Central Eyre Iron Project
Mining Lease Proposal

APPENDIX O
MINE PIT LAKE ASSESSMENT

CENTRAL EYRE IRON PROJECT
MINE PIT LAKE ASSESSMENT

Contents

List of Figures

List of Tables

1 Introduction

1.1 Background

The Central Eyre Iron Project (CIEP) mine pits comprise the Boo Loo and Murphy South Pits. At completion the Murphy South Pit will extend to a depth -527 mAHD, whilst Boo Loo Pit will terminate at -220 mAHD. The site layout is presented as Figure 1.

Modelling of mine pit lake water level recovery was undertaken by Jacobs (2014). The Jacobs model calculates the pit water level as a balance between evaporative loss, incident rainfall and groundwater seepage. Net evaporative loss increases with lake level elevation as the area of the lake increases. Conversely groundwater inflow decreases as lake level increases due to decreasing difference (less drawdown) between the lake level and the regional water table which is at approximately 60mAHD at the pit location. Lake level stabilises once these two fluxes are in balance.

Sensitivity analysis was undertaken by Jacobs (2014) for a range of aquifer parameters (varying transmissivity and storage and hence groundwater inflow). The predicted pit lake elevations ranged from -220 to -300 mAHD at quasi-steady state following 1000 years post mining simulation. The mid-range of the estimate was -280 mAHD. The pit lake water level is presented as Figure 1.

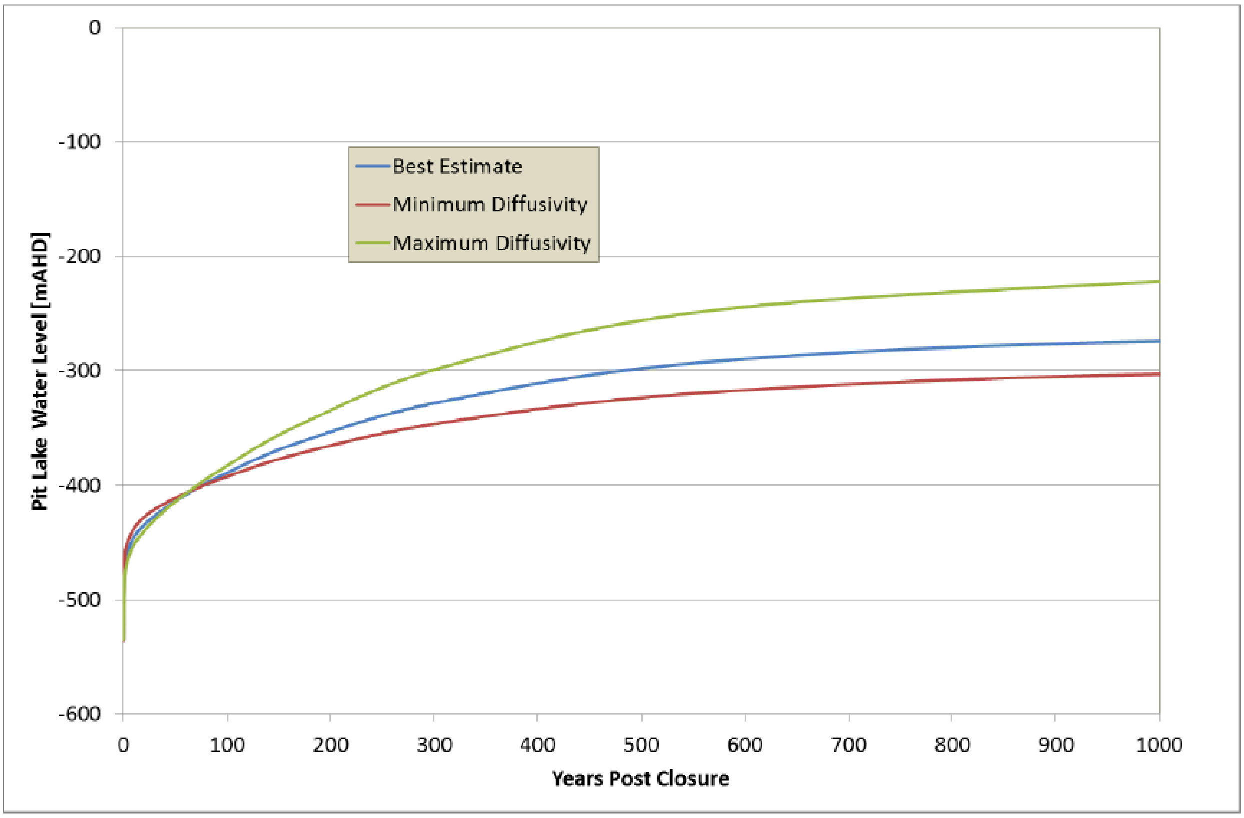

Figure 1: Modelled pit lake water level (from Jacobs 2014)

1.2 Scope

This report presents an assessment of the pit lake expected to evolve over time.

The approach taken is:

- Development of a water balance of pit lake inflow and loss.
- Characterisation of inflow water quality.
- Qualitative assessment of geochemical evolution by:
  - Approximation of salinity evolution over time using a mass balance approach
  - Assessment of host rock geology and inflow water quality

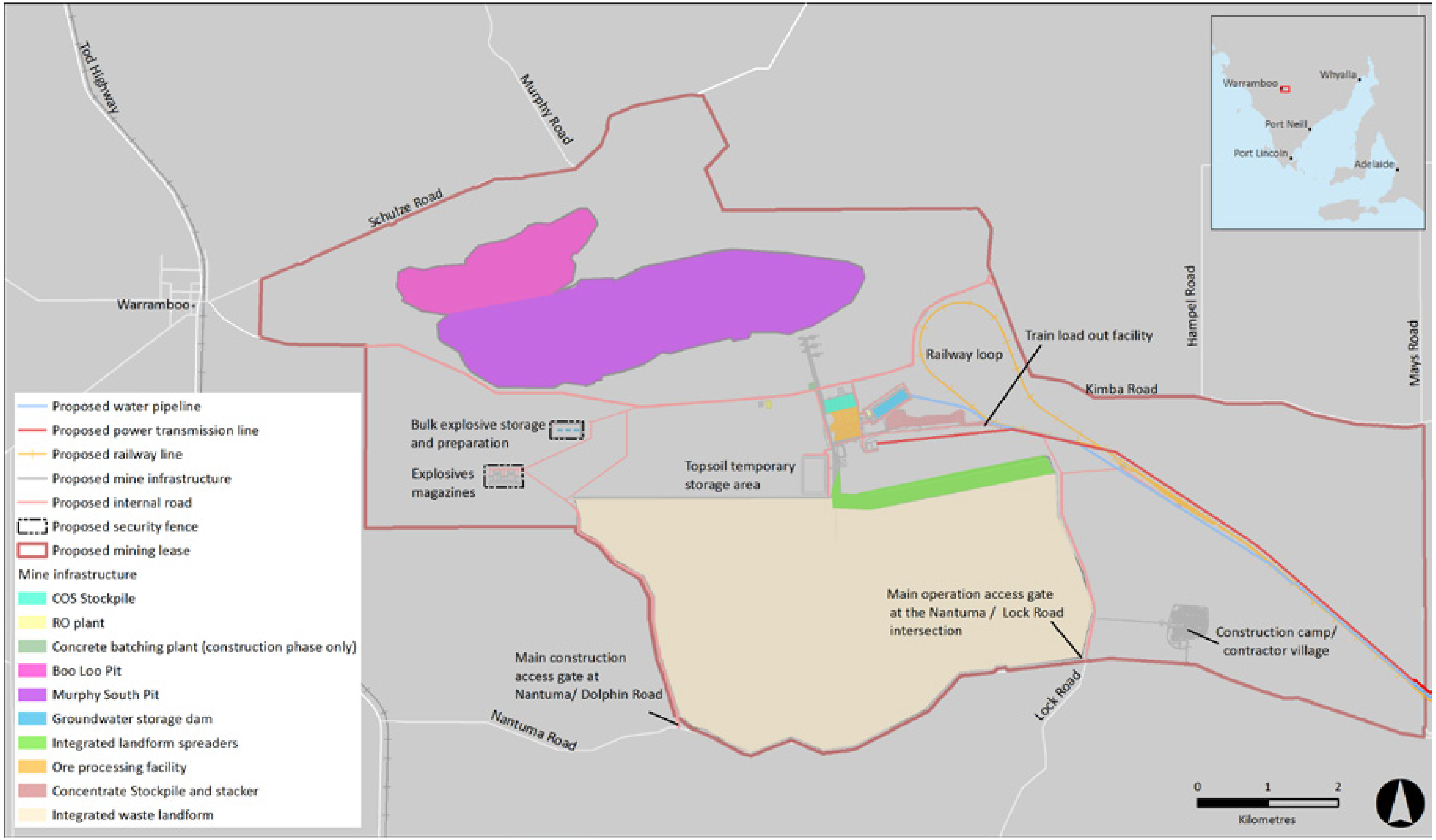

Figure 2: CEIP site Layout

2 Project Description

2.1 Pit design

The final Murphy South (MS) Pit extends approximately 6 km west east by 1.3 km north south to a base elevation of 527 mAHD. The smaller Boo Loo (BL) Pit is 2.9 by 1.0 km in extent to a base elevation of -220 mAHD. The pits' extent and exposure of geological layers is presented on Figure 1 and Figure 2.

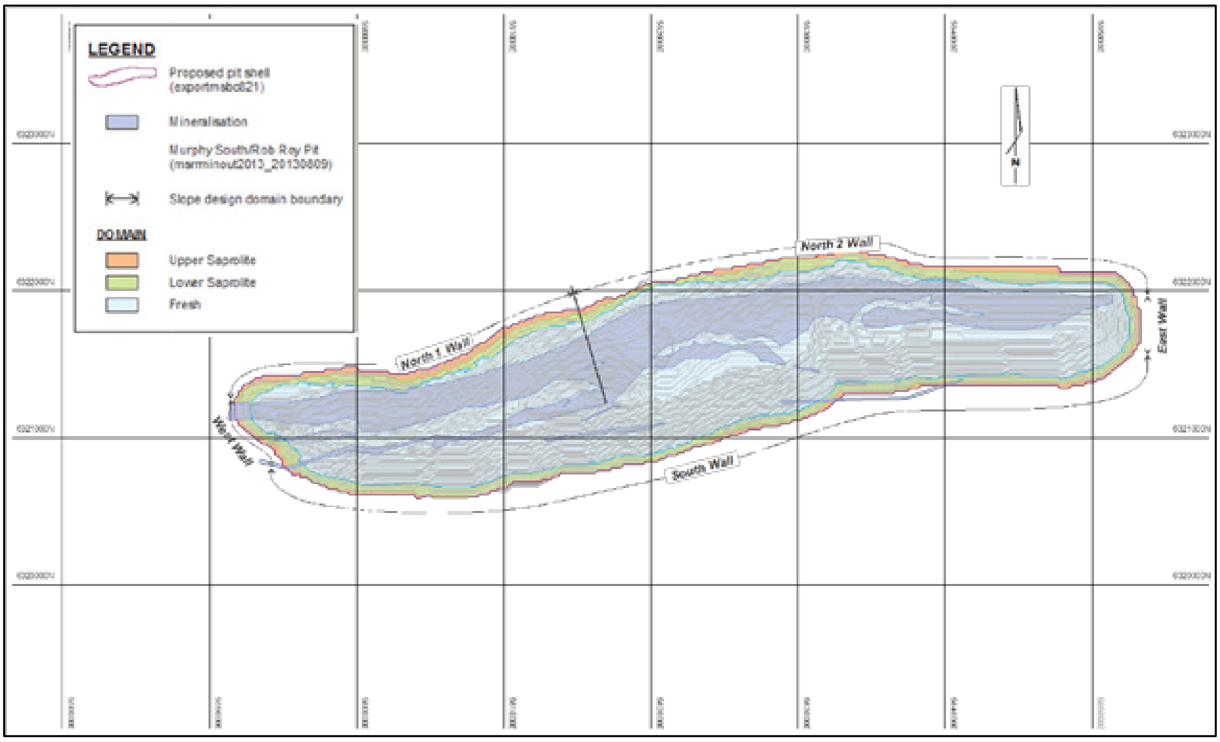

Figure 3: Murphy South Pit Extent and exposed geological units.

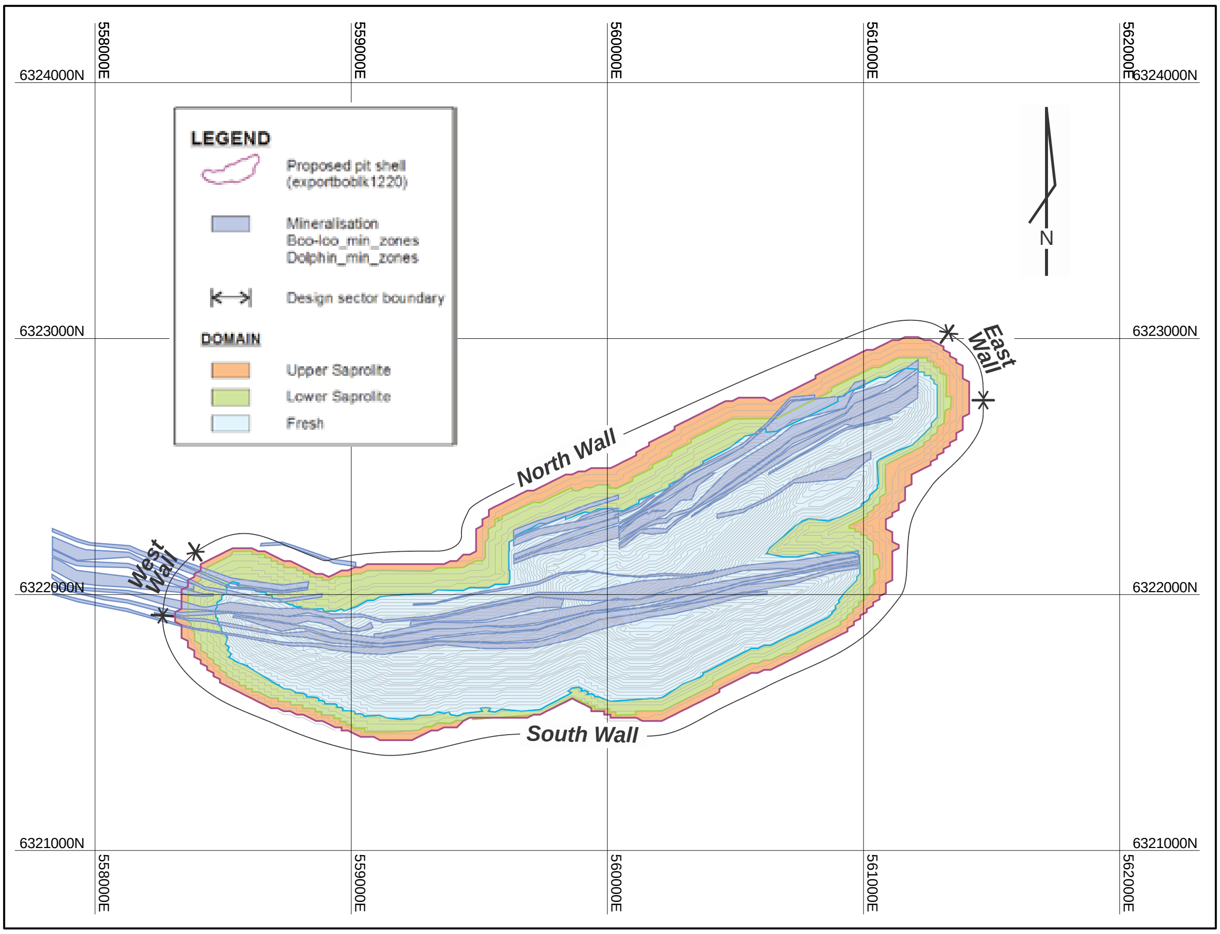

Figure 4: BooLoo Pit Extent and exposed geological units.

2.2 Geology

The CEIP geological units comprise recent sedimentary cover and saprolite overlying fresh gneiss with minor schist, amphibolite and carbonate layers with cross-cutting felsic and mafic dykes. A variable zone of transition occurs between these general rock types.

In the geotechnical figures presented above, Quaternary and Tertiary sediments are identified as "Upper Saprolite".

Quaternary

Quaternary sediments are described as aeolion (dune) sands, clayey sand, calcarenite and calcrete with thickness generally ranging from 0 to 10 m.

Tertiary

Tertiary sediments consists of unnamed Pliocene aged silts, clays and minor sands and Eocene aged Poelpena Formation containing silt, clay, sand, carbonaceous material and interbedded lignite. The thickness of the combined Pliocene and Eocene Tertiary sediments ranges from 0 to 40 m.

Saprolite

The upper part of the oxide zone is recognisable as a residual deposit formed from weathering of rock but does not contain any readily recognisable features of the original rock. This material is described locally as the Upper Saprolite.

The saprolite is comprised almost entirely of clayey and sandy materials formed by the insitu weathering of gneiss. Hard ferricrete and calcrete layers have formed near the surface by precipitation of iron oxide and calcium carbonate during weathering.

Deeper in the weathering profile, the texture of the parent rock becomes visible, most noticeably, the gneiss banding. This material is described locally as the Lower Saprolite.

Fresh Rock

The primary lithology of the fresh rock is magnetite-gneiss. Minor amphibolite, carbonate and schist have been logged. Mafic (magnesium and iron rich) dykes also occur with most dyke contacts being sub-horizontal.

The CEIP mine area has been subject to folding, with folds ranging in scale from centimetres to hundreds of metres, typically plunging at moderate dips generally to the south. Magnetite rich zones within the gneiss also dip to the south and lie sub-parallel to foliation. Similar stratigraphy exists along strike from MSRR and, albeit shallower, within the BLD complex to the north of Murphy South.

2.3 Hydrogeology

Groundwater at the CEIP mine site is saline to hyper saline and occurs in two aquifer units. The weathered saprolite forms a leaky confining unit separating these two units. Aquifer units are:

- Shallow Tertiary cover sediment exhibits a typically sandy lower horizon that yields saline to hyper saline water of 54 g/L total dissolved solids (TDS). Measured well yields were less than 1 L/s. The Tertiary aquifer distribution is constrained by basement elevation as the sandy unit is only found in basement lows (refer Figure 3). The aquifer is not found beneath Boo Loo Pit or the western part of Murphy South Pit.
- The gneiss basement contains groundwater in fractures and voids in the rock. Salinity is very high ranging from 113 to 150 g/L. The transmissivity of the formation is controlled by fracture frequency and interconnection. As such, well yields are variable and depend on intersection of fractures. Yields of 2 to 10 L/s were measured in test bores in the CEIP ore body.

The groundwater level across the site ranges around 60 mAHD. This results in groundwater within 1 m of surface in topographic lows, and depths to groundwater exceeding 25 m in elevated terrain.

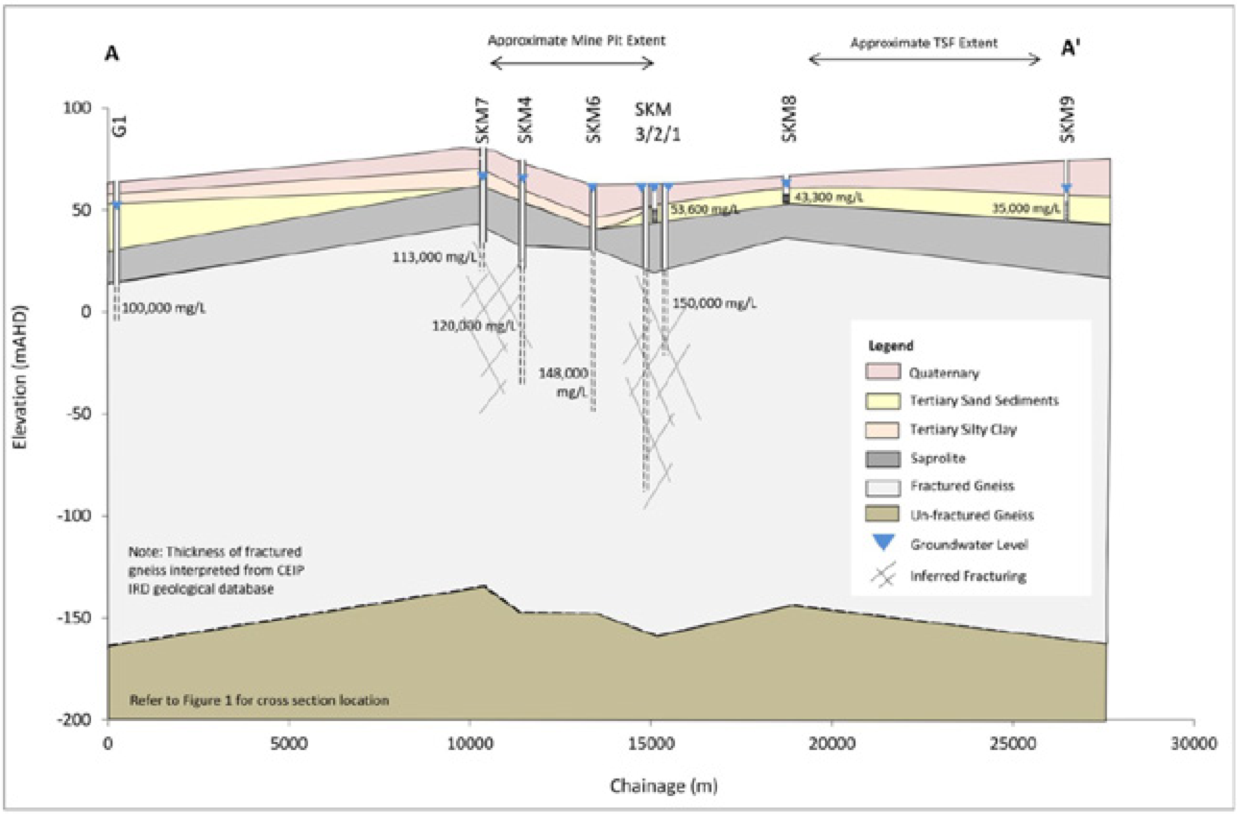

Figure 5: Hydrogeological Cross Section

2.4 Geochemistry

2.4.1 Mineralogy

The orebody and surrounding rock comprises quartz-feldspar-biotite gneiss "barren gneiss" that envelops the magnetite gneiss characterised by quartz-feldspar-magnetite-garnet-biotite. Thin, late stage, dolerite intrusives are also observed in the drill core.

Other minor bedrock lithologies present in the drillholes include calcite marble and amphibole-bearing gneiss. Relatively rare, thin dolerite dykes and sills also traverse the area.

2.4.2 Acid Generating Potential

Assessment of the acid generating potential of the orebody, waste rock and overburden (MWH, 2015) provides the following characteristics.

Overburden (saprolite and sedimentary cover)

Approximately 87 % of the overburden is predominately Inert.

Approximately 3% of the total volume comprises acid consuming rocks, primarily surficial calcrete and calcarenite.

Approximately 10% of the total overburden comprises potentially acid forming (PAF) material. Two discontinuous horizons exhibiting elevated sulphur were identified in the overburden:

- Upper horizon at approximately 60 mAHD, coincident with the elevation of the water table.
- Lower horizon at approximately 0 mAHD coincident with the base of the saprolite zone.

Each of these zones is discontinuous. The distribution elevated sulphur is presented in Figure 4. A summary of the acid generating potential of the overburden is presented in Table 1.

Table 1: Acid generation potential of the overburden

Classification	Percentage of total volume	Acid Generation Potential
Acid Consuming (CaCO3 >10%)	3	< -100 kg H_2SO_4/tonne
Inert	87	-
PAF (0.2-0.5% S)	9	< 20 kg H_2SO_4/tonne
PAF (>1% S)	1	<100 kg H_2SO_4/tonne

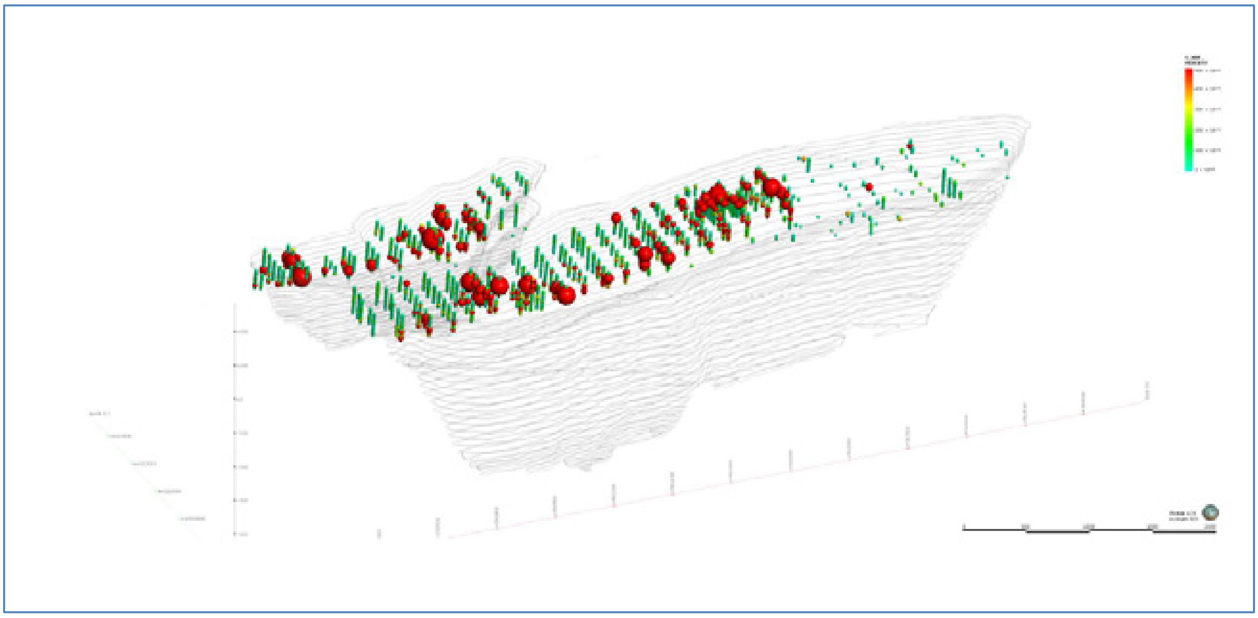

Figure 6: Distribution of elevated sulphur >0.2% in overburden (From MWH, 2015).

Orebody and waste rock

The orebody and waste rock exhibit sulphur concentrations below 0.3 %, averaging 0.04% which is classified as non- acid forming Price (1997). Geochemical assessment of fine and coarse tailings (which can be considered an analogue for waste rock) determined an average acid neutralisation capacity of 15.6 kg H_2SO_4/tonne (MWH, 2015 pp18).

2.4.3 Groundwater Chemistry

Tertiary Aquifer

Groundwater is saline. The upper Tertiary aquifer exhibits salinity of approximately 54,000 mg/L TDS and an acidic pH of 3.73. The low pH is thought to be associated with wetting and drying cycles, and subsequent oxidation of organic sulphides in the overlying salt pan. This mechanism of groundwater acidification beneath temperate salt pans in southern Australia is studied in detail in CSIRO, (2008)[1]. Detailed chemical composition of the water is presented in Table 2. Despite the low pH, metals concentrations are generally low. Only Aluminium exceeds guideline values for stock water (despite being too salty for stock consumption).

Basement Fractured Rock Aquifer

Groundwater is hypersaline, salinity ranges from 113,000 to 150,000 mg/L TDS. Groundwater pH ranges from 5.7 to 6.4. Metals concentrations are low and do not exceed guideline values for stock water (despite being too salty for stock consumption).

[1] CSIRO (2008). Avon Basin, WA Wheatbelt: Acidification and Formation of Inland ASS Materials in Salt Lakes by Acid Drainage and Regional Groundwater Discharge. In Inland Acid Sulfate Soil Systems Across Australia (Eds Rob Fitzpatrick and Paul Shand). pp 176-188. CRC LEME Open File Report No. 249. (Thematic Volume) CRC LEME, Perth, Australia.

Table 2: Groundwater Chemical data (From SKM 2013)

Aquifer		**Basement**					**Tertiary**
WellID		SKM1	SKM1	SKM4	SKM6	SKM7	SKM2
Sample Date		30/9/2013	31/9/2013	14/10/2013	16/10/2013	12/10/2013	6/10/2013
Lab report number		EM1310623	EM1310623	EM1310623	EM1310623	EM1310623	EM1310623
Salinity (TDS)	mg/L	150000	143000	120000	148000	113000	53600
pH		6.16	6.18	6.05	6.39	5.67	3.73
Na	mg/L	50300	47400	37500	47200	17200	18300
Ca	mg/L	785	763	592	810	316	418
Mg	mg/L	4880	4760	3640	4740	2000	1530
K	mg/L	1020	991	841	1080	500	671
Cl	mg/L	79800	81300	72000	84500	35100	27400
SO4	mg/L	11100	10900	9410	9760	4540	4050
Carbonate Alkalinity as CaCO3	mg/L	<1	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	mg/L	42	39	73	241	45	<1
Hydroxide Alkalinity as CaCO3	mg/L	<1	<1	<1	<1	<1	<1
Total Alkalinity as CaCO3	mg/L	42	39	73	241	45	<1
Ammonia as N	mg/L	1.61	1.59	1.9	6.49	0.67	0.04
Total Kjeldahl Nitrogen as N	mg/L	2.7	3.1	11.5	11	10.6	<0.1
Aluminium - Dissolved	mg/L	0.63	<0.10	<0.10	<0.10	<0.10	40.6
Arsenic - Dissolved	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.001
Barium - Dissolved	mg/L	0.05	0.024	0.023	0.034	0.023	0.024
Cobalt - Dissolved	mg/L	<0.010	<0.010	0.037	<0.010	0.154	0.022
Copper - Dissolved	mg/L	0.043	0.025	0.033	0.032	0.024	0.013
Iron - Dissolved	mg/L	36.7	34.7	94.6	14.5	418	20.6
Lead - Dissolved	mg/L	0.018	<0.010	<0.010	<0.010	<0.010	0.007
Manganese - Dissolved	mg/L	4.16	4.33	18.3	10.6	22.2	0.374
Selenium - Dissolved	mg/L	<0.10	<0.10	<0.10	<0.10	<0.10	<0.01
Strontium Dissolved	mg/L	20.3	18.3	12.3	18.8	6.66	15.5
Uranium - Dissolved	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.001
Zinc - Dissolved	mg/L	0.051	<0.050	0.163	0.222	1.27	0.103

3 Pit Lake Conceptual Model

3.1 Overview

The dewatering of the mine pit will create a cone of water table depression around the mine pit. Following mine closure, water levels in the pit will rise with the cessation of pumping, and the cone of water table depression will continue to extend until a steady-state balance is reached between groundwater recharge (rainfall infiltration) within the cone of depression, and the net removal of water from the pit lake by evaporation.

The CEIP mine pits are expected to form a pit Lake with steady state lake level between -220 and -300 mAHD elevation. At these levels the Boo Loo pit will be dry and all groundwater will drain to the Murphy South Pit.

Following mine closure until steady state is reached, the Tertiary aquifer will be dewatered to a radius of between approximately 2 to 3km (distance to the calculated 10m drawdown contour after 25 and 1000 years; Jacobs, 2014, E-F-16-RPT0024 pp 31 & 34). Groundwater inflow will move through the fractured rock aquifer to discharge to the pit lake.

Rainfall will fall directly onto the pit lake surface, and also onto the pit walls. Of the rainfall landing on the pit walls, some fraction will be lost to evaporation (particularly small rainfall events) and the remaining fraction will flow to the pit lake either over the surface or through infiltration and interflow seepage.

Water will be lost to evaporation from the pit lake surface, leaving behind dissolved salts.

Due to the low transmissivity of the aquifer (regional transmissivity of the basement rock is around 4 m^2/day), and the great rainfall deficit (approx. 1000 mm per year pan evaporation less rainfall) the mine pit lake will act as a terminal sink. All groundwater within the cone of depression will move towards the pit for eventual loss by evaporation.

The estimated volume and chemical characteristics or each source and sink in the pit lake water balance is discussed in the following sections.

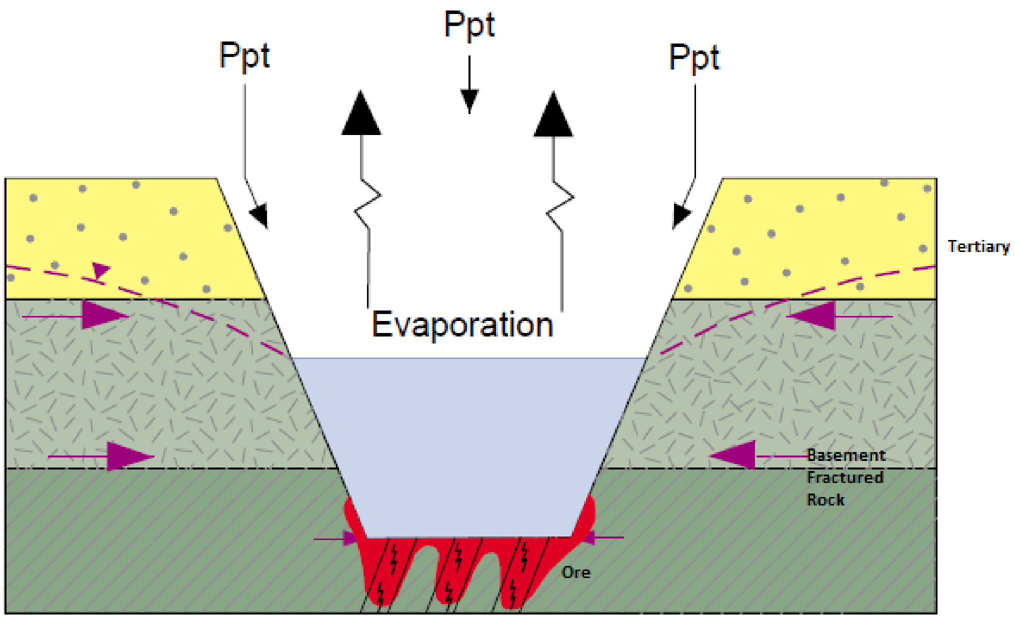

Figure 7: Pit lake conceptual model (Modified from Johnson and Wright, 2003)

3.2 Groundwater Seepage

3.2.1 Rate

Groundwater seepage rate is a function of water level drawdown, aquifer transmissivity and the radius of the drawdown cone Jacobs (2014) seepage decreases over time.

3.2.2 Water quality

The chemical composition of groundwater seeping to the pit lake is expected to be comparable to the groundwater samples from the basement fractured rock aquifer.

The Tertiary aquifer will be dewatered to a radius of approximately 2 to 3 km and thus will not contribute direct seepage to the pit. Recharge that does seep down through the Tertiary aquifer will then percolate through an additional 300 to 3000 m of fractured rock before discharging to the pit. The acidity of the Tertiary seepage should be buffered by the acid neutralising capacity of the basement rock and the subsequent inflow is expected to exhibit similar composition to the fractured rock aquifer.

The estimated average composition of groundwater seepage to the mine pit is presented in Table 3. The composition is calculated as the average of samples from fractured rock aquifer within the pit footprint.

Table 3: Estimated composition of groundwater seepage to the pit lake.

		Average Groundwater inflow composition
Salinity (TDS)	mg/L	134800
pH		6.1
Na	mg/L	39920
Ca	mg/L	653.2
Mg	mg/L	4004
K	mg/L	886.4
Cl	mg/L	70540
SO4	mg/L	9142
Carbonate Alkalinity as CaCO3	mg/L	<1
Bicarbonate Alkalinity as CaCO3	mg/L	88
Hydroxide Alkalinity as CaCO3	mg/L	<1
Total Alkalinity as CaCO3	mg/L	88
Ammonia as N	mg/L	2.452
Total Kjeldahl Nitrogen as N	mg/L	7.78
Aluminium - Dissolved	mg/L	<0.10
Arsenic - Dissolved	mg/L	<0.010
Barium - Dissolved	mg/L	0.0308
Cobalt - Dissolved	mg/L	0.0955
Copper - Dissolved	mg/L	0.0314
Iron - Dissolved	mg/L	119.7
Lead - Dissolved	mg/L	0.018
Manganese - Dissolved	mg/L	11.918
Selenium - Dissolved	mg/L	<0.10
Strontium Dissolved	mg/L	15.272
Uranium - Dissolved	mg/L	<0.010
Zinc - Dissolved	mg/L	0.4265

3.3 Pit Wall run-off

3.3.1 Rate

The rate of pit wall run-off is calculated based on the methodology of mine pit run-off estimation presented in RPS (2014). The methodology calculates run-off based on monthly rainfall, minus a wetting threshold of 15 mm per month multiplied by a volumetric run-off coefficient of 0.33. This methodology generates an effective annual average run-off volume of 151 mm per year from an average annual rainfall of 330 mm per year.

The area of pit wall available to harvest run-off is dependent on the water level in the pit lake. High lake water levels reduce the area of the exposed pit wall. The pit wall run-off volumes in the Murphy South Pit are presented for the high, average and low pit lake water levels in Table 4

Table 4: Pit wall run-off.

	Low lake level	Average lake level	High lake level
Pit wall area (m^2)	5,172,000	4,944,000	3,923,000
Effective run-of (mm/year)	151	151	151
Annual Volume (Gl/year)	**0.26**	**0.25**	**0.19**

3.3.2 Water quality

The water quality of the pit wall run-off will be a function of the interaction between rainfall and the material of the pit wall.

Two discontinuous zones of potentially acid forming material (PAF) are present in the saprolite and cover layers. Run-off interacting with these zones has the potential to generate acid. However, the remaining rock that makes up the pit wall has a moderate acid consuming potential. A length-weighted average net acid generation potential for the run-of path from the upper PAF zone to the pit lake is calculated and presented as Table 5 and shown conceptually in Figure 5. The calculation indicates that the amount of acid that can be potentially be generated by the small percentage of exposed PAF material near surface is far outweighed by the acid consuming potential of the 280m length of exposed fresh rock down to the pit lake level.

Table 5: Net acid generation potential of the mine pit wall

	Total Run-off Length	PAF, S>1%	PAF, S<0.5%	Fresh Rock
Net Acid Generation (kg H_2SO_4/t)		<100	<20	-15
Average Length (m) – based on thickness of zone x frequency of intersection.	285.1	0.3	4.8	280
% of total length		0.1	1.7	98.2
Length weighted Net Acid Generation (kg H_2SO_4/t)	**-14.3**	0.1	0.3	-14.7

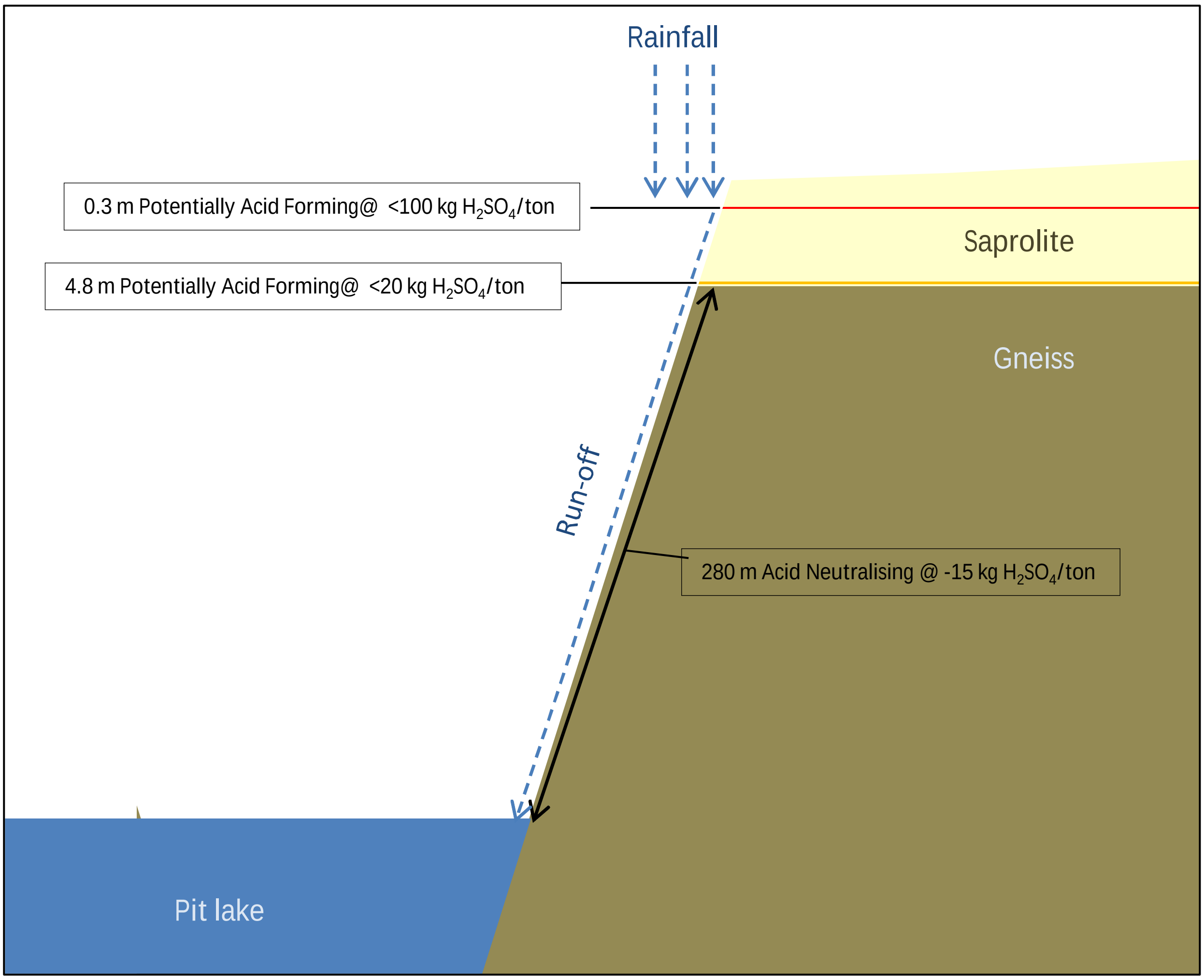

Figure 8: Relative proportions of PAF and acid neutralising material exposed to pit wall run-off.

An indication of the water quality that will be generated by percolation of rainfall across the pit walls is provided by leaching test work undertaken as part of the IWL study (MWH, 2015). Leaching testwork comprised percolation of distilled water though a column filled with tailings. The column was saturated and leached over five leaching cycles. The final leachate solution was captured and analysed. The chemical composition is presented in Table 6. The leachate exhibits low salinity, neutral pH with trace levels of some metals.

Table 6: Chemical composition of laboratory tailings leachate – indicative of pit wall run-off

Salinity	mg/L	140.4
pH		7.96
Aluminium	mg/L	0.08
Antimony	mg/L	<0.001
Arsenic	mg/L	0.002
Barium	mg/L	0.003
Berylium		<0.001
Bismuth	mg/L	<0.001
Boron	mg/L	0.18
Cadmium	mg/L	<0.0001
Chromium	mg/L	0.002
Colbalt	mg/L	<0.001
Copper	mg/L	0.004
Iron	mg/L	<0.05
Lead	mg/L	<0.001
Lithium	mg/L	0.003
Manganese	mg/L	0.011
Molybdynum	mg/L	0.004
Nickel	mg/L	0.001
Selenium	mg/L	<0.01
Silver	mg/L	<0.001
Strontium	mg/L	0.01
Thalium	mg/L	<0.001
Thorium	mg/L	0.001
Tin	mg/L	0.002
Uranium	mg/L	<0.001
Vandium	mg/L	0.01
Zinc	mg/L	<0.005

3.4 Rainfall to Pit lake

Rainfall will fall directly on the pit lake. The water will contribute negligible dissolved solids and neutral pH. The volume will vary based on pit lake level and area per the table below. The average annual rainfall is 330mm per year measured at the Kyancutta BOM station.

Table 7: Direct rainfall contribution to pit lake water balance

	Low lake level	Average lake level	High lake level
Pit lake Area (m^2)	1,524,000	1,752,000	2,773,000
Annual Average Rainfall (m)	0.325	0.325	0.325
Annual Average Rainfall (Gl/year)	0.50	0.57	0.90

3.5 Evaporation From Pit lake

Evaporation from the pit lake will vary depending on the area of the pit lake and the salinity of the water. Increasing salinity results in a reduced rate of evaporation.

Pan evaporation measured at Kyancutta BOM station averages 1.407m per year. The Pan factor used to convert the measured rate in a pan to an actual rate for an open water body is typically around 0.7 for a fresh water body. The reduction in evaporation rate due to salinity is expressed as salinity factor (SF), calculated as follows (Bonyton, 1966)[2]:

SF = 1 – (salinity‰ x 0.00086) .

For a salt saturated solution with salinity of 360 g/L TDS, the concomitant salinity factor is 0.69.

[2] Bonython, C. W. (1966). Factors Determining the Rate of Solar Evaporation in the Production of Salt. Second Symposium on Salt, The Northern Ohio Geographical Society Inc.

Table 8: Evaporation from pit lake

	Low lake level	Average lake level	High lake level
Pit lake Area (m^2)	1,524,000	1,752,000	2,773,000
Annual Average Pan Evaporation – Kyancutta BOM station (m)	1.407	1.407	1.407
Pan Factor for open water body	0.7	0.7	0.7
Salinity Factor for saturated brine	0.69	0.69	0.69
Total Evaporation (Gl/year)	1.0	1.2	1.9

3.6 Geochemical Evolution of Pit Lake

3.6.1 Salinity

The calculated evolution of pit lake salinity is presented as Figure 6. The calculation uses the stabilised pit lake as a starting point and calculates removal of water by evaporation (adjusting for increases salinity per the equation in Section 3.5) and addition of water from rainfall and groundwater seepage. The groundwater seepage rate is adjusted to balance the net removal of water by evaporation after allowing for direct rainfall and pit wall runoff.

The calculation is relatively insensitive to pit lake level. Whilst the larger pit lake evaporates more water and draws in more groundwater with salt burden, the larger pit lake also has greater volume in storage to dilute the inflowing salt; hence the additional salt inflow effect on concentration is negated.

After approximately 400 years, salinity is expected to stabilise at around 360 g/L which is the maximum solubility of sodium chloride (halite), the main dissolved species in the water. At that point additional evaporation will result in precipitation of halite. The effect of halite precipitation on salinity evolution is likely to be more asymptotic than the simple calculation allows. Less soluble minerals such as calcite and gypsum will precipitate at lower concentrations.

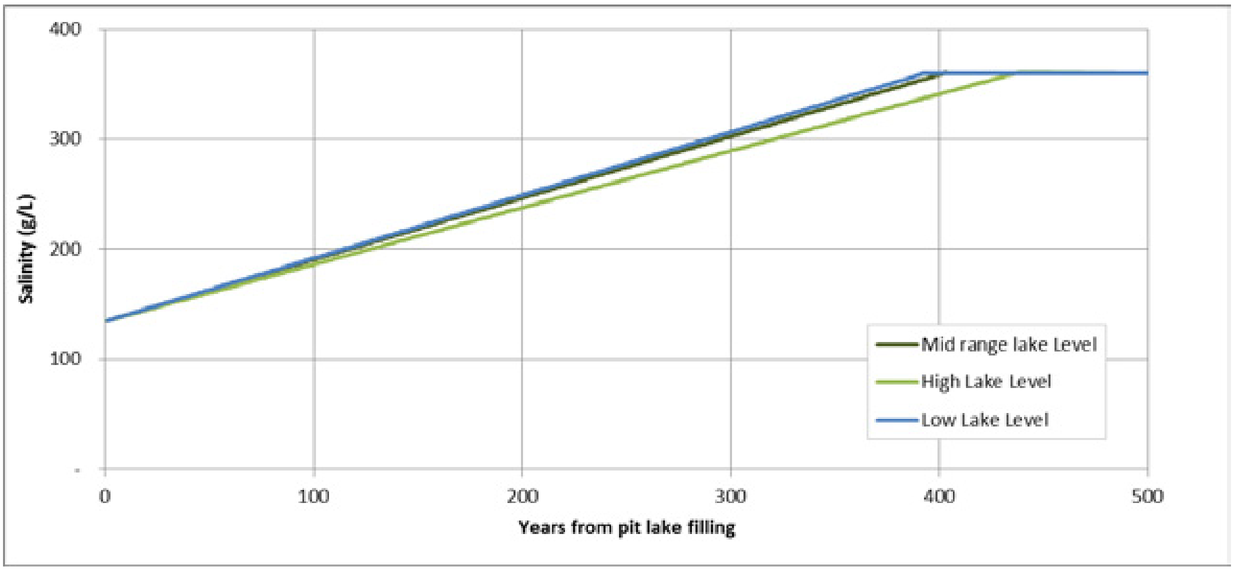

Figure 9: Calculated evolution of pit lake salinity

Other studies (e.g. BHP-B, 2008)[3] have proposed that hyper-saline mine pit lake evolution will result in the formation of a surface crust of evaporite minerals over the long term (100s to 1000s of years). The crust first forms around the edges of the lake. It then grows inwards. Outgrowths from lake edges bridge the gaps between them to give a continuous crust and the lack of wind in a deep lake below ground level is an advantage. The interlocking of crystals provides mechanical strength.

3.6.2 Acidification

Acidification of mine pit lakes is associated with coal mines and sulphide rich ore. In contrast, the potential for acid-water generation in metalliferous low-sulphur ore mines is relatively limited (Johnsons and Wright, 2003)[4].

At the CEIP mine pit, the orebody exhibits low sulphur ore and a gneiss host rock which is mildly acid consuming (Neutralisation Potential of approximately 15 kg H_2SO_4 per tonne on the basis of tailing test work). The average sulphur content over depth for the available 41,477 samples of magnetite-gneiss is shown in Figure 7. Average sulphur concentration is below 0.1% for all intervals. For reference sulphur concentration of 0.3% is highlighted as the threshold for PAF material defined in Price et al (1997)[5], whilst an acid rock drainage study of low sulphide mine waste (Lee, 2000)[6] proposes a more conservative threshold of 0.1% as the concentration where "a fresh mine waste containing less than 0.1% sulphide sulphur will not cause ARD generation, regardless of the Neutralisation Potential (NP) value".

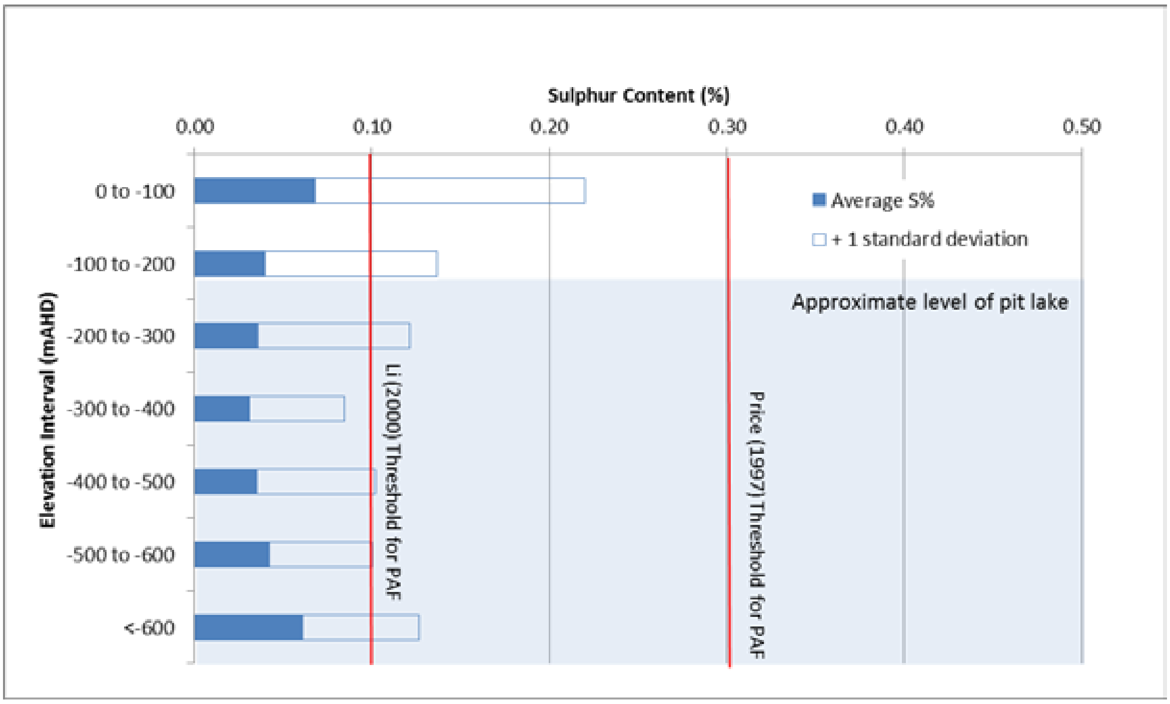

Figure 10: Magnetite – gneiss sulphur content vs elevation.

[3] BHP-B (2008) Olympic Dam Expansion EIS *Appendix J2 – Pit lake Assessment*. Report Prepared for BHP-Billiton by ENSR/AECOM.

[4] Johnson, S.L and Wright, A.H., 2003, Mine void water resource issues in Western Australia: Western Australia, Water and Rivers Commission, Hydrogeological Record Series, Report HG 9, 93p

[5] Price, W.A., Morin, K. and Hutt, N. (1997b), *Guidelines for the Prediction of Acid Rock Drainage and Metal Leaching for Mines in British Columbia: Part II - Recommended Procedures for Static and Kinetic Testing*, Proc. 4th International Conference on Acid Rock Drainage, Vancouver, BC, p15-30

[6] Li, M (2000) *Acid Rock Drainage Prediction for Low-Sulphide, Low- Neutralisation Potential Mine Wastes*. Proceedings from the Fifth International Conference on Acid Rock Drainage Volume I.

On this basis the potential for acidification in the pit lake is considered low. Minor quantities of PAF material are present in the saprolite and cover, however this material will be unsaturated in proximity to the mine pit and their capacity to impact on in-pit run-off is offset by the much larger exposure of mildly acid consuming gneiss rock.

4 Summary and conclusions

The CEIP mine pits are expected to form a pit Lake with steady-state lake level between -220 and -300 mAHD elevation. At these levels the Boo Loo pit will be dry and all groundwater will drain to the Murphy South Pit.

The ongoing removal of water by evaporation will create a permanent groundwater sink that generates a cone of water table depression with a maximum steady state radius of 10 to 12 km and dewater the thin Tertiary aquifer to a radius of approximately 2-3 km. The cone of depression will harvest all groundwater recharge within its extent which encompasses infiltration from all rehabilitated features of the mine lease, including the Integrated Waste Landform. The modelled extent of the cone of depression is presented on Figure 9 and a scaled cross section is presented as Figure 10.

Evaporation from the lake will result in increasing salinity that stabilises at salt (NaCl) saturation of approximately 360 g/l after approximately 400 years. Less soluble materials (Calcite and Gypsum) will precipitate at lower concentrations. Over very long time scales (hundreds to thousands of years) a surface crust of evaporite minerals is expected to form.

Acidification of the pit lake is not expected on the basis of low-sulphur host rock that is mildly acid consuming, and the very low proportion of PAF material in the un-saturated layers near ground surface.

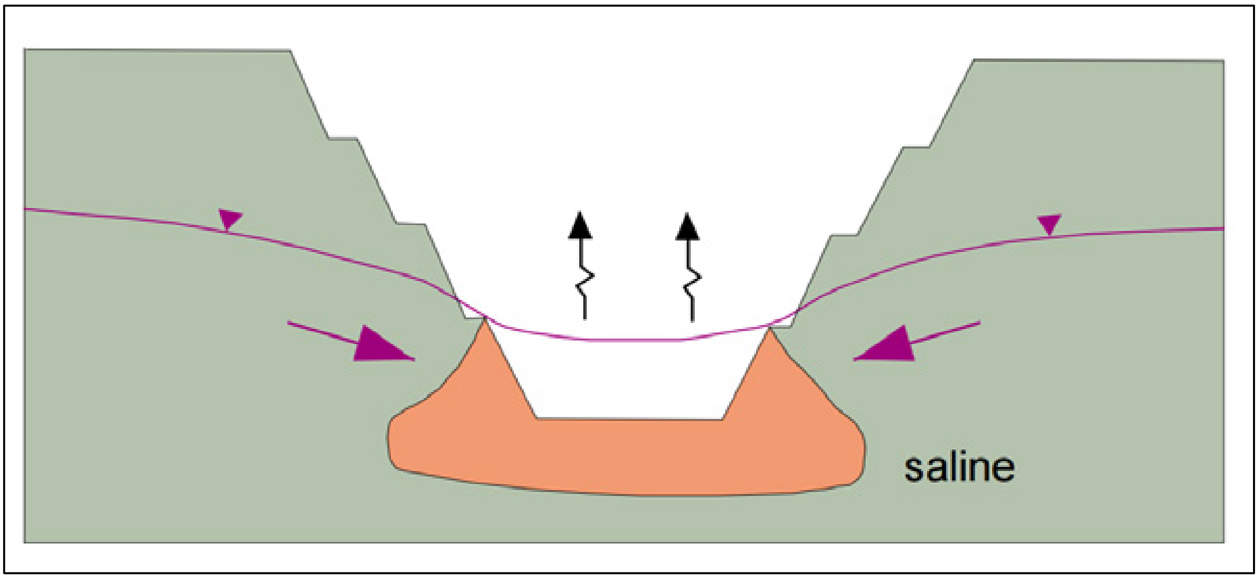

Figure 11: Groundwater sink mechanism (From Johnsons and Wright, 2003)

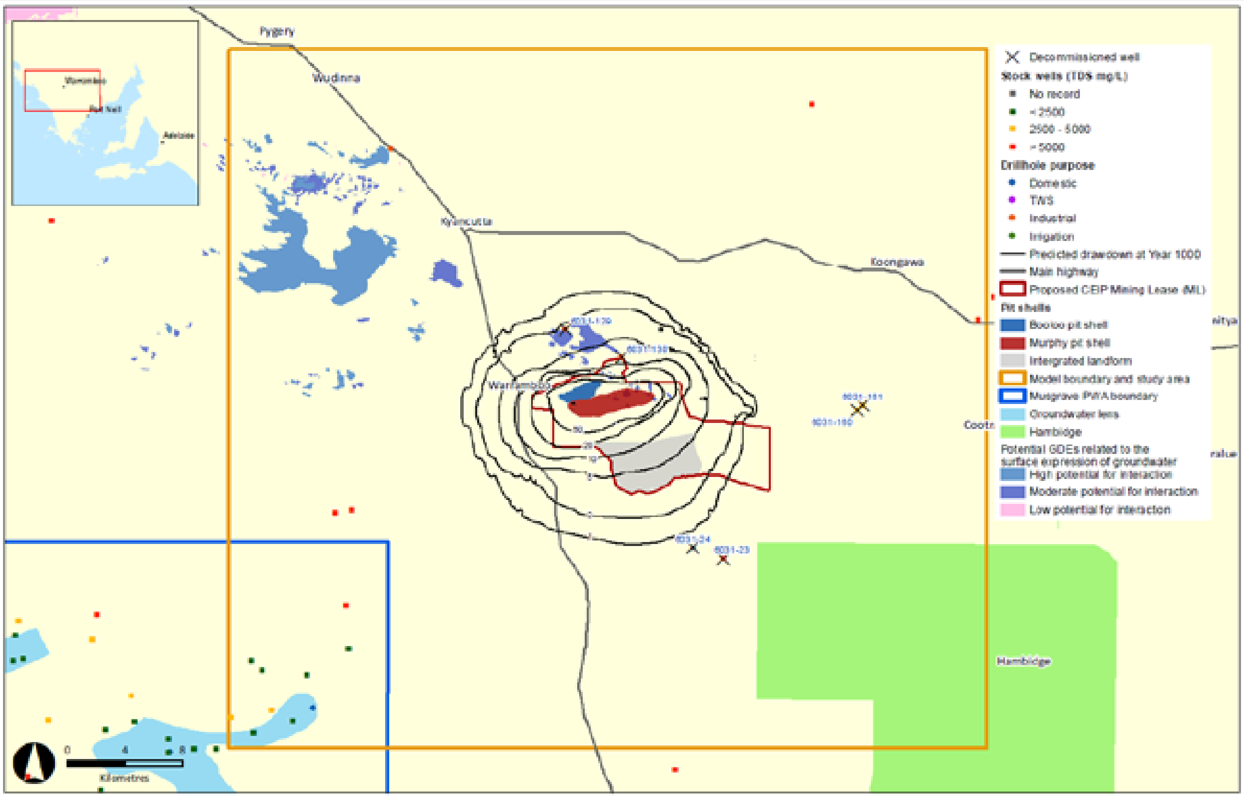

Figure 12: Extent of cone of depression after 1000 years (From Jacobs 2015)

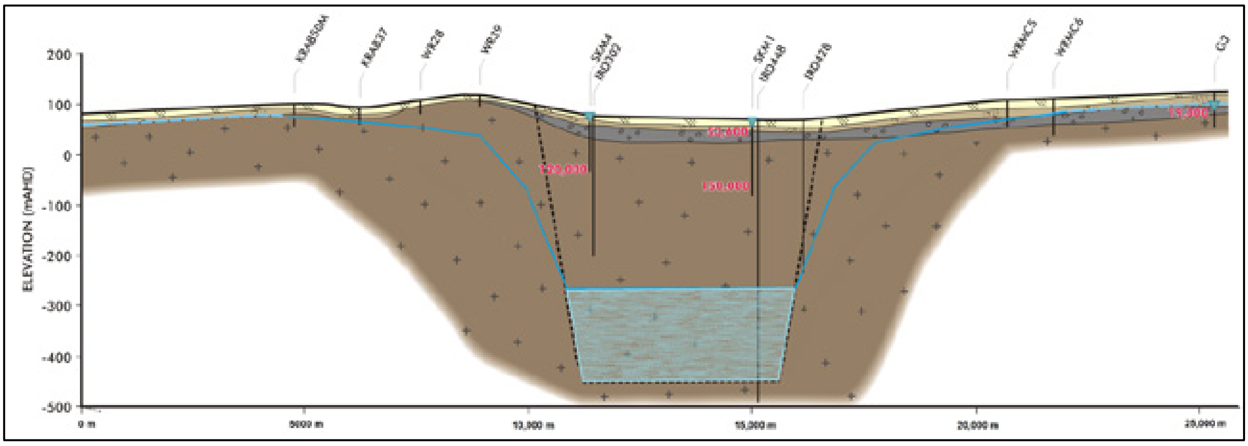

Figure 13: Scaled west – east cross-section of cone of depression after 1000 years. Note vertical exaggeration of V:H = 1:10. (Modified from Jacobs, 2015)

5 References

Jacobs (2014) *Central Eyre Iron project – Mine Water Management – Numerical Groundwater Flow Model*. Report EF-16-RPT-0017.

Jacobs (2015) *Central Eyre Iron project – Groundwater Impacts Assessment*. Report EF-16-RPT-0024

MWH (2015) *Central Eyre Iron Project – Conceptual Integrated Waste Landform Design for Rehabilitation and Closure*. Report IRON-LS-14001.

SKM (2013) *Iron Road Limited – Central Eyre Iron Project – Hydrogeological Drilling, Construction and Testing Completion Report*. EF-16-RPT-0015.

BHP-B (2008) *Olympic Dam Expansion EIS Appendix J2 – Pit lake Assessment*. Report Prepared for BHP-Billiton by ENSR/AECOM.

Johnson, S.L and Wright, A.H., (2003), *Mine void water resource issues in Western Australia*: Western Australia, Water and Rivers Commission, Hydrogeological Record Series, Report HG 9, 93p

Price, W.A., Morin, K. and Hutt, N. (1997b), *Guidelines for the Prediction of Acid Rock Drainage and Metal Leaching for Mines in British Columbia: Part II - Recommended Procedures for Static and Kinetic Testing*, Proc. 4th International Conference on Acid Rock Drainage, Vancouver, BC, p15-30

Li, M (2000) *Acid Rock Drainage Prediction for Low-Sulphide, Low- Neutralisation Potential Mine Wastes*. Proceedings from the Fifth International Conference on Acid Rock Drainage Volume I.

RPS, (2014) CEIP – *Hydrology and Surface Water Management Study*. Report E-F-34-RPT-0026

Bonython, C. W. (1966). *Factors Determining the Rate of Solar Evaporation in the Production of Salt*. Second Symposium on Salt, The Northern Ohio Geographical Society Inc.