Kalgoorlie Consolidated Gold Mines (KCGM)

Soil and Waste Characterisation

Section 10 – Kaltails

April 2010

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Distribution:

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Document Control for Job Number: KSU-SS-1009

Document Status	Author	Reviewer	Signature	Date of Issue
Draft Report	B. Gordon	M. Braimbridge	MB	20/04/10
	L. Welker			
		K. De Sousa (KCGM)		24/04/10
Final Report		M. Braimbridge	MB	24/04/10

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Executive Summary

Outback Ecology Services (OES) was commissioned by Kalgoorlie Consolidated Gold Mines (KCGM) to conduct a comprehensive soil and waste material characterisation study for the KCGM operations. Stage 1 of the investigation comprised an information review and gap analysis, while Stage 2 incorporated the findings of Stage 1 into a sampling and analysis program to develop a soil and waste materials inventory based on the volumes and characteristics of materials on site.

This report, which comprises Section 10 of the overarching KCGM Soil and Waste Characterisation report, presents the investigation into the characteristics of surface soils (0 to 20 cm depth) located within the proposed Kaltails tailing storage facility (TSF) seepage interception drain, and provides an assessment of their suitability for use as a rehabilitation resource.

Physical and chemical soil characteristics

The surface soils sampled (0 to 5 cm depth) were typically silty loam in texture, exhibited structural instability (Emerson Class 2) and a potential to hardset. The soils were moderately alkaline and extremely saline with a moderate organic carbon (OC) content and moderate nutrient status (Table ES1). With the exception of soil electrical conductivity (EC), the chemical properties of the surface soils were generally comparable to the native soils at similar depths within the KCGM operations (see Section 5 of overarching Soil and Waste Characterisation report).

The sub-surface soils sampled (10 to 20 cm depth) shared some similarities with the surface soil, being silty loam in texture with a hard setting potential. However, unlike the surface samples, the sub-surface soils exhibited relatively stable soil structure (Emerson Class 4). Similar to the surface soils, the sub-surface soil was moderately alkaline and extremely saline, however as would be expected, the sub-surface soils had a low organic carbon content and nutrient status compared to those from the surface (Table ES1). With the exception of soil EC, the chemical properties of this soil were again comparable to the native soils at similar depth within the KCGM operations.

Total metal concentrations of chromium and nickel in the soils sampled, were consistently above their respective Ecological Investigation Levels (EILs) of 50 and 60 mg/kg respectively, which is comparable to the native soils at similar depths within the KCGM operations, and common for native Western Australian soils.

Conclusions and recommendations

The hardsetting and in some cases, dispersive nature of the surface and sub-surface soil sampled suggest that these materials are likely to be structurally unstable. These soils are therefore likely to be susceptible to erosion if placed on rehabilitated slopes of waste landforms. The extreme salinity of the soils is also likely to limit the growth of some native species.

Based on these attributed, the surface soils within the proposed Kaltails drain footprint are considered limited in their suitability as a surface rehabilitation resource.

Table ES1: Physical and chemical properties of soils from within the proposed Kaltails seepage interception drain footprint. The figures presented represent average values or most common class for each parameter. Broad ratings of good, moderate and poor, for each parameter relate to suitability for plant growth and/or overall material stability relative to KCGM operations.

Average Depth (cm)	Physical properties			Chemical properties				
	Soil Texture	Emerson Class	MOR (kPa)	pH	Salinity Class (dS/cm)	OC (%)	Exchangeable Sodium Percentage (%)	Nutrient Status
0 to 5	Silty loam	2	High (78.3)	Moderately alkaline (8.2)	Extremely saline (10.4)	Moderate (1.00)	Non-sodic (3.4)	Moderate
10 to 20	Silty loam	4	High (80.3)	Moderately alkaline (8.2)	Extremely saline (7.8)	Low (0.78)	Non-sodic (3.7)	Low

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1. INTRODUCTION

1.1 Background

Outback Ecology Services was commissioned by Kalgoorlie Consolidated Gold Mines (KCGM) to conduct a comprehensive soil and waste material characterisation study at the KCGM operations. Stage 1 of the investigation comprised an information review and gap analysis, while Stage 2 incorporated the findings of Stage 1 with a sampling and analysis program to develop a soil and waste materials inventory based on of stockpiled and future soil and waste materials on site.

This report, which comprises Section 10 of the overarching KCGM Soil and Waste Characterisation report (Table 1), presents the investigation into the characteristics surface soil located within the footprint of the proposed Kaltails tailing storage facility (TSF) seepage interception drain.

Table 1 Structure of Soil and waste characterisation study (referred to as overarching report). The current report is bolded.

Section	Detail of Each Section
Section 1	Introduction Background Information Review (Stage 1 Report)
Section 2	KCGM Soil and Waste Materials Inventory
Section 3	Golden Pike Cutback Area
Section 4	As-mined Waste Rock
Section 5	Proposed Waste Landform Footprint Areas
Section 6	Existing Topsoil and Oxide Stockpiles
Section 7	Existing Rehabilitation and Rehabilitation Trial Areas
Section 8	Mt Percy
Section 9	Morrison Flats
Section 10	**Kaltails**
Section 11	Appendices Electronic data base of results

Soil within the proposed seepage interception drain footprint, is to be excavated and if suitable, salvaged for rehabilitation of other sites associated with KCGM Fimiston operations. This report discusses suitability of the Kaltails drain soil material in relation to its use as a rehabilitation medium, via:

- evaluation of soil physical parameters (soil structure [Emerson Aggregate Test], soil texture, hard-setting characteristics [modified Modulus of Rupture test], and

- measurement of soil chemical parameters (soil pH, electrical conductivity, plant-available nutrient concentrations, organic carbon (OC), exchangeable cations and total metals concentration).

2. MATERIALS AND METHODS

2.1 Sampling regime

The investigation into the characteristics of surface soils within the proposed Kaltails drain footprint comprised 6 sites (i.e. KTD 1 to 6) (Table 2) (Figure 1). A general description of the surface soils within the Kaltails TSF seepage interception drain was made, based on the Australian Soil and Land Survey Handbook (McDonald *et al.* 1998) and at each site, samples were taken from 0 to 5 cm, and 10 to 20 cm depth intervals. Collected samples were used for analysis of chemical and physical soil parameters.

Table 2: Sampling sites and locations within the Kaltails drain

Site number	Material description	Coordinates (Projection: UTM Zone 51J, Datum: GDA94)	
		Easting (mE)	Northing (mN)
KTD 1	Surface soils	361581	6591657
KTD 2	Surface soils	361587	6591604
KTD 3	Surface soils	361564	6591518
KTD 4	Surface soils	361558	6591434
KTD 5	Surface soils	361545	6591381
KTD 6	Surface soils	361540	6591296

Figure 1: Location of sampling sites within the proposed Kaltails seepage interception drain footprint

2.2 Test work and procedures

A range of physical and chemical analyses were conducted on the Kaltails seepage interception drain soils, as detailed in Table 3.

CSBP Soil and Plant Laboratory conducted analyses on the waste rock material samples from the 6 sites, for; ammonium and nitrate (Scarle 1984), extractable phosphorus and potassium (Colwell 1965, Rayment and Higginson 1992), extractable sulphur (Blair *et al.* 1991), and organic carbon (Walkley and Black 1934). Measurements of electrical conductivity (1:5 H_2O), soil pH (1:5 H_2O and 1:5 $CaCl_2$), were conducted using the methods described in Rayment and Higginson (1992). Exchangeable cations Ca^{2+}, Mg^{2+}, Na^+ and K^+ (Rayment and Higginson 1992) was also assessed on selected samples.

ALS Environmental Laboratory analysed selected samples for total concentrations of metals including arsenic (As), cadmium (Cd), chromium (Cr), copper (Cu), lead (Pb), manganese (Mn), nickel (Ni), zinc (Zn) and mercury (Hg). All elements were analysed via Intra Coupled Plasma Atomic Emission Spectroscopy (ICPAES), except Hg, which was analysed via a Cold Vapour / Flow Injection Mercury System (CV/FIMS).

Soil texture and a measure of soil slaking and dispersion (Emerson Aggregate Test) was conducted as described in McKenzie *et al.* (2002). Soil strength and the resulting tendency of each material to hardset was assessed using a modified Modulus of Rupture test (Aylmore and Sills 1982, Harper and Gilkes 1994).

Table 3: Soil analyses conducted for characterisation of the Kaltails seepage interception drain soils

Soil parameter	Measurement method	Conducted by	Number of samples analysed	Sample selection criteria
Chemical properties				
Total Metals (As, Cd, Cr, Cu, Pb, Ni and Zn)	ICP-AES method	ALS	12	All samples
Total Metals (Hg)	CV/FIMS method	ALS	12	All samples
Soil pH	pH measured in 1:5 soil:water and 1:5 Soil:$CaCl_2$ (Rayment and Higginson, 1992)	CSBP	12	All samples
Electrical conductivity	Measured in 1:5 soil:water (Rayment and Higginson, 1992)	CSBP	12	All samples
Plant-available nitrogen (ammonium and nitrate)	Scarle (1984)	CSBP	12	All samples
Exchangeable cations (Ca^{2+}, Mg^{2+}, Na^+ and K^+)	Rayment and Higginson (1992)	CSBP	12	All samples
Plant-available phosphorus and potassium	Colwell (1965); Rayment and Higginson (1992)	CSBP	12	All samples
Plant-available sulphur	Blair *et al.*, (1991)	CSBP	12	All samples
Organic carbon percentage	Walkley and Black (1934)	CSBP	12	All samples
Physical properties				
Particle size distribution	Pipette method (Day, 1965)	CSBP	12	All samples
Soil slaking and dispersive properties	Emerson Aggregate Test (McKenzie *et al.*, 2002)	Outback Ecology	12	All samples
Soil strength	Modified Modulus of Rupture test (Aylmore and Sills, 1982; Harper and Gilkes, 1994)	Outback Ecology	12	All samples

3. RESULTS AND DISCUSSION

3.1 Site description

The proposed Kaltails seepage interception drain footprint is located in a flat area adjacent to the south west corner of the Kaltails TSF (Figure 1), containing a mixture of *Maireana* sp. and *Atriplex* sp (Plate 1). The soil surface was typified by a surface crust with substantial cryptogam growth and between 5 and 10 % sub-rounded and sub-angular coarse fragments, 2 to 10 mm in size present at the surface. The surface soil had weak platy aggregates at the surface and was predominantly single grained below 5 cm. The surface horizon appeared very porous and had a spongy consistence, whilst the underlying sub-surface soil (i.e. below approximately 10 cm) was very dense in comparison. Roots were classed as 'common' (Root score 2) from 0 to 20 cm, based on standard root scoring classes (see Appendix C of Section 11 of overarching Soil and Waste Characterisation report).

Plate 1: Vegetation and general appearance of the proposed Kaltails seepage interception drain footprint area.

3.2 Soil physical properties

3.2.1 Soil texture

Soil texture describes the proportions of sand, silt and clay (the particle size distribution) within a soil. The particle size distribution and resulting textural class of soils is an important factor influencing most physical and many chemical and biological properties. Soil structure, water holding capacity, hydraulic conductivity, soil strength, fertility, erodibility and susceptibility to compaction are some of the factors closely linked to soil texture.

Surface soils from the Kaltails seepage interception drain footprint were classed as either a silty loam or clay loam (Table 4), with both classes contain roughly equivalent proportions of course sand, fine sand, silt and clay. There appeared to be no consistent difference in soil texture, between the two depth intervals sampled.

3.2.2 Structural stability

The structural stability of a soil and its susceptibility to structural decline is complex and depends on the net effect of a number of properties, including the amount and type of clay present, organic matter content, soil chemistry and the nature of disturbance. Soil aggregates that slake and disperse indicate a weak soil structure that is easily degraded. These soils should be seen as potentially problematic when used for the reconstruction of soil profiles for rehabilitation, particularly if left exposed at the surface.

The Emerson Aggregate Test identifies the potential slaking and dispersive properties of soil aggregates. The dispersion test identifies the properties of the soil materials under a worst case scenario, where severe stress is applied to the soil material. Generally, samples allocated into Emerson classes 1 and 2 are those most likely to exhibit dispersive properties and therefore be the most problematic.

The surface soils sampled (0 to 5 cm) typically reported an Emerson Class of 2 and are therefore considered relatively dispersive (Table 4). In contrast, the sub-surface soil (10 to 20cm depth interval) was considered relatively stable, with Emerson Classes of 4 and 6 reported. There appeared to be no correlation between Emerson Class and exchangeable sodium percentage (ESP) (see Section 3.3.4 of this report).

Compared to the local analogue surface soils that were investigated in Section 5 of the overarching Soil and Waste Characterisation report, the soil from the proposed Kaltails seepage interception drain footprint exhibited a greater tendency for clay dispersion.

Table 4: Summary of soil structure, texture and structural stability of materials within the Kaltails seepage interception drain footprint.

Depth (cm)	Soil Structure	Soil Texture (of <2 mm fraction)	Emerson Class			Exchangeable Sodium Percentage (ESP) (%)		Electrical Conductivity EC (dS/cm)	
			Range	Mode	f [1.]	Mean	SE	Mean	SE
0-5	Weak platy aggregates	Silty loam to clay loam	2 to 4	2	5 of 6	3.4	0.4	10.4	1.3
10-20	Single grained	Silty loam to clay loam	4 to 6	4	4 of 6	3.7	0.3	8.54	0.5

1. Where f is the frequency of the mode value, based on total number of samples analysed

3.2.3 Soil strength

A modified Modulus of Rupture (MOR) test was conducted on all samples collected (Figure 2). This test is a measure of soil strength and identifies the tendency of a soil to hard-set as a direct result of soil slaking and dispersion. A modulus of rupture of over 60 kPa has been described as the critical value for distinguishing potentially problematic soils in agricultural scenarios (Cochrane and Aylmore, 1997). Restricted root penetration into the soil matrix is a likely consequence of a high modulus of rupture. In reconstructed soil profiles, materials normally deep within the profile that may have a high MOR can often be re-deposited closer to the surface, leading to germination / emergence and root penetration problems.

As this test is conducted on reconstructed soil blocks composed of the < 2 mm soil fraction, it does not take into account the effect of gravel content or soil structure on soil strength, nor any degree of compaction that may be present in the field. It does, however, provide insight into the potential for layers to hard-set and compact with repeated wetting and drying cycles, and the ability of roots to fracture the soil and penetrate crack faces.

Surface soils within the proposed Kaltails seepage interception drain footprint were generally considered susceptible to hard setting, with MOR values above 60 kPa regularly being reported (Figure 2). On average, there was no apparent difference between the MOR of the surface (0 to 5 cm) and sub surface (10 to 20 cm) soil materials.

The MOR values recorded for these surface soils are higher than those reported for the local native soils, which generally reported MOR values well below the critical value of 60 kPa (see Section 5 of overarching Soil and Waste Characterisation report).

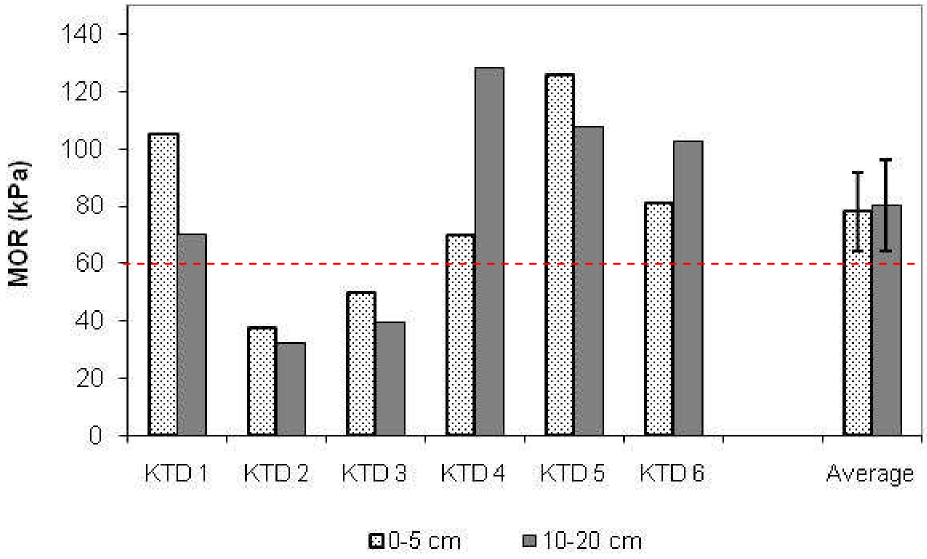

Figure 2: Individual and average modulus of rupture (kPa) values for surface soils from the proposed Kaltails seepage interception drain footprint, grouped into sample depth interval (error bars represent standard error). Red line indicates potential restrictions to plant and root development (Cochrane and Aylmore 1997)

3.3 Soil chemical properties

3.3.1 Soil pH

The soil pH gives a measure of the soil acidity or alkalinity. The ideal pH range for plant growth of most agricultural species is considered to be between 5.0 and 7.5 (Moore 1998). Outside this range, the plant-availability of some nutrients is affected, while various metal toxicities (e.g. Al and Mn) can become limiting at low pH. For native species, which are known to be tolerant of wider ranges in soil pH, preferred pH ranges are best inferred from the soil in which they are observed to occur.

The surface soils from the Kaltails seepage interception drain footprint typically reported moderately alkaline pH values (8 to 9) (van Gool *et al.* 2005), with no consistent difference in pH between surface and sub-surface soil material (Figure 3). These pH values are within the range exhibited by the local native surface soils within the northern and north-western footprint areas, which were also considered moderately alkaline (see Section 5 of overarching Soil and Waste Characterisation report).

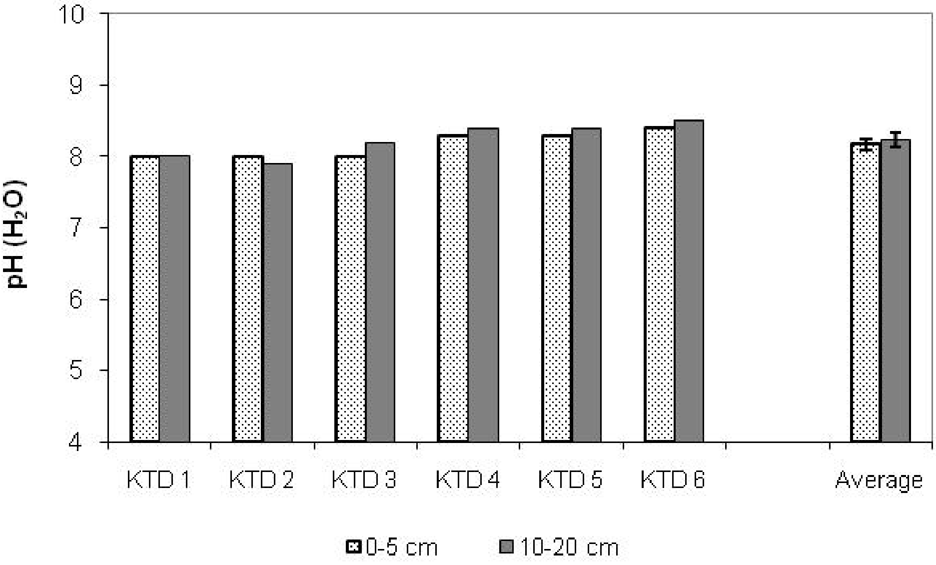

Figure 3: Individual and average soil pH (H_2O) values for the surface Kaltails seepage interception drain footprint materials, grouped into sample depth (error bars represent standard error).

3.3.2 Electrical conductivity

Electrical conductivity (EC) is a measurement of the soluble salts in soils or water. Soil salinity results from natural processes of landscape evolution, hydrological processes and rainfall (Hunt and Gilkes 1992).

Surface soils sampled from the Kaltails seepage interception drain footprint were consistently classed as extremely saline (> 2.67 dS/cm) (Figure 4). On average, the surface soils (0 to 5 cm) tended to have higher EC values than the underlying soil (10 to 20cm), which is likely a result of capillary rise of salt laden water to the soil surface. Both the surface and sub soil materials had significantly higher EC values than native soils from within the proposed footprint areas (Section 5 of the overarching Soil and Waste Characterisation report). The high EC values are attributable to elevated groundwater levels associated with operation of the TSF by previous owners between 1989 and 1999, and the naturally hyper saline groundwater, which, in the Kaltails area, is relatively close to the surface (Environmental Resources Management Australia, 2006).

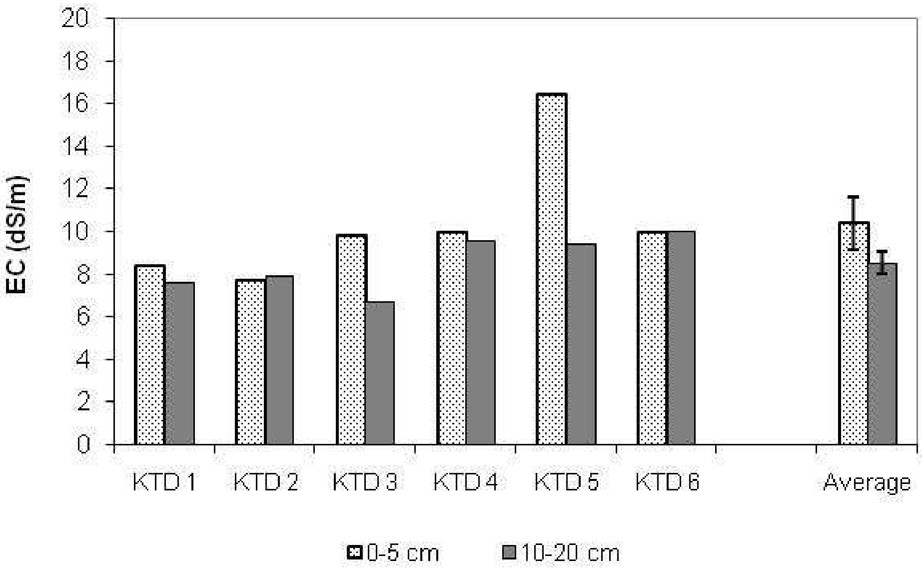

Figure 4: Individual and average electrical conductivity (EC 1:5 H_2O) of surface soils from within the proposed Kaltails seepage interception drain footprint, grouped into sample depth (error bars represent standard error).

3.3.3 Soil organic matter

The organic matter content of soil is an important factor influencing many physical, chemical and biological soil characteristics. Directly derived from plants and animals, its functions in soil include supporting the micro and macro fauna and flora populations in the soil, increasing the water retention capacity, buffering pH and improving soil structure. The organic matter content of the soils within the Kaltails seepage interception drain was determined as a measure of the soil organic carbon percentage.

The Kaltails seepage interception drain footprint soil material had soil organic carbon (SOC) contents that ranged from low (>1 %) to moderate (1 to 2 %) (Purdie, 1998) (Figure 5). For the surface soils (0 to 5 cm), SOC content was classed as moderate, with an average of 1.0 % being reported. As would be expected, the sub-surface soils (10 to 20 cm) had a lower average organic matter content of 0.8 %, considered to be low.

The SOC values for the Kaltails seepage interception drain soils were comparable with those measured for the native soils from adjacent KCGM operations, for which SOC contents ranged from low to moderate (See Section 5 of overarching Soil ad Waste Characterisation report).

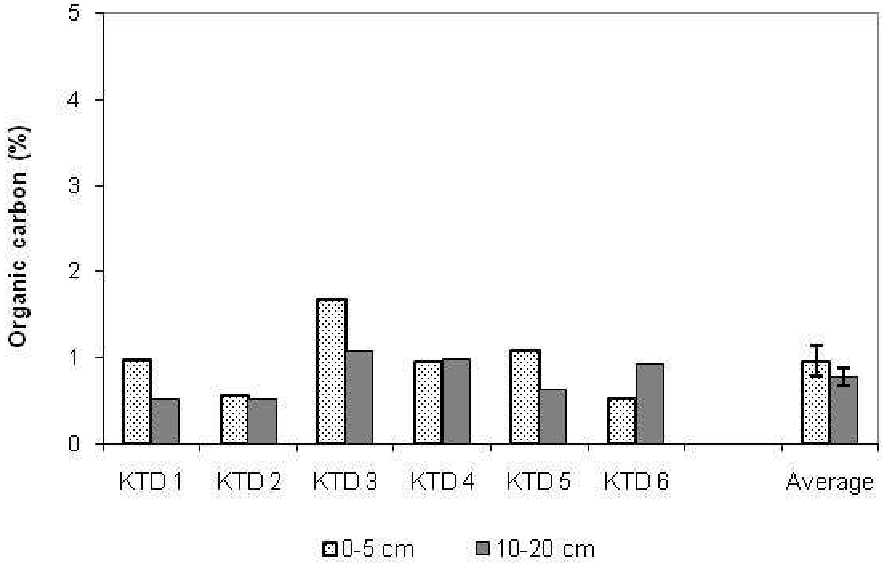

Figure 5: Individual and average soil organic carbon (%) values for soils from within the proposed Kaltails seepage interception drain footprint, grouped into sample depth (error bars represent standard error)

3.3.4 Exchangeable cations and exchangeable sodium percentage (ESP)

Exchangeable cations, held on clay surfaces and within organic matter are an important source of soil fertility and can influence the physical properties of soil. Generally, if cations such as Ca^{2+}, Mg^{2+} and K^{+} are dominant on the clay exchange surfaces, the soil will typically display increased physical structure and stability, leading to increased aeration, drainage and root growth (Moore, 1998). If Na cations (Na^{+}) are dominant on exchange surfaces and exceed more than 6 % of the total exchangeable cations, then the soil is considered to be *sodic*, which can lead to poor physical properties (i.e. dispersion, hard-setting and erosion in clay-rich soils).

If the ESP exceeds more than 15 %, then the soil is considered to be *highly sodic* (Moore, 1998). Sodic soils have an increased tendency to disperse upon wetting and are therefore more prone to hardsetting at the soil surface, and erosion when placed on the slopes of constructed landforms.

All soils from within the Kaltail seepage interception drain were classified as non-sodic, with all ESP values consistently reported below 6 % (Figure 6). There appeared to be no correlation between ESP and sample depth, nor any correlation with the structural instability of the surface soil (i.e. those samples from 0 to 5 cm) when compared to the sub-surface soils (10 to 20 cm), which was observed in the Emerson test.

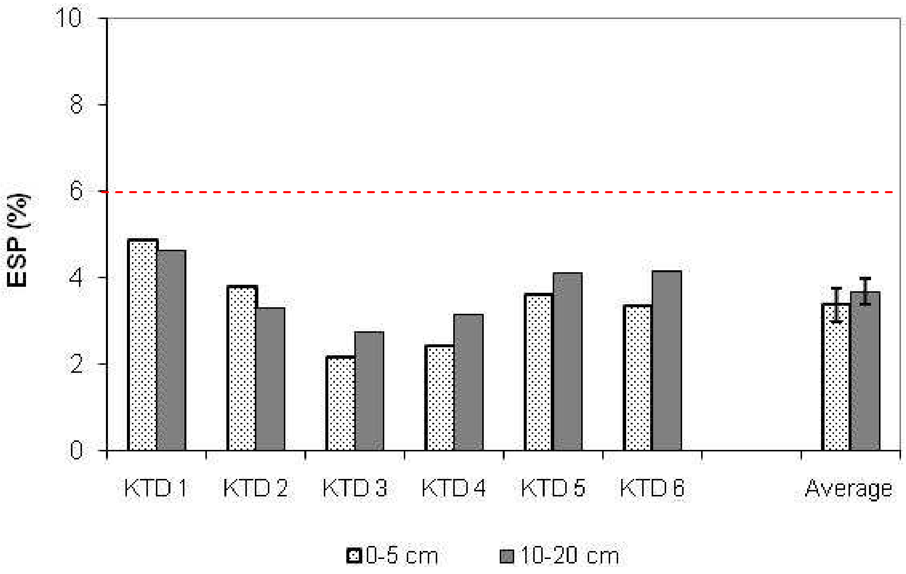

Figure 6: Individual and average exchangeable sodium percentage (%) values for soils from within the proposed Kaltails seepage interception drain footprint, grouped into sample depth (error bars represent standard error). Materials with values above dotted red line are considered sodic.

3.3.5 Soil macro-nutrients

The most important macro-nutrients for plant growth are nitrogen (N), phosphorus (P), potassium (K), and sulphur (S). These nutrients are largely derived from the soil mineral component and organic matter. While the definition of adequate levels of these nutrients are well known for agricultural plant species, relatively little information is available for the nutrient requirements of native species.

Levels of plant-available nitrogen varied substantially within the soil materials from the Kaltails seepage interception drain (Figure 7). On average, available nitrogen values were relatively high, and comparable to values measured for native surface soils from the adjacent KCGM operations (see Section 5 of the overarching Soil and Waste Characterisation report).

Plant-available phosphorus values were variable, and were generally highest within the surface (0 to 5 cm) samples (Figure 8), with an average value 18 mg/kg. The subsurface soils (10 to 20cm) reported lower average available phosphorus values (7 mg/kg). These values are comparable to values reported for native soils from the same depth from the adjacent KCGM operations (see Section 5 of the overarching Soil and Waste Characterisation report).

Plant-available potassium ranged between 202 and 452 mg/kg, and was, on average, slightly higher in the surface (0 to 5 cm) samples compared to the sub-surface soil material (Figure 9). All samples had available potassium contents considered to be high (Moore, 1998), which were again comparable to those of the native surface soils within the adjacent KCGM operations (see Section 5 of the overarching Soil and Waste Characterisation report).

There was a wide range in plant-available sulphur values reported, with no systematic difference between the surface and sub-surface soil materials (Figure 10). The high plant-available sulphur values reported, particularly at Sites KTD 2, KTD 4, KTD 5 and KTG 6, are extremely high compared to those measured for the native surface soils within the adjacent KCGM Fimiston operations (see section 5 of the overarching Soil and Waste Characterisation report).

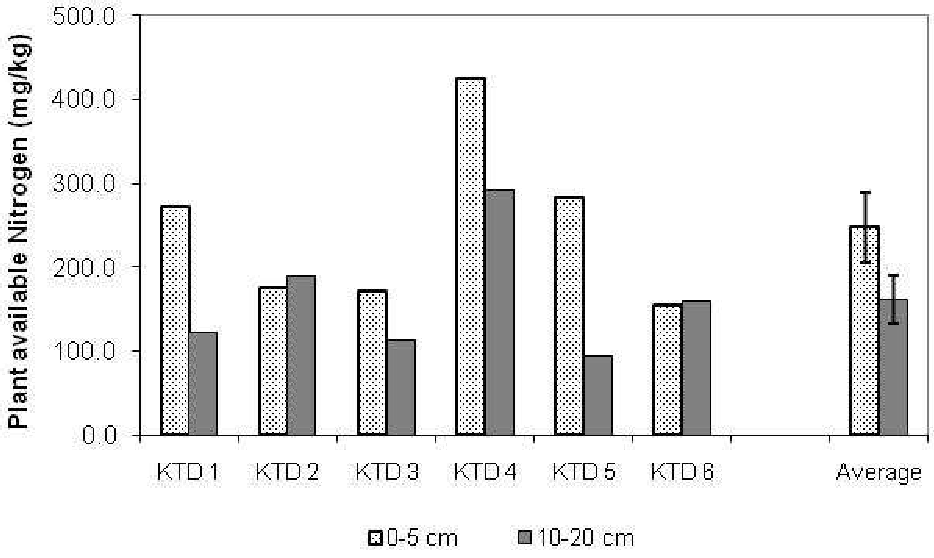

Figure 7: Individual and average nitrogen (mg/kg) values for soils from within the Kaltails seepage interception drain footprint, grouped into sample depth (error bars represent standard error).

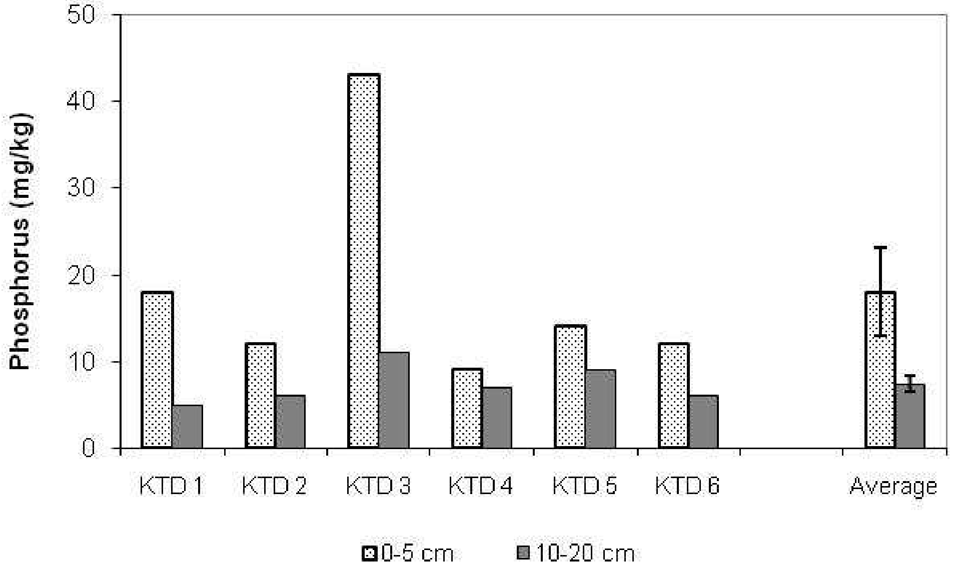

Figure 8: Individual and average extractable phosphorus (P) (mg/kg) values for soils from within the Kaltails seepage interception drain footprint, grouped into sample depth (error bars represent standard error).

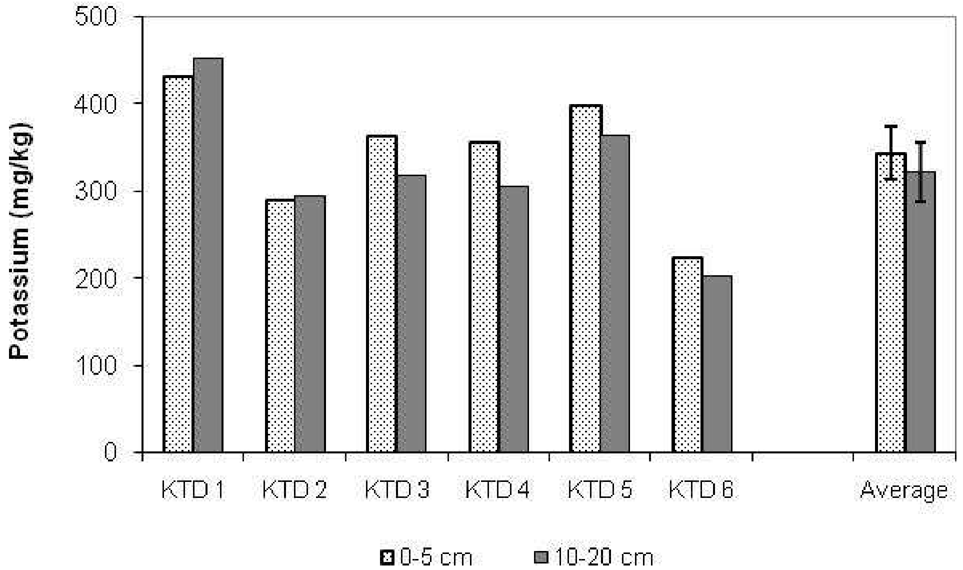

Figure 9: Individual and average extractable potassium (K) (mg/kg) values for soils from within the Kaltails seepage interception drain footprint, grouped into sample depth (error bars represent standard error).

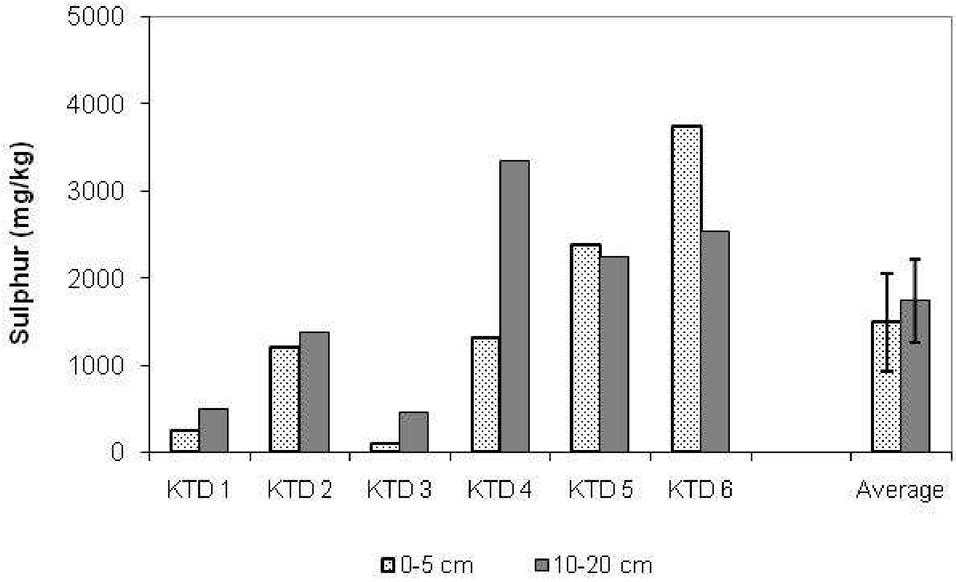

Figure 10: Individual and average extractable sulphur (S) (mg/kg) values for soils from within the Kaltails seepage interception drain footprint, grouped into sample depth (error bars represent standard error).

3.3.6 Total metal concentrations

Measurements of total metal concentrations of surface and sub-surface soil samples indicated that variable levels of arsenic, cadmium, chromium, copper, lead, nickel, zinc and mercury were present (Table 5). All results were compared with 'Ecological Investigation Levels' (EILs) for soils (Department of Environment, 2003). The EILs are intended as a guide only, as higher EIL values may be acceptable for some metal concentrations, such as arsenic, chromium, copper, nickel, lead and zinc, in areas where soils naturally have high background concentrations of these substances (Department of Environment, 2003).

Most soils sampled from within the Kaltails seepage interception drain footprint areas were below the limit of reporting for cadmium and mercury. The levels of chromium were consistently measured above the default 'Ecological Investigation Levels' (EILs) for soils (Department of Environment, 2003) of 50 mg/kg, which is a common characteristic of Western Australia soils, and comparable to the native soil investigated in Section 5 of the overarching Soil and Waste Characterisation report. Nickel concentrations were also consistently measured above the Ni EIL of 60 mg/kg, however values were within the range that may be expected of soils with high background concentrations, which can up to reach to 500 mg/kg (AIMM, 2001). There did not appear to be any distinct difference between surface and sub-surface material.

Table 5: Individual total metal values (mg/kg) for soils from within the Kaltails seepage interception drain footprint. LOR and EIL refer respectively to the Limit of reporting and Ecological investigation levels of each metal.

Site	Depth	Material	Arsenic	Cadmium	Chromium	Copper	Lead	Nickel	Zinc	Mercury
			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
KTD 1	0-5	Soil	13	<1	344	36	13	128	43	<0.1
	10-20	Soil	<5	<1	345	39	13	129	39	<0.1
KTD 2	0-5	Soil	7	<1	335	36	12	119	37	<0.1
	10-20	Soil	<5	<1	332	36	11	118	35	<0.1
KTD 3	0-5	soil	12	<1	311	35	12	120	46	<0.1
	10-20	soil	8	<1	352	36	13	131	41	0.1
KTD 4	0-5	soil	12	<1	266	33	10	93	35	<0.1
	10-20	soil	21	<1	252	34	10	95	41	0.1
KTD 5	0-5	Soil	12	<1	271	36	13	115	41	<0.1
	10-20	Soil	10	<1	283	34	11	108	36	<0.1
KTD 6	0-5	Soil	9	<1	315	30	10	93	26	<0.1
	10-20	Soil	6	<1	317	30	12	102	29	<0.1
LOR			**5**	**1**	**2**	**5**	**5**	**2**	**5**	**0.1**
EIL			**20**	**3**	**50**	**60**	**300**	**60**	**200**	**1**

Note: Values above the Ecological Investigation Levels (EIL) (DoE, 2003) are highlighted yellow

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