

Department of Primary Industry & Resources

Former Rum Jungle Mine Rehabilitation Project – Modified Health Investigation Levels for Surface Soils and Cover System Soils

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1. Introduction

1.1 Project overview

The former Rum Jungle Mine site (Rum Jungle), is located near Batchelor in the Northern Territory, approximately 63 kilometres south-southeast of Darwin.

The mine operated between 1954 and 1971. The mining and processing operations resulted in legacy soil contamination impacts, significant acid and metalliferous drainage (AMD) issues and subsequent adverse environmental impacts to the East Branch Finniss River (EBFR). The site has been the subject of numerous phases of investigation, remediation and rehabilitation since the late 1970s, with the most significant rehabilitation works being implemented in the mid-1980s.

Since 2009, the Northern Territory Government's Department of Primary Industry and Resources (DPIR) and the Commonwealth Government have been working under a National Partnership Agreement (NPA) to deliver site maintenance and continuing environmental monitoring at Rum Jungle. The results of these programs have been used to develop an improved rehabilitation strategy (the Project) that is consistent with the views and interests of traditional Aboriginal owners and that meets contemporary environmental and mined land rehabilitation standards.

This document presents consideration of plausible end land use scenarios that may be adopted following the rehabilitation of the Rum Jungle site, and develops site specific soil acceptance criteria (SAC) using human health risk assessment techniques for a range of anticipated site interaction and exposure scenarios.

1.2 Rehabilitation project objectives

The high-level objectives of the Project are two-fold and incorporate environmental remediation and advancement towards resolution of the Finniss River Land Claim:

1. Improve the environmental condition of the Site and downstream catchment of the East Branch Finniss River (EBFR), with success measured against the following key outcomes:
   - Surface water quality conditions within the EBFR progressively improve, such that they lastingly meet locally derived water quality objectives (LDWQOs).
   - Constructed and rehabilitated landforms are chemically and physically stable.
   - Self-sustaining vegetation systems are established within the rehabilitated landforms.
   - Physical environmental conditions support intended final land uses.
2. Improve site conditions to support future progress of the Finniss River Land Claim over the Rum Jungle site, inclusive of the following key outcomes:
   - Restoration of flows to the original course of the EBFR, as far as is possible.
   - Culturally insensitive landforms are relocated to locations that are deemed to provide a culturally safe separation distance from known Sacred Sites.
   - Return living systems including endemic species to the remaining landforms.
   - Preserve Aboriginal cultural heritage artefacts and places.
   - Isolate sources of pollution including radiological hazards.
   - Maximise opportunities for Traditional Owners to work on site, to aid reconnection to country.

1.2.1 Current preferred rehabilitation design

The (current) preferred rehabilitation strategy for Rum Jungle incorporates a 5 year construction period of mostly dry season earthworks. The Rum Jungle rehabilitation design includes:

- Relocation and consolidation of waste rock and contaminated soil. Specifically, contaminated soils are to be stored in the purpose-built Waste Storage Facilities (WSF) whilst waste rock is to be stored in one of three locations:
  - Main Pit Backfill
  - Eastern WSF
  - Western WSF
- Construction of a cover system over the backfilled main pit that incorporates a final Pit Lake feature with EBFR flowing through this Pit Lake.
- Retention of the Intermediate Pit as a water-filled void; to provide passive surface and ground water management for the site.
- Placement of an earthen cover system over the backfilled Dysons Pit, following the removal of contaminated material to design grades.
- Relocation of the Mt Burton Waste Rock Dump (WRD) to Rum Jungle.
- Relocation and consolidation of the Mt Fitch WRD into the Mt Fitch Pit.

1.3 Scope and purpose of this report

The scope and purpose of this report is to support the overall Environmental Impact Statement and align the evaluation of risks posed to the environment and future site users with modern environmental risk assessment procedures. Specifically, to propose land uses for known areas of contaminated land and establish site specific assessment criteria for soil, taking into consideration plausible end-use scenarios for the site.

1.4 Key assumptions and exclusions

1.4.1 Modes of future land use and occupancy

An assumption in the evaluation of risks posed by present levels of soil contamination at the site (and projected contaminant levels of end landform surfaces) is that the end land use will include infrequent but possibly temporary occupation, primarily by traditional Aboriginal owner groups.

In the context of the above, a recently developed Land Use Plan for the Project outlines the current planned future uses for the site which mainly focus on temporary occupation in the form of occasional visits. The modes of future land use incorporated into the development of the report as described below are conservative when compared to the recently developed Land Use Plan.

The most sensitive envisaged modes of land use may include temporary gatherings, recreational, ceremonial or cultural events, contemplative activities and the practice of traditional bushfood gathering, including from watercourses. An increased degree of consultation with traditional owner groups is required prior to the completion of this project, to confirm or revise these assumptions.

1.4.2 Previous investigations

A considerable volume of previous investigations and reporting has been undertaken for Rum Jungle. Reports used as reference material to inform this report are listed in Section 7. Some degree of reliance on those reports is inherent in the undertaking of this project.

1.4.3 Inapplicability of Health Investigation Levels (HILs) to construction/rehabilitation period

The assessments and derivation of modified HILs presented in this report does not include the evaluation of health risks potentially posed to workers during the proposed construction and rehabilitation project works. These risks will be considered in specific project, workplace and task-specific health and safety risk assessments.

2. Future land use scenarios

To evaluate health risks posed by current (and final landform) surface soil conditions, it is necessary to define plausible end land use scenarios and to develop a range of assumptions to quantify human exposure rates to potential soil contaminants.

Although the exact nature of end land uses and modes of site occupation are difficult to accurately predict, generalised definitions of plausible future land use scenarios have been established in consultation with DPIR and by acknowledging several expectations and anticipated site access restrictions previously communicated by Aboriginal owner groups connected to Rum Jungle.

Land uses at the completion of rehabilitation works (in approximately five-years' time) can only be defined in a generalised manner, but factors that have direct and varying implications on health risk assessment calculations (e.g. duration of occupation; incidental soil ingestion rates) can be calibrated to incorporate higher levels of conservatism. By incorporating this conservatism, the requirement to define exact future land use modes is diminished and any improved understanding of forward land use patterns can then be used to reduce these levels of precautionary conservatism.

At the time of preparing this report, future land uses are predicted to include:

- **Temporary occupation**: Infrequent but possibly temporary site occupation, primarily by traditional owner groups. Envisaged modes of land use may include temporary gatherings, recreational, ceremonial or cultural events, contemplative activities and the practice of bushfood gathering, including from watercourses.
- **Occasional site visits** (not occupation and not involving bushfood gathering): primarily by traditional owner groups, for gatherings, meetings, recreational, ceremonial or cultural events or contemplative activities.
- **Site maintenance:** Site monitoring, care and maintenance by Rangers or land management specialists.

Increased levels of consultation with traditional owner groups is required to confirm or revise these predicted future site uses, but as suggested above, the definition of land use is probably less important than more specifically defining the details of activities; or the details of acceptable (and enforceable) restrictions under each land use scenario.

A summary of assumptions made in relation to factors that affect the consideration of risks posed by potential soil contamination at the site are summarised in Table 1 below.

As mentioned in Section 1.4.1, a Land Use Plan has been recently developed for the project. This Land Use Plan focuses on occasional site visits as the current envisaged end-use. Based on the inclusion of temporary occupation in the abovementioned scenarios, the development of the HIL values as detailed in this report adopts an order of conservatism.

Table 1 Plausible land use scenario details

Land use scenario		Temporary occupation (for events)	Occasional visits	Site maintenance
Activity description		Infrequent but possibly temporary occupation, primarily by traditional owner groups. Envisaged modes of land use may include temporary gatherings, recreational, ceremonial or cultural events, contemplative activities and the practice of traditional bushfood gathering, including from watercourses.	Occasional visits, primarily by traditional owner groups. Envisaged modes of land use may include temporary gatherings, recreational, ceremonial or cultural events and contemplative activities.	Ranger type activities. Capping maintenance, erosion/sediment earthworks/repair, weed management, fire management. Ongoing monitoring activities Landform Function Analysis, water/groundwater sampling.
Included		Camping-style occupation in open		Working hours occupation only
		Hunting and 'camp-style' preparation and cooking of meals		
Excluded			No overnight occupation	No overnight occupation
		No active agriculture / produce cultivation for consumption in any scenario.		
			No traditional bushfood gathering, including from watercourses.	No traditional bushfood gathering, including from watercourses.
Person details		Adult or child. Male or female.	Adult or child. Male or female.	Adult only. Male or female.
Occupation Detail	Hr/day	24	12	8
	Day/yr	35	4	100

3. Existing site soil conditions

The most comprehensive modern investigation into metal concentrations across soils of Rum Jungle was undertaken by CSA Global Consultants in 2010/11 (CSA, 2011). This work involved a combination of laboratory and field (x-ray fluorescence (XRF)) soil testing methods and the 2011 CSA work is summarised below to provide a basis for considering background metal concentrations in soils of the site.

The objective of the CSA Global study was to establish an estimate of 'background' metal concentrations in soils of the site.

Having been mined for uranium, copper nickel and lead, Rum Jungle is obviously positioned on a series of geological fault lines and deposits that present atypical but natural geochemical conditions and exaggerated mineralisation of particular elements and metals. CSA identified that distinguishing between 'background' and elevated concentrations of metals at an abandoned mine site poses difficulties in this respect.

To assist in selecting metallic element threshold values, CSA collected groups of orientation samples from non-contaminated areas and others from suspected contaminated areas. The results of analyses conducted on the orientation samples and the results of the wider in-field sampling and analysis work were then used to generate 'Cut-off Values', which represent estimated metal concentrations in soil that might be considered to be 'background' concentrations. The CSA (2011) 'Cut-Off Values' are presented in Table 2 below.

Table 2 Previously estimated metal 'cut-off values' for background and contaminated soils (CSA, 2011)

Chemical	'Cut-off' Values' ppm / mg/kg
Arsenic	200
Chromium	300
Copper	2,000
Iron	15 %
Lead	1,000
Manganese	7,000
Nickel	600
Rubidium	200
Strontium	50
Uranium	100
Vanadium	350
Zinc	3,000

4. Site specific HIL development

4.1 Health investigation levels

The National Environment Protection (Assessment of Contaminated Sites) Measure (NEPM) was published by the National Environment Protection Council in 1999 and amended in 2013 (NEPC, 2013). The HILs presented in the NEPM are generic screening criteria for assessing human health risks associated with exposure to contamination for generic land use settings. These settings include:

- HIL-A: Low density residential use
- HIL-B: High density residential use
- HIL-C: Recreation and public open space
- HIL-D: Commercial and industrial use

The HILs are presented in Table 3 below. The HILs have been derived such that if contaminant concentrations are below, there is unlikely to be any concern of health over a lifetime of exposure for that contaminant and land use setting. An exceedance however, does not necessarily mean that unacceptable risk is present, though does indicate that further action (e.g. investigation or management) is warranted.

The HIL land uses do not correspond directly to the land use scenarios described in Section 2. However, there are similarities between these scenarios and those presented in the NEPM, in that there are similar exposure routes considered. HIL-A represents permanent occupation of a site by adults and children. HIL-C represents exposure in outdoor environments. HIL-D represents a workplace exposure setting.

Table 3 Health Investigation Levels (mg/kg)

Chemical	Low density Residential (HIL-A)	Open Space / Recreation (HIL-C)	Commercial / Industrial (HIL-D)
Arsenic	100	300	3,000
Beryllium	70	90	500
Boron	4,500	20,000	300,000
Cadmium	15	90	900
Chromium (VI)	80	300	3,600
Cobalt	100	300	4,000
Copper	6,000	17,000	240,000
Lead	300	600	1,500
Manganese	3,800	19,000	60,000
Mercury (inorganic)	40	80	730
Methyl mercury	7	13	180
Nickel	400	1,200	6,000
Selenium	200	700	10,000
Zinc	7,400	30,000	400,000
Cyanide (free)	200	240	1,500

4.2 Temporary occupation

As shown in Section 2, this scenario is described as infrequent but possibly temporary occupation, primarily by traditional owner groups. Envisaged modes of land use may include temporary gatherings, recreational, ceremonial or cultural events, contemplative activities and the practice of traditional bushfood gathering, including from watercourses.

The application of the open space HILs to temporary exposure/occupation (HIL-C) is consistent with the temporary occupation scenario given in Section 2 where:

- Home-grown produce consumption is not considered;
- Exposure occurs in the outdoors and not in an enclosed building;
- Adults and children are considered, with children usually the most sensitive receptors due to lower body weight and higher level of hand to mouth activities. The NEPM uses parameters that represent a child of 2 to 3 years of age to derive HIL-C.

The following parameters have direct effect on the development of site specific criteria to be applied to the Rum Jungle.

4.2.1 Exposure frequency

The number of days exposed per year is a direct correlation to risk and the development of the HILs. HIL-C is based on 365 days per year exposure.

The scenario for temporary occupation for events occurring within Rum Jungle is estimated be for 35 days per year. This is a tenfold reduction in risk when compared to the default exposure scenario for recreation and public open space (i.e. a site specific criteria is 10 times HIL-C).

4.2.2 Exposure time (and soil ingestion rate)

The number of hours per day exposure has two possible effects on criteria:

- The exposure time increases the amount of dust inhaled. HIL-C criteria are based on 2 hours exposure per day, whereas during events attended by temporary occupants exposure is likely to occur 24 hours per day during their stay. This is a 12 fold increase on inhalation risk, however for most metals, inhalation risk makes up less than 1% of the total risk (the greatest contribution is usually ingestion), and therefore this increase is very small overall.
- The soil ingestion rate is based on a daily quantity, not hourly, but one would expect that being present for 24 hours per day would result in an increase of soil ingestion rate when compared to exposure based on 2 hours per day. The assumed soil ingestion rate for children used to derive HIL-C criteria is 50 mg/d, and adults is 25 mg/d. If comparing to HIL-A (low density residential), where exposure is for 20 hours per day indoors and 4 hours per day outdoors, the ingestion rates for children and adults are 100 mg/d and 50 mg/d, respectively, i.e. double that for HIL-C. Therefore it is considered appropriate to use 2 times the soil ingestion rate of HIL-C as applicable for the temporary occupation scenario. In the case of most metals, this directly relates to a decrease factor of 2 to HIL-C.

4.2.3 Soil ingestion rate

In addition to the increase in the ingestion rate due to higher exposure time (discussed above), there is some uncertainty associated with soil ingestion accompanying food preparation. While growing produce is considered unlikely for the area, hunting and food gathering activities may still occur as part of cultural activities associated with events. Activities may include the practice of traditional bushfood and hunting of animals such as snake, kangaroo and buffalo. These foods may contain additional contaminated soil on their exterior if not adequately cleaned prior

to cooking/consumption. Likewise, preparation/cooking of food in outdoor dusty environments may contribute to the additional amount of incidental soil ingestion rate.

The level of increase is unknown and is a data gap in the derivation of site specific health based criteria. For the purpose of assessment, an allowance factor of 2 for soil ingestion rate has been applied.

4.2.4 Dust levels

The dust particle emission factor (PEF) parameter in the NEPM HIL calculations are related to a number of other parameters such as vegetation cover and annual average wind speed. Moving from a low dust area of land that is landscaped, to a dust region with no landscaped gardens may result in the PEF increasing by a few orders of magnitude. However, the inhalation of dust risk component contributes less than 1 % of total exposure and therefore increasing the PEF is unlikely to result in a significant impact on the overall site specific criteria.

For the purpose of deriving site specific criteria for temporary occupation at Rum Jungle, a factor of 10 increase to the dust level has been applied (e.g. the PEF is divided by 10, which results in the factor being 10 times more conservative for dust exposure).

4.2.5 Bioavailability

Bioavailability is the proportion of the mass of a chemical ingested compared with the amount of the chemical absorbed or metabolised. Chemicals with high bioavailability are strongly taken into human biological systems and contribute to the risk of health detriment. Chemicals with low bioavailability are not absorbed and pass through the digestive system unabsorbed and do not have an effect on the individual's health.

All chemicals, particularly metals, behave differently and are effected by:

- solubility of the chemical at varying pH within the digestive system
- reactions with different enzymes in the digestive system
- mineralogy of the metal
- electrochemistry and valence state of the metal
- Co-presence of other chemicals.

Given the uncertainty and range of values for the bioavailability for different chemicals in different environments and from different source types, the NEPM uses a default value of 100% for oral bioavailability factor for deriving HILs. This is considered to be a conservative, but reasonable assumption for the site given the uncertainty associated with available components from mining tailings and waste rock dump derivatives.

4.2.6 Summary

Table 4 compares the exposure parameters used to derive HIL-C and suggested site specific parameters (discussed above) to represent the temporary occupation scenario.

Table 4 Exposure parameters for temporary occupation scenario

Parameter	HIL-C default	Site specific value for temporary occupation
Exposure frequency (d/y)	365	35
Exposure time (h/d)	2	24
Soil ingestion rate – child (mg/d)	50	200
Soil ingestion rate – adult (mg/d)	25	100
Particle Emission Factor (m^3/kg)	2.6×10^7	2.6×10^6
Bioavailability	Chemical specific	No change

The NEPM HIL calculator spreadsheet has been used with the site specific parameters presented in Table 4, and is located in Appendix A. The resulting derived proposed site specific criteria for temporary occupation scenario compared to HIL-C is presented in Table 5.

Table 5 Derived soil criteria for temporary occupation and occasional visits (mg/kg)

Chemical	Open space / recreation (HIL-C)	Site specific criteria for temporary occupation
Arsenic	300	700
Beryllium	90	400
Boron	20,000	50,000
Cadmium	90	100
Chromium (VI)	300	600
Cobalt	300	800
Copper	17,000	44,000
Manganese	19,000	7,500
Mercury (inorganic)	80	300
Methyl mercury	13	36
Nickel	1,200	870
Selenium	700	2,000
Zinc	30,000	80,000
Cyanide (free)	240	1,400

The results presented in Table 5 show that for most of the metals the derived criteria for temporary occupation is less stringent than the NEPM HIL-C. The exceptions are manganese and nickel. This is because these chemicals are particularly toxic through inhalation, and the added risk by increasing the level of dust has resulted in the inhalation pathway becoming more significant in the criteria derivation.

4.3 Occasional visits

As outlined in Section 2, this scenario is described as infrequent visits, primarily by traditional owner groups. Envisaged modes of land use may include temporary gatherings, recreational, ceremonial or cultural events or contemplative activities.

Occupancy is estimated to occur for 4 days per year, 12 hours per day. This occupancy rate is lower than the temporary occupation scenario presented in Section 2, and therefore, the derived site specific criteria for temporary occupation is protective of this scenario (Table 5).

4.4 Site maintenance

This scenario includes:

- Ranger type activities
- Capping maintenance, erosion/sediment earthworks/repair, weed management, fire management
- Ongoing monitoring activities, landform function analysis, water/groundwater sampling

The commercial / industrial scenario used to derive the HIL-D is similar to the site maintenance scenario discussed in Section 2 where:

- Only adults are considered
- Exposure considers an 8 hour working day

The following parameters have direct effect on the development of the site specific criteria.

4.4.1 Exposure frequency

The number of days exposed per year is a direct correlation to risk and the development of the HILs. HIL-D is based on 240 days per year exposure.

The exposure frequency of the site maintenance activities is estimated as 100 days per year. This is a 2.4 factor reduction in risk compared to the default exposure scenario for commercial / industrial worker (i.e. a site specific criteria is 2.4 times HIL-D).

4.4.2 Soil ingestion rate

The soil ingestion rate assumed in the NEPM HIL-D is 25 mg/d, which is half the value used for adults in low density residential setting (HIL-A). This soil ingestion rate is suitable workers exposed to fugitive dust in a work place environment, but not suitable for exposure where a worker is directly involved with regular contact and excavation in contaminated soil.

USEPA (2002) publish a soil ingestion rate of 330 mg/d as an upper value associated with construction workers. This is a factor of 13 higher than that assumed in the derivation of HIL-D and has been used to derive the site specific criteria.

4.4.3 Dust levels

The dust particle emission factor (PEF) parameter in the NEPM HIL calculations are related to a number of other parameters such as vegetation cover and annual average wind speed. Moving from a low dust area of land that is landscaped to a dust region with no landscaped gardens could result in the PEF increasing by a few orders of magnitude. However, the inhalation risk component contributes less than 1 % of total exposure and therefore, increasing the PEF is not likely to result in a significant impact on the overall criteria.

For the purpose of deriving site specific criteria for site maintenance, a factor of 10 increase dust level has been applied (i.e. the PEF is divided by 10, which results in a factor of 10 more conservative result of dust exposure).

4.4.4 Bioavailability

Bioavailability is the proportion of the mass of a chemical ingested compared with the amount of the chemical absorbed or metabolised. Chemicals with high bioavailability are strongly taken into the human biological system and contribute to risk of adverse health impacts. Chemicals with low bioavailability are not absorbed and pass through the digestive system unabsorbed and do not have an effect on an individual's health.

As discussed above, given the uncertainty and range of values of bioavailability for different chemicals in different environments and from different source types, the NEPM uses a default value of 100% for oral bioavailability factor for deriving HILs.

4.4.5 Summary

Table 6 compares the exposure parameters used to derive HIL-D and site specific parameters (discussed above) to represent the Rum Jungle site maintenance scenario.

Table 6 Exposure parameters for site maintenance scenario

Parameter	HIL-D default	Suggested value for site maintenance
Exposure frequency (d/y)	240	100
Soil ingestion rate – adult (mg/d)	25	330
Particle Emission Factor (m^3/kg)	2.6×10^7	2.6×10^6
Bioavailability	Chemical specific	No change

The NEPM HIL calculator spreadsheet has been used with the site specific parameters presented in Table 6, and is located in Appendix A. The resulting derived criteria for site specific site worker scenario compared to HIL-C and HIL-D is presented in Table 7.

Table 7 Derived soil criteria for site maintenance (mg/kg)

Chemical	Open space / recreation (HIL-C)	Commercial / industrial (HIL-D)	Site specific criteria for site maintenance
Arsenic	300	3,000	700
Beryllium	90	500	400
Boron	20,000	300,000	50,000
Cadmium	90	900	100
Chromium (VI)	300	3,600	640
Cobalt	300	4,000	800
Copper	17,000	240,000	43,000
Manganese	19,000	60,000	8,000
Mercury (inorganic)	80	730	250
Methyl mercury	13	180	35
Nickel	1,200	6,000	900
Selenium	700	10,000	2,000
Zinc	30,000	400,000	80,000
Cyanide (free)	240	1,500	1,400

The results presented in Table 7 show that for most of the metals the site specific criteria for site maintenance is between NEPM HIL-C and HIL-D. The exception is nickel. This is because nickel is particularly toxic through inhalation and the added risk by increasing the level of dust has resulted in the inhalation pathway becoming more significant in the criteria derivation.

4.5 Lead

Lead is a unique chemical in the derivation of the NEPM HILs as the site specific criteria was derived using a USEPA lead biokinetics model rather than the HIL calculator spreadsheet. Lead was modelled specifically for low-density residential land use (HIL-A) only (300 mg/kg), with

arbitrary factors of 2 and 5 applied for public open space (600 mg/kg) and commercial / industrial (1,500 mg/kg) land use settings. There are significant considerations with deriving a site specific lead criterion for soil as follows.

In May 2015, the National Health and Medical Research Council (NHRMC) published a statement: *Evidence on the Effects of Lead on Human Health*, in which the NHMRC recommended that if a person has a blood lead level greater than 5 micrograms per decilitre, the source of exposure should be investigated and reduced, particularly if the person is a child or pregnant woman. The NEPM HIL for lead was based on the previous guideline value of 10 microgram per decilitre.

In selecting appropriate criteria for lead the following is considered:

- Lead exposure primarily occurs through ingestion (soil and dust) and inhalation. As seen for nickel, the site maintenance derived criteria is similar to the derived criteria for temporary occupation scenario
- Target blood lead level has been reduced since the derivation of the NEPM HILs

It is therefore recommended that the low density residential HIL-A value of 300 mg/kg for lead be adopted for both temporary occupation and site maintenance scenarios.

4.6 Development of non-generic investigation levels

Of all elevated metal concentrations present at Rum Jungle, only vanadium, iron and uranium have been identified which do not have published criteria in the NEPM. Vanadium poses a potential health risk at low concentrations and therefore require a site specific criteria to be developed however uranium and iron do not require further consideration as;

- Uranium risks are expected to be managed predominantly via radiation testing and assessment at the site
- Iron is generally not a risk to human health with background levels in soil at percent levels

The US EPA Regional Screening Levels (latest published May 2018) presents a residential soil criterion for vanadium of 390 mg/kg, and industrial criterion of 5,800 mg/kg.

Criteria for vanadium for temporary occupation and site maintenance has been derived utilising the NEPM HIL spreadsheet (refer to Appendix A) and using the chemical specific parameters presented by USEPA. These are:

- Oral Reference Dose of 0.005 mg/kg/d
- Inhalation Reference Concentration of 0.0001 mg/m^3
- Background intake of 0%
- GI absorption factor of 2.6%
- USEPA do not present a skin absorption coefficient. The highest coefficient used for any metal in the NEPM HILs is for arsenic at 0.005. This value has been adopted for vanadium.

The resulting vanadium criteria are presented in Table 8.

Table 8 Site specific soil criteria for vanadium (mg/kg)

Chemical	Regional screening level, residential	Site specific criteria for temporary occupation	Site specific criteria for site maintenance
Vanadium	390	1,400	1,500

4.7 Summary

Site specific soil criteria for protection of human health derived for anticipated future modes of land use for the former Rum Jungle mine site area are presented in Table 9.

Table 9 Summary of site specific soil criteria (mg/kg)

Chemical	Site specific criteria for temporary occupation	Site specific criteria for site maintenance
Arsenic	700	700
Beryllium	400	400
Boron	50,000	50,000
Cadmium	100	100
Chromium (VI)	600	640
Cobalt	800	800
Copper	44,000	43,000
Manganese	7,500	8,000
Mercury (inorganic)	300	250
Methyl mercury	36	35
Nickel	870	900
Selenium	2,000	2,000
Zinc	80,000	80,000
Cyanide (free)	1,400	1,400
Lead	300	300
Vanadium	1,400	1,500

5. Site specific HILs and cut-off values

A comparison of the site specific HILs derived for future land uses and the 'Cut-Off Values' derived from the CSA Global work of 2011 is presented in Table 10 below.

Background 'Cut-Off Values' developed by CSA that are more than 50% of the site specific HIL derived soil criteria for the Rum Jungle are shown in bold text. The bold and underlined cut-off value for lead is greater than the site specific soil criteria for lead, suggesting that naturally elevated lead concentrations in site soils may present health risks.

Based on these comparisons, the manner of assessing health risks posed by lead in soil (discussed in Section 4.5) and the representativeness of the CSA Cut-Off Value as a 'background' concentration for in soils of the site may require further assessment to validate that the site can be safely used for the predicted end uses discussed in this report.

Table 10 Comparison of modified HILs and background soil 'Cut-Off Values'

Chemical	Site specific criteria for temporary occupation	Site specific criteria for site maintenance	'Cut-off' values'
Arsenic	700	700	200
Beryllium	400	400	
Boron	50,000	50,000	
Cadmium	100	100	
Chromium (VI)	600	640	300*
Cobalt	800	800	
Copper	44,000	43,000	2,000
Cyanide (free)	1,400	1,400	
Iron			15 %
Lead	300	300	**1,000**
Manganese	7,500	8,000	**7,000**
Mercury (inorganic)	300	250	
Methyl mercury	36	35	
Nickel	870	900	**600**
Rubidium			200
Selenium	2,000	2,000	
Strontium			50
Uranium			100
Vanadium	1,400	1,500	350
Zinc	80,000	80,000	3,000

* Chromium Cut-Off Value was developed for total chromium, rather than the less naturally prevalent Cr VI valency form, which presents higher toxicity to humans and is therefore used in the site specific HIL calculations.

6. Site specific HIL and cut-off values in the context of remaining site soils and borrow material

This section provides a comparison between the site specific HIL values (Section 5) and the recorded heavy metal concentrations from soils in the Old Tailings Dam (OTD) area and the proposed borrow areas. A discussion on the measured copper concentrations in the OTD area is also presented in this section.

The purpose is to discuss the recorded metal concentrations in the remaining soils at the OTD and proposed borrow areas in the context of the adopted HIL and Cut-off-values.

6.1 Copper concentrations in Soil – Old Tailings Dam

Background

Between 1954 and 1961, tailings were discharged onto approximately 33 ha of low-lying land, which was bunded to form the 'Old Tailings Dam' area.

In the 1984 dry season, approximately 330,000 m^3 of remnant tailings and contaminated sub-soils were re-located from the Old Tailings Dam into the pre-drained Dyson's Pit. Although rehabilitation designs intended that sub-soils be removed to a depth of 0.3 m below the base of tailings, other reports suggest that on average only 0.2 m was over-excavated.

Therefore some residual contaminated soils remained and hydrated lime was ploughed into the area at a rate of 8 tonnes per hectare, prior to the placement of a gravelly topsoil cover to an average depth of 0.3 m.

Vegetation impacts post-1984 rehabilitation

During the 1984 rehabilitation works, the cover materials utilised for the OTD were obtained from neighbouring borrow areas (Borrow Area 3 immediately west of the Old Tailings Dam; and Borrow Area 5 north of Dyson's Pit). Results for these borrow materials are not known but given the proximity to the OTD, these may have been contaminated with residual copper concentrations from soil runoff originating from the OTD prior to excavation and removal of its original topsoils. Usage of these soils may potentially have had an influence in reintroducing copper concentrations at the OTD post-rehabilitation in 1984. In December 1984 the area was seeded with a mixture of grasses and legumes. (Ryan, 1986)

It was observed that vegetation dieback has occurred in this area over the years after the initial successful propagation. Likely causes to consider would be,

- Lack of maintenance,
- Increased fire risks (posed by the historical introduction of foreign grass species),
- Lack of a self-sustaining topsoil structure,
- Partially and varyingly attributable to the legacy of low soil pH (and therefore encouraging the increased solubility of ecotoxic heavy metals, including copper, manganese, zinc and aluminium under acidic soil conditions). Other elements critical to vegetation health also become less available at lower soil pH, including phosphorous and calcium. (Ryan, 1985).

In the context of the site specific health investigation levels

Table B1 in Appendix B illustrates the measured copper concentrations in sub-soils ranging from sample depths of 0.280m to 0.870m across the OTD based on data collected in 1984. These sampling depths correspond to the remnant sub-soils left behind post 1984 dry season excavation works.

Total copper concentrations within these depths ranged from 10-990 mg/kg and generally decreasing with depth. All recorded values did not exceed the adopted HIL-C, HIL-D and CSA Global "Cut-off values" for copper (refer Section 5).

6.2 Heavy metal concentrations with regard to Old Tailings Dam area remnant soils and proposed borrow areas

6.2.1 Recorded metal concentrations

Old Tailings Dam soils from CSA global 2010 study

Table B2 in Appendix B compares the measured concentrations of various metal concentration in the soils across the OTD in varying depths ranging from 0.1 to 4m.

- Majority of the exceedances to either the HIL-C, HIL-D and CSA Global "Cut-off Values" comprised the following metals:
  - Manganese (ranging from 7,528 to 27,945 mg/kg)
  - Vanadium (ranging from 366 to 478 mg/kg)
  - Nickel (ranging from 759 to 2488 mg/kg)
  - Lead (ranging from 1,223 to 78,662 mg/kg)
  - Arsenic (ranging from 361 to 19,532 mg/kg)

Proposed borrow areas

Table B3 in Appendix B compares the various metal concentrations in soils from the proposed borrow areas at varying depths ranging from 0.1 to 5.4m. None of the metal concentrations in the soil exceeded the adopted HIL-C, HIL-D and CSA Guideline "Cut-off" values. This illustrates that the proposed borrow areas are sited beyond the highly mineralised geological zones that the Rum Jungle mine targeted and potential use of this material would be of potential benefit in the rehabilitation works.

Discussion

Based on the observations, majority of the metal concentrations at the OTD area exhibit a relatively irregular trend with most exceedances randomly spaced at shallow or mid-depth. There seems no continuous trend of heavy metal concentrations at the various depths. This phenomenon is potentially indicative of either isolated remaining tailings or waste rock rather than a continuous layer of contamination. In general the recorded values for both the OTD soils and proposed borrow soils illustrate that most metal concentrations are several orders of magnitude below the proposed health risk assessment values.

7. References

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Appendices

Appendix A – Modified NEPM HIL calculations

Derivation of Investigation Levels

HIL C - Recreational (MODIFIED FOR TEMPORARY OCCUPATION FOR EVENTS SCENARIO)

Summary of Exposure Parameters		Abbreviation	units	Parameter	References/Notes
Soil and Dust Ingestion Rate	- Young children (0-5 years)	IR_{SC}	mg/day	200	4 times HIL-C
	- Adults	IR_{SA}	mg/day	100	4 times HIL-C
Surface Area of Skin	- Young children (0-5 years)	SA_C	cm^2/day	2700	As per enHealth (2012)
	- Adults	SA_A	cm^2/day	6300	As per enHealth (2012) for male and female combined
Soil-to-Skin Adherence Factor		AF	mg/cm^2/day	0.5	Schedule B7, Table 5
Time Spent Outdoors		ETo	hours	24	12 times HIL-C
Time Spent Indoors		ETi	hours	0	Schedule B7, Table 5
Lung Retention Factor		RF	-	0.375	Schedule B7, Table 5
Particulate Emission Factor		PEFo	(m^3/kg)	2.6E+06	10% of HIL-C
Outdoor Air-to-Soil Gas Attenuation Factor		α	-	0.05	Value adopted as discussed in Section 5.5 of Schedule B7
Body weight	- Young children (0-5 years)	BW_C	kg	15	Schedule B7, Table 5
	- Adults	BW_A	kg	70	Schedule B7, Table 5
Exposure Frequency		EF	days/year	35	10% of HIL-C
Exposure Duration	- Young children (0-5 years)	ED_C	years	6	Schedule B7, Table 5
	- Adults	ED_A	years	29	Schedule B7, Table 5
Averaging Time (non-carcinogenic)		AT_T	days	ED*365	Calculated based on ED for each relevant age group, multiplied by 24 hours for the assessment of inhalation exposures
Averaging Time (carcinogenic)		AT_{NT}	days	25550	Based on lifetime of 70 years, multiplied by 24 hours for the assessment of inhalation exposures

Threshold Calculations - Young Child Aged 2-3 years

Compound	Toxicity Reference Value Oral (TRV_O) (mg/kg/day)	GI Absorption (GAF) (unitless)	Toxicity Reference Value Dermal (TRV_D) (mg/kg/day)	Oral Bioavailability BA_O (%)	Dermal Absorption Factor (DAF) (unitless)	Background Intake Oral/Dermal (BI_O) (% of TDI)	Toxicity Reference Value Inhalation (TRV_I) (mg/m^3)	Background Intake Inhalation (BIi) (% of TC)		Pathway Specific HILs (mg/kg)			Soil Vapour HIL (mg/m^3) (eqn 12)	Derived Interim Soil Gas HIL - Threshold (to 1 or 2 s.f.) (mg/m3)	Derived Soil HIL (not rounded) (mg/kg) (eqn 2 for relevant pathways)	Derived Soil HIL (to 1 or 2 s.f.) (mg/kg)	Notes
										Soil Ingestion (eqn 3)	Dermal (eqn 6)	Dust (eqn 9)					
arsenic	0.002	1	0.002	100%	0.005	50%	0.001	0%		7.8E+02	2.3E+04	7.1E+04			749	**700**	
beryllium	0.002	0.007	0.000014	100%	0.001	30%	0.000020	0%		1.1E+03	1.1E+03	1.4E+03			401	**400**	
boron	0.2			100%		65%	0.7	65%		5.5E+04	NA	1.7E+07			54579	**50000**	
cadmium	0.0008			100%		60%	0.000005	20%		2.5E+02	NA	2.9E+02			133	**100**	
chromium (VI)	0.001			100%		10%	0.0001	0%		7.0E+02	NA	7.1E+03			641	**600**	
cobalt	0.001	1	0.0014	100%	0.001	20%	0.0001	0%		8.8E+02	1.3E+05	7.1E+03			775	**800**	
copper	0.14			100%		60%	0.49	60%		4.4E+04	NA	1.4E+07			43663	**44000**	
manganese	0.16			100%		50%	0.00015	20%		6.3E+04	NA	8.6E+03			7527	**7500**	
methyl mercury	0.00023	1	0.00023	100%	0.001	80%	0.000805	80%		3.6E+01	5.3E+03	1.1E+04			36	**36**	
mercury (inorganic)	0.0006	0.07	0.000042	100%	0.001	40%	0.0002	10%		2.8E+02	2.9E+03	1.3E+04			252	**300**	
nickel	0.012	1	0.012	100%	0.005	60%	0.00002	20%		3.8E+03	1.1E+05	1.1E+03			868	**870**	
selenium	0.006			100%		60%	0.021	60%		1.9E+03	NA	6.0E+05			1871	**2000**	
zinc	0.5	1	0.5	100%	0.001	80%	1.75	80%		7.8E+04	1.2E+07	2.5E+07			77449	**80000**	
cyanide (free) (no VI)	0.006	1	0.006	100%	0.1	50%	0.0008	0%		2.3E+03	3.5E+03	5.7E+04			1367	**1400**	
TCE							0.002	10%		NA	NA	NA	3.8E-01	**0.4**			
1,1,1-TCA							5	0%		NA	NA	NA	1.0E+03	**1043**			
PCE							0.2	10%		NA	NA	NA	3.8E+01	**40**			
cis-1,2-dichloroethene							0.007	0%		NA	NA	NA	1.5E+00	**1**			
phenol	0.7	1	0.7	100%	0.1	30%	0.035	30%		3.8E+05	5.7E+05	1.7E+06			202309	**200000**	
pentachlorophenol	0.003	1	0.003	100%	0.24	0%	0.0105	0%		2.3E+03	1.4E+03	7.5E+05			895	**890**	
cresols	0.1	1	0.1	100%	0.1	50%	0.35	50%		3.9E+04	5.8E+04	1.2E+07			23304	**20000**	
DDX	0.002	1	0.002	100%	0.018	0%	0.007	0%		1.6E+03	1.3E+04	5.0E+05			1391	**1000**	
aldrin and dieldrin	0.0001	1	0.0001	100%	0.1	10%	0.00035	10%		7.0E+01	1.0E+02	2.2E+04			41.9	**10**	
chlordane	0.0005	1	0.0005	100%	0.04	0%	0.00175	0%		3.9E+02	1.4E+03	1.2E+05			307	**300**	
endosulfan	0.006	1	0.006	100%	0.1	30%	0.021	30%		3.3E+03	4.9E+03	1.0E+06			1958	**2000**	
endrin	0.0002	1	0.0002	100%	0.1	0%	0.0007	0%		1.6E+02	2.3E+02	5.0E+04			93	**90**	
heptachlor	0.0001	1	0.0001	100%	0.1	0%	0.00035	0%		7.8E+01	1.2E+02	2.5E+04			46.6	**10**	
HCB	0.00016	1	0.00016	100%	0.1	0%	0.00056	0%		1.3E+02	1.9E+02	4.0E+04			75	**70**	
methoxychlor	0.005	1	0.005	100%	0.1	0%	0.0175	0%		3.9E+03	5.8E+03	1.2E+06			2330	**2000**	
mirex	0.0002	1	0.0002	100%	0.1	0%	0.0007	0%		1.6E+02	2.3E+02	5.0E+04			93	**90**	
toxaphene	0.00035	1	0.00035	100%	0.1	10%	0.001225	10%		2.5E+02	3.7E+02	7.9E+04			147	**100**	
2,4,5-T	0.01	1	0.01	100%	0.1	0%	0.035	0%		7.8E+03	1.2E+04	2.5E+06			4661	**5000**	
2,4-D	0.01	1	0.01	100%	0.05	0%	0.035	0%		7.8E+03	2.3E+04	2.5E+06			5834	**5800**	
MCPA	0.01	1	0.01	100%	0.1	0%	0.035	0%		7.8E+03	1.2E+04	2.5E+06			4661	**5000**	
MCPB	0.01	1	0.01	100%	0.1	0%	0.035	0%		7.8E+03	1.2E+04	2.5E+06			4661	**5000**	
mecoprop	0.01	1	0.01	100%	0.1	0%	0.035	0%		7.8E+03	1.2E+04	2.5E+06			4661	**5000**	
picloram	0.07	1	0.07	100%	0.1	0%	0.245	0%		5.5E+04	8.1E+04	1.7E+07			32626	**33000**	
atrazine	0.005	1	0.005	100%	0.1	0%	0.0175	0%		3.9E+03	5.8E+03	1.2E+06			2330	**2000**	
chlorpyrifos	0.003	1	0.003	100%	0.03	50%	0.0105	50%		1.2E+03	5.8E+03	3.7E+05			973	**970**	
bifenthrin	0.01	1	0.01	100%	0.1	10%	0.035	10%		7.0E+03	1.0E+04	2.2E+06			4195	**4200**	
PCBs	0.00002	1	0.00002	100%	0.14	0%	0.00007	0%		1.6E+01	1.7E+01	5.0E+03			8.0	**8**	
PBDE Flame Retardants (Br1-Br9)	0.0001	1	0.0001	100%	0.1	80%	0.00035	80%		1.6E+01	2.3E+01	5.0E+03			9.3	**9**	
Vanadium	0.005	0.026	0.00013	100%	0.005	0%	0.0001	0%		3.9E+03	3.0E+03	7.1E+03			1373.9	**1400**	

NA Pathway not of significance for chemical assessed (refer to Appendix A for chemical-specific details)

Non-Threshold Effects - Lifetime Exposures [young child and adult]

Compound	Toxicity Reference Value Oral (TRV_O) $(mg/kg/day)^{-1}$	GI Absorption (GAF) (unitless)	Non-Threshold Slope Factor Dermal (SFd) $(mg/kg/day)^{-1}$	Oral Bioavailability BA_O (%)	Dermal Absorption Factor (DAF) (unitless)		Toxicity Reference Value Inhalation (TRV_I) (mg/m^3) [1]		Target Risk (TR)	Pathway Specific HILs (mg/kg)			Soil Vapour HIL (mg/m^3) (eqns 13 and 14)	Derived Interim Soil Gas IL - Threshold (to 1 or 2 s.f.) (mg/m3)	Derived Soil HIL (not rounded) (mg/kg) (eqn 2 for relevant pathways)	Derived Soil HIL (to 1 or 2 s.f.) (mg/kg)	Notes
										Soil Ingestion (eqns 4 and 5)	Dermal (eqns 7 and 8)	Dust (eqns 10 and 11)					
TCE							0.004		1E-05	NA	NA	NA	1.0E+00	**1**			
vinyl chloride							0.0088		1E-05	NA	NA	NA	4.7E-01	**0.5**			
benzo(a)pyrene	0.5	1	0.5	100%	0.06		1.43E-01		1E-05	1.2E+02	1.3E+02	1.0E+04			62.5	**60**	1
benzo(a)pyrene (Early-Life)	0.5	1	0.5	100%	0.06		1.43E-01		1E-05	2.9E+01	4.8E+01	3.7E+03			18.1	**20**	1

NA Pathway not of significance for chemical assessed (refer to Appendix A for chemical-specific details)

1 Refer to Appendix A for discussion on different calculations conducted for benzo(a)pyrene and basis for HIL adopted

Derivation of Investigation Levels

HIL D - Commercial/Industrial (MODIFIED FOR SITE MAINTENANCE SCENARIO)

Summary of Exposure Parameters	Abbreviation	units	Parameter	References/Notes
Soil and Dust Ingestion Rate - Adults	IR_{SA}	mg/day	330	HIL-D was 25 mg/d
Surface Area of Skin - Adults	SA_A	cm^2/day	3800	Based on 19% total skin area of 20000 cm^2 exposed (Schedule B7, Table 5)
Soil-to-Skin Adherence Factor	AF	mg/cm^2/day	0.5	Schedule B7, Table 5
Time Spent Outdoors	ETo	hours	8	Schedule B7, Table 5
Time Spent Indoors	ETi	hours	0	Schedule B7, Table 5
Lung Retention Factor	RF	-	0.375	Schedule B7, Table 5
Particulate Emission Factor	PEFo	(m^3/kg)	2.6E+06	10% HIL-D
Indoor Air Dust Factor	PEFi	(m^3/kg)	2.6E+06	10% HIL-D
Fraction of indoor dust comprised of outdoor soil	TF	-	0.5	Assume 50% soil concentration present in dust as noted in Schedule B7
Indoor Air-to-Soil Gas Attenuation Factor	α	-	0.1	Value adopted as discussed in Section 5.5 of Schedule B7
Body weight - Adults	BW_C	kg	70	Schedule B7, Table 5
Exposure Frequency	EF	days/year	100	HIL-D was 240 d/y
Exposure Duration - Adults	ED_C	years	30	Schedule B7, Table 5
Averaging Time (non-carcinogenic)	AT_T	days	ED*365	Calculated based on ED for each relevant age group, multiplied by 24 hours for the assessment of inhalation exposures
Averaging Time (carcinogenic)	AT_{NT}	days	25550	Based on lifetime of 70 years, multiplied by 24 hours for the assessment of inhalation exposures

Threshold Calculations - Adult Worker

Compound	Toxicity Reference Value Oral (TRV_O) (mg/kg/day)	GI Absorption (GAF) (unitless)	Toxicity Reference Value Dermal (TRV_D) (mg/kg/day)	Oral Bioavailability BA_O (%)	Dermal Absorption Factor (DAF) (unitless)	Background Intake Oral/Dermal (BI_O) (% of TDI)	Toxicity Reference Value Inhalation (TRV_I) (mg/m^3)	Background Intake Inhalation (BIi) (% of TC)		Pathway Specific HILs (mg/kg)			Soil Vapour HIL (mg/m^3) (eqn 12)	Derived Interim Soil Gas HIL - Threshold (to 1 or 2 s.f.) (mg/m3)	Derived Soil HIL (not rounded) (mg/kg) (eqn 2 for relevant pathways)	Derived Soil HIL (to 1 or 2 s.f.) (mg/kg)
										Soil Ingestion (eqn 3)	Dermal (eqn 6)	Dust (eqn 9)				
arsenic	0.002	1	0.002	100%	0.005	50%	0.001	0%		7.7E+02	2.7E+04	7.5E+04			745	**700**
beryllium	0.002	0.007	0.000014	100%	0.001	30%	0.000020	0%		1.1E+03	1.3E+03	1.5E+03			426	**400**
boron	0.2			100%		65%	0.7	65%		5.4E+04	NA	1.8E+07			54037	**50000**
cadmium	0.0008			100%		60%	0.000005	20%		2.5E+02	NA	3.0E+02			136	**100**
chromium (VI)	0.001			100%		10%	0.0001	0%		7.0E+02	NA	7.5E+03			637	**640**
cobalt	0.001	1	0.0014	100%	0.001	20%	0.0001	0%		8.7E+02	1.5E+05	7.5E+03			773	**800**
copper	0.14			100%		60%	0.49	60%		4.3E+04	NA	1.5E+07			43230	**43000**
manganese	0.16			100%		50%	0.00015	20%		6.2E+04	NA	9.0E+03			7846	**8000**
methyl mercury	0.00023	1	0.00023	100%	0.001	80%	0.000805	80%		3.6E+01	6.2E+03	1.2E+04			35	**35**
mercury (inorganic)	0.0006	0.07	0.000042	100%	0.001	40%	0.0002	10%		2.8E+02	3.4E+03	1.3E+04			253	**250**
nickel	0.012	1	0.012	100%	0.005	60%	0.00002	20%		3.7E+03	1.3E+05	1.2E+03			900	**900**
selenium	0.006			100%		60%	0.021	60%		1.9E+03	NA	6.3E+05			1853	**2000**
zinc	0.5	1	0.5	100%	0.001	80%	1.75	80%		7.7E+04	1.3E+07	2.6E+07			76756	**80000**
cyanide (free) (no VI)	0.006	1	0.006	100%	0.1	50%	0.0008	0%		2.3E+03	4.0E+03	6.0E+04			1439	**1400**
TCE							0.002	10%		NA	NA	NA	#DIV/0!	**#DIV/0!**		
1,1,1-TCA							5	0%		NA	NA	NA	#DIV/0!	**#DIV/0!**		
PCE							0.2	10%		NA	NA	NA	#DIV/0!	**#DIV/0!**		
cis-1,2-dichloroethene							0.007	0%		NA	NA	NA	#DIV/0!	**#DIV/0!**		
phenol	0.7	1	0.7	100%	0.1	30%	0.035	30%		3.8E+05	6.6E+05	1.8E+06			212826	**210000**
pentachlorophenol	0.003	1	0.003	100%	0.24	0%	0.0105	0%		2.3E+03	1.7E+03	7.9E+05			974	**970**
cresols	0.1	1	0.1	100%	0.1	50%	0.35	50%		3.9E+04	6.7E+04	1.3E+07			24521	**25000**
DDX	0.002	1	0.002	100%	0.018	0%	0.007	0%		1.5E+03	1.5E+04	5.2E+05			1399	**1400**
aldrin and dieldrin	0.0001	1	0.0001	100%	0.1	10%	0.00035	10%		7.0E+01	1.2E+02	2.4E+04			44.1	**44**
chlordane	0.0005	1	0.0005	100%	0.04	0%	0.00175	0%		3.9E+02	1.7E+03	1.3E+05			314	**310**
endosulfan	0.006	1	0.006	100%	0.1	30%	0.021	30%		3.3E+03	5.6E+03	1.1E+06			2060	**2000**
endrin	0.0002	1	0.0002	100%	0.1	0%	0.0007	0%		1.5E+02	2.7E+02	5.2E+04			98	**100**
heptachlor	0.0001	1	0.0001	100%	0.1	0%	0.00035	0%		7.7E+01	1.3E+02	2.6E+04			49.0	**50**
HCB	0.00016	1	0.00016	100%	0.1	0%	0.00056	0%		1.2E+02	2.2E+02	4.2E+04			78	**80**
methoxychlor	0.005	1	0.005	100%	0.1	0%	0.0175	0%		3.9E+03	6.7E+03	1.3E+06			2452	**2500**
mirex	0.0002	1	0.0002	100%	0.1	0%	0.0007	0%		1.5E+02	2.7E+02	5.2E+04			98	**100**
toxaphene	0.00035	1	0.00035	100%	0.1	10%	0.001225	10%		2.4E+02	4.2E+02	8.3E+04			154	**150**
2,4,5-T	0.01	1	0.01	100%	0.1	0%	0.035	0%		7.7E+03	1.3E+04	2.6E+06			4904	**5000**
2,4-D	0.01	1	0.01	100%	0.05	0%	0.035	0%		7.7E+03	2.7E+04	2.6E+06			5998	**6000**
MCPA	0.01	1	0.01	100%	0.1	0%	0.035	0%		7.7E+03	1.3E+04	2.6E+06			4904	**5000**
MCPB	0.01	1	0.01	100%	0.1	0%	0.035	0%		7.7E+03	1.3E+04	2.6E+06			4904	**5000**
mecoprop	0.01	1	0.01	100%	0.1	0%	0.035	0%		7.7E+03	1.3E+04	2.6E+06			4904	**5000**
picloram	0.07	1	0.07	100%	0.1	0%	0.245	0%		5.4E+04	9.4E+04	1.8E+07			34330	**34000**
atrazine	0.005	1	0.005	100%	0.1	0%	0.0175	0%		3.9E+03	6.7E+03	1.3E+06			2452	**2500**
chlorpyrifos	0.003	1	0.003	100%	0.03	50%	0.0105	50%		1.2E+03	6.7E+03	3.9E+05			988	**1000**
bifenthrin	0.01	1	0.01	100%	0.1	10%	0.035	10%		7.0E+03	1.2E+04	2.4E+06			4414	**4400**
PCBs	0.00002	1	0.00002	100%	0.14	0%	0.00007	0%		1.5E+01	1.9E+01	5.2E+03			8.6	**9**
PBDE Flame Retardants (Br1-Br9)	0.0001	1	0.0001	100%	0.1	80%	0.00035	80%		1.5E+01	2.7E+01	5.2E+03			9.8	**10**
Vanadium	0.005	0.026	0.00013	100%	0.005	0%	0.0001	0%		3.9E+03	3.5E+03	7.5E+03			1475.2	**1500**

NA Pathway not of significance for chemical assessed (refer to Appendix A for chemical-specific details)

Non-Threshold Effects - Lifetime Exposures [adult]

Compound	Toxicity Reference Value Oral (TRV_O) (mg/kg/day)$^{-1}$	GI Absorption (GAF) (unitless)	Non-Threshold Slope Factor Dermal (SFd) (mg/kg/day)$^{-1}$	Oral Bioavailability BA_O (%)	Dermal Absorption Factor (DAF) (unitless)		Toxicity Reference Value Inhalation (TRV_I) (mg/m^3) [1]		Target Risk (TR)	Pathway Specific HILs (mg/kg)			Soil Vapour HIL (mg/m^3) (eqns 13 and 14)	Derived Interim Soil Gas IL - Threshold (to 1 or 2 s.f.) (mg/m3)	Derived Soil HIL (not rounded) (mg/kg) (eqn 2 for relevant pathways)	Derived Soil HIL (to 1 or 2 s.f.) (mg/kg)
										Soil Ingestion (eqns 4 and 5)	Dermal (eqns 7 and 8)	Dust (eqns 10 and 11)				
TCE							0.004		1E-05	NA	NA	NA	#DIV/0!	**#DIV/0!**		
vinyl chloride							0.00880		1E-05	NA	NA	NA	#DIV/0!	**#DIV/0!**		
benzo(a)pyrene	0.5	1	0.5	100%	0.06		1.43E-01		1E-05	3.6E+01	1.0E+02	1.2E+04			26.8	**30**

Appendix B – Comparison tables HIL criteria versus soils

Table B1 – Total and Water Soluble Copper Concentrations Measured 1984 in Sub-soil of the Old Tailings Dam Area

Table B2 – Metal Concentrations Across the Old Tailings Dam Area Measured via XRF in 2010

Table B3 – Metal Concentrations In Proposed Borrow Material Soils

TABLE B1: Total and Water Soluble Copper Concentrations Measured 1984 in Sub-soil of the Old Tailings Dam Area

			Sample Location	1.10	2.70	2.80	2.90	2.10	3.80	3.90	3.10	4.10	4.11	4.12	4.13	4.14
			Sample Depth (mm)	300	360	440	710	840	280	530	700	270	410	510	640	870
			Corrected Sample depth (mm)	400	460	540	810	940	380	630	800	370	510	610	740	970
Compound	**HIL C - Recreational (*MODIFIED FOR TEMPORARY OCCUPATION SCENARIO*)**	**HIL D - Commercial/Industrial (*MODIFIED FOR SITE MAINTENANCE SCENARIO*)**	**CSA Global 'Cut-off Values' (*PROXY BACKGROUND FOR MINERALISED ZONE*)**													
copper (total)	44000	43000	2000	580	600	260	110	300	270	20	20	190	10	20	10	20
copper (soluble)				169	14	1.5	1.2	11.5	4.4	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3

			Sample Location	5.12	5.13	5.14	5.15	6.11	6.12	6.13	6.14	7.70	7.80	7.90	7.10	8.12
			Sample Depth (mm)	250	400	500	700	240	390	720	870	280	490	660	840	300
			Corrected Sample depth (mm)	350	500	600	800	340	490	820	970	380	590	760	940	400
Compound	**HIL C - Recreational (*MODIFIED FOR TEMPORARY OCCUPATION SCENARIO*)**	**HIL D - Commercial/Industrial (*MODIFIED FOR SITE MAINTENANCE SCENARIO*)**	**CSA Global 'Cut-off Values' (*PROXY BACKGROUND FOR MINERALISED ZONE*)**													
copper (total)	44000	43000	2000	20	30	20	20	10	10	20	20	90	20	20	20	30
copper (soluble)*				<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	<0.3	6.8	<0.3	<0.3	<0.3	0.4

			Sample Location	8.13	9.70	9.80	10.13	11.80	11.90	11.10	11.11	12.12	13.80	13.90	13.10	13.11
			Sample Depth (mm)	400	280	480	300	240	340	440	740	330	240	500	630	800
			Corrected Sample depth (mm)	500	380	580	400	340	440	540	840	430	340	600	730	900
Compound	**HIL C - Recreational (*MODIFIED FOR TEMPORARY OCCUPATION SCENARIO*)**	**HIL D - Commercial/Industrial (*MODIFIED FOR SITE MAINTENANCE SCENARIO*)**	**CSA Global 'Cut-off Values' (*PROXY BACKGROUND FOR MINERALISED ZONE*)**													
copper (total)	44000	43000	2000	20	140	140	280	30	20	50	40	15	180	300	230	260
copper (soluble)*				<0.3	<0.3	<0.3	<0.3	1	0.7	3	3	8	0.9	8	7	5

			Sample Location	14.11	14.12	14.13	15.70	15.80	15.90	16.40	16.50	16.60	16.70	17.50	17.60	17.70
			Sample Depth (mm)	280	410	570	220	280	420	200	300	400	470	270	350	450
			Corrected Sample depth (mm)	380	510	670	320	380	520	300	400	500	570	370	450	550
Compound	**HIL C - Recreational (*MODIFIED FOR TEMPORARY OCCUPATION SCENARIO*)**	**HIL D - Commercial/Industrial (*MODIFIED FOR SITE MAINTENANCE SCENARIO*)**	**CSA Global 'Cut-off Values' (*PROXY BACKGROUND FOR MINERALISED ZONE*)**													
copper (total)	44000	43000	2000	100	70	50	80	60	10	940	990	950	640	119	330	130
copper (soluble)*				0.4	<0.3	<0.3	<0.3	0.3	<0.3	41	34	20	9	<0.3	0.3	<0.3

Data Source: Australian Nuclear Science and Technology Organisation. September 1987. *The Rum Jungle Tailings Dam – Chemical Profile of the Subsoil*.

NOTES:

* Copper (soluble) represents water extractable copper

Sample depth refers to depth (in millimetres) beneath the '*interface*' i.e. the inferred original ground level beneath tailings, as reported by ANSTO.

Corrected depths include the addiiton of 100-mm to the reported ANSTO depth. Rehabilitation works completed in 1984 involved the removal of 200-mm of sub-soil (on average) beneath the tailings, prior to the placement of 300-mm (on average) of rehabilitation soils (from 'Borrow Areas 3 and 5')

TABLE B2: Metal Concentrations Across the Old Tailings Dam Area Measured via XRF in 2010

Compound	HIL C - (Modified for Temporary Occupation Scenario)	HIL D - (Modified for Site Maint. Scenario)	CSA Global 'Cut-off Values' (Proxy Background)	Test Pit Reference	1057	1057	1058	1058	1058	1059	1059	1059	1060	1060	1061	1061	1062	1062	1063	1063	1063	1064	1064	1064	1065	1065	1066	1066	1067	1067	1068	1068	1069	1069	1070	1070	1071	1071	1072
				Sample Depth	0-0.1	0.1-0.2	0-0.1	0.1-0.2	0.2-0.3	0-0.1	0.1-0.2	0.2-0.3	0-0.1	0.1-0.2	0-0.1	0.1-0.2	0-0.1	0.1-0.2	0-0.1	0.1-0.2	0.2-0.3	0-0.1	0.1-0.2	0.2-0.3	0-0.1	0.1-0.2	0-0.1	0.1-0.2	0-0.1	0.1-0.2	0-0.1	0.1-0.2	0-0.1	0.1-0.2	0-0.1	0.1-0.2	0-0.1	0.1-0.2	0-0.1
arsenic	700	700	200		114.081	141.975	43.0445	47.3281	45.1711	14.7935	9.9641	5.4083	24.358	13.9696	25.2731	14.7935	7.652	13.1533	20.7736	33.851	25.2731	41.9926	25.2731	28.064	11.5435	12.3446	3.9505	4.6756	40.9483	49.5155	3.9505	2.5231	3.9505	1.8208	3.233	2.5231	3.233	2.5231	3.233
barium					712.391	695.569	350.694	466.047	416.07	116.385	83.065	54.049	105.554	56.9344	92.817	56.9344	111.456	166.225	304.727	307.91	313.223	1336.58	798.912	1022.08	104.572	82.092	126.273	116.385	740.198	1057.41	116.385	114.412	329.222	308.972	296.257	272.047	604.447	570.743	210.911
chromium (VI)	600	640			161.215	163.679	133.025	148.987	135.179	34.171	32.171	23.0522	70.347	60.2314	57.4222	55.5374	50.7834	78.4074	110.297	141.511	114.235	174.292	145.625	148.987	83.673	75.7422	17.9022	24.075	173.151	197.881	18.937	12.6922	14.7834	15.8254	23.0522	16.865	29.153	19.9694	10.5914
copper	44000	43000	2000		224.971	235.24	70.3984	74.4813	68.3572	241.403	124.549	83.6701	392.851	273.269	386.653	281.499	49.9936	52.0334	388.719	168.564	100.014	83.6701	63.2549	73.4605	20.4351	16.3607	16.3607	10.2503	40.8167	34.7005	20.4351	11.2686	16.3607	10.2503	18.3978	15.3422	116.368	52.0334	180.861
Iron			15%		9.42022	9.68481	9.75179	10.1153	10.3329	3.04763	2.68409	2.10002	3.6008	3.15401	3.57181	3.20129	3.55386	4.47019	6.36223	8.29026	7.26012	7.50227	5.81394	6.13658	4.93679	4.70218	1.74691	1.94194	10.5216	10.6978	1.3967	1.25106	1.71307	1.48201	1.67218	1.73767	1.53963	1.24465	1.58495
lead	300	300	**1000**		176.697	172.204	46.4301	56.5351		71.1317	30.712		80.1146	50.9212	77.8689	54.2895	34.0801	31.8347	110.434	71.1317		149.741	116.049		19.4852	16.1172	14.9945	10.504	137.387	159.849	17.2398	11.6266	19.4852	17.2398	22.8531	20.6078	55.4123	34.0801	44.1846
manganese	7500	8000	**7000**		4906.96	5146.23	2588.55	2938.02	2572.39	426.641	452.881	218.221	530.797	702.551	502.694	678.881	614.313	967.478	1735.95	2577.14	2703.79	**8819.64**	6061.56	**7528.17**	451.976	406.745	223.621	211.022	**7580.69**	**9731.22**	250.632	167.856	470.988	246.129	532.611	452.881	344.409	192.131	243.427
nickel	870	900	**600**		36.7654	39.8661	0	0	0	85.385	81.2437	85.385	78.1382	83.3143	81.2437	81.2437	59.5125	50.2045	56.4095	7.8425	35.7319	77.1031	92.6338	101.957	36.7654	32.6316	90.5625	87.4559	0	0	96.7768	97.8127	90.5625	92.6338	88.4914	90.5625	112.319	94.7052	108.173
rubidium			200		36.369	36.369	25.164	31.407	30.162	4.884	4.884	4.884	3.6012	0	4.884	0	9.9972	12.543	23.91	23.91	22.6542	15.0816	8.7216	11.271	20.1372	15.0816	33.8916	35.1312	51.0822	61.947	22.6542	21.3966	126.274	131.743	64.3416	72.666	207.423	211.233	60.747
strontium			50		18.5435	16.4441	12.2285	13.2845	12.2285	13.2845	6.9275	4.7973	18.5435	14.3391	17.4945	12.2285	9.0521	7.9905	17.4945	10.1123	11.1711	14.3391	12.2285	13.2845	11.1711	7.9905	11.1711	9.0521	27.9215	28.9565	12.2285	9.0521	23.7675	22.7255	26.8851	24.8081	42.2841	36.1623	20.6373
uranium			100		6.7471	3.2806	5.5924	7.901		23.9716	10.2064		56.7619	34.2199	56.7619	36.4885	11.3579	7.901	53.401	23.9716		4.4369	3.2806		2.1235	4.4369	0.9656	0.9656	7.901	15.9559	2.1235	0.9656	0	0	4.4369	5.5924	14.8076	3.2806	13.6585
Vanadium	1400	1500	350		266.017	294.678	188.786	220.237	215.855	67.2646	42.1195	24.9421	86.3067	67.2646	86.3067	67.2646	61.7412	102.27	155.532	200.226	143.219	384.709	301.971	309.117	72.7512	99.6322	39.2796	53.3871	339.452	402.25	24.9421	24.9421	47.7717	42.1195	61.7412	64.5075	153.088	125.593	61.7412
zinc	80000	80000	3000		22.6014	20.5856	18.5702	20.5856	0	21.5935	23.6095	19.5779	42.777	29.6593	49.8461	31.6765	23.6095	19.5779	63.9959	27.6423	26.634	50.8562	50.8562	56.919	20.5856	20.5856	17.5625	19.5779	27.6423	23.6095	20.5856	21.5935	18.5702	20.5856	16.555	19.5779	23.6095	17.5625	17.5625

Compound	HIL C - (Modified for Temporary Occupation Scenario)	HIL D - (Modified for Site Maint. Scenario)	CSA Global 'Cut-off Values' (Proxy Background)	Test Pit Reference	1072	1073	1073	1074	1074	1075	1075	1076	1076	1077	1077	1078	1078	1087	1087	1088	1088	1089	1089	1089	1090	1090	1091	1091	1098	1098	1099	1099	1100	1100	1101	1101	1108	1108	1109
				Sample Depth	0.1-0.2	0-0.1	0.1-0.2	0-0.1	0.1-0.2	0-0.1	0.1-0.2	0-0.1	0.1-0.2	0-0.1	0.1-0.2	0-0.1	0.1-0.2	0-0.1	0.1-0.2	0-0.1	0.1-0.2	0-0.1	0.1-0.2	0.2-0.3	0-0.1	0.1-0.2	0-0.1	0.1-0.2	0-0.1	0.1-0.2	0-0.1	0.1-0.2	0-0.1	0.1-0.2	0-0.1	0.1-0.2	0-0.1	0.1-0.2	0-0.1
arsenic	700	700	200		3.233	5.4083	5.4083	10.75	17.3108	5.4083	5.4083	19.8965	27.1261	3.233	2.5231	25.2731	12.3446	4.6756	3.9505	10.75	11.5435	26.1958	26.1958	29.0095	15.625	13.9696	4.6756	3.9505	9.9641	9.1858	12.3446	10.75	13.9696	8.4151	13.9696	9.1858	38.8825	39.9116	0
barium					200.687	283.599	260.543	129.247	114.412	158.183	118.359	146.169	123.302	152.169	135.206	378.847	314.287	176.313	169.247	130.239	103.59	168.239	208.863	222.204	393.025	365.82	50.2074	29.193	138.191	80.1472	109.487	131.232	210.911	69.4794	162.201	116.385	293.087	250.127	408.369
chromium (VI)	600	640			7.4222	39.129	57.4222	60.2314	93.1022	32.171	42.075	125.689	158.713	14.7834	12.6922	184.651	219.092	33.1722	34.171	67.617	70.347	114.235	113.452	127.915	83.673	98.9514	44.027	32.171	65.785	73.9534	87.1354	93.1022	111.879	106.299	115.015	98.9514	200.583	192.702	201.902
copper	44000	43000	2000		89.7978	44.8949	32.6621	97.9703	49.9936	85.7125	47.954	44.8949	38.7778	31.643	26.5479	59.1738	54.0733	134.778	81.6279	107.167	79.5858	102.057	104.101	82.649	924.985	688.938	224.971	88.7764	381.489	68.3572	251.678	129.663	51.0135	27.5668	41.8362	40.8167	0	0	0
Iron			15%		1.39291	3.18021	3.86859	4.5413	6.41413	2.52434	3.01549	7.98512	9.78518	1.85231	1.83078	9.68128	10.4971	2.30429	2.14079	3.75109	4.10232	7.08752	6.89953	7.76042	4.14975	4.29546	1.76255	1.52676	3.65299	4.10504	5.42172	5.52777	7.34125	5.6742	6.90342	5.74623	10.6595	10.6287	6.2614
lead	300	300	**1000**		23.9758	22.8531	17.2398	29.5893	16.1172	22.8531	16.1172	23.9758	25.0985	17.2398	13.8719	46.4301	122.787	43.0619	28.4666	26.2212	23.9758	32.9574	35.2028	-	207.025	107.065	61.0263	16.1172	104.819	20.6078	54.2895	35.2028	20.6078	27.3439	20.6078	20.6078	0	0	143.002
manganese	7500	8000	**7000**		179.542	782.765	764.521	381.438	331.772	446.546	374.21	492.727	479.139	216.421	200.226	1320.87	1032.6	327.26	241.626	420.309	427.545	993.146	1009.66	1093.22	1097.81	1331.03	1196.29	404.937	893.312	464.65	3105.1	2779.19	2585.7	1204.59	2100.42	1379.12	1602.72	1443.95	5293.96
nickel	870	900	**600**		95.741	66.7543	52.2727	53.3068	0	80.2085	62.6159	0	0	87.4559	82.279	0	0	102.993	96.7768	79.1733	61.5814	15.0703	17.1357	0	142.393	104.029	172.5	136.168	147.581	79.1733	118.538	86.4204	17.1357	60.5469	26.4322	49.1705	0	0	0
rubidium			200		58.3416	58.3416	63.1452	33.8916	32.6502	58.3416	59.5452	38.8392	48.648	35.1312	37.605	38.8392	70.2966	65.5362	71.4822	48.648	46.2066	63.1452	61.947	64.3416	53.5092	43.758	8.7216	3.6012	9.9972	2.3166	0	0	2.3166	0	2.3166	0	31.407	27.6666	71.4822
strontium			50		18.5435	25.8473	22.7255	12.2285	6.9275	14.3391	13.2845	6.9275	6.9275	11.1711	13.2845	5.8631	5.8631	16.4441	15.3923	10.1123	11.1711	10.1123	51.3723	10.1123	18.5435	13.2845	9.0521	6.9275	11.1711	9.0521	22.7255	22.7255	24.8081	16.4441	23.7675	19.5911	89.4441	91.3391	53.3765
uranium			100		5.5924	7.901	6.7471	7.901	7.901	7.901	0	6.7471	6.7471	0.9656	3.2806	10.2064	17.1034	11.3579	10.2064	12.5086	7.901	14.8076	7.901	-	97.621	47.7835	17.1034	9.0541	25.1135	5.5924	14.8076	9.0541	9.0541	6.7471	7.901	4.4369	53.401	47.7835	37.6216
Vanadium	1400	1500	350		44.9502	83.614	70.0125	58.9657	70.0125	44.9502	70.0125	91.6645	99.6322	24.9421	42.1195	239.504	314.38	94.3296	112.728	70.0125	70.0125	112.728	125.593	150.634	153.088	143.219	56.181	33.5722	58.9657	44.9502	91.6645	72.7512	86.3067	47.7717	64.5075	72.7512	64.5075	58.9657	138.229
zinc	80000	80000	3000		19.5779	21.5935	0	21.5935	0	24.6176	18.5702	0	0	19.5779	20.5856	0	0	22.6014	19.5779	21.5935	18.5702	0	18.5702	18.5702	36.721	21.5935	28.6508	25.6257	22.6014	16.555	30.6678	27.6423	21.5935	19.5779	25.6257	19.5779	0	0	0

Compound	HIL C - (Modified for Temporary Occupation Scenario)	HIL D - (Modified for Site Maint. Scenario)	CSA Global 'Cut-off Values' (Proxy Background)	Test Pit Reference	1109	1110	1110	1111	1111	1112	1112	1113	1113	1114	1114	1115	1115	1324	1324	1324	1324	1325	1325	1325	1325	1326	1326	1326	1326	1332	1332	1332	1332	1333	1333	1333	1333	1334	1334
				Sample Depth	0.1-0.2	0-0.1	0.1-0.2	0-0.1	0.1-0.2	0-0.1	0.1-0.2	0-0.1	0.1-0.2	0-0.1	0.1-0.2	0-0.1	0.1-0.2	0-1	1-2	2-3	3-4	0-1	1-2	2-3	3-4	0-1	1-2	2-3	3-4	0-1	1-2	2-3	3-4	0-1	1-2	2-3	3-4	0-1	1-2
arsenic	700	700	200		0	0	0	35.8408	0	0	0	9.1858	9.1858	0	0	6.8965	9.1858	0	50.6206	10.75	16.4641	8.4151	146.864	6853.3	8852.45	7.652	34.8421	19,532	4812.57	33.851	34.8421	361.053	6894.28	1.8208	332.333	143.597	2568.07	12.3446	11.5435
barium					401.783	361.49	418.274	213.986	194.572	153.17	154.172	270.999	288.866	345.311	548.844	116.385	119.347	109.487	267.858	44.457	119.347	205.794	321.745	691.974	793.984	237.681	376.672	702.769	619.665	459.337	124.032	496.422	669.292	604.447	111.421	353.929	631.417	98.6874	93.7944
chromium (VI)	600	640			201.465	128.652	131.577	170.257	159.969	156.811	170.841	159.969	177.102	205.313	225.451	90.5594	84.5422	169.083	138.721	100.601	140.817	186.721	148.987	106.299	118.113	164.289	133.745	97.2922	100.601	130.849	102.716	101.422	107.905	167.303	101.207	162.452	98.9514	65.785	74.849
copper	44000	43000	2000		0	60.194	23.4913	843.977	580.516	2.10532	0	0	0	0	0	19.4164	11.2686	14.3237	1287.66	164.467	151.154	94.9053	283.557	10,599	12,124	20.4351	1025.26	10,998	5918.53	0	1499.64	5093.5	8271.69	51.0135	1543.23	47.954	5976.32	157.297	386.653
Iron			15%		6.52664	4.25615	2.57888	10.5677	9.51688	1.70326	0	10.7702	10.7894	9.46975	0	5.47897	6.02175	9.71229	8.07573	3.68525	7.45938	10.4544	8.98551	4.40413	4.34914	10.8154	6.59014	4.54721	4.7413	10.1323	8.1688	7.54635	4.85387	9.17728	8.26399	10.8031	5.54381	4.68329	5.10686
lead	300	300	**1000**		158.726	205.902	158.726	46.4301	132.894	178.943	218.259	61.0263	59.9035	135.14	262.073	4.89091	2.6457	99.2041	1036	14.9945	48.6757	235.11	580.19	73,295	78,662	96.9582	3048.25	101,285	67,484	12.7493	1223.02	17,500	74,972	266.567	14,119	351.968	51,436	84.6062	31.8347
manganese	7500	8000	**7000**		5387.64	6826.12	**7259.01**	4984.92	4538.8	3113.76	3159.96	4331.07	4538.8	3478.87	**7249.61**	1042.69	1172.34	2950.48	738.081	182.239	3010.92	3764.83	596.143	233.523	271.352	4601.3	464.65	228.122	238.925	**23,140**	526.101	539.867	292.985	5566.43	533.319	796.453	323.651	549.846	1037.19
nickel	870	900	**600**		0	0	0	31.5983	0	0	0	0	0	0	0	73.998	63.6504	0	161.076	45.0348	18.1685	0	71.9282	**1669.25**	**2488.16**	0	221.366	**1760.26**	**759.416**	228.651	154.847	208.881	**990.621**	0	319.363	79.1733	**1262.56**	53.3068	75.033
rubidium			200		69.1092	86.7312	83.2392	28.9152	58.3416	93.6666	102.813	25.164	32.6502	54.72	129.561	0	0	78.558	57.1362	0	13.8132	57.1362	46.2066	114.084	110.722	61.947	90.207	101.676	109.597	40.0716	24.1753	75.0282	115.201	64.3416	21.317	0	110.722	6.165	8.7216
strontium			50		49.3625	47.3471	51.3723	32.0531	25.8473	23.7675	18.5435	36.1623	37.1861	37.1861	39.2295	7.9905	9.0521	12.2285	18.5435	13.2845	19.5911	14.3391	40.2491	0	0	15.3923	22.7255	0	0	45.3261	15.592	32.0531	0	28.9565	15.1884	69.2085	0	13.2845	13.2845
uranium			100		34.2199	36.4885	33.0844	53.401	54.5221	25.1135	21.6854	15.9559	15.9559	21.6854	29.6731	2.1235	0.9656	14.8076	72.3509	38.7539	28.5344	13.6585	166.748	0	0	14.8076	33.0844	0	0	9.0541	60.1156	159.466	0	22.8289	187.338	481.631	0	34.2199	5.5924
Vanadium	1400	1500	350		165.217	110.127	123.039	191.093	140.728	128.139	16.2292	104.898	135.72	130.675	177.117	13.3065	19.1427	153.088	247.827	0	61.7412	337.845	279.65	271.915	289.111	135.72	256.004	264.033	264.033	179.469	118.53	251.934	316.116	360.986	111.377	348.902	262.039	78.201	96.9855
zinc	80000	80000	3000		17.5625	52.8768	36.721	26.634	48.836	32.6852	26.634	26.634	30.6678	28.6508	20.5856	19.5779	0	0	51.8665	0	25.6257	168.58	163.484	941.678	763.756	44.7964	143.118	862.091	433.233	34.703	0	205.334	1316.3	80.1863	0	141.083	944.914	18.5702	32.6852

Compound	HIL C - (Modified for Temporary Occupation Scenario)	HIL D - (Modified for Site Maint. Scenario)	CSA Global 'Cut-off Values' (Proxy Background)	Test Pit Reference	1334	1334	1335	1335	1335	1335	1336	1336	1336	1336	1337	1337	1337	1337	1338	1338	1338	1339	1339	1340	1340	1340	1341	1341	1341	1341	1342	1342	1343	1343	1343	1344	1344	1344	1344
				Sample Depth	2-3	3-4	0-1	1-2	2-3	3-4	0-1	1-2	2-3	3-4	0-1	1-2	2-3	3-4	0-1	1-2	2-3	0-1	1-2	0-1	1-2	2-3	0-1	1-2	2-3	3-4	0-1	1-2	0-1	1-2	2-3	0-1	1-2	2-3	3-4
arsenic	700	700	200		19.027	12.3446	14.7935	26.1958	19.8965	1.1261	21.6583	34.8421	29.0095	24.358	18.1651	28.064	15.625	22.5506	28.064	9.1858	0	31.8916	0	50.6206	8.4151	14.7935	48.418	11.5435	15.625	3.233	13.1533	0	11.5435	11.5435	7.652	15.625	31.8916	0	60.9085
barium					118.359	65.6122	231.479	83.065	79.1754	114.412	406.172	201.708	180.359	197.628	424.896	192.537	175.302	191.52	175.302	422.687	270.999	439.292	729.292	752.354	1091.71	3440.21	600.945	1235.71	2348.65	70.4472	595.116	889.972	105.554	118.359	106.537	131.232	280.444	1085.09	339.938
chromium (VI)	600	640			109.502	87.995	54.5914	121.931	105.492	193.185	157.447	174.859	165.502	128.652	127.915	138.721	115.015	115.015	141.511	206.142	206.553	182.009	229.823	182.542	223.153	225.172	174.292	222.252	212.799	0	222.555	231.201	72.155	80.1722	58.361	58.361	167.303	231.641	173.723
copper	44000	43000	2000		260.929	196.24	554.517	293.848	243.458	239.349	27.5668	198.291	198.291	204.445	57.1335	282.528	313.413	202.394	43.8753	82.649	38.7778	38.7778	16.3607	38.7778	20.4351	57.1335	43.8753	24.5101	68.3572	6.17748	32.6621	21.4538	629.461	190.087	122.503	336.086	356.714	318.565	167.54
Iron			15%		6.51309	5.53091	3.95791	8.02515	6.46321	9.78545	10.7012	9.81527	8.75793	7.60036	10.4562	9.66872	5.8036	7.57244	9.31879	9.43532	4.02522	9.62442	7.46265	10.7489	9.45953	10.1192	10.572	8.86044	9.81541	1.7417	6.73203	4.11863	4.80425	4.40738	3.89077	4.96704	9.46984	3.62869	10.5717
lead	300	300	**1000**		45.3074	29.5893	100.327	39.6937	28.4666	132.894	82.3604	48.6757	43.0619	31.8347	68.8861	53.1668	34.0801	50.9212	48.6757	163.218	240.727	94.7123	209.272	63.2719	183.436	175.574	54.2895	198.039	177.82	4.89091	232.863	254.208	28.4666	39.6937	30.712	17.2398	48.6757	221.629	17.2398
manganese	7500	8000	**7000**		2095.71	528.077	797.366	1937.02	472.799	689.804	4739.46	2178.58	1961.39	1980.15	5610.97	2057.16	1247.92	2423.36	1420.79	4499.17	2063.74	**7048.37**	6246.8	6269.36	**13,591**	**27,945**	5481.5	**13,905**	**21,611**	470.988	5651.49	6055.43	598.868	470.988	321.846	696.177	2685.68	5725.53	1569.25
nickel	870	900	**600**		49.1705	49.1705	107.137	45.0348	62.6159	0	0	0	9.90738	38.8325	40.8998	18.1685	113.355	75.033	0	0	0	60.5469	0	0	52.2727	292.222	0	45.0348	245.311	78.1382	0	0	107.137	143.43	84.3496	70.8933	0	0	0
rubidium			200		15.0816	9.9972	16.3482	23.91	16.3482	59.5452	51.0822	31.407	17.613	13.8132	49.866	44.9832	32.6502	32.6502	37.605	77.3832	94.8162	42.531	86.7312	60.747	79.731	65.5362	57.1362	85.569	69.1092	0	98.2542	106.213	40.0716	38.8392	32.6502	27.6666	36.369	97.11	28.9152
strontium			50		17.4945	19.5911	12.2285	13.2845	32.0531	31.0223	11.1711	26.8851	29.9901	25.8473	9.0521	13.2845	20.6373	14.3391	9.0521	15.3923	19.5911	10.1123	7.9905	10.1123	7.9905	9.0521	11.1711	7.9905	10.1123	1.5915	12.2285	7.9905	9.0521	7.9905	9.0521	9.0521	12.2285	15.3923	22.7255
uranium			100		26.2546	22.8289	46.6576	11.3579	10.2064	20.5411	13.6585	15.9559	18.2501	15.9559	20.5411	21.6854	19.396	15.9559	6.7471	22.8289	27.3949	9.0541	14.8076	11.3579	21.6854	21.6854	6.7471	25.1135	21.6854	0	18.2501	28.5344	7.901	6.7471	9.0541	18.2501	41.0161	41.0161	17.1034
Vanadium	1400	1500	350		125.593	88.9902	112.728	143.219	117.902	213.65	231.033	222.415	174.755	130.675	184.146	165.217	138.229	179.469	155.532	264.033	319.56	298.343	336.229	281.56	366.807	478.78	287.237	399.854	457	0	344.218	365.365	115.319	148.172	91.6645	44.9502	193.39	369.662	218.051
zinc	80000	80000	3000		27.6423	28.6508	18.5702	79.1738	27.6423	0	21.5935	20.5856	24.6176	28.6508	55.9083	56.919	56.919	61.9735	19.5779	22.6014	0	18.5702	0	17.5625	0	27.6423	0	0	41.7675	17.5625	19.5779	0	96.3971	185.923	54.8978	23.6095	65.0072	59.9515	74.1125

Data Source: CSA Global Pty Ltd. March 2011. *Rum Jungle Mine Site: Results of Soil and Fluvial Zone Sampling and Assessment.*

NOTES:
Zero results are not considered a valid result, and are likely a function of XRF procedure

TABLE B2: Metal Concentrations Across the Old Tailings Dam Area Measured via XRF in 2010

			Test Pit Reference	1345	1345	1345	1345	1346	1346	1346	1346	1347	1347	1347	1347	1348	1348	1348	1348	1349	1349	1349	1349	1350	1350	1350	1350	1351	1351	1351	1351	1352	1352	1352	1352	1353	1353	1353
			Sample Depth	0-1	1-2	2-3	3-4	0-1	1-2	2-3	3-4	0-1	1-2	2-3	3-4	0-1	1-2	2-3	3-4	0-1	1-2	2-3	3-4	0-1	1-2	2-3	3-4	0-1	1-2	2-3	3-4	0-1	1-2	2-3	3-4	0-1	1-2	2-3
Compound	**HIL C - (Modified for Temporary Occupation Scenario)**	**HIL D - (Modified for Site Maint. Scenario)**	**CSA Global 'Cut-off Values' (Proxy Background)**																																		
arsenic	700	700	200	23.4505	17.3108	30.9233	18.1651	9.1858	20.7736	31.8916	31.8916	26.1958	15.625	14.7935	37.861	14.7935	9.1858	8.4151	13.9696	36.8471	17.3108	10.75	16.4641	19.027	18.1651	13.9696	9.1858	13.1533	16.4641	17.3108	24.358	59.735	6.1486	12.3446	9.1858	19.027	24.358	3178.41
barium				140.183	188.471	111.456	54.049	104.572	138.191	140.183	288.866	202.729	64.6464	93.7944	153.17	221.175	126.273	81.1194	105.554	234.578	240.787	260.543	183.398	108.503	73.353	56.9344	53.088	115.398	86.961	108.503	119.347	462.69	78.204	47.3304	51.1672	143.174	332.433	805.081
chromium (VI)	600	640		149.652	99.7774	152.942	203.627	74.849	120.411	164.897	196.961	139.422	110.297	97.2922	188.753	79.291	64.8654	71.2522	93.945	185.172	106.299	91.4094	98.9514	90.5594	90.5594	66.7022	64.8654	56.481	94.7854	103.871	140.817	133.025	14.7834	97.2922	65.785	57.4222	87.1354	112.667
copper	44000	43000	2000	448.702	235.24	340.21	267.099	77.5439	316.504	303.114	324.747	398.018	266.07	230.105	240.376	223.944	143.988	155.249	156.273	351.555	118.413	146.035	192.138	126.594	125.571	95.9269	142.965	183.936	215.733	161.394	163.442	424.9	111.256	197.265	128.64	43.8753	325.778	9405.72
Iron			15%	8.0462	6.23543	9.44864	10.8163	3.66163	6.96102	9.78851	9.87606	7.95302	5.70758	4.83971	10.5885	5.66349	3.8967	3.75841	5.59945	10.4389	7.91122	5.79973	6.91317	7.80548	7.36878	6.02169	5.05786	5.02211	7.68947	7.06362	9.74128	8.60429	3.15721	5.29954	5.01269	9.61644	4.27561	3.90657
lead	300	300	**1000**	48.6757	26.2212	34.0801	76.746	29.5893	35.2028	31.8347	48.6757	36.3255	27.3439	31.8347	19.4852	40.8164	22.8531	22.8531	34.0801	44.1846	20.6078	41.9392	26.2212	7.13613	17.2398	21.7305	18.3625	40.8164	14.9945	25.0985	25.0985	1337.99	13.8719	44.1846	102.573	53.1668	181.19	59,692
manganese	7500	8000	**7000**	715.302	1028.92	611.587	518.103	730.791	1139.2	1536.73	3286.3	1732.21	450.166	482.762	818.364	1343.05	503.601	269.55	804.668	1959.52	4012.29	2342.88	1644.6	1176.95	1472.69	791.89	347.117	647.039	1263.61	1497.74	706.194	1418.93	224.521	367.887	419.405	670.691	286.674	218.221
nickel	870	900	**600**	15.0703	75.033	0	0	93.6695	28.4985	0	0	0	54.341	75.033	0	59.5125	82.279	89.5269	71.9282	0	61.5814	70.8933	51.2386	11.9724	50.2045	51.2386	63.6504	70.8933	20.2342	60.5469	0	96.7768	75.033	44.001	53.3068	0	155.885	**2075.98**
rubidium			200	37.605	41.3022	32.6502	38.8392	9.9972	22.6542	27.6666	25.164	15.0816	11.271	8.7216	36.369	12.543	2.3166	2.3166	7.4442	31.407	6.165	1.0302	4.884	1.0302	2.3166	0	0	7.4442	6.165	4.884	17.613	21.3966	0	0	2.3166	23.91	98.2542	115.201
strontium			50	12.2285	11.1711	14.3391	22.7255	17.4945	19.5911	35.1371	39.2295	13.2845	20.6373	31.0223	28.9565	13.2845	17.4945	22.7255	22.7255	18.5435	14.3391	23.7675	18.5435	6.9275	9.0521	9.0521	12.2285	7.9905	6.9275	6.9275	6.9275	41.2673	5.8631	6.9275	10.1123	14.3391	24.8081	0
uranium			100	61.2319	12.5086	54.5221	39.8854	9.0541	25.1135	46.6576	46.6576	55.6424	20.5411	21.6854	20.5411	15.9559	23.9716	27.3949	19.396	18.2501	36.4885	39.8854	25.1135	94.3489	33.0844	30.811	21.6854	29.6731	19.396	22.8289	14.8076	195.485	5.5924	20.5411	21.6854	5.5924	34.2199	0
Vanadium	1400	1500	350	145.7	135.72	165.217	197.956	72.7512	135.72	193.39	245.76	123.039	94.3296	107.517	160.393	110.127	75.4807	70.0125	91.6645	172.384	83.614	102.27	70.0125	4.4832	53.3871	61.7412	42.1195	24.9421	44.9502	27.828	94.3296	231.033	19.1427	0	30.7047	172.384	195.678	289.111
zinc	80000	80000	3000	36.721	50.8562	32.6852	25.6257	25.6257	24.6176	25.6257	25.6257	0	26.634	28.6508	36.721	20.5856	25.6257	24.6176	23.6095	0	16.555	21.5935	22.6014	0	19.5779	24.6176	31.6765	20.5856	0	17.5625	20.5856	96.3971	22.6014	21.5935	30.6678	61.9735	65.0072	1360.6

			Test Pit Reference	1354	1354	1354	1354	1355	1355	1355	1355	1356	1356	1356	1356	1357	1357	1357	1357	1358	1358	1358	1358	1359	1359	1359	1359	1360	1360	1360	1361	1361	1361	1361	1362	1362	1362	1362
			Sample Depth	0-1	1-2	2-3	3-4	0-1	1-2	2-3	3-4	0-1	1-2	2-3	3-4	0-1	1-2	2-3	3-4	0-1	1-2	2-3	3-4	0-1	1-2	2-3	3-4	0-1	1-2	2-3	0-1	1-2	2-3	3-4	0-1	1-2	2-3	3-4
Compound	**HIL C - (Modified for Temporary Occupation Scenario)**	**HIL D - (Modified for Site Maint. Scenario)**	**CSA Global 'Cut-off Values' (Proxy Background)**																																		
arsenic	700	700	200	52.8536	9.1858	8.4151	9.9641	35.8408	17.3108	19.027	35.8408	23.4505	30.9233	15.625	35.8408	17.3108	14.7935	9.9641	10.75	22.5506	11.5435	8.4151	9.9641	18.1651	29.0095	0	14.7935	17.3108	9.9641	37.861	19.8965	11.5435	38.8825	4.6756	29.0095	18.1651	17.3108	9.1858
barium				253.248	45.4144	27.2922	33.952	206.817	103.59	68.512	30.144	96.729	55.0104	127.264	50.2074	100.647	97.708	51.1672	52.1274	208.863	74.3224	75.2922	85.9864	211.936	138.191	205.794	499.815	162.201	138.191	82.092	116.385	169.247	66.5784	40.6314	386.473	177.324	94.7722	41.5872
chromium (VI)	600	640		84.5422	46.937	51.739	75.7422	164.897	98.9514	98.123	139.422	104.683	158.081	185.691	154.887	51.739	72.155	67.617	66.7022	93.1022	80.1722	73.0554	91.4094	80.1722	184.127	236.331	189.255	96.459	202.769	167.899	81.051	204.475	189.755	1.019	140.817	163.679	220.385	212.799
copper	44000	43000	2000	569.073	136.825	106.145	97.9703	139.894	200.342	217.785	523.352	152.178	108.189	181.886	200.342	379.423	92.8622	76.523	78.5648	146.035	52.0334	92.8622	138.871	563.874	395.951	231.132	107.167	203.42	180.861	216.759	201.368	184.961	233.186	19.4164	216.759	156.273	272.241	170.613
Iron			15%	8.46803	3.68911	3.99675	4.75875	9.90194	7.55157	7.8715	10.6154	7.82498	10.3898	10.7249	10.3439	4.16843	6.74426	5.23669	4.75959	6.10884	4.87282	4.02925	5.24053	5.37476	8.8161	0.952972	6.83435	6.2471	10.7168	10.716	5.90052	10.81	10.8085	1.97075	9.14428	10.7141	10.7418	9.59747
lead	300	300	**1000**	599.31	168.834	21.7305	30.712	63.2719	21.7305	18.3625	6.01352	41.9392	9.38137	77.8689	23.9758	41.9392	18.3625	11.6266	23.9758	54.2895	23.9758	18.3625	22.8531	66.6404	21.7305	171.081	3.7683	70.0089	98.0812	12.7493	62.1491	132.894	17.2398	3.7683	93.5894	102.573	104.819	128.402
manganese	7500	8000	**7000**	1108.85	254.235	232.623	228.122	1807.85	1002.32	625.219	366.983	1516.3	326.358	643.402	437.497	515.384	1378.2	454.692	578.889	1356	366.08	292.083	278.562	1439.32	1083.11	1047.28	1223.94	1200.9	895.141	526.263	994.063	949.153	461.029	241.626	3641.09	852.165	598.868	372.403
nickel	870	900	**600**	71.9282	69.8585	65.7196	47.1026	0	7.8425	10.9399	0	30.565	0	0	0	89.5269	28.4985	54.341	39.8661	51.2386	26.4322	57.4438	48.1365	72.9631	0	0	283.876	49.1705	0	0	63.6504	0	0	76.068	0	0	0	0
rubidium			200	18.876	0	0	1.0302	33.8916	2.3166	1.0302	20.1372	11.271	25.164	30.162	25.164	1.0302	0	0	0	17.613	3.6012	0	0	11.271	18.876	98.2542	0	18.876	46.2066	32.6502	20.1372	42.531	37.605	0	59.5452	55.929	46.2066	59.5452
strontium			50	31.0223	7.9905	9.0521	10.1123	9.0521	6.9275	6.9275	10.1123	7.9905	13.2845	22.7255	16.4441	10.1123	12.2285	16.4441	17.4945	12.2285	14.3391	14.3391	31.0223	14.3391	16.4441	33.0825	21.6821	12.2285	20.6373	34.1105	13.2845	18.5435	34.1105	1.5915	10.1123	11.1711	19.5911	20.6373
uranium			100	122.468	9.0541	22.8289	15.9559	13.6585	25.1135	26.2546	46.6576	19.396	17.1034	33.0844	25.1135	52.2791	107.394	54.5221	53.401	27.3949	13.6585	6.7471	26.2546	50.0329	15.9559	63.4621	21.6854	31.9481	91.0696	48.9086	34.2199	91.0696	46.6576	0	58.9985	107.394	54.5221	37.6216
Vanadium	1400	1500	350	112.728	7.4335	7.4335	13.3065	184.146	10.3746	58.9657	96.9855	53.3871	91.6645	174.755	88.9902	50.584	47.7717	0	27.828	110.127	58.9657	27.828	42.1195	94.3296	133.202	204.737	140.728	96.9855	206.979	162.81	99.6322	220.237	191.093	0	188.786	184.146	260.037	206.979
zinc	80000	80000	3000	36.721	23.6095	22.6014	24.6176	22.6014	21.5935	24.6176	25.6257	23.6095	23.6095	32.6852	23.6095	21.5935	0	0	18.5702	23.6095	18.5702	0	21.5935	20.5856	32.6852	0	48.836	25.6257	22.6014	24.6176	30.6678	0	24.6176	19.5779	26.634	25.6257	27.6423	44.7964

			Test Pit Reference	1363	1363	1363	1363	1364	1364	1364	1364	1365	1365	1365	1365	1366	1366	1366	1367	1367	1367	1367	1368	1368	1368	1368	1369	1369	1369	1369	1370	1370	1370	1370	1394	1394	1394	1394
			Sample Depth	0-1	1-2	2-3	3-4	0-1	1-2	2-3	3-4	0-1	1-2	2-3	3-4	0-1	1-2	2-3	0-1	1-2	2-3	3-4	0-1	1-2	2-3	3-4	0-1	1-2	2-3	3-4	0-1	1-2	2-3	3-4	0-1	1-2	2-3	3-4
Compound	**HIL C - (Modified for Temporary Occupation Scenario)**	**HIL D - (Modified for Site Maint. Scenario)**	**CSA Global 'Cut-off Values' (Proxy Background)**																																		
arsenic	700	700	200	30.9233	13.9696	13.1533	9.9641	7.652	0	19.8965	13.9696	13.9696	24.358	11.5435	0	48.418	9.9641	6.8965	7.652	41.9926	11.5435	8.4151	24.358	19.8965	13.9696	22.5506	32.8675	2568.07	7.652	51.7333	17.3108	29.0095	2027.65	106.769	6.8965	92.716	8157.79	6194.75
barium				514.56	173.282	95.7504	36.8122	55.0104	119.347	139.187	180.359	81.1194	84.0384	87.936	109.487	280.444	49.248	89.8872	244.934	345.311	27.2922	35.8584	105.554	209.887	41.5872	111.456	242.86	597.446	31.0954	172.273	140.183	264.721	627.887	194.572	260.543	327.084	753.572	797.679
chromium (VI)	600	640		197.422	177.657	105.492	133.745	46.937	237.652	212.427	197.881	49.8254	130.119	85.409	211.295	191.729	60.2314	48.865	154.887	184.127	61.163	48.865	199.243	65.785	63.019	104.683	198.337	128.652	37.153	70.347	107.103	134.463	106.299	166.105	185.691	110.297	117.342	116.569
copper	44000	43000	2000	64.2753	13.3053	28.5858	6.17748	221.891	166.515	172.662	37.7584	317.534	82.649	100.014	115.345	842.926	140.918	62.2346	4.14132	716.111	111.256	92.8622	92.8622	3367.12	179.836	499.483	402.152	5661.39	48.9738	491.186	46.9343	766.348	10,464	16,004	75.5021	3284.95	9209.56	14,367
Iron			15%	10.8051	10.8127	5.21734	9.93212	3.52973	0	9.72459	8.63684	4.57458	10.8162	6.15914	0	10.5862	4.21158	3.51329	10.7873	9.31448	4.70309	3.01733	10.7478	4.56966	6.36002	8.39076	10.6954	5.79826	3.36351	5.52856	9.80407	5.42617	5.05975	8.64633	10.7134	7.49146	4.28406	4.52085
lead	300	300	**1000**	116.049	72.2546	22.8531	80.1146	86.852	293.533	37.4482	0	246.344	1.5231	37.4482	262.073	744.433	126.156	75.6232	62.1491	930.152	17.2398	44.1846	90.2207	1861.51	78.9917	205.902	242.974	53,504	120.541	5013.87	29.5893	826.586	48,748	11,894	268.814	8100.4	83,850	67,232
manganese	7500	8000	**7000**	4519.97	1290.38	837.545	773.642	319.14	263.243	732.613	480.045	199.327	256.036	259.639	202.025	877.763	315.531	430.259	4964.92	1045.45	242.527	231.722	875.934	2709.51	302.002	1084.03	1494.95	314.629	162.463	2657.09	334.48	285.773	261.441	420.309	1666.02	1013.32	232.623	357.049
nickel	870	900	**600**	0	0	58.4781	0	80.2085	0	188.086	192.243	42.9672	0	8.87492	0	82.279	65.7196	78.1382	0	119.575	38.8325	76.068	0	256.771	21.2671	0	0.61668	**1174.14**	51.2386	120.612	0	205.761	**1335**	176.655	0	**610.196**	**2154.87**	**2020.55**
rubidium			200	42.531	40.0716	0	46.2066	0	152.115	15.0816	25.164	0	23.91	0	140.4	60.747	0	0	41.3022	71.4822	0	0	43.758	9.9972	2.3166	13.8132	58.3416	87.8916	0	17.613	97.11	52.2966	99.3966	18.876	75.0282	47.4282	101.676	111.844
strontium			50	14.3391	25.8473	34.1105	28.9565	15.3923	57.3681	17.4945	9.0521	13.2845	44.3135	33.0825	45.3261	18.5435	9.0521	21.6821	11.1711	17.4945	17.4945	18.5435	11.1711	18.5435	5.8631	9.0521	14.3391	0	7.9905	14.3391	15.3923	21.6821	6.9275	16.4441	19.5911	25.8473	0	0
uranium			100	13.6585	14.8076	9.0541	31.9481	70.1335	141.618	41.0161	18.2501	121.396	84.4894	47.7835	91.0696	38.7539	14.8076	4.4369	9.0541	27.3949	7.901	5.5924	5.5924	55.6424	6.7471	19.396	20.5411	71.2426	0.9656	17.1034	10.2064	53.401	27.3949	291.123	9.0541	191.418	0	0
Vanadium	1400	1500	350	267.992	162.81	88.9902	153.088	27.828	179.469	110.127	102.27	1.5237	0	0	75.4807	337.845	7.4335	16.2292	112.728	331.325	10.3746	19.1427	249.885	80.9121	0	61.7412	345.789	285.354	0	36.4305	107.517	249.885	260.037	104.898	314.38	226.742	298.343	290.976
zinc	80000	80000	3000	0	0	21.5935	104.51	22.6014	21.5935	91.329	54.8978	22.6014	0	0	0	246.293	29.6593	36.721	0	239.116	25.6257	34.703	163.484	32.6852	18.5702	26.634	199.201	673.505	28.6508	89.3024	45.8061	135.997	707.414	135.997	492.647	627.014	984.881	1626.83

			Test Pit Reference	1395	1395	1395	1396	1396	1396	1397	1397	1397	1398	1398	1399	1399	1399	1400	1400	1400	1401	1401	1401	1401	1402	1402	1402	1403	1403	1403	1404	1404	1405	1405	1406	1406	1407	1407
			Sample Depth	0-1	1-2	2-3	0-1	1-2	2-3	0-1	1-2	2-3	0-1	1-2	0-1	1-2	2-3	0-1	1-2	2-3	0-1	1-2	2-3	3-4	0-1	1-2	2-3	0-1	1-2	2-3	0-1	1-2	0-1	1-2	0-1	1-2	0-1	1-2
Compound	**HIL C - (Modified for Temporary Occupation Scenario)**	**HIL D - (Modified for Site Maint. Scenario)**	**CSA Global 'Cut-off Values' (Proxy Background)**																																		
arsenic	700	700	200	9.9641	2210.52	13.9696	16.4641	150.161	18.1651	24.358	16.4641	9.1858	25.2731	8.4151	19.027	13.9696	11.5435	9.1858	18.1651	23.4505	9.1858	15.625	5.4083	3.233	8.4151	15.625	25.2731	9.9641	19.027	4.6756	6.8965	10.75	6.1486	6.8965	9.9641	13.1533	3.233	30.9233
barium				173.282	467.167	59.8234	251.167	307.91	47.3304	70.4472	46.3722	37.7664	209.887	31.0954	86.961	101.628	82.092	89.8872	136.201	109.487	96.729	84.0384	165.218	55.9722	75.2922	38.721	37.7664	177.324	233.545	610.292	45.4144	28.2424	20.652	30.144	76.2624	121.324	314.287	466.047
chromium (VI)	600	640		208.172	127.175	75.7422	147.649	87.995	46.937	110.297	72.155	40.1134	63.9434	43.0522	96.459	108.705	98.9514	63.9434	133.025	147.649	68.5294	100.601	175.985	0	63.9434	134.463	156.172	185.691	136.603	215.692	63.9434	72.155	32.171	42.075	48.865	59.2974	184.127	140.121
copper	44000	43000	2000	224.971	4669.5	118.413	304.144	2199.38	538.93	15.3422	27.5668	115.345	979.827	119.435	16.3607	46.9343	38.7778	387.686	164.467	110.234	317.534	113.301	101.036	12.2869	43.8753	44.8949	48.9738	1.08738	63.2549	18.3978	19.4164	13.3053	18.3978	13.3053	17.3792	137.848	113.301	1257.79
Iron			15%	10.5552	6.442	5.53597	10.8149	6.20579	6.73038	10.5345	8.33242	4.06481	4.73432	4.22243	9.36406	7.1064	6.38949	4.96932	7.90491	9.92896	5.02381	7.00658	10.8057	1.96419	4.03314	6.43958	8.65054	10.7757	8.5567	10.6286	4.04298	6.0272	3.15837	3.48093	4.88714	6.2545	10.4702	6.80618
lead	300	300	**1000**	304.77	42,589	220.505	890.748	17,486	501.474	54.2895	28.4666	30.712	1246.69	107.065	26.2212	29.5893	29.5893	327.244	135.14	104.819	445.261	89.0978	150.864	8.25875	17.2398	25.0985	6.01352	63.2719	21.7305	86.852	11.6266	7.13613	8.25875	10.504	9.38137	67.7632	289.039	751.184
manganese	7500	8000	**7000**	1413.38	445.641	176.845	2502.08	747.197	298.395	238.025	263.243	173.249	1022.5	249.731	251.533	163.362	160.666	541.681	662.502	256.937	489.103	384.149	319.14	249.731	227.221	220.921	197.528	196.628	192.131	204.724	166.058	164.261	175.047	141.798	425.736	888.738	1533.94	465.555
nickel	870	900	**600**	0	511.157	27.4653	0	430.294	15.0703	0	0	58.4781	216.163	48.1365	0	0	0	70.8933	1.64882	0	61.5814	0	0	67.789	54.341	0	0	0	0	0	52.2727	0	54.341	41.9335	31.5983	17.1357	0	331.898
rubidium			200	53.5092	84.405	7.4442	61.947	51.0822	0	60.747	20.1372	0	15.0816	0	9.9972	0	0	0	3.6012	11.271	0	0	28.9152	0	0	0	3.6012	31.407	6.165	38.8392	0	2.3166	0	0	1.0302	66.729	87.8916
strontium			50	10.1123	17.4945	16.4441	12.2285	14.3391	6.9275	7.9905	5.8631	9.0521	11.1711	9.0521	27.9215	53.3765	49.3625	18.5435	24.8081	74.0825	18.5435	25.8473	114.554	1.5915	18.5435	49.3625	29.9901	154.136	172.456	383.636	20.6373	23.7675	5.8631	10.1123	11.1711	9.0521	22.7255	18.5435
uranium			100	12.5086	13.6585	11.3579	23.9716	78.9839	36.4885	17.1034	9.0541	5.5924	54.5221	9.0541	18.2501	45.5309	48.9086	97.621	71.2426	77.8804	99.7984	60.1156	83.3899	0	14.8076	17.1034	17.1034	38.7539	41.0161	66.8014	6.7471	9.0541	0.9656	0.9656	3.2806	10.2064	0.9656	62.3474
Vanadium	1400	1500	350	341.05	273.862	1.5237	191.093	165.217	0	91.6645	88.9902	1.5237	75.4807	0	0	10.3746	1.5237	0	64.5075	64.5075	33.5722	33.5722	86.3067	0	19.1427	91.6645	67.2646	125.593	75.4807	211.435	0	0	0	0	369.662	289.111
zinc	80000	80000	3000	214.539	261.686	23.6095	74.1125	264.766	26.634	19.5779	21.5935	32.6852	91.329	47.8259	0	18.5702	0	36.721	29.6593	18.5702	34.703	21.5935	18.5702	19.5779	26.634	20.5856	17.5625	28.6508	23.6095	26.634	33.6941	26.634	21.5935	19.5779	25.6257	27.6423	2615.84	320.342

Data Source: CSA Global Pty Ltd. March 2011. *Rum Jungle Mine Site: Results of Soil and Fluvial Zone Sampling and Assessment.*

NOTES:
Zero results are not considered a valid result, and are likely a function of XRF procedure

TABLE B2: Metal Concentrations Across the Old Tailings Dam Area Measured via XRF in 2010

Compound	HIL C - (Modified for Temporary Occupation Scenario)	HIL D - (Modified for Site Maint. Scenario)	CSA Global 'Cut-off Values' (Proxy Background)																																				
Test Pit Reference				1407	1407	1408	1408	1408	1409	1409	1410	1410	1410	1411	1411	1411	1412	1412	1412	1412	1413	1413	1413	1414	1414	1414	1414	1415	1415	1415	1416	1416	1416	1417	1417	1418	1418	2042
Sample Depth				2-3	3-4	0-1	1-2	2-3	0-1	1-2	0-1	1-2	2-3	0-1	1-2	2-3	0-1	1-2	2-3	3-4	0-1	1-2	2-3	0-1	1-2	2-3	3-4	0-1	1-2	2-3	0-1	1-2	2-3	0-1	1-2	0-1	1-2	0-0.2
arsenic	700	700	200	19.027	17.3108	1.8208	26.1958	6.1486	4.6756	26.1958	0	27.1261	43.0445	11.5435	11.5435	10.75	518.176	10.75	18.1651	17.3108	0.439	26.1958	8.4151	5.4083	33.851	31.8916	8.4151	21.6583	13.1533	8.4151	29.0095	6.1486	9.9641	6.1486	16.4641	26.1958	21.6583	
barium				53.088	81.1194	177.324	506.612	51.1672	189.487	79.1754	315.351	90.8634	108.503	124.292	40.6314	56.9344	312.16	31.0954	76.2624	88.9114	62.716	680.018	36.8122	144.172	410.567	88.9114	154.172	115.398	224.262	37.7664	132.225	18.7584	30.144	51.1672	26.3424	23.4954	50.2074	6691.68
chromium (VI)	600	640		67.617	70.347	172.577	138.017	39.129	199.243	88.8522	167.303	83.673	89.707	130.849	92.257	93.1022	148.319	61.163	113.452	161.215	133.745	160.593	19.9694	143.579	130.849	63.9434	84.5422	111.089	62.0922	18.937	130.849	14.7834	41.0954	32.171	59.2974	132.302	138.721	213.537
copper	44000	43000	2000	114.323	287.673	20.4351	1155.62	183.936	355.682	188.037	2.10532	195.214	228.051	13.3053	17.3792	58.1536	1058.06	106.145	47.954	153.201	5.15938	2657.48	63.2549	15.3422	1031.6	798.841	1737.27	32.6621	4805.11	318.565	469.418	46.9343	69.3778	72.4398	63.2549	4.14132	0	1000.95
Iron			15%	6.55252	6.62523	10.2319	6.3712	4.40386	10.7994	6.41534	9.41019	4.97858	6.4801	10.5415	5.78196	3.87287	10.7549	4.85618	5.96909	4.52532	10.3737	6.31532	3.32759	10.7253	5.25353	3.97124	4.49053	9.78582	3.49357	3.40142	10.6679	2.96331	4.47812	3.63353	7.27698	8.74311	7.72638	10.767
lead	300	300	**1000**	113.803	818.707	137.387	6434.38	519.465	246.344	148.618	118.295	11.6266	92.4665	75.6232	7.13613	8.25875	20,483	18.3625	233.986	573.443	127.279	2913.4	50.9212	91.3436	1191.47	196.915	200.285	9.38137	1903.29	139.633	34.0801	8.25875	3.7683	8.25875	14.9945	7.13613	11.6266	
manganese	7500	8000	**7000**	257.838	527.17	2100.42	586.153	191.232	1418.93	340.798	5824.08	496.351	786.415	935.415	286.674	180.441	509.945	189.433	338.09	269.55	343.506	265.045	183.139	1883.62	226.321	326.358	526.263	570.719	1331.03	213.722	640.674	169.653	149.883	134.613	173.249	202.025	175.047	**29,240**
nickel	870	900	**600**	39.8661	79.1733	0	253.645	62.6159	0	39.8661	0	23.333	25.3991	0	9.90738	39.8661	143.43	38.8325	29.5317	77.1031	0	538.516	62.6159	0	260.939	172.5	260.939	0	295.352	68.8237	0	53.3068	47.1026	45.0348	0	0	0	
rubidium			200	1.0302	9.9972	59.5452	95.964	0	54.72	12.543	67.92	2.3166	11.271	59.5452	3.6012	0	72.666	12.543	17.613	33.8916	69.1092	103.948	0	40.0716	95.964	0	3.6012	36.369	2.3166	0	46.2066	0	2.3166	0	1.0302	2.3166	0	43.758
strontium			50	9.0521	5.8631	12.2285	24.8081	6.9275	13.2845	13.2845	43.2995	19.5911	29.9901	15.3923	14.3391	15.3923	21.6821	10.1123	10.1123	13.2845	9.0521	21.6821	4.7973	11.1711	19.5911	14.3391	12.2285	7.9905	25.8473	7.9905	14.3391	7.9905	10.1123	14.3391	10.1123	13.2845	19.5911	55.3751
uranium			100	14.8076	17.1034	14.8076	36.4885	12.5086	18.2501	58.9985	21.6854	46.6576	37.6216	17.1034	28.5344	104.144	15.9559	72.3509	26.2546	58.9985	17.1034	35.3546	10.2064	11.3579	39.8854	66.8014	73.4584	9.0541	85.5881	10.2064	34.2199	6.7471	0.9656	4.4369	11.3579	7.901	7.901	7.26955
Vanadium	1400	1500	350	33.5722	27.828	184.146	256.004	0	277.73	96.9855	78.201	0	50.584	165.217	0	0	235.287	0	61.7412	99.6322	88.9902	289.111	0	138.229	271.915	42.1195	72.7512	107.517	88.9902	0	67.2646	0	0	0	0	1.5237	36.4305	464.687
zinc	80000	80000	3000	100.453	85.25	81.1988	140.065	29.6593	272.985	50.8562	65.0072	28.6508	65.0072	27.6423	25.6257	25.6257	385.475	23.6095	38.7394	71.0766	0	2360.5	27.6423	54.8978	226.821	63.9959	56.919	0	0	27.6423	0	0	0	0	0	16.555	0	40.758

Compound	HIL C - (Modified for Temporary Occupation Scenario)	HIL D - (Modified for Site Maint. Scenario)	CSA Global 'Cut-off Values' (Proxy Background)																																				
Test Pit Reference				2042	2043	2043	2044	2044	2045	2045	2045	2046	2046	2047	2047	2047	2048	2048	2048	2049	2049	2049	2050	2050	2050	2051	2051	2051	2052	2052	2052	2057	2057	2058	2058	2058	2059	2059	
Sample Depth				0.2-0.8	0-0.2	0.2-0.8	0-0.2	0.2-0.8	0-0.2	0.2-0.8	0.8-1.5	0-0.2	0.2-0.8	0-0.2	0.2-0.8	0.8-1.5	0-0.2	0.2-0.8	0.8-1.5	0-0.2	0.2-0.8	0.8-1.5	0-0.2	0.2-0.8	0.8-1.5	0-0.2	0.2-0.8	0.8-1.5	0-0.2	0.2-0.8	0.8-1.5	0-0.2	0.2-0.8	0.8-1.5	0-0.2	0.2-0.8	0.8-1.5	0-0.2	0.2-0.8	
arsenic	700	700	200																																				
barium				2433.89	1035.13	1508.48	272.047	173.282	155.174	83.065	112.441	235.612	533.943	123.302	152.169	109.487	89.8872	82.092	66.5784	1027.3	561.505	171.264	947.167	939.494	3438.31	1882.18	2289.11	3516.77	2597.17	805.081	616.147	198.647	123.302	1859.05	1292.1	2418.77	1054.79	1438.16	
chromium (VI)	600	640		168.492	233.889	232.971	176.545	183.073	104.683	142.892	162.452	139.422	187.233	132.302	164.897	213.537	214.983	209.361	199.243	188.249	185.691	134.463	194.619	218.097	237.963	196.497	195.563	166.705	170.257	96.459	95.6234	160.593	132.302	169.671	184.651	132.302	173.151	210.142	
copper	44000	43000	2000	739.125	516.085	748.545	155.249	173.687	32.6621	19.4164	32.6621	23.4913	8.2138	17.3792	6.17748	6.17748	27.5668	21.4538	15.3422	110.234	130.686	177.786	184.961	193.163	163.442	341.241	510.896	436.281	135.801	118.413	114.323	71.4191	58.1536	116.368	123.526	92.8622	124.549	141.941	
Iron			15%	10.1063	10.8019	10.7461	10.661	10.7494	6.69514	8.89453	10.4665	8.23495	10.7825	7.72149	10.3677	10.7467	10.4107	10.4817	10.3282	10.6271	9.3178	10.6874	9.53474	10.8178	10.2855	10.6771	10.7499	9.71019	10.7215	8.12572	8.79989	-0.94908	0	10.777	10.7597	7.49328	7.85933	10.5896	
lead	300	300	**1000**																																				
manganese	7500	8000	**7000**	**13,925**	**7676.41**	**13,567**	1214.72	634.309	484.574	368.79	812.885	901.546	1707.96	395.897	423.023	414.883	305.609	300.198	241.626	4911.96	3240.93	843.941	6422.4	5267.8	**12,573**	**15,575**	**25,072**	**26,740**	**11,288**	3622.61	3185.01	1333.8	773.642	**10,134**	**8527.12**	**9066.16**	**7128.57**	**9246.6**	
nickel	870	900	**600**																																				
rubidium			200	26.4162	58.3416	58.3416	55.929	59.5452	27.6666	47.4282	57.1362	47.4282	80.9022	36.369	63.1452	100.537	55.929	57.1362	95.964	55.929	70.2966	58.3416	33.8916	53.5092	64.3416	44.9832	54.72	43.758	46.2066	13.8132	20.1372	116.317	166.71	37.605	51.0822	4.884	18.876	41.3022	
strontium			50	32.0531	16.4441	20.6373	7.9905	7.9905	7.9905	6.9275	7.9905	6.9275	7.9905	6.9275	6.9275	9.0521	6.9275	7.9905	9.0521	10.1123	10.1123	11.1711	11.1711	12.2285	14.3391	22.7255	24.8081	35.1371	16.4441	12.2285	12.2285	11.1711	6.9275	19.5911	16.4441	14.3391	12.2285	12.2285	
uranium			100	10.3472	20.606	18.5543	14.4508	20.606	5.21777	7.26955	12.399	12.399	21.6319	2.14009	12.399	18.5543	13.4249	14.4508	27.7872	7.26955	12.399	14.4508	5.21777	8.29544	12.399	4.19188	8.29544	3.16598	7.26955	5.21777	4.19188	12.399	16.5025	7.26955	3.16598	2.14009	4.19188	4.19188	
Vanadium	1400	1500	350	379.366	451.613	451.164	273.862	256.004	91.6645	96.9855	165.217	125.593	213.65	67.2646	120.475	179.469	91.6645	123.039	224.583	378.008	309.117	220.237	358.02	384.709	448.227	405.774	441.605	457	392.447	172.384	170.005	305.562	195.678	397.422	331.325	339.452	353.502	423.171	
zinc	80000	80000	3000	30.6678	19.5779	26.634	20.5856	22.6014	17.5625	0	0	-6058.24	0	17.5625	0	17.5625	-6058.24	0	0	21.5935	23.6095	22.6014	23.6095	18.5702	23.6095	23.6095	17.5625	21.5935	19.5779	21.5935	24.6176	-6058.24	56.919	24.6176	22.6014	221.702	42.777	26.634	

Compound	HIL C - (Modified for Temporary Occupation Scenario)	HIL D - (Modified for Site Maint. Scenario)	CSA Global 'Cut-off Values' (Proxy Background)																																				
Test Pit Reference				2060	2060	2060	2061	2061	2061	2062	2063	2063	2064	2064	2064	2070	2070	2070	2071	2071	2072	2072	2073	2074	2074	2075	2075	2076	2076	2076	5194	5194	5194	5194	5195	5195	5195	5195	
Sample Depth				0-0.2	0.2-0.8	0.8-1.5	0-0.2	0.2-0.8	0.8-1.5	0-0.2	0-0.2	0.2-0.8	0-0.2	0.2-0.8	0.8-1.5	0-0.2	0.2-0.8	0.8-1.5	0-0.2	0.2-0.8	0-0.2	0.2-0.8	0-0.2	0-0.2	0.2-0.8	0-0.2	0.2-0.8	0-0.2	0.2-0.8	0.8-1.5	0-1	1-2	2-3	3-4	0-1	1-2	2-3	3-4	
arsenic	700	700	200																											9.1858	63.2783	85.9745	24.358	10.75	23.4505	19.8965	17.3108	
barium				876.114	2811.75	3803.63	802.612	2533.8	4107.29	3559.15	1108.96	872.343	521.388	822.407	386.473	104.572	154.172	33.952	140.183	108.503	104.572	321.745	675.247	89.8872	121.324	137.196	258.457	114.412	97.708	378.847	482.886	335.647	384.292	129.247	308.972	218.092	192.537	153.17	
chromium (VI)	600	640		173.723	214.265	156.172	138.017	199.243	141.511	215.339	202.769	217.422	124.942	201.902	192.217	61.163	93.945	0	54.5914	54.5914	30.1614	143.579	226.542	46.937	111.879	65.785	111.879	42.075	51.739	165.502	225.727	177.102	185.172	88.8522	216.043	113.452	115.015	93.1022	
copper	44000	43000	2000	100.014	89.7978	40.8167	81.6279	87.7551	49.9936	47.954	46.9343	55.0933	46.9343	34.7005	48.9738	34.7005	28.5858	4.14132	24.5101	38.7778	162.418	68.3572	-0.94838	29.6048	35.7198	197.265	97.9703	39.7972	30.6239	40.8167	56.1134	170.613	94.9053	73.4605	177.786	479.781	388.719	219.838	
Iron			15%	9.57774	10.3851	5.56367	6.97158	9.7337	5.74079	10.3813	10.459	7.60394	9.03458	10.1422	10.2585	3.77067	5.92156	1.45442	3.49982	4.78004	2.39314	9.43285	4.00415	3.28503	7.36742	3.56856	7.15932	3.26335	3.43061	9.64835	10.8063	9.85548	9.70025	6.04389	10.7855	7.00361	6.79156	6.43068	
lead	300	300	**1000**																											100.327	56.5351	47.5529	37.4482	104.819	108.188	66.6404	44.1846	
manganese	7500	8000	**7000**	6908.06	**17,707**	**12,849**	6974.53	**15,116**	**12,388**	**14,978**	6532.58	5663.65	3562.34	5372.52	3414.92	644.311	1177.87	216.421	592.51	663.412	444.736	4096.7	5947.27	404.033	825.67	555.29	1503.31	477.328	575.258	4037.79	**16,160**	**7446.34**	**10,197**	948.237	3994.64	1171.42	1244.23	958.314	
nickel	870	900	**600**																											195.362	90.5625	165.229	78.1382	1.64882	91.5981	72.9631	76.068	
rubidium			200	35.1312	37.605	1.0302	26.4162	35.1312	0	54.72	54.72	87.8916	38.8392	72.666	77.3832	15.0816	20.1372	0	11.271	32.6502	4.884	42.531	97.11	6.165	25.164	17.613	33.8916	16.3482	16.3482	43.758	38.8392	23.91	25.164	36.369	37.605	18.876	18.876	21.3966	
strontium			50	11.1711	20.6373	23.7675	11.1711	18.5435	21.6821	25.8473	13.2845	10.1123	9.0521	11.1711	7.9905	7.9905	7.9905	0	5.8631	7.9905	7.9905	6.9275	14.3391	6.9275	5.8631	7.9905	10.1123	11.1711	11.1711	12.2285	9.0521	12.2285	10.1123	14.3391	26.8851	15.3923	14.3391	12.2285	
uranium			100	7.26955	2.14009	2.14009	3.16598	2.14009	3.16598	5.21777	2.14009	16.5025	5.21777	8.29544	9.32133	4.19188	5.21777	0	2.14009	4.19188	10.3472	11.3731	19.5802	2.14009	6.24366	16.5025	13.4249	2.14009	1.11419	8.29544	12.5086	37.6216	26.2546	11.3579	20.5411	39.8854	31.9481	14.8076	
Vanadium	1400	1500	350	309.117	460.067	431.921	264.033	447.187	434.673	458.254	345.789	371.076	177.117	317.842	253.973	61.7412	99.6322	0	61.7412	80.9121	47.7717	153.088	329.672	47.7717	99.6322	83.614	138.229	47.7717	39.2796	200.226	298.343	224.583	235.287	160.393	206.979	130.675	140.728	115.319	
zinc	80000	80000	3000	29.6593	0	33.6941	21.5935	20.5856	28.6508	-6058.24	-6058.24	0	-6058.24	0	0	20.5856	22.6014	18.5702	17.5625	20.5856	22.6014	25.6257	-6058.24	18.5702	17.5625	22.6014	20.5856	23.6095	19.5779	18.5702	0	0	20.5856	30.6678	0	0	22.6014	18.5702	

Compound	HIL C - (Modified for Temporary Occupation Scenario)	HIL D - (Modified for Site Maint. Scenario)	CSA Global 'Cut-off Values' (Proxy Background)																																				
Test Pit Reference				5196	5196	5196	5196	5197	5197	5197	5197	5198	5198	5198	5198	5199	5199	5199	5199	5200	5200	5200	5200	5201	5201	5201	5201	5202	5202	5202	5202	5203	5203	5203	5203	5204	5204	5204	
Sample Depth				0-1	1-2	2-3	3-4	0-1	1-2	2-3	3-4	0-1	1-2	2-3	3-4	0-1	1-2	2-3	3-4	0-1	1-2	2-3	3-4	0-1	1-2	2-3	3-4	0-1	1-2	2-3	3-4	0-1	1-2	2-3	3-4	0-1	1-2	2-3	
arsenic	700	700	200	10.75	3.9505	18.1651	15.625	0	0	15.625	0	27.1261	29.0095	32.8675	16.4641	39.9116	32.8675	13.1533	16.4641	13.9696	18.1651	16.4641	9.1858	31.8916	21.6583	11.5435	13.1533	13.1533	27.1261	22.5506	29.0095	7.652	13.9696	14.7935	16.4641	3.233	6.8965	13.1533	
barium				244.934	300.489	401.783	111.456	652.671	888.71	1212.53	1829.88	201.708	332.433	706.374	889.972	586.972	515.697	215.012	378.847	344.236	431.532	416.07	359.328	364.737	469.408	493.033	348.54	286.758	191.52	213.986	752.354	253.248	366.903	363.654	407.27	247.01	226.322	223.233	
chromium (VI)	600	640		215.692	231.641	176.545	89.707	181.473	210.913	218.763	210.913	196.497	169.671	156.811	183.073	153.593	126.433	85.409	100.601	193.665	99.7774	95.6234	81.051	187.233	118.113	90.5594	78.4074	125.689	126.433	141.511	139.422	225.451	86.2734	77.5214	88.8522	15.8254	30.1614	59.2974	
copper	44000	43000	2000	116.368	73.4605	227.025	51.0135	250.651	35.7198	88.7764	53.0533	24.5101	106.145	33.6813	49.9936	46.9343	125.571	74.4813	43.8753	184.961	257.845	74.4813	51.0135	362.905	284.586	54.0733	37.7584	142.965	212.654	223.944	31.643	0	311.353	59.1738	153.201	74.4813	37.7584	36.7391	
Iron			15%	10.8155	10.6328	10.3009	5.8753	10.6853	7.97253	10.3758	8.15868	9.15574	9.44886	9.22163	10.6785	9.22462	8.11986	5.12114	6.25495	10.7642	5.96216	5.7026	4.97262	10.4193	6.56459	4.94735	5.18146	6.68763	8.94402	9.01491	8.73145	10.8135	4.81904	5.42051	6.61836	1.40314	2.44969	5.18557	
lead	300	300	**1000**	131.771	134.017	222.752	39.6937	2.6457	280.05	227.246	300.275	14.9945	47.5529	55.4123	132.894	30.712	38.5709	40.8164	31.8347	101.45	86.852	48.6757	41.9392	62.1491	99.2041	55.4123	40.8164	53.1668	45.3074	44.1846	34.0801	74.5003	202.532	29.5893	36.3255	35.2028	113.803	26.2212	
manganese	7500	8000	**7000**	3308.52	4346.86	3299.82	1468.98	3402.33	5559.34	**7137.95**	**8000.53**	3236.11	2818.37	3614.83	4711.6	4131.1	3159.96	1428.2	3111.83	4323.17	2608.53	3165.74	2033.67	4076.08	2519.17	3015.72	2011.13	2258.76	1893.92	1821.87	4322.19	5499.69	1667.88	1298.69	1671.61	175.047	235.324	497.257	
nickel	870	900	**600**	0	0	35.7319	69.8585	95.741	0	0	0	0	0	0	0	0	24.366	57.4438	67.789	0	88.4914	69.8585	57.4438	0	82.279	65.7196	58.4781	60.5469	0	10.9399	0	0	126.833	45.0348	42.9672	99.8845	83.3143	47.1026	
rubidium			200	37.605	43.758	36.369	17.613	60.747	82.0716	65.5362	77.3832	36.369	31.407	31.407	43.758	43.758	46.2066	40.0716	43.758	44.9832	47.4282	52.2966	52.2966	38.8392	43.758	48.648	53.5092	59.5452	58.3416	63.1452	49.866	36.369	71.4822	77.3832	91.362	93.6666	99.3966	103.948	
strontium			50	27.9215	29.9901	23.7675	14.3391	12.2285	10.1123	11.1711	7.9905	10.1123	11.1711	10.1123	10.1123	10.1123	11.1711	10.1123	11.1711	9.0521	7.9905	10.1123	11.1711	9.0521	10.1123	9.0521	10.1123	17.4945	12.2285	10.1123	10.1123	10.1123	15.3923	14.3391	14.3391	19.5911	17.4945	12.2285	
uranium			100	26.2546	25.1135	45.5309	10.2064	0	33.0844	36.4885	47.7835	3.2806	15.9559	17.1034	23.9716	12.5086	12.5086	10.2064	10.2064	17.1034	28.5344	10.2064	9.0541	18.2501	31.9481	10.2064	6.7471	10.2064	17.1034	11.3579	18.2501	13.6585	21.6854	12.5086	19.396	4.4369	5.5924	11.3579	
Vanadium	1400	1500	350	186.471	218.051	264.033	133.202	353.502	403.434	432.848	473.642	128.139	186.471	275.801	353.502	209.212	200.226	153.088	181.812	188.786	195.678	188.786	115.319	193.39	206.979	174.755	130.675	128.139	153.088	155.532	253.973	226.742	138.229	138.229	181.812	53.3871	70.0125	91.6645	
zinc	80000	80000	3000	17.5625	20.5856	19.5779	20.5856	0	0	0	0	0	0	23.6095	17.5625	19.5779	0	19.5779	23.6095	0	22.6014	23.6095	19.5779	0	16.555	17.5625	17.5625	17.5625	0	0	0	0	20.5856	18.5702	0	20.5856	22.6014	0	

Data Source: CSA Global Pty Ltd. March 2011. *Rum Jungle Mine Site: Results of Soil and Fluvial Zone Sampling and Assessment.*

NOTES:
Zero results are not considered a valid result, and are likely a function of XRF procedure

TABLE B2: Metal Concentrations Across the Old Tailings Dam Area Measured via XRF in 2010

Compound	HIL C - (Modified for Temporary Occupation Scenario)	HIL D - (Modified for Site Maint. Scenario)	CSA Global 'Cut-off Values' (Proxy Background)																						
Test Pit Reference				5204	5205	5205	5205	5206	5206	5206	5206	5207	5207	5207	5207	5208	5208	5208	5208	5209	5209	5209	5209	5210	5210	5210
Sample Depth				3-4	0-1	1-2	2-3	0-1	1-2	2-3	3-4	0-1	1-2	2-3	3-4	0-1	1-2	2-3	3-4	0-1	1-2	2-3	3-4	0-1	1-2	2-3
arsenic	700	700	200	19.027	4.6756	20.7736	19.027	9.9641	21.6583	29.9626	38.8825	11.5435	9.9641	6.8965	5.4083	20.7736	13.9696	16.4641	12.3446	8.4151	13.1533	15.625	9.9641	9.1858	12.3446	28.064
barium				252.207	189.487	220.147	203.75	136.201	112.441	130.239	216.038	319.612	682.406	934.387	806.316	199.667	198.647	202.729	272.047	393.025	605.615	759.667	905.145	323.879	198.647	133.218
chromium (VI)	600	640		95.6234	15.8254	123.441	122.687	53.643	78.4074	115.015	132.302	70.347	78.4074	59.2974	63.9434	152.942	149.652	161.835	154.241	59.2974	61.163	59.2974	63.019	81.9274	93.945	142.203
copper	44000	43000	2000	32.6621	21.4538	28.5858	25.529	71.4191	53.0533	53.0533	42.8557	482.891	206.497	75.5021	40.8167	117.39	93.8837	79.5858	180.861	475.635	574.274	595.086	462.165	587.8	272.241	86.7338
Iron			15%	6.662	1.6985	7.88036	7.50203	2.98623	5.76152	7.4434	9.37217	4.0272	4.57713	3.72541	3.20867	7.55735	7.02847	7.00448	6.35176	4.09042	5.56974	6.23144	4.41854	3.81489	5.12965	8.89682
lead	300	300	**1000**	45.3074	16.1172	47.5529	45.3074	20.6078	21.7305	25.0985	36.3255	46.4301	28.4666	21.7305	13.8719	12.7493	11.6266	2.6457	1.5231	27.3439	28.4666	25.0985	30.712	287.915	116.049	39.6937
manganese	7500	8000	**7000**	918.935	163.362	1218.41	1135.52	281.266	534.425	659.773	1075.76	1091.38	1869.58	2125.83	1857.41	990.395	980.31	909.782	750.843	850.337	1658.57	2295.6	2598.07	313.727	283.069	305.609
nickel	870	900	**600**	45.0348	87.4559	19.2013	31.5983	85.385	73.998	30.565	0	97.8127	94.7052	94.7052	98.8486	60.5469	75.033	84.3496	66.7543	88.4914	50.2045	45.0348	85.385	190.164	107.137	0
rubidium			200	108.471	53.5092	79.731	76.2066	42.531	67.92	63.1452	58.3416	59.5452	33.8916	20.1372	15.0816	37.605	38.8392	28.9152	25.164	107.343	98.2542	97.11	122.971	57.1362	72.666	73.848
strontium			50	13.2845	16.4441	10.1123	7.9905	11.1711	10.1123	6.9275	6.9275	18.5435	11.1711	13.2845	16.4441	12.2285	10.1123	9.0521	19.5911	17.4945	16.4441	15.3923	20.6373	15.3923	12.2285	7.9905
uranium			100	13.6585	2.1235	14.8076	15.9559	7.901	6.7471	7.901	11.3579	18.2501	7.901	7.901	0	3.2806	3.2806	3.2806	0	22.8289	21.6854	27.3949	14.8076	35.3546	18.2501	17.1034
Vanadium	1400	1500	350	157.967	36.4305	179.469	197.956	78.201	96.9855	133.202	153.088	104.898	170.005	184.146	155.532	107.517	115.319	133.202	102.27	128.139	174.755	195.678	215.855	125.593	99.6322	117.902
zinc	80000	80000	3000	18.5702	17.5625	0	0	21.5935	17.5625	0	0	28.6508	27.6423	38.7394	40.758	19.5779	24.6176	25.6257	25.6257	16.555	0	0	21.5935	18.5702	20.5856	0

Compound	HIL C - (Modified for Temporary Occupation Scenario)	HIL D - (Modified for Site Maint. Scenario)	CSA Global 'Cut-off Values' (Proxy Background)																																	
Test Pit Reference				5210	5210	5211	5211	5211	5212	5212	5212	5212	5213	5213	5213	5213	5214	5214	5214	5215	5215	5215	5216	5216	5217	5217	5218	5218	5218	5218	5219	5219	5219	5219	5220	5220	5221	5221
Sample Depth				2-3	3-4	0-1	1-2	2-3	0-1	1-2	2-3	3-4	0-1	1-2	2-3	3-4	0-1	1-2	2-3	0-1	1-2	2-3	0-1	1-2	0-1	1-2	0-1	1-2	2-3	3-4	0-1	1-2	2-3	3-4	0-1	1-2	0-1	1-2
arsenic	700	700	200	28.064	23.4505	7.652	13.9696	21.6583	7.652	10.75	19.027	26.1958	3.233	7.652	9.1858	13.1533	1.8208	3.9505	6.1486	12.3446	16.4641	6.8965	3.9505	12.3446	3.233	20.7736	0	28.064	12.3446	0	44.104	50.6206	0	0	19.8965	16.4641	16.4641	17.3108
barium				133.218	125.282	116.385	127.264	136.201	118.359	135.206	167.232	113.426	103.59	88.9114	134.212	96.729	172.273	176.313	289.921	757.228	452.641	236.646	176.313	173.282	66.5784	207.84	152.169	180.359	478.387	607.953	194.572	225.292	1024.69	2750.08	120.335	73.353	78.204	101.628
chromium (VI)	600	640		142.203	136.603	59.2974	95.6234	122.687	42.075	56.481	105.492	138.721	14.7834	43.0522	57.4222	84.5422	9.5374	19.9694	42.075	59.2974	66.7022	59.2974	41.0954	77.5214	34.171	84.5422	164.897	109.502	150.315	202.337	144.945	156.811	194.619	138.017	58.361	56.481	45.9694	58.361
copper	44000	43000	2000	86.7338	28.5858	47.954	41.8362	25.529	43.8753	42.8557	45.9146	32.6621	36.7391	34.7005	36.7391	34.7005	43.8753	21.4538	28.5858	1142.88	603.415	125.571	257.845	40.8167	43.8753	16.3607	429.038	336.086	273.269	174.712	363.937	932.361	169.589	305.174	27.5668	35.7198	30.6239	26.5479
Iron			15%	8.89682	8.80469	3.64274	5.37874	7.73546	2.94433	4.18067	6.48988	8.30313	1.57004	3.07707	3.55358	5.24115	1.32297	1.88613	3.53016	4.08912	4.62037	3.93866	2.37326	4.95859	2.19094	7.3828	9.13756	9.42859	10.817	9.40115	8.11068	4.9366	5.07397	5.12197	4.90769	4.85605	4.55201	5.17536
lead	300	300	**1000**	39.6937	29.5893	22.8531	22.8531	27.3439	13.8719	19.4852	22.8531	25.0985	14.9945	19.4852	22.8531	27.3439	22.8531	17.2398	26.2212	349.72	128.402	16.1172	43.0619	23.9758	16.1172	20.6078	128.402	25.0985	95.8353	157.603	56.5351	105.942	242.974	218.259	13.8719	14.9945	14.9945	16.1172
manganese	7500	8000	**7000**	305.609	304.707	464.65	457.407	531.704	265.045	490.915	541.681	526.263	164.261	198.427	204.724	273.155	154.376	176.845	873.191	1368.02	1243.31	1061.06	509.039	868.619	693.446	1430.98	2010.19	1115.28	4100.63	6422.4	1291.3	670.691	4825.13	**23,184**	809.233	603.41	582.521	590.694
nickel	870	900	**600**	0	0	73.998	50.2045	17.1357	90.5625	84.3496	33.665	0	94.7052	83.3143	80.2085	59.5125	94.7052	94.7052	79.1733	97.8127	84.3496	85.385	112.319	51.2386	110.246	11.9724	0	0	0	0	0	136.168	0	108.173	30.565	27.4653	35.7319	18.1685
rubidium			200	73.848	77.3832	44.9832	63.1452	61.947	61.947	76.2066	70.2966	71.4822	23.91	49.866	54.72	64.3416	70.2966	89.0502	112.965	53.5092	85.569	22.6542	95.964	55.929	22.6542	41.3022	58.3416	32.6502	51.0822	67.92	21.3966	35.1312	92.5152	93.6666	0	0	0	0
strontium			50	7.9905	9.0521	10.1123	9.0521	9.0521	9.0521	9.0521	10.1123	9.0521	9.0521	9.0521	7.9905	9.0521	16.4441	14.3391	14.3391	26.8851	21.6821	9.0521	17.4945	9.0521	7.9905	9.0521	26.8851	14.3391	17.4945	18.5435	40.2491	66.2673	13.2845	95.1123	11.1711	12.2285	11.1711	10.1123
uranium			100	17.1034	11.3579	3.2806	7.901	11.3579	2.1235	5.5924	5.5924	10.2064	0.9656	3.2806	6.7471	9.0541	2.1235	5.5924	0.9656	78.9839	34.2199	2.1235	14.8076	4.4369	2.1235	6.7471	48.9086	22.8289	30.811	30.811	41.0161	89.9749	55.6424	45.5309	5.5924	4.4369	5.5924	5.5924
Vanadium	1400	1500	350	117.902	138.229	80.9121	91.6645	130.675	61.7412	99.6322	110.127	145.7	24.9421	72.7512	72.7512	96.9855	30.7047	47.7717	133.202	162.81	138.229	70.0125	86.3067	61.7412	30.7047	128.139	61.7412	86.3067	206.979	213.65	195.678	309.117	328.009	371.076	47.7717	50.584	36.4305	50.584
zinc	80000	80000	3000	0	0	20.5856	17.5625	0	21.5935	18.5702	19.5779	0	18.5702	17.5625	18.5702	19.5779	0	18.5702	22.6014	26.634	40.758	46.816	34.703	22.6014	22.6014	19.5779	25.6257	17.5625	24.6176	24.6176	26.634	50.8562	32.6852	50.8562	36.721	32.6852	29.6593	32.6852

Compound	HIL C - (Modified for Temporary Occupation Scenario)	HIL D - (Modified for Site Maint. Scenario)	CSA Global 'Cut-off Values' (Proxy Background)																																	
Test Pit Reference				5222	5222	5222	5223	5223	5223	5223	5224	5224	5224	5224	5225	5225	5225	5225	5226	5226	5226	5227	5227	5228	5228	5229	5229	5230	5230	5230	5231	5231	5232	5232	5232	5233	5233	5234
Sample Depth				0-1	1-2	2-3	0-1	1-2	2-3	3-4	0-1	1-2	2-3	3-4	0-1	1-2	2-3	3-4	0-1	1-2	2-3	0-1	1-2	0-1	1-2	0-1	1-2	0-1	1-2	2-3	0-1	1-2	0-1	1-2	2-3	0-1	1-2	0-1
arsenic	700	700	200	15.625	20.7736	20.7736	38.8825	23.4505	0	0	19.8965	0	0	0	38.8825	23.4505	24.358	4.6756	13.9696	0	8.4151	2.5231	15.625	0	19.027	15.625	13.9696	37.861	24.358	8.4151	20.7736	33.851	11.5435	16.4641	5.4083	17.3108	31.8916	51.7333
barium				132.225	113.426	96.729	124.292	301.548	676.439	751.137	301.548	505.478	1102.32	1027.3	624.361	213.986	127.264	337.792	410.567	884.927	1014.27	396.306	718.418	247.01	2136.07	370.156	98.6874	521.388	198.647	242.86	460.454	432.639	486.265	590.46	552.292	403.977	640.847	877.372
chromium (VI)	600	640		206.961	158.713	163.679	146.977	133.745	158.713	228.107	145.625	172.577	216.043	189.255	127.175	93.1022	98.9514	181.473	77.5214	208.967	190.252	212.799	71.2522	214.983	89.707	110.297	85.409	127.915	117.342	44.9994	170.841	158.081	87.995	82.8014	69.4394	85.409	112.667	146.977
copper	44000	43000	2000	142.965	36.7391	65.2957	939.74	456.987	165.491	218.812	1232.21	189.062	194.189	187.011	632.588	260.929	112.278	125.571	389.752	146.035	97.9703	236.267	21.4538	76.523	16.3607	82.649	41.8362	85.7125	47.954	47.954	196.24	66.3162	148.083	273.269	27.5668	92.8622	28.5858	243.458
Iron			15%	3.29619	5.21181	4.95053	5.93977	10.2139	8.30879	0	10.7436	10.2475	0	0	7.69012	9.69537	10.0303	10.6893	5.28184	4.84074	10.4066	9.12465	6.01715	6.5957	6.13663	7.03204	5.4946	8.35935	8.31991	2.9397	10.8179	10.088	5.65836	6.41837	4.13647	5.94544	7.992	10.0725
lead	300	300	**1000**	76.746	13.8719	30.712	23.9758	36.3255	182.313	432.895	71.1317	114.926	260.95	394.677	404.793	30.712	26.2212	107.065	78.9917	286.792	150.864	202.532	20.6078	260.95	27.3439	49.7984	32.9574	47.5529	45.3074	28.4666	109.311	52.044	61.0263	38.5709	14.9945	46.4301	46.4301	78.9917
manganese	7500	8000	**7000**	222.721	233.523	249.731	476.422	4334.03	**11,908**	**11,198**	1296.85	**7030.68**	**10,265**	**9624.39**	1913.59	1344.9	1207.35	3329.78	2630.43	2985.97	**7006.76**	1822.81	2775.37	2353.28	5033.96	3802.89	503.601	3290.16	1877.07	541.681	3484.69	2995.56	1817.2	1901.41	2130.54	1885.49	3472.09	4349.83
nickel	870	900	**600**	101.957	41.9335	44.001	171.461	0	26.4322	0	0	0	0	0	221.366	21.2671	4.74548	0	116.465	0	59.5125	0	87.4559	0	146.543	98.8486	82.279	47.1026	26.4322	90.5625	0	0	71.9282	41.9335	78.1382	56.4095	26.4322	20.2342
rubidium			200	26.4162	22.6542	26.4162	1.0302	33.8916	76.2066	186.948	40.0716	59.5452	132.832	199.717	43.758	35.1312	40.0716	54.72	92.5152	95.964	52.2966	64.3416	0	91.362	6.165	44.9832	25.164	54.72	63.1452	102.813	70.2966	63.1452	82.0716	80.9022	25.164	73.848	63.1452	65.5362
strontium			50	130.727	50.3681	73.1105	38.2085	19.5911	29.9901	41.2673	13.2845	28.9565	40.2491	50.3681	20.6373	17.4945	15.3923	17.4945	19.5911	15.3923	23.7675	14.3391	24.8081	13.2845	25.8473	11.1711	13.2845	11.1711	10.1123	17.4945	16.4441	11.1711	13.2845	14.3391	17.4945	13.2845	13.2845	16.4441
uranium			100	44.4034	14.8076	26.2546	43.2751	30.811	26.2546	44.4034	82.2896	18.2501	35.3546	37.6216	77.8804	31.9481	20.5411	19.396	26.2546	45.5309	27.3949	58.9985	15.9559	33.0844	2.1235	11.3579	11.3579	14.8076	19.396	10.2064	19.396	11.3579	14.8076	12.5086	0.9656	11.3579	13.6585	25.1135
Vanadium	1400	1500	350	292.831	235.287	249.885	319.56	150.634	162.81	174.755	160.393	165.217	231.033	251.934	209.212	128.139	72.7512	148.172	135.72	305.562	334.603	277.73	117.902	253.973	256.004	162.81	107.517	220.237	165.217	117.902	237.4	215.855	138.229	143.219	107.517	130.675	218.051	251.934
zinc	80000	80000	3000	32.6852	29.6593	25.6257	70.0649	28.6508	21.5935	30.6678	0	23.6095	29.6593	46.816	28.6508	24.6176	25.6257	27.6423	22.6014	23.6095	45.8061	16.555	44.7964	16.555	40.758	24.6176	19.5779	24.6176	0	23.6095	17.5625	20.5856	16.555	19.5779	44.7964	21.5935	0	25.6257

Compound	HIL C - (Modified for Temporary Occupation Scenario)	HIL D - (Modified for Site Maint. Scenario)	CSA Global 'Cut-off Values' (Proxy Background)																																	
Test Pit Reference				5234	5235	5235	5236	5236	5236	5236	5237	5237	5237	5238	5238	5238	5239	5239	5239	5239	5240	5240	5240	5240	5241	5241	5241	5241	5242	5242	5242	5243	5243	5244	5244	5245	5245	5246
Sample Depth				1-2	0-1	1-2	0-1	1-2	2-3	3-4	0-1	1-2	2-3	0-1	1-2	2-3	0-1	1-2	2-3	3-4	0-1	1-2	2-3	3-4	0-1	1-2	2-3	3-4	0-1	1-2	2-3	0-1	1-2	0-1	1-2	0-1	1-2	0-1
arsenic	700	700	200	31.8916	19.027	27.1261	6.1486	0	4.6756	19.027	6.8965	6.8965	16.4641	3.9505	0	20.7736	19.027	22.5506	26.1958	20.7736	238.409	4.81	51.9391	54.1901	222.485	0	64.6958	46.4446	0	37.0333	19.1866	12.493	16.6195	0	8.5565	36.8471	0	2.5231
barium				360.409	261.587	125.282	238.716	179.347	3246.02	1819.18	396.306	1834.48	1293.49	276.242	544.252	1610.59	189.487	203.75	215.012	250.127	159.187	489.647	334.575	305.788	163.206	539.666	318.546	323.879	426.001	177.324	183.398	134.212	539.666	288.866	1546.18	827.372	785.375	316.416
chromium (VI)	600	640		148.319	69.4394	142.203	201.025	241.502	139.422	120.411	202.769	163.067	93.1022	178.209	216.737	187.233	222.252	112.667	98.9514	97.2922	142.892	200.139	169.083	162.452	152.942	206.142	194.619	169.671	185.172	230.977	231.201	214.625	229.425	169.083	173.151	163.067	208.172	154.241
copper	44000	43000	2000	65.2957	95.9269	83.6701	141.941	59.1738	193.163	42.8557	280.47	345.366	49.9936	210.601	42.8557	72.4398	129.663	199.317	132.732	94.9053	134.778	183.936	157.297	0	129.663	154.225	75.5021	56.1134	400.085	0	0	0	0	55.0933	0	547.242	0	97.9703
Iron			15%	9.40607	4.10021	8.46876	10.6071	0	10.664	9.4356	10.5365	10.7718	6.22307	10.6863	0	10.4564	10.8164	10.708	10.4234	9.9877	10.2735	0	0	0	0	10.4578	0	0	0	0	0	0	0	0	3.6629	0	10.7008	0	10.7731
lead	300	300	**1000**	48.6757	25.0985	32.9574	130.648	360.959	89.0978	16.1172	138.51	134.017	21.7305	111.557	301.399	78.9917	108.188	28.4666	26.2212	13.8719	246.344	604.934	612.807	606.059	240.727	563.321	618.431	588.063	317.13	536.332	489.106	493.604	490.231	262.073	471.118	770.314	385.685	72.2546
manganese	7500	8000	**7000**	2383.57	1630.64	657.954	1201.82	946.405	**7744.88**	**9513.41**	2538.17	**8184.02**	4144.86	1966.08	2921.73	6584.14	**7701.68**	1390.23	1333.8	1403.19	2210.63	**11,735**	**8612.68**	**11,951**	2823.15	**14,403**	**8985.3**	**12,521**	**11,660**	3810.7	2739.09	2535.32	**10,630**	5047.98	**16,796**	3006.12	**13,937**	2141.83
nickel	870	900	**600**	0	69.8585	0	0	0	0	137.205	0	0.61668	107.137	0	0	4.74548	14.0376	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	115.428	154.847	0	0
rubidium			200	57.1362	37.605	26.4162	49.866	147.88	38.8392	16.3482	54.72	42.531	9.9972	52.2966	124.074	47.4282	48.648	70.2966	71.4822	46.2066	47.4282	263.242	284.59	278.151	43.758	243.342	286.975	282.189	139.324	264.927	245.992	286.182	228.022	82.0716	207.423	64.3416	177.93	30.162
strontium			50	11.1711	13.2845	12.2285	12.2285	18.5435	38.2085	95.1123	13.2845	38.2085	36.1623	17.4945	40.2491	53.3765	11.1711	22.7255	32.0531	20.6373	16.4441	62.3261	69.2085	83.7255	20.6373	71.1623	72.1371	85.6373	27.9215	38.2085	73.1105	20.6373	55.3751	29.9901	61.3373	22.7255	43.2995	31.0223
uranium			100	13.6585	10.2064	12.5086	26.2546	34.2199	13.6585	4.4369	39.8854	25.1135	2.1235	34.2199	62.3474	43.2751	17.1034	11.3579	12.5086	12.5086	50.0329	94.3489	77.8804	73.4584	54.5221	97.621	67.9129	71.2426	75.671	72.3509	62.3474	42.146	36.4885	87.7831	48.9086	67.9129	50.0329	22.8289
Vanadium	1400	1500	350	179.469	83.614	112.728	211.435	392.447	384.709	281.56	184.146	351.978	193.39	170.005	309.117	301.971	184.146	115.319	138.229	102.27	1.5237	91.6645	138.229	64.5075	44.9502	135.72	83.614	140.728	61.7412	50.584	117.902	86.3067	96.9855	47.7717	211.435	228.892	195.678	39.2796
zinc	80000	80000	3000	17.5625	21.5935	0	0	29.6593	26.634	63.9959	17.5625	30.6678	53.8873	24.6176	31.6765	59.9515	16.555	24.6176	47.8259	40.758	22.6014	66.0185	84.2371	78.1613	22.6014	72.0885	73.1004	73.1004	43.7867	52.8768	105.525	26.634	0	38.7394	82.2115	24.6176	55.9083	26.634

Data Source: CSA Global Pty Ltd. March 2011. *Rum Jungle Mine Site: Results of Soil and Fluvial Zone Sampling and Assessment.*

NOTES:
Zero results are not considered a valid result, and are likely a function of XRF procedure

TABLE B2: Metal Concentrations Across the Old Tailings Dam Area Measured via XRF in 2010

			Test Pit Reference	5246	5247	5247	5247	5247	5248	5248	5248	5249	5249	5249	5250	5250	5250	5251	5251	5251	5252	5252	5252	5252	5253	5253	5254	5255	5255	5256	5256	5257	5257	5258	5258	5258	5259	5259
			Sample Depth	1-2	0-1	1-2	2-3	3-4	0-1	1-2	2-3	0-1	1-2	2-3	0-1	1-2	2-3	0-1	1-2	2-3	0-1	1-2	2-3	3-4	0-1	1-2	0-1	0-1	1-2	0-1	1-2	0-1	1-2	0-1	1-2	2-3	0-1	1-2
Compound	**HIL C - (Modified for Temporary Occupation Scenario)**	**HIL D - (Modified for Site Maint. Scenario)**	**CSA Global 'Cut-off Values' (Proxy Background)**																																		
arsenic	700	700	200	0	36.8471	9.9641	10.75	0	19.027	20.7736	24.358	12.3446	19.8965	3.233	15.625	15.625	16.4641	12.3446	6.1486	3.9505	22.5506	32.8675	6.8965	8.4151	5.4083	4.6756	8.4151	0	36.8471	13.1533	3.9505	0	14.7935	13.9696	0	19.8965	0	10.75
barium				406.172	522.527	360.409	294.143	1025.99	98.6874	102.609	98.6874	101.628	154.172	1239.82	295.2	185.426	123.302	469.408	328.153	267.858	622.012	844.799	467.167	315.351	312.16	362.572	304.727	2395.32	902.612	337.792	364.737	647.937	413.868	365.82	359.328	333.504	147.168	200.687
chromium (VI)	600	640		220.702	150.315	146.302	179.852	213.902	102.241	96.459	132.302	77.5214	145.625	211.295	81.9274	83.673	99.7774	42.075	42.075	41.0954	88.8522	141.511	55.5374	60.2314	36.1614	39.129	41.0954	195.092	146.302	201.025	202.769	217.081	91.4094	159.342	197.881	142.892	227.073	81.9274
copper	44000	43000	2000	0	305.174	138.871	122.503	100.014	141.941	136.825	122.503	232.159	189.062	115.345	169.589	151.154	139.894	846.078	249.623	5.15938	649.272	779.969	175.737	85.7125	22.4725	26.5479	32.6621	349.492	359.809	419.728	236.267	116.368	56.1134	124.549	111.256	74.4813	64.2753	52.0334
Iron			15%	0	9.39877	10.6897	10.8175	8.0348	6.23986	7.58689	8.61505	6.5734	9.55243	10.5799	6.46025	5.96823	6.21378	3.09654	3.12683	3.07896	7.02755	9.57271	3.75869	3.8454	2.68768	2.82635	3.84457	8.67162	10.1682	10.7984	10.6139	5.28123	6.17978	10.2201	2.06654	8.63246	3.90658	6.21756
lead	300	300	**1000**	395.801	86.852	78.9917	94.7123	262.073	23.9758	38.5709	31.8347	36.3255	73.3774	186.806	75.6232	37.4482	32.9574	32.9574	20.6078	9.38137	46.4301	46.4301	17.2398	9.38137	23.9758	25.0985	26.2212	223.876	74.5003	109.311	169.958	276.679	40.8164	72.2546	277.803	41.9392	227.246	10.504
manganese	7500	8000	**7000**	3916.28	2892.03	1343.05	1618.54	4953.92	516.29	550.753	699.819	506.32	802.843	6622.33	1357.85	485.479	697.088	1430.05	1869.58	1567.39	2331.52	4307.38	2252.15	1485.68	616.131	720.768	827.497	**19,994**	3626.5	3047.42	2554.33	2676.15	1888.3	4795.23	2845.14	1778.89	1414.3	1135.52
nickel	870	900	**600**	0	38.8325	0	0	0	80.2085	45.0348	0	59.5125	0	0	47.1026	53.3068	64.685	93.6695	93.6695	85.385	41.9335	26.4322	90.5625	84.3496	82.279	78.1382	70.8933	157.961	0	0	0	0	69.8585	14.0376	0	0	0	86.4204
rubidium			200	183.958	23.91	40.0716	44.9832	66.729	16.3482	20.1372	21.3966	18.876	30.162	48.648	48.648	37.605	33.8916	76.2066	20.1372	0	98.2542	76.2066	27.6666	15.0816	133.918	161.538	128.467	76.2066	42.531	41.3022	47.4282	85.569	0	32.6502	94.8162	4.884	82.0716	0
strontium			50	48.3555	17.4945	17.4945	16.4441	16.4441	12.2285	15.3923	16.4441	13.2845	12.2285	14.3391	12.2285	14.3391	13.2845	22.7255	24.8081	11.1711	14.3391	12.2285	38.2085	12.2285	20.6373	25.8473	17.4945	16.4441	13.2845	16.4441	17.4945	21.6821	19.5911	10.1123	32.0531	24.8081	59.3555	59.3555
uranium			100	57.8806	28.5344	19.396	23.9716	29.6731	13.6585	18.2501	19.396	28.5344	34.2199	20.5411	21.6854	14.8076	19.396	30.811	5.5924	0	27.3949	22.8289	6.7471	0	0	0.9656	4.4369	30.811	18.2501	30.811	29.6731	36.4885	7.901	12.5086	35.3546	12.5086	35.3546	12.5086
Vanadium	1400	1500	350	155.532	186.471	148.172	130.675	332.969	102.27	112.728	99.6322	96.9855	133.202	398.643	128.139	99.6322	104.898	133.202	53.3871	53.3871	174.755	258.025	104.898	61.7412	64.5075	91.6645	86.3067	449.442	266.017	170.005	177.117	316.116	112.728	174.755	125.593	99.6322	148.172	13.3065
zinc	80000	80000	3000	111.613	32.6852	19.5779	22.6014	24.6176	28.6508	26.634	27.6423	30.6678	25.6257	25.6257	33.6941	29.6593	31.6765	26.634	42.777	65.0072	17.5625	0	46.816	65.0072	23.6095	21.5935	19.5779	21.5935	23.6095	19.5779	38.7394	50.8562	39.7487	18.5702	42.777	32.6852	59.9515	56.919

			Test Pit Reference	5260	5260	5260	5261	5261	5261	5262	5262	5262	5263	5263	5264	5264	5264	5264	5265	5265	5266	5266	5266	5267	5267	5268	5268	5268	5269	5269	5269	5269	5270	5270	5270	5270	5271	5271
			Sample Depth	0-1	1-2	2-3	0-1	1-2	2-3	0-1	1-2	2-3	0-1	1-2	0-1	1-2	2-3	3-4	0-1	1-2	0-1	1-2	3-4	0-1	1-2	0-1	1-2	2-3	0-1	1-2	2-3	3-4	0-1	1-2	2-3	3-4	0-1	1-2
Compound	**HIL C - (Modified for Temporary Occupation Scenario)**	**HIL D - (Modified for Site Maint. Scenario)**	**CSA Global 'Cut-off Values' (Proxy Background)**																																		
arsenic	700	700	200	0	9.1858	8.4151	0	15.625	6.1486	14.7935	0	1.8208	0	0	28.064	6.1486	33.851	6.1486	29.0095	24.358	29.0095	0	0	0	8.4151	10.75	0	0.439	32.8675	0	0	13.9696	0	0	0	14.7935	32.8675
barium				486.265	1063.99	91.84	407.27	829.857	81.1194	50.2074	183.398	51.1672	127.264	61.7514	310.034	1093.04	687.187	254.289	531.657	668.102	253.248	622.012	0	1065.3	545.399	266.812	1409.74	1478.22	163.206	222.204	1543.27	666.913	306.849	80.1472	51.1672	75.2922	602.112	203.75
chromium (VI)	600	640		196.031	107.103	38.1422	161.215	61.163	28.1422	37.153	64.8654	66.7022	156.172	147.649	142.892	180.395	172.001	174.292	146.302	108.705	113.452	155.531	0	217.761	70.347	182.542	209.361	182.009	148.319	210.913	181.473	116.569	175.423	172.001	161.835	174.292	197.422	144.263
copper	44000	43000	2000	45.9146	62.2346	63.2549	198.291	59.1738	37.7584	4.14132	0	0	0	35.7198	96.9486	206.497	233.186	125.571	261.957	28.5858	139.894	76.523	0	416.625	120.458	124.549	73.4605	0	40.8167	92.8622	11.2686	10.2503	230.105	169.589	176.761	113.301	54.0733	86.7338
Iron			15%	1.52805	10.8026	5.51757	6.4811	8.22508	3.73393	7.80539	10.7959	10.8035	2.54632	9.15669	9.99707	10.7535	10.7843	10.6838	9.96204	7.66301	10.7774	0	0	4.62227	4.48228	10.8137	0	9.41945	10.4103	0	9.50738	6.56757	6.87681	8.56805	0	0	10.6809	10.5855
lead	300	300	**1000**	275.556	34.0801	4.89091	240.727	0.400508	4.89091	0	37.4482	37.4482	167.711	108.188	21.7305	120.541	126.156	119.418	64.3948	28.4666	30.712	341.853	0	284.544	37.4482	80.1146	210.395	118.295	0	293.533	119.418	4.89091	194.669	128.402	212.642	281.174	92.4665	8.25875
manganese	7500	8000	**7000**	6740.16	**9778.15**	1074.84	5333.22	**8241.41**	718.946	943.657	2006.43	1053.71	1701.44	416.692	2905.44	4497.19	3100.29	2067.5	2586.65	3398.46	1074.84	3302.72	0	**8573.09**	5322.15	2852.79	**13,296**	**13,750**	1681.86	2696.16	**36,113**	4183.23	3671.27	389.571	607.953	559.827	**7173.4**	1573.9
nickel	870	900	**600**	0	13.005	45.0348	0	53.3068	58.4781	0	0	0	0	0	0	0	0	0	0	118.538	0	0	0	0	84.3496	0	0	55.3752	0	0	521.677	112.319	0	0	0	0	0	0
rubidium			200	86.7312	17.613	0	65.5362	0	0	0	28.9152	22.6542	85.569	49.866	25.164	41.3022	32.6502	41.3022	79.731	3.6012	110.722	182.958	0	86.7312	0	44.9832	111.844	58.3416	25.164	168.766	46.2066	0	90.207	61.947	131.743	152.115	69.1092	28.9152
strontium			50	41.2673	74.0825	33.0825	38.2085	73.1105	23.7675	21.6821	23.7675	24.8081	49.3625	51.3723	19.5911	27.9215	28.9565	24.8081	18.5435	27.9215	27.9215	58.3625	0	14.3391	13.2845	14.3391	41.2673	35.1371	14.3391	29.9901	112.729	25.8473	35.1371	65.2841	60.3471	58.3625	14.3391	25.8473
uranium			100	47.7835	73.4584	29.6731	82.2896	75.671	37.6216	11.3579	12.5086	12.5086	29.6731	37.6216	25.1135	27.3949	34.2199	21.6854	20.5411	3.2806	27.3949	61.2319	0	35.3546	3.2806	17.1034	26.2546	14.8076	12.5086	51.1564	21.6854	6.7471	34.2199	26.2546	37.6216	39.8854	12.5086	14.8076
Vanadium	1400	1500	350	140.728	145.7	0	107.517	91.6645	0	0	0	0	138.229	155.532	102.27	264.033	204.737	94.3296	170.005	145.7	96.9855	215.855	0	353.502	102.27	120.475	350.444	348.902	61.7412	130.675	296.515	117.902	184.146	150.634	150.634	165.217	239.504	94.3296
zinc	80000	80000	3000	46.816	69.0532	46.816	38.7394	54.8978	28.6508	40.758	55.9083	55.9083	73.1004	77.149	28.6508	53.8873	48.836	30.6678	29.6593	44.7964	40.758	65.0072	0	0	74.1125	17.5625	39.7487	37.7301	25.6257	37.7301	72.0885	32.6852	44.7964	59.9515	56.919	70.0649	21.5935	33.6941

			Test Pit Reference	5272	5272	5273	5273	5274	5274	5275	5275	5275	5275	5276	5276	5276	5276	5277	5277	5278	5279	5279	5279	5279	5280	5280	5280	5280	5281	5281	5281	5281	5282	5282	5282	5283	5283	5284
			Sample Depth	0-1	1-2	0-1	1-2	0-1	1-2	0-1	1-2	2-3	3-4	0-1	1-2	2-3	3-4	0-1	1-2	0-1	0-1	1-2	2-3	3-4	0-1	1-2	2-3	3-4	0-1	1-2	2-3	3-4	0-1	1-2	2-3	0-1	1-2	0-1
Compound	**HIL C - (Modified for Temporary Occupation Scenario)**	**HIL D - (Modified for Site Maint. Scenario)**	**CSA Global 'Cut-off Values' (Proxy Background)**																																		
arsenic	700	700	200	0	0	0	5.4083	23.4505	11.5435	9.9641	0	0	40.9483	19.8965	6.8965	0	31.8916	9.9641	35.8408	7.652	25.2731	0	16.4641	14.7935	22.5506	19.8965	6.8965	31.8916	16.4641	20.7736	1.1261	32.8675	29.9626	14.7935	0	14.7935	0	8.4151
barium				169.247	80.1472	443.735	1538.91	178.335	651.487	353.929	118.359	266.812	2257.89	238.716	1234.35	1391.35	839.812	849.793	2084.78	168.239	229.415	791.522	511.151	353.929	485.138	248.049	702.769	2595.45	366.903	204.772	742.626	2051.35	426.001	169.247	2974.41	135.206	286.758	64.6464
chromium (VI)	600	640		150.315	168.492	203.199	150.975	122.687	156.811	163.679	221.329	225.172	170.841	124.193	185.172	163.067	133.745	197.422	183.601	61.163	138.017	221.329	92.257	108.705	138.721	144.263	199.692	157.447	91.4094	134.463	197.422	152.289	188.753	113.452	205.313	114.235	215.339	98.123
copper	44000	43000	2000	0	30.6239	0	0	81.6279	55.0933	355.682	185.986	194.189	89.7978	233.186	179.836	135.801	46.9343	303.114	93.8837	214.706	201.368	253.734	269.155	150.13	200.342	168.564	167.54	20.4351	225.998	171.638	156.273	47.954	25.529	30.6239	0	29.6048	24.5101	48.9738
Iron			15%	0	0	0	10.5702	9.15689	10.7099	10.7069	0	0	10.8041	7.73321	10.1242	7.58175	9.99764	10.6297	10.2692	4.31099	8.40557	9.75686	6.7512	5.32877	7.80225	8.37028	10.7724	9.98246	6.65697	8.72022	10.8186	9.76815	10.1095	7.18197	2.45122	7.45101	9.77172	5.28912
lead	300	300	**1000**	342.977	218.259	367.702	73.3774	18.3625	75.6232	77.8689	263.197	268.814	0	14.9945	116.049	160.972	0.400508	141.879	40.8164	23.9758	30.712	164.342	16.1172	7.13613	35.2028	29.5893	103.696	18.3625	40.8164	29.5893	130.648	17.2398	38.5709	23.9758	256.455	25.0985	148.618	27.3439
manganese	7500	8000	**7000**	2355.17	617.039	**8370.23**	**10,488**	3397.49	5871.9	2417.67	898.801	1606.44	**10,562**	1959.52	**11,775**	**16,889**	**7245.43**	**9833.87**	**22,550**	1490.31	2222.9	**13,283**	3239	**7584.9**	3439.13	1859.28	**7165.06**	**15,912**	1735.95	1774.22	**8733.76**	**12,602**	4115.37	2353.28	**15,551**	2200.26	2395.88	1006.9
nickel	870	900	**600**	0	0	0	119.575	17.1357	0.61668	0	0	0	276.576	20.2342	72.9631	150.695	45.0348	40.8998	250.519	106.101	13.005	73.998	69.8585	98.8486	26.4322	15.0703	30.565	240.104	31.5983	4.74548	80.2085	156.923	0	54.341	19.2013	44.001	0	67.789
rubidium			200	206.466	130.653	193.861	37.605	15.0816	22.6542	38.8392	143.617	139.324	22.6542	17.613	49.866	61.947	12.543	58.3416	17.613	44.9832	17.613	61.947	26.4162	26.4162	78.558	9.9972	31.407	12.543	83.2392	13.8132	33.8916	18.876	55.929	0	78.558	3.6012	53.5092	0
strontium			50	40.2491	70.1861	37.1861	88.4945	31.0223	52.3751	26.8851	63.3135	66.2673	101.661	13.2845	50.3681	48.3555	29.9901	15.3923	32.0531	14.3391	12.2285	16.4441	11.1711	15.3923	14.3391	17.4945	27.9215	26.8851	15.3923	18.5435	23.7675	28.9565	13.2845	18.5435	101.661	27.9215	56.3723	12.2285
uranium			100	42.146	53.401	42.146	15.9559	13.6585	15.9559	55.6424	42.146	39.8854	13.6585	23.9716	23.9716	23.9716	10.2064	25.1135	4.4369	10.2064	26.2546	20.5411	5.5924	10.2064	19.396	15.9559	27.3949	6.7471	30.811	13.6585	19.396	11.3579	9.0541	5.5924	30.811	4.4369	18.2501	5.5924
Vanadium	1400	1500	350	112.728	206.979	104.898	267.992	133.202	186.471	202.486	184.146	184.146	317.842	72.7512	264.033	300.161	197.956	296.515	383.387	102.27	125.593	285.354	140.728	165.217	179.469	115.319	222.415	384.709	117.902	112.728	251.934	331.325	213.65	91.6645	438.212	94.3296	213.65	39.2796
zinc	80000	80000	3000	71.0766	63.9959	51.8665	61.9735	37.7301	40.758	29.6593	77.149	91.329	96.3971	18.5702	44.7964	37.7301	40.758	34.703	41.7675	31.6765	0	0	22.6014	43.7867	20.5856	18.5702	18.5702	25.6257	0	0	19.5779	24.6176	17.5625	27.6423	56.919	27.6423	56.919	0

			Test Pit Reference	5284	5285	5285	5285	5285	5286	5287	5287	5288	5288	5289	5289	5290	5290	5290	5290	5291	5291	5291	5291	5292	5292	5292	5292	5293	5293	5294	5295	5295	5296	5296	5297	5298	5298	5299
			Sample Depth	1-2	0-1	1-2	2-3	3-4	0-1	0-1	1-2	0-1	1-2	0-1	1-2	0-1	1-2	2-3	3-4	0-1	1-2	2-3	3-4	0-1	1-2	2-3	3-4	0-1	1-2	0-1	0-1	1-2	0-1	1-2	0-1	0-1	1-2	0-1
Compound	**HIL C - (Modified for Temporary Occupation Scenario)**	**HIL D - (Modified for Site Maint. Scenario)**	**CSA Global 'Cut-off Values' (Proxy Background)**																																		
arsenic	700	700	200	0	23.4505	0	0	16.4641	19.027	6.1486	9.9641	19.027	25.2731	13.9696	13.1533	22.5506	23.4505	0	0	36.8471	0	0	29.9626	19.027	0	0	0	10.75	9.1858	10.75	10.75	22.5506	12.3446	6.8965	19.8965	29.9626	13.9696	28.064
barium				84.0384	324.947	448.185	495.292	261.587	194.572	903.878	330.292	32.0472	152.169	82.092	66.5784	162.201	303.667	867.321	1045.6	319.612	494.162	771.887	560.352	181.372	516.834	1301.8	790.292	85.9864	56.9344	73.353	125.282	144.172	129.247	81.1194	96.729	315.351	303.667	294.143
chromium (VI)	600	640		87.995	143.579	234.267	235.513	132.302	133.745	210.142	101.422	59.2974	64.8654	48.865	54.5914	76.633	114.235	167.899	173.151	140.817	177.102	148.319	164.289	95.6234	153.593	161.215	150.315	48.865	68.5294	64.8654	57.4222	111.879	83.673	41.0954	95.6234	148.319	79.291	149.652
copper	44000	43000	2000	46.9343	127.617	143.988	115.345	32.6621	127.617	161.394	7.19562	38.7778	29.6048	112.278	350.524	522.314	459.058	409.388	361.873	458.022	126.594	250.651	105.123	454.915	156.273	499.483	798.841	60.194	65.2957	42.8557	46.9343	34.7005	206.497	27.5668	53.0533	674.317	44.8949	81.6279
Iron			15%	5.37372	8.41017	9.61814	7.4603	7.37827	7.56601	10.6888	4.98485	6.94751	6.27191	3.53724	3.0721	6.20235	8.90746	2.68604	2.68201	8.57489	0	3.73924	10.7983	6.53256	0	0	0	4.34974	4.34006	4.14338	4.19492	7.92667	4.4375	2.96765	6.51799	8.86813	5.92892	8.87692
lead	300	300	**1000**	2.6457	34.0801	203.655	246.344	20.6078	29.5893	174.45	12.7493	8.25875	12.7493	32.9574	45.3074	47.5529	36.3255	273.308	226.122	168.834	253.085	207.025	0	36.3255	212.642	291.286	235.11	25.0985	21.7305	23.9758	20.6078	36.3255	34.0801	21.7305	23.9758	46.4301	29.5893	54.2895
manganese	7500	8000	**7000**	990.395	5833.23	**9598.26**	**7822.93**	5802.73	2584.75	**11,422**	**19,116**	351.631	872.276	409.458	692.535	828.41	1838.7	**9485.15**	5782.4	2271.98	**12,599**	**9037.04**	**12,430**	2286.15	6395.66	**8542.08**	4766.34	650.677	425.736	491.821	1066.57	1368.02	1218.41	361.564	513.571	4090.81	1483.82	2439.47
nickel	870	900	**600**	0	82.279	0	0	101.957	40.8998	52.2727	140.317	0	9.90738	59.5125	94.7052	96.7768	15.0703	0	0	93.6695	64.685	0	289.092	82.279	0	0	0	138.242	104.029	99.8845	77.1031	20.2342	100.921	94.7052	37.7989	70.8933	31.5983	2.681
rubidium			200	0	13.8132	55.929	69.1092	0	23.91	55.929	2.3166	0	0	4.884	8.7216	18.876	27.6666	106.213	102.813	32.6502	138.247	94.8162	28.9152	26.4162	137.167	159.457	145.752	15.0816	13.8132	13.8132	13.8132	23.91	26.4162	17.613	33.8916	47.4282	58.3416	51.0822
strontium			50	13.2845	10.1123	13.2845	19.5911	10.1123	9.0521	11.1711	73.1105	4.7973	10.1123	20.6373	48.3555	12.2285	13.2845	19.5911	18.5435	18.5435	16.4441	29.9901	18.5435	14.3391	13.2845	19.5911	21.6821	12.2285	11.1711	11.1711	10.1123	10.1123	10.1123	10.1123	9.0521	15.3923	13.2845	12.2285
uranium			100	0	11.3579	22.8289	20.5411	5.5924	11.3579	23.9716	0.9656	7.901	10.2064	6.7471	18.2501	43.2751	38.7539	42.146	34.2199	71.2426	41.0161	34.2199	12.5086	19.396	33.0844	35.3546	35.3546	7.901	6.7471	4.4369	6.7471	7.901	39.8854	2.1235	6.7471	19.396	7.901	13.6585
Vanadium	1400	1500	350	44.9502	153.088	281.56	294.678	125.593	135.72	363.915	78.201	47.7717	64.5075	33.5722	78.201	120.475	138.229	285.354	283.462	117.902	231.033	197.956	120.475	130.675	247.827	347.35	258.025	107.517	78.201	99.6322	78.201	120.475	80.9121	83.614	110.127	191.093	125.593	172.384
zinc	80000	80000	3000	20.5856	29.6593	36.721	31.6765	27.6423	22.6014	20.5856	25.6257	27.6423	24.6176	31.6765	46.816	17.5625	24.6176	32.6852	30.6678	20.5856	73.1004	74.1125	198.179	0	39.7487	32.6852	80.1863	23.6095	40.758	34.703	22.6014	0	19.5779	21.5935	19.5779	0	18.5702	20.5856

Data Source: CSA Global Pty Ltd. March 2011. *Rum Jungle Mine Site: Results of Soil and Fluvial Zone Sampling and Assessment.*

NOTES:
Zero results are not considered a valid result, and are likely a function of XRF procedure

TABLE B2: Metal Concentrations Across the Old Tailings Dam Area Measured via XRF in 2010

Compound	HIL C - (Modified for Temporary Occupation Scenario)	HIL D - (Modified for Site Maint. Scenario)	CSA Global 'Cut-off Values' (Proxy Background)																																				
Test Pit Reference				5299	5300	5300	5301	5301	5302	5303	5303	5304	5304	5305	5306	5306	5306	5306	5307	5307	5307	5307	5308	5308	5308	5308	5309	5309	5309	5309	5310	5310	5310	5310	5311	5311	5311	5311
Sample Depth				1-2	0-1	1-2	0-1	1-2	0-1	0-1	1-2	0-1	1-2	0-1	0-1	1-2	2-3	3-4	0-1	1-2	2-3	3-4	0-1	1-2	2-3	3-4	0-1	1-2	2-3	3-4	0-1	1-2	2-3	3-4	0-1	1-2	2-3	3-4
arsenic	700	700	200	15.625	30.9233	24.358	33.851	25.2731	13.9696	29.0095	20.7736	9.9641	12.3446	25.2731	15.625	21.6583	16.4641	44.104	11.5435	11.5435	17.3108	17.3108	14.7935	10.75	39.9116	32.8675	14.7935	13.1533	16.4641	9.9641	19.027	15.625	26.1958	0	19.8965	0	0	0
barium				505.478	625.536	529.372	678.825	564.966	506.612	454.871	221.175	94.7722	102.609	256.372	0	176.313	1366	3843.32	93.7944	65.6122	120.335	59.8234	109.487	52.1274	329.222	1019.47	112.441	106.537	104.572	1704.17	204.772	93.7944	175.302	566.121	258.457	774.336	1126.28	1397
chromium (VI)	600	640		92.257	136.603	93.1022	142.203	94.7854	195.563	123.441	100.601	74.849	81.9274	129.387	0	121.172	182.009	150.315	73.9534	76.633	89.707	81.9274	82.8014	86.2734	159.342	70.347	63.019	84.5422	81.9274	153.593	76.633	77.5214	111.879	166.705	103.057	157.447	143.579	174.859
copper	44000	43000	2000	9.23202	82.649	34.7005	69.3778	33.6813	222.918	986.161	47.954	42.8557	49.9936	220.865	0	553.478	277.384	122.503	248.595	216.759	193.163	143.988	69.3778	909.186	913.398	130.686	166.515	434.211	760.063	755.874	608.622	347.429	310.323	331.962	622.165	771.586	510.896	553.478
Iron			15%	5.79996	8.36272	6.77296	8.56958	7.00002	10.4095	7.14782	6.78704	3.78612	5.14303	8.34291	0	7.92868	10.6671	10.1833	4.79279	4.70848	5.46605	5.905	5.4244	5.23055	10.0947	9.17146	5.73293	5.81247	6.09876	10.7148	5.70485	6.58356	9.22465	0	8.11585	5.65456	0	0
lead	300	300	**1000**	11.6266	36.3255	36.3255	38.5709	38.5709	173.327	597.061	45.3074	21.7305	31.8347	62.1491	68.8861	34.0801	129.525	28.4666	37.4482	32.9574	50.9212	35.2028	29.5893	28.4666	30.712	32.9574	32.9574	39.6937	27.3439	125.033	122.787	28.4666	30.712	486.858	35.2028	221.629	466.621	231.739
manganese	7500	8000	**7000**	2044	3766.78	2602.82	3857.6	2748.63	5173.33	1091.38	2092.89	469.177	658.864	2712.37	0	1659.5	**8193.58**	**9468.85**	926.258	585.245	633.4	474.611	1390.23	404.937	2065.62	5198.44	514.477	1485.68	801.017	**7640.63**	1143.8	1065.65	2279.54	**9232.53**	2523.92	**7884.18**	**13,086**	**14,919**
nickel	870	900	**600**	61.5814	45.0348	56.4095	29.5317	37.7989	0	244.269	48.1365	87.4559	72.9631	60.5469	93.6695	4.74548	0	3.71322	99.8845	95.741	89.5269	89.5269	94.7052	102.993	0	6.81012	76.068	126.833	108.173	2.681	112.319	55.3752	6.81012	0	52.2727	0	0	95.741
rubidium			200	20.1372	70.2966	72.666	76.2066	67.92	67.92	52.2966	42.531	20.1372	26.4162	41.3022	0	20.1372	55.929	36.369	18.876	15.0816	18.876	15.0816	15.0816	13.8132	35.1312	27.6666	18.876	16.3482	21.3966	51.0822	23.91	20.1372	28.9152	227.104	23.91	92.5152	202.62	115.201
strontium			50	11.1711	12.2285	12.2285	12.2285	13.2845	11.1711	16.4441	10.1123	9.0521	9.0521	11.1711	0	9.0521	9.0521	15.3923	11.1711	13.2845	14.3391	16.4441	12.2285	13.2845	16.4441	23.7675	12.2285	11.1711	13.2845	10.1123	13.2845	12.2285	14.3391	32.0531	13.2845	25.8473	51.3723	71.1623
uranium			100	10.2064	11.3579	11.3579	13.6585	11.3579	17.1034	64.576	12.5086	7.901	10.2064	22.8289	60.1156	14.8076	27.3949	18.2501	7.901	9.0541	11.3579	9.0541	9.0541	10.2064	15.9559	10.2064	15.9559	10.2064	10.2064	22.8289	44.4034	9.0541	15.9559	44.4034	42.146	41.0161	48.9086	33.0844
Vanadium	1400	1500	350	157.967	206.979	174.755	211.435	160.393	314.38	197.956	160.393	102.27	112.728	157.967	0	145.7	378.008	453.702	120.475	94.3296	83.614	123.039	123.039	112.728	211.435	95.3122	83.614	125.593	135.72	402.25	110.127	88.9902	115.319	218.051	112.728	226.742	324.657	296.515
zinc	80000	80000	3000	25.6257	17.5625	17.5625	0	0	0	17.5625	19.5779	24.6176	21.5935	16.555	0	0	17.5625	19.5779	56.919	46.816	47.8259	45.8061	30.6678	39.7487	44.7964	37.7301	28.6508	83.2242	65.0072	52.8768	30.6678	31.6765	35.7119	44.7964	24.6176	21.5935	41.7675	61.9735

Compound	HIL C - (Modified for Temporary Occupation Scenario)	HIL D - (Modified for Site Maint. Scenario)	CSA Global 'Cut-off Values' (Proxy Background)																																				
Test Pit Reference				5312	5312	5312	5312	5313	5313	5313	5318	5318	5318	5319	5319	5319	5320	5320	5320	5320	5321	5321	5321	5321	5322	5322	5322	5322	5323	5323	5323	5323	5324	5324	5324	5324	5325	5325
Sample Depth				0-1	1-2	2-3	3-4	0-1	1-2	2-3	0-1	1-2	2-3	0-1	1-2	2-3	0-1	1-2	2-3	3-4	0-1	1-2	2-3	3-4	0-1	1-2	2-3	3-4	0-1	1-2	2-3	3-4	0-1	1-2	2-3	3-4	0-1	1-2
arsenic	700	700	200	28.064	12.3446	16.4641	19.8965	26.1958	23.4505	9.1858	21.6583	12.3446	17.3108	19.8965	23.4505	7.652	535.637	14.7935	0	0	470.19	12.3446	0	0	20.7736	13.1533	13.9696	22.5506	12.3446	12.3446	8.4151	6.8965	23.4505	14.7935	12.3446	21.6583	12.3446	11.5435
barium				385.382	176.313	85.9864	121.324	161.196	223.233	59.8234	66.5784	481.761	88.9114	60.7872	398.496	68.512	203.75	107.52	784.147	944.608	255.33	98.6874	1263.14	1597.35	250.127	156.177	67.545	203.75	92.817	151.168	52.1274	46.3722	142.177	123.302	93.7944	97.708	135.206	94.7722
chromium (VI)	600	640		151.633	87.1354	95.6234	123.441	96.459	97.2922	48.865	135.892	66.7022	96.459	125.689	137.311	49.8254	195.092	71.2522	158.713	144.263	201.902	58.361	148.319	146.302	80.1722	73.0554	61.163	121.172	63.019	74.849	57.4222	39.129	114.235	85.409	75.7422	122.687	73.9534	56.481
copper	44000	43000	2000	762.158	1060.17	452.844	510.896	90.8192	2380.47	170.613	91.8407	1353.9	37.7584	69.3778	4082.02	90.8192	116.648	835.574	1833.91	293.848	124.000	578.435	6334.85	439.386	450.773	377.358	398.018	386.653	446.632	433.177	441.456	371.163	470.454	185.986	369.098	347.429	219.838	404.219
Iron			15%	6.4176	4.15814	6.50574	7.48936	6.10833	3.47617	3.62833	8.26484	3.14384	5.79385	7.30594	5.28591	3.13098	7.29837	5.13535	0	0	3.80108	5.12872	5.05195	0	5.84873	5.33049	5.56535	8.70926	4.98137	4.48908	3.64562	3.17528	7.568	5.10115	4.73354	6.95045	4.26219	3.93784
lead	300	300	**1000**	111.557	159.849	41.9392	44.1846	94.7123	94.7123	27.3439	25.0985	49.7984	16.1172	12.7493	656.676	39.6937	443.012	122.787	316.007	251.961	616.182	28.4666	265.444	377.817	54.2895	27.3439	23.9758	40.8164	30.712	81.2375	28.4666	20.6078	52.044	36.3255	21.7305	55.4123	38.5709	18.3625
manganese	7500	8000	**7000**	1205.51	1005.07	997.731	845.768	416.692	212.822	214.621	562.55	289.379	315.531	333.577	292.083	229.922	2239.88	508.132	**11,661**	2450.85	2855.66	531.704	**17,478**	3054.14	1577.61	1272.84	582.521	1029.84	574.35	524.45	492.727	305.609	1165.9	962.896	370.597	813.798	792.803	460.123
nickel	870	900	**600**	45.0348	141.355	76.068	59.5125	27.4653	333.988	99.8845	0	144.468	31.5983	0	669.365	104.029	122.685	95.741	0	0	55.3752	70.8933	220.325	0	84.3496	83.3143	106.101	33.665	91.5981	133.056	170.422	140.317	52.2727	92.6338	106.101	62.6159	122.685	108.173
rubidium			200	49.866	28.9152	21.3966	25.164	40.0716	98.2542	8.7216	11.271	110.722	8.7216	1.0302	64.3416	7.4442	0	13.8132	151.059	135.003	0	9.9972	69.1092	182.958	13.8132	13.8132	11.271	21.3966	9.9972	18.876	8.7216	6.165	23.91	16.3482	9.9972	17.613	15.0816	16.3482
strontium			50	29.9901	16.4441	13.2845	13.2845	14.3391	13.2845	9.0521	16.4441	27.9215	11.1711	7.9905	29.9901	11.1711	41.2673	9.0521	77.9565	36.1623	50.3681	10.1123	99.7973	46.3373	12.2285	12.2285	12.2285	14.3391	9.0521	14.3391	13.2845	11.1711	12.2285	14.3391	14.3391	16.4441	11.1711	12.2285
uranium			100	51.1564	120.324	21.6854	13.6585	150.046	22.8289	10.2064	137.385	10.2064	6.7471	150.046	6.7471	831.194	53.401	88.8794	26.2546	835.331	33.0844	199.539	34.2199	34.2199	14.8076	12.5086	18.2501	41.0161	22.8289	10.2064	7.901	17.1034	6.7471	6.7471	7.901	42.146	0.9656
Vanadium	1400	1500	350	231.033	172.384	99.6322	96.9855	94.3296	209.212	70.0125	30.7047	204.737	33.5722	22.047	298.343	64.5075	86.3067	80.9121	243.684	197.956	186.471	50.584	266.017	296.515	86.3067	80.9121	75.4807	130.675	67.2646	107.517	115.319	78.201	138.229	104.898	83.614	155.532	83.614	88.9902
zinc	80000	80000	3000	29.6593	26.634	37.7301	32.6852	25.6257	32.6852	23.6095	51.8665	0	17.5625	31.6765	19.5779	21.5935	0	27.6423	48.836	51.8665	0	25.6257	0	77.149	27.6423	32.6852	48.836	39.7487	18.5702	24.6176	50.8562	41.7675	25.6257	24.6176	37.7301	35.7119	33.6941	41.7675

Compound	HIL C - (Modified for Temporary Occupation Scenario)	HIL D - (Modified for Site Maint. Scenario)	CSA Global 'Cut-off Values' (Proxy Background)																																				
Test Pit Reference				5325	5325	5326	5326	5327	5328	5328	5329	5329	5330	5330	5331	5332	5333	5333	5334	5334	5335	5335	5336	5336	5336	5336	5337	5337	5338	5338	5338	5338	5339	5339	5339	5339	5340	5340
Sample Depth				2-3	3-4	0-1	1-2	0-1	0-1	1-2	0-1	1-2	0-1	1-2	0-1	0-1	0-1	1-2	0-1	1-2	0-1	1-2	0-1	1-2	2-3	3-4	0-1	1-2	0-1	1-2	2-3	3-4	0-1	1-2	2-3	3-4	0-1	1-2
arsenic	700	700	200	12.3446	37.861	24.358	21.6583	29.9626	19.027	19.027	18.1651	26.1958	24.358	20.7736	37.861	23.4505	28.064	16.4641	23.4505	31.8916	33.851	18.1651	33.851	34.8421	6.8965	3.9505	17.3108	19.027	19.027	15.625	19.8965	19.027	12.3446	19.8965	19.027	16.4641	19.027	14.7935
barium				72.384	75.2922	162.201	77.233	178.335	156.177	144.172	298.372	278.342	484.012	600.945	956.137	2060.88	282.547	199.667	365.82	302.607	315.351	142.177	184.412	487.392	232.512	348.54	139.187	114.412	126.273	126.273	148.167	66.5784	89.8872	155.174	72.384	122.313	234.578	144.172
chromium (VI)	600	640		91.4094	185.172	125.689	121.172	133.025	94.7854	112.667	183.601	140.121	198.791	206.553	197.422	226.001	103.871	87.995	118.113	158.713	158.081	163.679	173.151	207.367	225.451	210.529	83.673	110.297	111.879	77.5214	115.793	109.502	45.9694	105.492	96.459	98.123	57.4222	81.9274
copper	44000	43000	2000	337.117	296.937	56.1134	123.526	67.3367	61.2143	51.0135	80.6068	52.0334	65.2957	24.5101	27.5668	49.9936	61.2143	40.8167	246.54	34.7005	81.6279	31.643	39.7972	146.035	113.301	71.4191	52.0334	150.13	88.7764	606.539	303.114	249.623	448.702	389.752	204.445	214.706	631.545	352.587
Iron			15%	5.06315	10.5439	7.80293	7.6107	9.12457	6.70345	7.00084	10.672	8.49498	10.5422	10.8143	10.4797	10.3904	7.45288	6.07417	7.19431	9.31786	9.82808	10.509	10.0774	10.2002	9.60844	9.97303	5.4353	6.82183	6.16157	5.75538	6.96895	6.7596	3.73868	6.54981	5.94949	5.99488	3.81684	5.32748
lead	300	300	**1000**	28.4666	30.712	27.3439	28.4666	35.2028	40.8164	41.9392	118.295	53.1668	148.618	107.065	137.387	165.465	56.5351	43.0619	40.8164	52.044	90.2207	62.1491	50.9212	128.402	158.726	159.849	30.712	23.9758	38.5709	25.0985	35.2028	28.4666	63.2719	26.2212	20.6078	55.4123	112.68	38.5709
manganese	7500	8000	**7000**	341.701	427.545	1180.63	457.407	2136.18	1126.32	1004.15	2916.94	3253.48	5632.24	5960.52	**13,009**	**20,108**	2080.67	1594.35	1563.67	3272.78	3746.3	843.027	2834.62	5203.46	3441.07	3644.98	1215.65	853.079	1594.35	1629.71	1413.38	467.366	328.163	676.151	374.21	1273.76	791.89	1341.2
nickel	870	900	**600**	96.7768	0	24.366	24.366	0	28.4985	28.4985	0	53.3068	0	0	51.2386	152.771	18.1685	44.001	21.2671	0	6.81012	0	0	32.6316	0	0	69.8585	73.998	65.7196	115.428	72.9631	58.4781	152.771	67.789	75.033	84.3496	135.13	65.7196
rubidium			200	17.613	32.6502	22.6542	20.1372	36.369	42.531	41.3022	57.1362	30.162	49.866	51.0822	75.0282	77.3832	54.72	40.0716	59.5452	44.9832	52.2966	51.0822	40.0716	36.369	64.3416	57.1362	18.876	26.4162	18.876	21.3966	23.91	16.3482	3.6012	8.7216	9.9972	7.4442	15.0816	8.7216
strontium			50	14.3391	24.8081	12.2285	14.3391	10.1123	9.0521	11.1711	10.1123	12.2285	10.1123	15.3923	9.0521	14.3391	12.2285	9.0521	13.2845	10.1123	7.9905	11.1711	14.3391	17.4945	21.6821	18.5435	11.1711	14.3391	12.2285	13.2845	17.4945	18.5435	10.1123	11.1711	17.4945	20.6373	14.3391	14.3391
uranium			100	19.396	17.1034	10.2064	12.5086	12.5086	9.0541	10.2064	22.8289	15.9559	15.9559	15.9559	17.1034	15.9559	6.7471	4.4369	30.811	13.6585	17.1034	18.2501	14.8076	20.5411	22.8289	25.1135	5.5924	7.901	7.901	10.2064	13.6585	9.0541	113.874	120.324	29.6731	19.396	99.7984	13.6585
Vanadium	1400	1500	350	94.3296	224.583	115.319	125.593	150.634	91.6645	128.139	239.504	191.093	303.771	292.831	382.056	444.052	155.532	117.902	170.005	228.892	226.742	195.678	193.39	342.639	301.971	305.562	128.139	112.728	135.72	104.898	145.7	125.593	64.5075	64.5075	107.517	143.219	123.039	102.27
zinc	80000	80000	3000	42.777	31.6765	28.6508	37.7301	32.6852	18.5702	20.5856	0	21.5935	0	22.6014	0	22.6014	18.5702	21.5935	19.5779	0	0	42.777	24.6176	33.6941	20.5856	27.6423	21.5935	65.0072	20.5856	54.8978	36.721	32.6852	23.6095	22.6014	30.6678	26.634	24.6176	18.5702

Compound	HIL C - (Modified for Temporary Occupation Scenario)	HIL D - (Modified for Site Maint. Scenario)	CSA Global 'Cut-off Values' (Proxy Background)																																				
Test Pit Reference				5340	5340	5341	5341	5341	5341	5342	5342	5342	5342	5343	5343	5343	5343	5344	5344	5344	5344	5347	5347	5347	5347	5348	5348	5349	5349	5350	5350	5350	5351	5351	5351	5352	5352	5352
Sample Depth				2-3	3-4	0-1	1-2	2-3	3-4	0-1	1-2	2-3	3-4	0-1	1-2	2-3	3-4	0-1	1-2	2-3	3-4	0-1	1-2	2-3	3-4	0-1	1-2	0-1	1-2	0-1	1-2	2-3	0-1	1-2	2-3	0-1	1-2	2-3
arsenic	700	700	200	6.1486	9.9641	20.7736	15.625	6.8965	9.9641	6.1486	8.4151	8.4151	9.9641	13.1533	9.1858	8.4151	8.4151	26.1958	10.75	19.8965	11.5435	33.851	74.3186	177.631	15.625	5.4083	3.9505	29.9626	5.4083	46.2458	30.9233	9.9641	9.1858	22.5506	11.5435	4.6756	6.1486	10.75
barium				45.4144	81.1194	234.578	123.302	33.952	59.8234	74.3224	97.708	81.1194	51.1672	103.59	84.0384	70.4472	39.676	82.092	93.7944	101.628	67.545	176.313	362.572	3014.23	169.247	63.681	57.897	355.008	33.952	156.177	244.934	156.177	54.049	193.554	38.721	133.218	144.172	161.963
chromium (VI)	600	640		26.1134	48.865	63.019	82.8014	27.129	56.481	22.027	59.2974	46.937	48.865	32.171	43.0522	49.8254	35.1674	154.241	52.6922	96.459	72.155	79.291	130.849	182.009	54.5914	24.075	12.6922	85.409	17.9022	137.311	105.492	42.075	44.027	128.652	69.4394	51.739	52.6922	66.7022
copper	44000	43000	2000	139.894	190.087	601.333	283.557	145.012	166.515	213.68	450.773	363.937	267.099	903.921	451.809	231.132	165.491	322.686	417.66	478.745	217.785	31.643	29.6048	334.024	205.471	43.8753	15.3422	173.687	104.101	134.778	334.024	154.225	235.24	268.127	161.394	42.8557	41.8362	36.7391
Iron			15%	2.73943	4.13443	4.2972	5.15783	2.7809	4.14196	2.481	3.7919	3.38219	3.92063	2.84643	3.59389	3.74886	3.88234	8.14398	3.42762	4.87653	4.26803	6.70329	9.50085	8.69155	4.70011	2.88246	2.46948	6.89334	2.81975	10.0494	9.95793	4.57667	3.45049	8.34031	4.35414	3.35492	3.38498	4.93304
lead	300	300	**1000**	14.9945	20.6078	102.573	32.9574	12.7493	19.4852	11.6266	18.3625	11.6266	16.1172	73.3774	25.0985	23.9758	17.2398	31.8347	17.2398	67.7632	22.8531	25.0985	61.0263	2853.36	546.453	103.696	26.2212	55.4123	14.9945	58.7807	31.8347	14.9945	21.7305	28.4666	18.3625	19.4852	16.1172	26.2212
manganese	7500	8000	**7000**	238.025	397.705	827.497	1356.92	203.825	382.341	319.14	895.141	545.31	533.518	206.524	483.668	576.165	306.511	252.433	1255.3	482.762	538.053	357.952	570.719	312.825	293.887	351.631	218.221	380.534	211.022	2151.25	4547.73	1995.17	332.675	894.227	287.576	261.441	236.224	311.923
nickel	870	900	**600**	96.7768	77.1031	118.538	71.9282	95.741	86.4204	83.3143	110.246	110.246	92.6338	112.319	86.4204	82.279	79.1733	0	93.6695	79.1733	61.5814	32.6316	0	120.612	111.283	85.385	88.4914	0	87.4559	0	13.005	76.068	93.6695	0	67.789	72.9631	68.8237	37.7989
rubidium			200	0	4.884	13.8132	8.7216	0	2.3166	27.6666	8.7216	4.884	3.6012	18.876	13.8132	6.165	3.6012	11.271	11.271	12.543	8.7216	22.6542	9.9972	0	4.884	0	0	105.082	1.0302	18.876	21.3966	0	0	18.876	1.0302	97.11	89.0502	101.676
strontium			50	6.9275	10.1123	14.3391	12.2285	6.9275	10.1123	6.9275	10.1123	7.9905	6.9275	9.0521	6.9275	6.9275	7.9905	10.1123	11.1711	11.1711	10.1123	20.6373	48.3555	165.043	21.6821	7.9905	6.9275	15.3923	5.8631	17.4945	26.8851	15.3923	9.0521	10.1123	11.1711	15.3923	15.3923	14.3391
uranium			100	5.5924	6.7471	92.1635	11.3579	6.7471	4.4369	2.1235	5.5924	11.3579	18.2501	95.4404	29.6731	20.5411	14.8076	60.1156	6.7471	69.0236	21.6854	127.813	327.951	455.44	95.4404	10.2064	3.2806	17.1034	6.7471	85.5881	53.401	30.811	29.6731	45.5309	12.5086	5.5924	3.2806	3.2806
Vanadium	1400	1500	350	33.5722	58.9657	117.902	91.6645	30.7047	39.2796	24.9421	67.2646	44.9502	61.7412	56.181	64.5075	53.3871	27.828	72.7512	67.2646	64.5075	36.4305	128.139	258.025	447.948	96.9855	27.828	27.828	184.146	4.4832	107.517	64.5075	19.1427	39.2796	102.27	39.2796	112.728	88.9902	117.902
zinc	80000	80000	3000	20.5856	21.5935	25.6257	0	22.6014	20.5856	17.5625	35.7119	29.6593	26.634	0	17.5625	24.6176	23.6095	16.555	30.6678	84.2371	25.6257	28.6508	46.816	93.356	124.815	30.6678	19.5779	36.721	19.5779	27.6423	35.7119	25.6257	20.5856	0	23.6095	20.5856	17.5625	21.5935

Data Source: CSA Global Pty Ltd. March 2011. *Rum Jungle Mine Site: Results of Soil and Fluvial Zone Sampling and Assessment.*

NOTES:
Zero results are not considered a valid result, and are likely a function of XRF procedure

TABLE B2: Metal Concentrations Across the Old Tailings Dam Area Measured via XRF in 2010

			Test Pit Reference	5353	5353	5354	5354	5355	5355	5356	5356	5357	5357	5358	5358	5359	5359	5360	5360	5361	5361	5362	5362	5363	5363	5363	5364	5364	5365	5365	5366	5366	5366	5367	5367	5368	5368	5369
			Sample Depth	0-1	1-2	0-1	1-2	0-1	1-2	0-1	1-2	0-1	1-2	0-1	1-2	0-1	1-2	0-1	1-2	0-1	1-2	0-1	1-2	0-1	1-2	2-3	0-1	1-2	0-1	1-2	0-1	1-2	2-3	0-1	1-2	0-1	1-2	0-1
Compound	**HIL C - (Modified for Temporary Occupation Scenario)**	**HIL D - (Modified for Site Maint. Scenario)**	**CSA Global 'Cut-off Values' (Proxy Background)**																																	
arsenic	700	700	200	5.4083	6.1486	20.7736	17.3108	3.233	34.8421	20.7736	9.9641	24.358	14.7935	2.5231	6.8965	18.1651	12.3446	4.6756	5.4083	2.5231	5.4083	2.5231	6.8965	3.9505	19.027	38.8825	3.9505	3.9505	3.9505	8.4151	17.3108	0	12.3446	78.1355	47.3281	41.9926	27.1261	40.9483
barium				302.607	361.49	1174.59	433.747	732.924	420.48	187.456	95.7504	508.881	230.447	445.959	249.088	315.351	411.667	580.007	432.639	536.231	457.103	253.248	166.225	72.384	160.191	261.587	457.103	373.412	107.52	140.183	259.5	330.292	144.172	181.372	103.59	346.387	107.52	793.984
chromium (VI)	600	640		51.739	47.9022	69.4394	65.785	211.675	188.249	148.319	96.459	114.235	86.2734	9.5374	26.1134	92.257	79.291	26.1134	33.1722	22.027	0	8.481	39.129	11.643	70.347	164.289	30.1614	23.0522	12.6922	51.739	208.571	235.847	100.601	164.289	109.502	202.769	94.7854	175.423
copper	44000	43000	2000	82.649	63.2549	379.423	529.582	9.23202	18.3978	22.4725	40.8167	560.755	25.529	44.8949	17.3792	17.3792	26.5479	17.3792	8.2138	18.3978	2.10532	10.2503	10.2503	385.62	150.13	201.368	18.3978	12.2869	18.3978	27.5668	269.155	313.413	166.515	85.7125	51.0135	38.7778	23.4913	160.37
Iron			15%	3.04039	2.82279	5.95077	4.1616	9.90259	10.4448	8.15606	4.90947	8.27414	5.94834	1.3789	3.22899	6.57389	6.17328	1.44647	3.9678	1.47375	3.91863	1.50099	4.49284	1.45562	4.57431	10.8114	1.72842	2.38233	1.55735	2.94095	8.00746	6.03846	4.24155	10.8114	9.38706	9.34655	5.31481	9.52193
lead	300	300	**1000**	35.2028	32.9574	26.2212	13.8719	138.51	70.0089	17.2398	21.7305	59.9035	25.0985	30.712	19.4852	62.1491	50.9212	27.3439	28.4666	30.712	28.4666	17.2398	18.3625	32.9574	23.9758	119.418	34.0801	28.4666	16.1172	25.0985	246.344	329.492	38.5709	82.3604	29.5893	137.387	32.9574	109.311
manganese	7500	8000	**7000**	1057.39	1244.23	3658.61	1527.44	**12,404**	**7398.14**	2446.11	1034.43	2574.29	1906.09	228.122	329.065	804.668	929.921	168.755	197.528	181.34	0	159.767	174.148	451.976	696.177	2124.89	200.226	436.592	172.35	260.54	1728.48	3144.55	780.028	1130.92	358.855	1337.5	447.451	**7769.12**
nickel	870	900	**600**	98.8486	95.741	61.5814	130.981	36.7654	19.2013	8.87492	67.789	15.0703	51.2386	95.741	57.4438	0	0	88.4914	35.7319	87.4559	42.9672	87.4559	16.103	99.8845	81.2437	0	88.4914	71.9282	92.6338	81.2437	0	0	97.8127	0	0	0	81.2437	46.0687
rubidium			200	140.4	141.474	57.1362	30.162	65.5362	43.758	15.0816	4.884	70.2966	57.1362	171.837	108.471	76.2066	93.6666	217.831	197.772	216.894	203.584	82.0716	65.5362	6.165	20.1372	53.5092	198.745	148.942	25.164	55.929	86.7312	100.537	7.4442	55.929	46.2066	71.4822	33.8916	37.605
strontium			50	17.4945	19.5911	14.3391	16.4441	5.8631	9.0521	10.1123	7.9905	13.2845	13.2845	32.0531	15.3923	11.1711	16.4441	38.2085	28.9565	37.1861	29.9901	18.5435	18.5435	7.9905	7.9905	5.8631	34.1105	24.8081	11.1711	10.1123	6.9275	3.7301	7.9905	12.2285	13.2845	5.8631	9.0521	14.3391
uranium			100	2.1235	0	21.6854	2.1235	19.396	7.901	10.2064	7.901	17.1034	3.2806	4.4369	9.0541	14.8076	15.9559	4.4369	15.9559	6.7471	14.8076	0.9656	10.2064	14.8076	5.5924	19.396	3.2806	3.2806	0	0	31.9481	45.5309	5.5924	10.2064	5.5924	14.8076	0.9656	20.5411
Vanadium	1400	1500	350	125.593	153.088	226.742	91.6645	305.562	249.885	88.9902	53.3871	188.786	138.229	94.3296	39.2796	155.532	135.72	112.728	91.6645	112.728	148.172	33.5722	39.2796	24.9421	120.475	289.111	120.475	94.3296	42.1195	75.4807	386.022	471.215	174.755	184.146	148.172	260.037	99.6322	316.116
zinc	80000	80000	3000	22.6014	21.5935	28.6508	36.721	19.5779	0	20.5856	21.5935	30.6678	22.6014	19.5779	19.5779	0	0	19.5779	17.5625	16.555	18.5702	19.5779	17.5625	0	29.6593	0	29.6593	21.5935	19.5779	29.6593	16.555	20.5856	27.6423	24.6176	0	0	22.6014	16.555

			Test Pit Reference	5369	5370	5370	5371	5371	5372	5372	5373	5373	5374	5374	5374	5374	5375	5375	5376	5376	5377	5377	5377	5377	5378	5378
			Sample Depth	1-2	0-1	1-2	0-1	1-2	0-1	1-2	0-1	1-2	0-1	1-2	2-3	3-4	0-1	1-2	0-1	1-2	0-1	1-2	2-3	3-4	0-1	1-2
Compound	**HIL C - (Modified for Temporary Occupation Scenario)**	**HIL D - (Modified for Site Maint. Scenario)**	**CSA Global 'Cut-off Values' (Proxy Background)**																							
arsenic	700	700	200	31.8916	24.358	26.1958	6.8965	12.3446	9.9641	36.8471	33.851	25.2731	22.5506	6.1486	0	0	22.5506	37.861	11.5435	14.7935	16.4641	14.7935	12.3446	11.5435	8.4151	12.3446
barium				764.55	250.127	341.012	103.59	98.6874	132.225	251.167	452.641	1296.26	286.758	362.572	731.713	0	289.921	258.457	148.167	69.4794	162.201	87.936	56.9344	36.8122	47.3304	69.4794
chromium (VI)	600	640		176.545	188.249	199.692	39.129	54.5914	71.2522	179.307	149.652	203.199	167.899	209.753	212.427	0	121.931	139.422	65.785	123.441	111.089	93.1022	121.931	225.451	84.5422	101.422
copper	44000	43000	2000	77.5439	44.8949	28.5858	48.9738	62.2346	220.865	60.194	92.8622	54.0733	210.601	296.937	637.8	0	40.8167	34.7005	783.114	33.6813	5728.57	1865.46	107.167	48.9738	54.0733	27.5668
Iron			15%	9.20278	9.83324	9.97689	2.97301	3.80378	5.11125	10.6715	8.62804	10.7194	10.7078	10.2789	6.80561	0	7.43843	10.2197	3.62783	5.9237	6.93331	5.53778	5.66855	10.7859	4.3774	5.12796
lead	300	300	**1000**	91.3436	157.603	159.849	26.2212	28.4666	62.1491	48.6757	50.9212	147.494	107.065	181.19	262.073	0	34.0801	39.6937	2714.07	18.3625	248.591	57.6579	10.504	62.1491	11.6266	11.6266
manganese	7500	8000	**7000**	**7893.69**	1815.33	2744.81	1216.57	853.993	606.136	3750.2	3302.72	**11,781**	3847.83	5589.7	**8068.34**	0	2175.75	3205.25	311.021	260.54	1298.69	691.625	336.285	248.831	351.631	374.21
nickel	870	900	**600**	29.5317	0	0	89.5269	81.2437	70.8933	0	0	25.3991	0	0	0	0	1.64882	0	119.575	25.3991	69.8585	79.1733	64.685	0	85.385	68.8237
rubidium			200	37.605	71.4822	72.666	28.9152	42.531	25.164	59.5452	27.6666	37.605	44.9832	61.947	82.0716	0	26.4162	46.2066	0	0	0	0	0	32.6502	0	6.165
strontium			50	10.1123	10.1123	10.1123	9.0521	7.9905	6.9275	9.0521	9.0521	12.2285	6.9275	6.9275	10.1123	0	7.9905	9.0521	15.3923	18.5435	17.4945	17.4945	16.4441	38.2085	16.4441	18.5435
uranium			100	7.901	13.6585	14.8076	0.9656	0	21.6854	10.2064	7.901	11.3579	42.146	61.2319	42.146	0	7.901	12.5086	201.561	4.4369	117.102	53.401	6.7471	22.8289	5.5924	6.7471
Vanadium	1400	1500	350	294.678	292.831	289.111	64.5075	70.0125	78.201	195.678	177.117	384.709	172.384	243.684	347.35	0	130.675	145.7	94.3296	24.9421	42.1195	33.5722	19.1427	88.9902	27.828	47.7717
zinc	80000	80000	3000	0	17.5625	0	20.5856	20.5856	41.7675	21.5935	0	0	0	0	0	0	0	16.555	43.7867	18.5702	315.186	73.1004	31.6765	0	28.6508	22.6014

			Test Pit Reference
			Sample Depth
Compound	**HIL C - (Modified for Temporary Occupation Scenario)**	**HIL D - (Modified for Site Maint. Scenario)**	**CSA Global 'Cut-off Values' (Proxy Background)**
arsenic	700	700	200
barium			
chromium (VI)	600	640	
copper	44000	43000	2000
Iron			15%
lead	300	300	**1000**
manganese	7500	8000	**7000**
nickel	870	900	**600**
rubidium			200
strontium			50
uranium			100
Vanadium	1400	1500	350
zinc	80000	80000	3000

			Test Pit Reference
			Sample Depth
Compound	**HIL C - (Modified for Temporary Occupation Scenario)**	**HIL D - (Modified for Site Maint. Scenario)**	**CSA Global 'Cut-off Values' (Proxy Background)**
arsenic	700	700	200
barium			
chromium (VI)	600	640	
copper	44000	43000	2000
Iron			15%
lead	300	300	**1000**
manganese	7500	8000	**7000**
nickel	870	900	**600**
rubidium			200
strontium			50
uranium			100
Vanadium	1400	1500	350
zinc	80000	80000	3000

Data Source: CSA Global Pty Ltd. March 2011. *Rum Jungle Mine Site: Results of Soil and Fluvial Zone Sampling and Assessment.*

NOTES:

Zero results are not considered a valid result, and are likely a function of XRF procedure

TABLE B3: Metal Concentrations In Proposed Borrow Material Soils

			Test Pit Reference	NTP-01		NTP-05	NTP-07	STP-03	STP-05		STP-06	STP-07		WRTP-02	WRTP-04	WRTP-12	WRTP-14	WRTP-15
			Sample Depth	**0.6-0.8**	5.3-5.4	1.5-1.7	3.8-4.0	**0.4-0.6**	**0-0.5**	**0.5-0.6**	**0.7-0.9**	**0-0.5**	**0.9-1.0**	**0-0.5**	**0.8-1.0**	**0.4-0.5**	**0.4-0.6**	**0.1-0.2**
Compound	**HIL C - Recreational (*MODIFIED FOR TEMPORARY OCCUPATION SCENARIO*)**	**HIL D - Commercial/ Industrial (*MODIFIED FOR SITE MAINTENANCE SCENARIO*)**	**CSA Global 'Cut-off Values' (*PROXY BACKGROUND FOR MINERALISED ZONE*)**															
arsenic	700	700	200	9	16	<5	<5	<5	<5	<5	<5	<5	<5	12	<5	8	<5	5
arsenic - 25% bioavailability	3000	2700																
barium				20	220	80	370	<10	10	<10	10	<10	<10	20	<10	<10	40	30
beryllium	400	400		<1	4	1	2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
boron	50000	50000		<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50	<50
cadmium	100	100		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
chromium			300*	72	40	21	24	<2	5	<2	57	<2	8	32	11	14	33	102
chromium (VI)	600	640		1.3	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
cobalt	800	800		8	19	17	68	<2	<2	<2	<2	<2	<2	7	4	<2	4	6
copper	44000	43000	2000	10	59	<5	93	<5	<5	<5	<5	<5	<5	307	72	<5	8	<5
cyanide (free) (no VI)	1400	1400																
total cyanide				<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Iron			15%															
lead (also PbB model)	1600	1600	**1000**															
lead	300	300		19	<5	8	9	<5	<5	5	<5	<5	14	62	<5	<5	6	9
manganese	7500	8000	**7000**	290	2230	1440	1900	<5	7	<5	11	<5	<5	41	16	52	341	94
methyl mercury	36	35																
mercury (inorganic)	300	250		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
nickel	870	900	**600**	6	71	15	50	<2	<2	<2	<2	<2	<2	12	5	<2	5	9
rubidium			200															
selenium	2000	2000		<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
strontium			50															
uranium			100															
Vanadium	1400	1500	350	110	55	36	151	<5	9	8	22	<5	31	64	9	40	65	121
zinc	80000	80000	3000	<5	17	<5	<5	<5	<5	<5	<5	<5	<5	14	<5	<5	<5	<5

Source: SLR Consulting Australia Limited. July 2019. *Analytical Results from Soil Samples Collected from Proposed Borrow Material Areas*. (unpublished)

NOTES:

* Chromium Cut-Off Value (CSAG, 2011) was developed for total chromium, rather than the less naturally prevalent Cr VI valency form, which presents higher toxicity to humans and is therefore used in the site specific HIL calculations.

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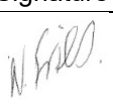
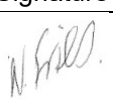
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4322822-39168/https://projects.ghd.com/oc/NorthernTerritory/contaminatedlandasse/Delivery/Documents/4322822-REP_Modified Health Investigation Levels for Surface Soils and Cover System Soils.docx

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