POTENTIAL HORTICULTURE DEVELOPMENT - BOOTU CREEK MINE Locality

Preliminary Soil Investigation

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Figure 1 Bootu Creek locality Preliminary Soil Observation Sites
1.0 Introduction

The Bootu Creek manganese open cut mine needs to lower the water table to enable dry pit operations below 25 metres. To achieve this, a number of bores in the mine’s surrounds are extracting groundwater. Availability of this extracted water presents an opportunity for its use for commercial horticulture should other relevant aspects meet development criteria.

The opportunity to use this water for irrigated horticulture forms a key part of a funding submission, by Centrefarm Aboriginal Horticulture Ltd., to the National Water Commission (NWC), through the National Water Initiative and Water Smart Australia.

A collaborative approach between various Northern Territory Government departments has assisted Centrefarm in identifying areas for potential horticulture development: one such area is located near the Bootu Creek mine site. An area to the east of the mine and exploration area, down slope from the water discharge point, is being assessed for proposed irrigated horticultural use.

1.1 Summary

Soils at three sites were inspected.
Notable observations resulting from this limited soil survey work include;

i. Slope characteristics (ranging from 0.6% to 6%) are favourable for horticultural use.

ii. The soils down slope of the mine water discharge point appear to be suitable for proposed irrigated horticulture use. Soil depths and field textures indicate there are no significant impediments to their use as a growing medium.

iii. A study of the potential long term effects, on the soils, of irrigating with the available ground water is recommended to minimise risks of adverse soil water interactions.

1.2 Location

The Bootu Creek Manganese mine is located 110 km north of Tennant Creek in the Northern Territory. Figure 1 illustrates the regional setting of the mine site and infrastructure. The potential horticultural sites lie about 2km NNE of the mine site.
2.0 Work Program

Field investigations were undertaken at selected sites using a hand auger. Maximum penetration of the auger under ideal soil conditions is 2.0 metres. Depth of penetration varied from site to site and was continued to auger refusal. Results from the three sites were collated and used in the interpretation of soil characteristics.

Important issues assessed include:

- The characterisation of the nature and variability of the near surface soil profiles.
- The interpretation of soil profiles to identify and define areas that show suitable and comparable characteristics that can be targeted for further detailed survey.
- The determination of the basic engineering properties of each soil type.
- The detection of the presence and distribution of any existing problem soils in the area and potential soil problems that may arise with changed land use, in particular those due to irrigation. Full chemical analyses of the water id recommended.

Soil auger holes were logged according to the Australian Soil Classification (ASC) to determine the nature, thickness and variability of the near-surface soil profile.

Previous ground water / aquifer studies were undertaken by groundwater consultants as part of the required mine management plan. Preliminary chemical water analysis indicates that the groundwater being extracted has the potential to be utilised for irrigated horticulture.

Further groundwater studies may be required to determine other aquifer parameters.

Biodiversity issues will be addressed as investigation work progresses and actual development areas are identified.
3.0 Discussion and Comments.

This survey was designed as a preliminary investigation to determine if there were soils close to the current mining operation that could support irrigated horticulture development.

Three sites were investigated for near-surface soil characteristics. Sites 1 and 2 were in low lying areas that showed a consistent sandy trend (Loamy sands to Sandy loams: 5-20% clay) in the soil profile.

Site 3 indicates an increase in clay content to a maximum texture grade of Clay loam sandy (30% - 50% clay). Cryptogam surface crusting indicates that the soil is not as well drained as the soils represented at Sites 1 and 2 and may require specific management techniques for horticulture development.

Vehicular access to inspection area was severely restricted by remnant dry vegetation and the proposed extent of the soil survey was very much reduced. The soils inspected did provide enough basic information for a preliminary assessment during the initial visit.

The site inspection did indicate that large areas, down slope of the Bootu Creek mine, were suitable for potential horticulture development.

There is a requirement to have expert agronomic or horticultural input to determine the best approach to take for future development.

Future survey work may be required further North-East of the area inspected during this visit.
APPENDIX 1.0 - Soil investigation sites.

**Site 1** (408754mE, 7901753mN)

**Soil Classification:** Earthy sands. Kandosol – KA, AA, -, CD, A, E, K, L, W


**Surface Soil Description:** Loose, dry surface condition.

A

- **A₁** 0.00m – 0.02m. Dark reddish brown. (5.0YR3/4). Loamy sand (LS). Single grained with a sandy fabric. Dry with loose strength. Non-calcareous. Field pH 5.5

- **B₁** 0.02m – 0.20m. Dark reddish brown. (2.5YR3/4). Sandy loam (SL). Single grained with a sandy fabric. Dry with loose strength. Non-calcareous. Field pH 6.0

- **B₂₁** 0.20m – 0.40m. Dark reddish brown (2.5YR2.5/3). Sandy loam-heavy (SL`). Single grained with a sandy fabric. Dry with loose strength. Non-calcareous. Field pH 6.0

- **B₂₂** 0.40m – 1.00m. Dark red (10R3/6). Sandy loam-heavy (SL`). Single grained with a sandy fabric. Dry with loose strength. Non-calcareous. Field pH 6.5

**Site 2** (409942mE, 7931862mN)

**Soil Classification:** Earthy sands. Kandosol – KA, AA, -, CD, A, E, K, M, V


**Surface Soil Description:** Loose, dry surface condition.

A

- **A₁** 0.00m – 0.02m. Brown (7.5YR4/4). Loamy sand (LS). Single grained with a sandy fabric. Dry with loose strength. Non-calcareous. Field pH 5.5

- **B₁** 0.02m – 0.40m. Dark reddish brown (2.5YR3/4). Loamy sand-heavy (LS`). Single grained with a sandy fabric. Dry with loose strength. Non-calcareous. Field pH 6.0

- **B₂₁** 0.40m – 1.10m. Dark red (2.5YR3/6). Sandy loam (SL`). Single grained with a sandy fabric. 5% 2-6mm sub angular ferruginous/quartz fragments. Dry with loose strength. Non-calcareous. Field pH 6.5
Site 3 (408378mE, 7933706mN)


Surface Soil Description: Dark grey / black cryptogam surface crusting in parts. Loose surface sand in some parts. No effective surface disturbance.

A1 0.00m – 0.01m Reddish brown (2.5YR5/4). Sandy loam (SL). Massive with an earthy fabric. Dry and loose. Non-calcareous. Field pH 6.0

B1 0.01m – 0.30m Reddish brown (2.5YR4/4). Sandy clay loam (SCL). Massive with an earthy fabric. Dry and loose. Non-calcareous. Field pH 6.0

B2 0.30m – 1.00m Yellowish red (5YR4/6). Clay loam sandy (CLS). Massive with an earthy fabric. Dry with very weak strength. Non-calcareous. Field pH 6.5
APPENDIX 2.0 - Soil Classifications.

In this report, soils are classified according to two different classification systems widely used throughout Australia:

(a) Great Soil Groups (Stace et al., 1968) - This classification is now superseded but relatively easy for non-professionals to use. The following Great Soil Groups were recorded on the station:

- **Red Earths** - These are medium-textured soils, red in colour, with a massive structure and earthy fabric. There is a gradual increase in clay content with soil depth.

- **Alluvial Soils** - These are brown sandy soils associated with floodplains, floodouts and range frontage fans.

- **Lithosols** - Shallow gravelly soils such as occur on rocky hillslopes.

- **Siliceous Sands** - These occur as red dune soils with less then 5% clay content, single grain structure and a sandy fabric.

- **Earthy Sands** - These soils are found in sandplain areas. They have deep, uniform profiles with little increase in clay content with depth, massive structure, earthy fabric and are red in colour.

- **Red Calcareous Soils** - These soils are shallow, medium-textured and highly alkaline. They have developed directly from underlying calcareous rocks or calcrete.

- **Brown and Red Clays** - Deep, heavy-textured soils that are strongly structured. These soils may present deep cracking when dry and often display gilgai micro-relief.

- **Solonized Brown Soils** - These soils are characterised by large amounts of calcareous material in the profile, increasing in concentration with depth.

- **Red-Brown Earths** - These soils are characterised by an abrupt boundary between a sandy topsoil and a heavy textured subsoil. They are often highly erodible, saline, and calcareous at depth.

- **Non-calcic Brown Soils** - These soils are very similar to red-brown earths, although generally shallower, and carbonate free.

(b) The Australian Soil Classification System - 3rd Approximation (Isbell 1993) is a key based on both soil characteristics and laboratory data. The main soil orders found in central Australia are as follows.

- **Calcarosols (CA)** - soils are normally calcareous throughout the profile (often highly calcareous).

- **Chromosols (CH)** - these soils have a strong texture contrast between the A and B horizons, are weakly acid and are non-sodic.

- **Dermosols (DE)** - soils lacking strong texture contrast between the A horizon and the structured B horizon. This order is diverse.

- **Ferrosols (FE)** - The structured B horizons of these soils are high in free iron oxide, and lack strong texture contrast between the A and B horizons.

- **Kandosols (KA)** - These soils lack strong texture contrast, B horizons are massive or weakly structured and the profile is not calcareous throughout. These soils are a widespread group in central Australia, and occur locally in large areas.

- **Rudosols (RU)** - Soils in this order have little if any pedological organisation. They are usually young soils that vary widely in terms of texture and depth. These soils may be stratified and some may be highly saline.
Tenosols (TE) - This order is made up of a diverse range of soils, with generally weak pedological organisation, apart from the A horizons.

Vertosols (VE) - These are clay soils that exhibit strong cracking tendencies when dry due to swell-shrink properties. Slickensides and/or lenticular peds appear at depth. Each order has a series of keys that are used to classify the suborder, great group, subgroup and family classes.
APPENDIX 3.0 – Soil data sheets.
Bibliography
