impacts on the vertebrate fauna potentially found in the project area and a Level 2 vertebrate fauna survey was not considered as being required.</p>

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	Terrestrial Ecosystems (2018)		<p>The project area had five broad fauna habitat types:</p> <ul style="list-style-type: none"> • Open eucalypt woodland over chenopods, mostly on a red clayey substrate. • Open eucalypt woodland over low shrubs on a stony, red clayey substrate. • Open eucalypt woodland over tall shrubs mostly on a stony red clay soils. • Low trees with limited understorey of shrubs on red clayey substrate. • Low trees with a dense understorey of low shrubs on red clayey and often stony substrate. <p>Fauna habitats in the project area are rated as good with small patches of disturbance. The project area currently does not provide any important ecological linkages or fauna movement corridors with the exception that mining pits and waste dumps provide a movement barrier for small vertebrates.</p> <p>The desktop review listed a possible 129 bird species, 36 mammal species, 82 species of reptiles and 9 amphibian species</p> <p>No conservation significant vertebrate fauna were assessed as likely to be significantly impacted by the proposed development.</p> <p>There is a very low possibility that the project area supports:</p> <ul style="list-style-type: none"> • Southern Death Adder. • Western Rosella (inland). • Peregrine Falcon. • Malleefowl. • Fork-tailed Swift. <p>The Rainbow Bee-eater* may potentially inhabit the project area on a seasonal basis but are unlikely to be significantly impacted by further vegetation clearing.</p> <p>As with the previous Mitchell report, Terrestrial Ecosystems concluded that there is a very low possibility that the area supports Southern Death Adder, Western Rosella, Peregrine Falcon, Malleefowl and the Fork-tailed Swift. The Rainbow Bee-eater* is probably in the area on a seasonal basis. All avian species potentially found in the project area are mobile and will readily move to adjacent areas if disturbed.</p> <p>The same impact summary as with the previous Terrestrial Ecosystems reports was provided</p>

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Year	Report Title	Company	Summary
			<ul style="list-style-type: none"> “Based on the available information, it is Terrestrial Ecosystems’ view that clearing of the vegetation for exploration or development will not significantly impact on conservation significant species listed under the Commonwealth <i>EPBC Act 1999</i> or WA <i>Wildlife Conservation Act 1950</i>. Fauna will be lost during the clearing process, but this impact is unlikely to be significant, as similar fauna habitat supporting similar fauna assemblages are abundant in adjacent areas.”
2019	<p>Level 1 Vertebrate Fauna Risk Assessment for the Eundynie Project. Unpublished report for Native Vegetation Solutions on behalf of RNC Minerals Limited, Version 1, July 2019.</p> <p>Terrestrial Ecosystems (2019)</p>	Terrestrial Ecosystems	<p>A Level 1 survey was undertaken over the same area as the NVS Eundynie flora and vegetation survey (NVS 2019a), refer to Figure 6. The Eundynie survey area was a small extension south from the Baloo area. The results were similar to the Baloo survey (see above) with the difference being that many of the species listed in Baloo were no longer conservation significant.</p> <p>Fauna survey data from other HGO project areas and in the bioregion in general provided an adequate indication of the fauna assemblages likely to be encountered in the project area. These datasets were adequate to assess potential impacts on the vertebrate fauna potentially found in the project area and a Level 2 vertebrate fauna survey was not considered as being required.</p> <p>There were three broad fauna habitats identified in the project area:</p> <ul style="list-style-type: none"> Open Salmon Gum woodland over sparse chenopods. Eucalypt woodland over mixed shrubland and chenopod over scattered grasses of varying densities on a sandy-clay substrate. Mixed sclerophyll shrubland. <p>No threatened ecological fauna communities were identified in the project area. The fauna habitat quality varies from degraded to good with the more degraded areas due to historical and recent exploration activity. As much of the project area has been highly disturbed by previous mining or exploration activity, the vertebrate fauna assemblage would have been depleted. The area has also been grazed by cattle with evident degradation. The project area does not provide an important ecological linkage or fauna movement corridor.</p> <p>The desktop review listed a possible 130 bird species, 36 mammal species, 106 species of reptiles and 9 amphibian species.</p> <p>The following conservation significant fauna were assessed as having a likelihood of occurring in the project area:</p> <ul style="list-style-type: none"> Malleefowl. Western Rosella (inland).

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			<ul style="list-style-type: none"> • Central Long-eared Bat - Priority 3 DBCA. Not <i>EPBC Act 1999</i> listed. • Oriental Plover - <i>BC Act 2016</i> Migratory. <i>EPBC Act 1999</i> Marine and Migratory. • Fork-tailed Swift. • Peregrine Falcon. <p>No Malleefowl or mounds were recorded in the project area.</p> <p>Terrestrial Ecosystems concluded that that fauna habitats present in the project area are abundant in adjacent areas. It is therefore likely that the fauna assemblage in the project area is similar to the many square kilometres of similar habitat in adjacent areas and the bioregion. And secondly, that the proposed project is unlikely to significantly impact on a conservation significant species</p>

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2.9 HERITAGE

The Department of Planning, Lands and Heritage ('DPLH') Aboriginal Heritage Inquiry System ('AHIS') has no Registered Aboriginal Sites listed for General Purpose Lease G15/26 or Mineral Lease M15/665.

The wider HGO locality does have registered sites on Karora leases. Information on the four heritage places that occur in the HGO locality is provided in Table 6. None of these registered sites are within proximity of the proposed project area.

Site developments will only occur over areas that have received a heritage work clearance and Karora works closely with the Ngadju Native Title Aboriginal Corporation (NNTAC) to conduct this work. Karora will work with NNTAC to determine if a heritage survey is required over the project area before work commences.

Table 6: Information on the four heritage places that occur in the HGO locality

Place ID	Name	Status	Type
165	Pluto	Stored Data / Not a Site	-
166	Mouse Hallow	Registered Site	Quarry
2805	Lake Cowan	Registered Site	Artefacts / Scatter, Other: Part of Failed PA 154
20609	Yundarnie Rocks	Lodged	Artefacts / Scatter, Camp

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3 STATEMENT AGAINST EACH OF THE 10 CLEARING PRINCIPLES

3.1 PRINCIPLE A

Native vegetation should not be cleared if it comprises a high level of biological diversity

The TSF5 project area is located in the IBRA Coolgardie 3 - COO03 Eastern Goldfields subregion, described by Cowan (2001) as gently undulating plains on the Yilgarn Craton with calcareous soil being dominant. The subregion supports a diverse eucalypt woodland around the salt lakes, on the low ranges and in the broad valleys and mallee and Acacia thickets and shrub heaths on the plains (Cowan 2001). The sub-region is rich in endemic Acacias. The subregional area is 5,102,428 ha (Cowan 2001).

The project area is part of the Great Western Woodlands, an internationally significant area of biological diversity and the largest remaining area of intact Mediterranean climate woodland on Earth, covering almost 16 million hectares (DEC 2010). It forms a continuous band of native vegetation that extends from the edge of the Wheatbelt through the Goldfields to the Nullarbor Plain. Notwithstanding its biological importance, the Great Western Woodlands occurrence at the TSF5 area and immediate surrounds (various HGO mining operations) has been the subject of significant levels of mining and exploration disturbance for >100 years and is not considered as being a good representation intact woodland environment. There are extensive areas of the Great Western Woodlands under DBCA managed lands that in the 2010 report totalled 2,569,728ha or 16.1% with the potential to increase to 3,650,028ha or 22.9% (DEC 2010).

Two studies cover the proposed NVCP amendment area. The first includes the broadscale vegetation mapping that was undertaken by GHD in 2010 which includes the inferred vegetation groups. With the exception of gaps at Pioneer and Eundynie which have since been covered by subsequent Native Vegetation Solutions (NVS) surveys, all central HGO mapping gaps were covered by the GHD 2010 broadscale vegetation survey including the NVCP amendment area.

A summary of the key findings from the GHD 2010 Biological Assessment and Broad Scale Vegetation Mapping included:

- Five broad scale communities and one degraded landform were recorded. The community specific to the NVCP amendment area is Woodland of Eucalyptus salmonophloia and E. salubris with scattered midstorey of Melaleuca sheathiana over Eremophila scoparia, Cratystylis conocephala and Maireana sedifolia on loamy plains).
- No TECs or PECs were reported in the survey area.
- The total species count was a composite from previous surveys and consisted of 136 taxa from 45 genera and 23 families.
- Conservation significant taxa were not specifically searched for and none were listed from the review of previous surveys

The second study that covers a section of the proposed NVCP amendment area was completed by GHD in 2008 and included a baseline flora and fauna assessment comprised of a desktop review and field survey. A summary of the key findings from the GHD 2008 report is provided below:

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- Two vegetation groups were recorded in the survey area including Transitional *Eucalyptus* Woodland Community; and *Acacia acuminata* and *Eremophila dempsteri* shrubland over *Dodonaea microzyga*, *Stenanthemum* sp. and *Prostanthera* sp.
- A total of 66 taxa from 25 genera and 19 families were recorded
- No Conservation listed taxa were recorded (*Eremophila parvifolia* subsp. *auricampa* (ex-P1) was observed but was subsequently delisted as a priority species).
- No introduced species were recorded in the survey area, although *Carrichtera annua* (Ward's Weed) was observed in a rehabilitation area. *Carrichtera annua* is not a declared pest.

Since 2011, Native Vegetation Solutions has been conducting surveys in the general HGO locality. As discussed in these NVS vegetation reports (Table 3), no PECs or TECs were recorded in the HGO survey area. The DBCA PEC/TEC search conducted by NVS in 2011 did reveal that some survey areas are within the buffer zone of the Fraser Range Vegetation Complex (Priority 1).

- "Plant assemblages of the Fraser Range Vegetation Complex: *Allocasuarina huegeliana* and *Pittosporum angustifolia* open woodland over *Beyeria lechenaultii* and *Dodonaea microzyga* Scrub and *Aristida contorta* bunch grasses (granite complex), on the slopes and summits of hills; *Acacia acuminata* Tall Shrubland dominated by *Melaleuca uncinata* and *Triodia scariosa* on uplands with shallow loamy sands; *Eucalyptus* aff. *uncinata* (KRN 7854) over *Senna artemisioides* subsp. *helmsii*, *Cryptandra miliaris*, *Dodonaea boroniifolia*, *D. stenozyga* and *Triodia scariosa* (*Eucalyptus* effusa Mallee) on colluvial flats with loamy clay sands, and; *E. oleosa*, *E. transcontinentalis*, *E. flocktoniae* Woodland on flats."

Vegetation groups within the HGO survey areas did not compare to this description of the Fraser Range Vegetation Complex. NVS concluded that the Fraser Range PEC is not present in the HGO locality and there are no PECs or TECs within 49km of the existing NVCP area.

As reported in the NVS and GHD reports, no unique or restricted vegetation communities were identified, and all vegetation types/communities are common, widespread and well represented in the Eastern Goldfields subregion.

On the basis of the lack of PECs, TECs and unique or restricted vegetation groups as discussed in 13 flora and vegetation surveys, it is considered that there is sufficient vegetation community knowledge in the HGO locality to confidentially predict that clearing under this amendment will not have any impact on any ecologically significant communities.

Assessed Outcome: Based on the above, the proposed clearing is not at variance with Principle A (flora, fauna or biological diversity).

3.2 PRINCIPLE B

Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia

The HGO locality has been covered by nine fauna surveys that have been conducted over a 14 year period. The combined fauna survey coverage approximates the vegetation survey areas (Figure 7) with the exception that Pioneer has not had a specific fauna survey.

The results of the previous surveys are summarised in Table 5. In summary:

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- As reviewed in Terrestrial Ecosystems for in the Eundynie report (Terrestrial Ecosystems 2019), 46 fauna surveys have been conducted in the HGO locality and regionally. The accumulated data is considered as being adequate to assess which vertebrate fauna would occur in the HGO area and the potential impacts on fauna from vegetation clearing.
- The large number of local and regional surveys provides an accurate representation of the assemblages of conservation significant species that could occur in the HGO area.
- Most of the regionally listed conservation significant species that appear in database searches have a low probability of occurring in the HGO area based on a lack of local and/or recent occurrence records, and poor habitat suitability.
- As the potential impact area is small relative to the undisturbed similar habitat in the adjacent areas and the broader region, the probability of significantly impacting on conservation listed species is low.
- Most of the conservation significant species are mobile and have the ability to move away from areas being cleared.

On the basis of the above points and the many surveys conducted nearby, clearing associated with the TSF5 project is likewise considered as having a low probability of significantly impacting fauna habitat.

Assessed Outcome: Based on the above, the proposed clearing is not at variance with Principle B (significant fauna habitat).

3.3 PRINCIPLE C

Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, rare flora

No Threatened Flora or Priority Flora (DBCAs) were recorded in the GHD (2008) survey in the project area.

The vegetation groups within the HGO locality area are common, widespread and well represented in the Eastern Goldfields subregion (NVS 2015 and NVS 2019) and are considered as being unlikely to be necessary for the continued existence of any species of Threatened flora (and also priority Flora).

Assessed Outcome: Based on the above, the proposed clearing is not at variance with Principle C (existence of rare flora).

3.4 PRINCIPLE D

Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of a threatened ecological community

Conservation estates are discussed in Section 2.6 and Principle A. In summary:

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- There are no ESAs, DBCA managed lands, TECs or PECs occurring at the NVCP amendment area.
- The buffer for the Fraser Range Vegetation Complex PEC encroaches into the HGO locality. However, NVS has reported that from their site assessments, that the vegetation groups within the HGO survey areas did not match the DBCA description of the Fraser Range Vegetation Complex.
- The absence of PECs and TECs is collaborated by the “data.wa” WMS Server. There are no TECs or PECs within 49km of NVCP amendment area (Data WA 2022).

Assessed Outcome: Based on the above, the proposed clearing is not at variance with Principle D (conservation areas).

3.5 PRINCIPLE E

Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared

As discussed in section 2.7, the TSF5 project area is contained within Beard Vegetation Association 8.6 - Medium woodland; salmon gum & gimlet with a 30,744 ha pre-European extent (Data WA 2022).

Under the previous amendment application for CPS 8152/3 which amalgamated five existing NVCP permits at HGO, vegetation sub-association 8.6 was calculated as having a current extent of 29,804 ha and was revised to 29,011.34 post clearing which equals a percentage of 94.36% remaining of the pre-european extent. This figure assumes all the vegetation under CPS 8152/3 would be cleared which is unlikely given the extent and buffer zones built into the permit.

Under this amendment, there would be a maximum additional 82.81 ha cleared with 28,928.53 ha remaining which is equal to a further 0.27% reduction. Sub-association 8.6 has a final revised percentage of 94.09% down from 94.36% (Table 4)

Assessed Outcome: Based on the above, the proposed clearing is unlikely to be at variance with Principle E (remnant vegetation).

3.6 PRINCIPLE F

Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland

The surface hydrology is discussed in Section 2.5 and displayed in Figure 10.

A drainage line is located within the northern section of the project area and is only likely to flow towards Lake Cowan following major rainfall events. Sheetflow may also occur on the alluvial plains adjacent to the salt lake system following periods of heavy rainfall. There are no major watercourses or wetlands in the NVCP amendment area.

All mining areas have internal catchments confined by drains and bunds such that incident rainfall and spillages are contained to within the site or managed with via settlement dams for runoff overflow. Runoff and drainage generated within mining areas is controlled to minimise

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the impact on local surface water flows and is considered during the design and planning phase of infrastructure. The natural drainage of the landscape will be considered during the design of the TSF and avoided or mitigated with appropriate controls as required to ensure both the infrastructure is protected and natural drainage is controlled and re-instated as necessary.

Lake Cowan is one of the larger lakes in the Goldfields bioregion with an area of approximately 96,929ha. Although not recognised nationally or internationally as a wetland of conservation significance, it is listed as a wetland of subregional significance in the DBCA biodiversity audit for the Coolgardie 3 Eastern Goldfields subregion (Cowan 2001). Lake Cowan is not listed in the Directory of Important Wetlands in Australia (DWIA) Spatial Database (DOEE 2018). Mining impacts on Lake Cowan are also mitigated under relevant Mining Proposals at HGO.

Assessed Outcome:

Based on the above, the proposed clearing is not at variance with Principle F (watercourse or wetland).

3.7 PRINCIPLE G

Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation

All mining disturbances that could potentially cause land degradation are controlled by the DMIRS regulatory systems (MP, MCP, AER, MRF, site audits) and are managed on site by the Environmental Department, Mining Engineers and the Registered Manager.

The TSF is planned to operate for 6 years between 2027 to 2033. Post closure, the TSF is required by DMIRS to be covered and revegetated with ongoing monitoring and maintenance including flood mitigation and drainage control, groundwater quality, structural integrity of the TSF (e.g. retaining structure, covers) and pollution control until relinquishment.

All other cleared area within the project footprint (topsoil stockpiles, hardstand and infrastructure) will be returned to pre-mining ground levels, covered with topsoil and have ripping on the contour. These areas will be restored with native vegetation that is similar to the pre-mining types. The Mining Proposal for the infrastructure will be accompanied by an update to the Mine Closure Plan which will outline the schedule and performance criteria for the project.

Assessed Outcome: Based on the above (and subject to environmental controls and progressive rehabilitation), the proposed clearing is not at a variance with Principle G (appreciable land degradation).

3.8 PRINCIPLE H

Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area

As discussed in Section 2.2, there are no National Parks, Nature Reserves, other DBCA Managed Lands, ESAs, TECs or PECs occurring near the NVCP amendment area. The closest DBCA managed land is the Binaronca Nature Reserve (Reserve 32552), located approximately 2.6km to the northwest of the main HGO NVCP area and within 1.7km of the

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Redcross powerline easement. The proposed developments under this NVCP amendment will not impact on the Binaronca Nature Reserve

Assessed Outcome: Based on the above, the proposed clearing is not at variance with Principle H (conservation areas).

3.9 PRINCIPLE I

Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water

There are no Public Drinking Water Source Areas within 120km of NVCP amendment area (DWER 2020).

The HGO area receives an average annual rainfall of approximately 298mm (Table 2: BOM Climate data from Norseman (Station 12065) and Norseman Aero (Station 12009). The average annual evaporation rate is between 2,400 and 2,500mm. Any surface flows are therefore likely to be short lived.

Drainage lines for the HGO locality are displayed in Figure 10. The NVCP amendment area is contained within the Balladonia catchment with drainage flowing to Lake Cowan. Lake Cowan is a salt lake that remains dry for most of the year. Drainage from mining areas is restricted from entering the natural flow lines as discussed below.

All mining areas, including TSF infrastructure have internal catchments confined by drains and bunds such that incident rainfall and spillages are contained to within the site or managed with via settlement dams for runoff overflow. Runoff and drainage generated within mining areas is controlled to minimise the impact on local surface water flows.

The groundwater in the HGO locality is hypersaline (typically 200,000 to 230,000mg/L TDS). Higginsville lies within the Eastern Goldfields Region of the Archaean Yilgarn Craton. The geology is characterised by northwest trending granite-greenstone belts that display low to medium grade metamorphism, which have been intruded by eastwest dolerite dykes of Proterozoic age. The greenstone belts comprise metamorphic, igneous and sedimentary assemblages and are highly sheared and fractured. The granites tend to be relatively massive, except for locally sheared margins or joints. The tightness of shears and fractures results in very low groundwater transmissivities. Thus, if surface water percolates down it is unlikely to alter existing groundwater quality.

The TSF infrastructure is regulated by DMIRS and DWER which includes the requirement to manage and monitor TSF seepage and surrounding groundwater quality during the life of the infrastructure as well as post closure. The TSF is also audited annually by qualified engineers to determine compliance with the HGO Premise Licence and provides advice and actions to mitigate potential groundwater contamination.

Assessed Outcome: Based on the above, the proposed clearing is not at variance with Principle I (surface and ground water).

3.10 PRINCIPLE J

Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence or intensity of flooding

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The HGO locality is situated on a large peninsular on the western edge of Lake Cowan from the lakebed to the Goldfields to Esperance Highway, refer to Figure 2 and Figure 3. The landforms range from extensive pediplains and stony plains, basalt and greenstone undulating rises and low hills, salt lakes with fringing sand plains and sand or gypsum dunes.

The incidence or intensity of flooding is not considered as being a high risk event due to the low rainfall (298mm annually), relatively flat land that is surrounded by woodlands and shrublands, no major watercourses, no lower lying flood plains associated with major water courses and mine runoff managed through containment.

From a regional perspective, the NVCP amendment area is located within the Balladonia catchment. Given the size of the area to be cleared (82.81 ha) in relation to the size of the DWER stated catchment area (3,483,400ha), the proposed clearing is not likely to increase the potential of flooding at a catchment scale.

Therefore, the proposed clearing is not likely to alter the incidence or intensity of flooding within the Project area or surrounds.

Assessed Outcome: Based on the above, the proposed clearing is not at variance with Principle J (flooding).

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