5. PROJECT DESCRIPTION

5.1 Project Overview

The Wonarah Phosphate Project involves the mining of two phosphate deposits, known as 'Arruwurra' and 'Main Zone'. The project has a Joint Ore Reserves Committee (JORC) compliant indicated resource estimate of 399 Mt at 21% phosphate (P_2O_5) (15% cut-off grade) that will be developed over two discrete stages.

Stage 1 of the Wonarah phosphate project will involve the mining of direct shipping ore (DSO) from up to 23 open pits, 4 at Arruwurra and 19 at Main Zone, two mobile crushing and screening plants and associated mine infrastructure (Figures 5.1, 5.2 and 5.3). The average grade for DSO is approximately 30% P_2O_5 and the location of open pits reflects the areas of the deposit containing the highest proportion of DSO. Based on currently defined resources Stage 1 has a mine life of around ten years and will produce approximately 19.9 Mt of DSO. Exploration currently underway may extend the mine life in excess of the ten year predicted mine life. The ore will initially be mined at a rate of 0.5 Mt/a, sourced solely from Arruwurra open pits, increasing to 1.0 Mt/a as mining in Main Zone commences, before reaching the combined maximum ore mining rate of 3.0 Mt/a after two and a half years. The phosphate produced at the mine will be transported by road to Tennant Creek and then transported by rail to the Port of Darwin for export.

The capital cost of the project is estimated to be $107 M.

Stage 2 of the project is still being defined and is outside the scope of this document. Stage 2 will involve the expansion of the mining and processing operation possibly extending operations beyond the current Mineral Lease. The project description in this chapter relates to Stage 1 only, unless direct reference to Stage 2 is made.

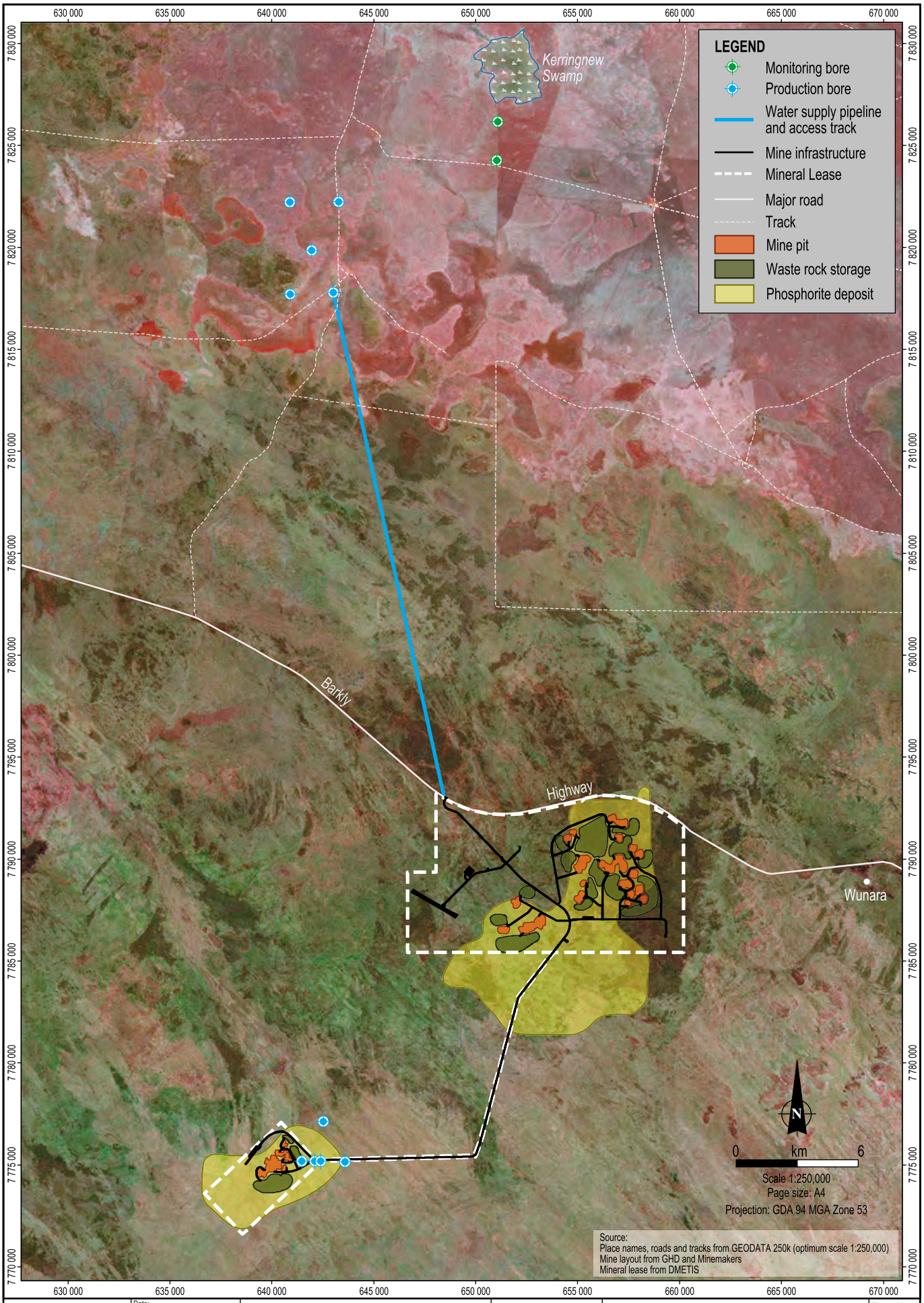
5.2 Project Schedule

5.2.1 Construction Schedule

Subject to agreement with the land owners (the Arruwurra Aboriginal Corporation) and the Central Land Council (CLC), the construction of infrastructure that will support mine construction and operation will commence once all regulatory approvals are in place, initial off-take agreements have been secured, financing is assured and the Minemakers Board has given its approval. This is anticipated to be around April 2010, with construction expected to take approximately four months.

Mining is scheduled to commence mid-2010, subject to agreement with the landowners and receipt of all necessary regulatory approvals.

Mining will commence with the excavation of a box cut and pre-strip of the initial slot for the first pits and will commence approximately eight weeks after construction commences. This initial phase of mine development at is expected to take 12 weeks, with production of DSO commencing as soon as one half of the initial slot is fully developed.



coffey natural systems

Date: 06.11.2009
MXD: Minemakers_Wonarah_GIS.mxd
File Name: 9014_07_F05.01_GIS_HB

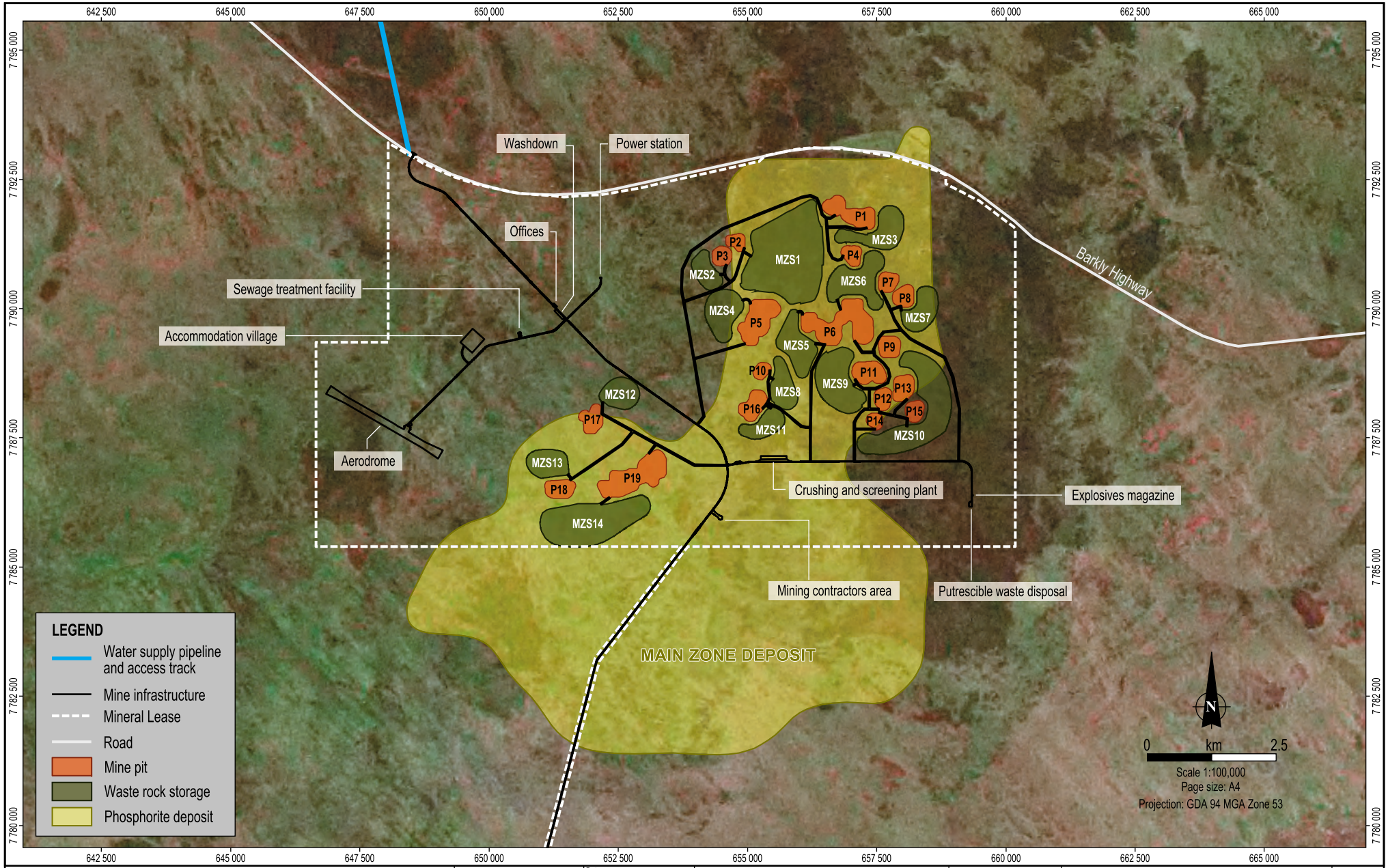
Minemakers Australia Pty Ltd

Wonarah Phosphate Project

MINEMAKERS AUSTRALIA PTY LTD

Project area layout

Figure No: **5.1**



Source:
Place names, roads and tracks from GEODATA 250k (optimum scale 1:250,000)
Mine layout from GHD and Minemakers
Proposed mineral lease from DMETIS

coffey natural systems

Date: 11.11.2009
MXD: Minemakers_Wonarah_GIS.mxd
File Name: 9014_07_F05.02_GIS_HB

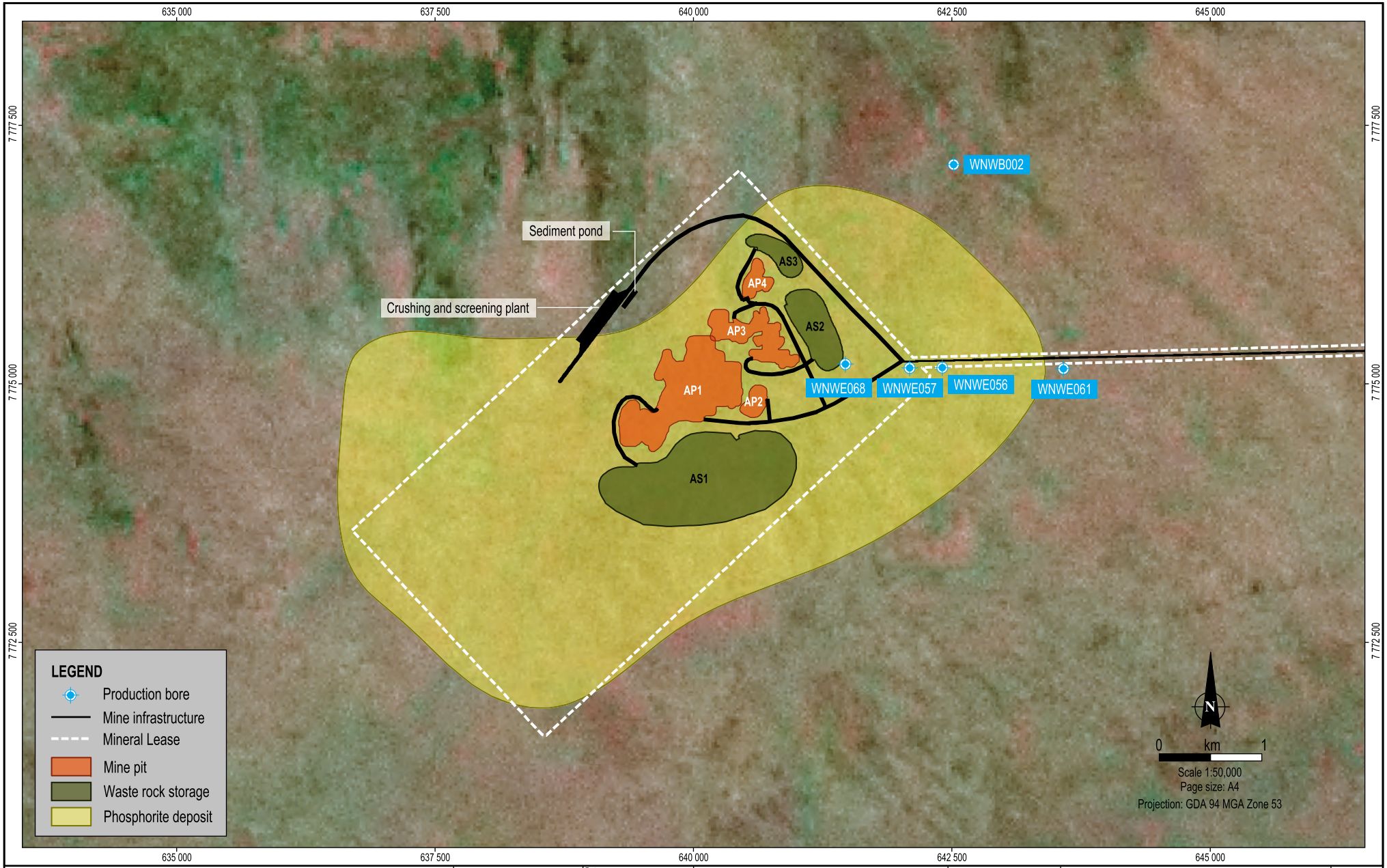
Minemakers Australia Pty Ltd

Wonarah Phosphate Project

MINEMAKERS AUSTRALIA PTY LTD

Main Zone mine layout

Figure No: **5.2**



Source:
Mine layout from GHD and Minemakers
Mineral lease from DMETIS

coffey natural systems

Date: 12.11.2009
MXD: Minemakers_Wonarah_GIS.mxd
File Name: 9014_07_F05.03_GIS_HB

Minemakers Australia Pty Ltd

Wonarah Phosphate Project

MINEMAKERS AUSTRALIA PTY LTD

Arruwurra mine layout

Figure No: 5.3

Delivery of crushed and screened DSO product to Tennant Creek will commence immediately after the ore has been treated. Stockpiles at the mine site, Tennant Creek and the Port of Darwin will be allowed to accumulate progressively over time, with initial focus on getting product to market in as short a timeframe as possible. The first railing of DSO ore is expected to occur in the third quarter of 2010. The timeframe for completion of the permitting, construction and production of DSO is shown in Figure 5.4.

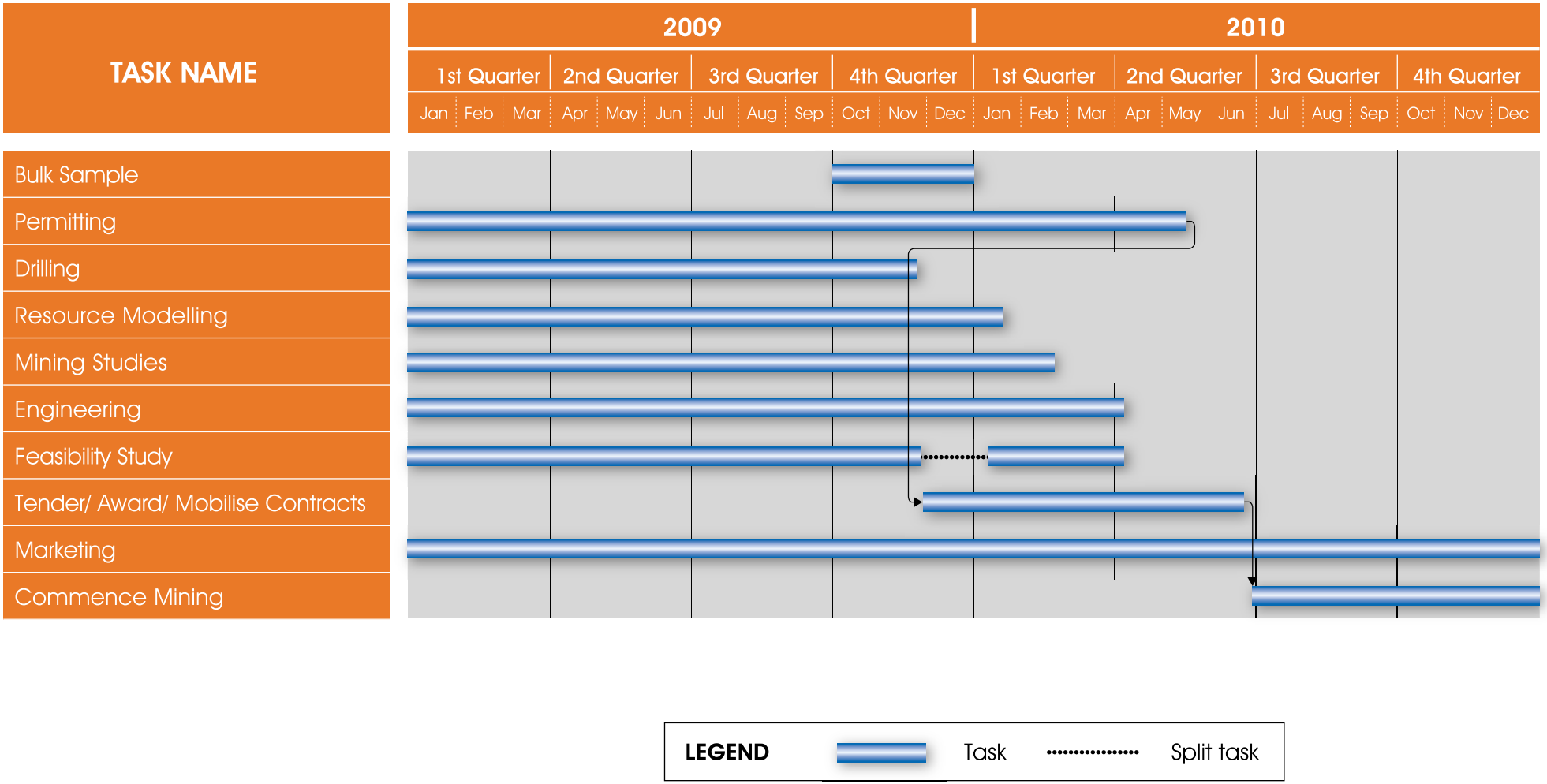
5.2.2 Mining Schedule

Mining will commence initially at Arruwurra, at an ore mining rate 0.5 Mt/a. Mining at Main Zone will be phased in approximately 18 months later with the combined ore mining rate ultimately reaching 3.0 Mt/a in the third full year of mining.

The mining of several pits concurrently will allow blending of ore types to achieve optimum blends for market requirements; consequently, the mining sequence may vary from time to time to meet specific market requirements. Table 5.1 shows the proposed pit working schedule.

Table 5.1 Proposed pit working schedule

Pit	Working Period									
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Arruwurra										
1										
2										
3										
4										
Main Zone										
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										



	coffey natural systems	Job No: ne09014	Minemakers Australia Pty Ltd	MINEMAKERS AUSTRALIA PTY LTD	Wonarah schedule	Figure No: 5.4
		File Name: 9014_07_F05.04_GL	Wonarah Phosphate Project			

For some pits a strip mining process or a variation on the process will be used. This process will involve the progressive backfilling and rehabilitation of pits as mining advances. For these pits, rehabilitation and mine closure will therefore be completed within 12 months of cessation of operations, subject to requirements for monitoring of landforms and rehabilitation performance over future years.

A summary of the proposed mining schedule is shown in Table 5.2. Exploration drilling currently underway has the potential to increase the DSO resource and may further extend the mine life.

Table 5.2 Mining schedule

Type of Material	Year										Totals (Mt)
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	
Arruwurra											
Waste rock (Mt)	4.2	6.2	7.0	4.8	0.0	0.0	0.0	0.0	0.0	0.0	**22.1**
DSO (Mt)	0.1	0.5	1.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	**2.6**
Non-DSO (Mt)	0.4	2.0	1.5	4.2	0.0	0.0	0.0	0.0	0.0	0.0	**8.2**
Main Zone											
Waste rock (Mt)	0.0	0.0	11.5	17.0	22.1	28.3	37.3	42.5	48.4	9.8	**216.8**
DSO (Mt)	0.0	0.0	0.0	2.0	3.0	3.0	3.0	3.0	3.0	0.3	**17.3**
Non-DSO (Mt)	0.0	0.0	0.1	0.0	1.7	2.3	0.2	1.7	2.6	0.1	**8.8**
Total											
Waste rock (Mt)	4.2	6.2	18.5	21.8	22.1	28.3	37.3	42.5	48.4	9.8	**238.9**
DSO (Mt)	0.1	0.5	1.0	3.0	3.0	3.0	3.0	3.0	3.0	0.3	**19.9**
Non-DSO (Mt)	0.4	2.0	1.6	4.2	1.7	2.3	0.2	1.7	2.6	0.1	**16.9**
All material (Mt)	**4.7**	**8.7**	**21.1**	**28.9**	**26.8**	**33.6**	**40.5**	**47.2**	**54.0**	**10.2**	**275.8**

Any apparent errors are a consequence of rounding.

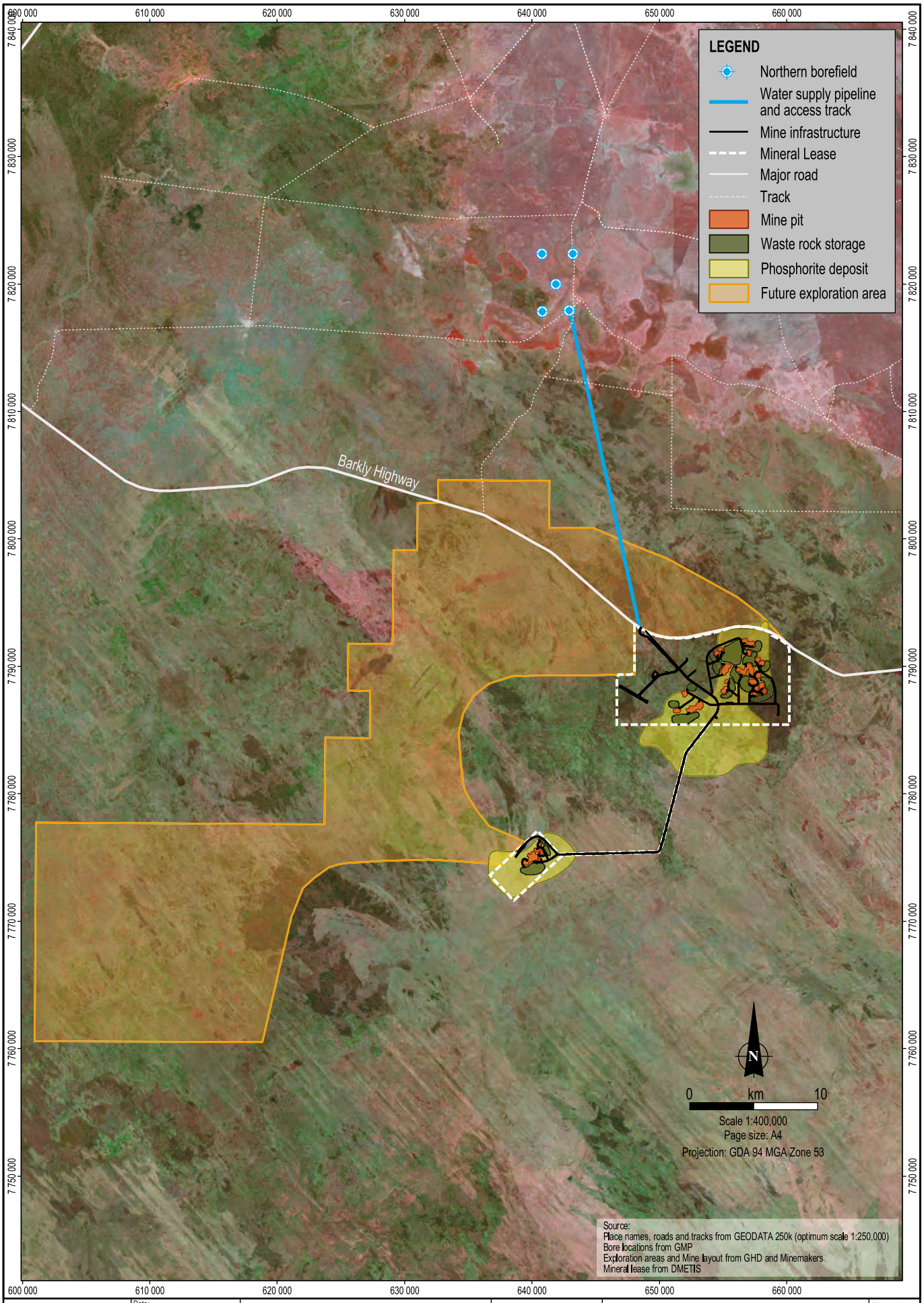
5.2.3 Future Exploration and Expansion

In the short term, exploration activities will infill and extend the known phosphate resource at both the Main Zone and Arruwurra deposits, with the purpose of increasing the known resource of DSO at Wonarah. At Arruwurra, there is potential to expand the DSO resource to the west of the current mapped deposit, albeit at greater depths than the current DSO resource being targeted at Arruwurra for Stage 1.

In the southwestern section of the Main Zone deposit there is potential for a series of smaller, contiguous to semi-contiguous bodies of DSO at shallower depths than in the main part of the Main Zone. Further exploration drilling will confirm this assumption.

The area northwest of the Main Zone has the potential to contain a significant amount of DSO at similar to slightly shallower depths than the main part of the northern Main Zone. A significant amount of exploration drilling will be required to adequately define the potential resource in this area.

In the longer term, exploration activities will focus on the area to the west of the known deposits (Figure 5.5). Minemakers' review of previous phosphate exploration conducted at the turn of the century and in the 1960s has resulted in an upgrade of the resource potential of this area. This area is now considered to have the potential to host high grade phosphate at depths that are



coffey natural systems

Date: 06.11.2009
MXD: Minemakers_Wonarah_GIS.mxd
File Name: 9014_07_F05.5_GIS_HB

Minemakers Australia Pty Ltd

Wonarah Phosphate Project

MINEMAKERS AUSTRALIA PTY LTD

Future exploration area

Figure No: 5.5

equivalent to, or shallower than, the northern part of the Main Zone. A small portion of the area identified for future exploration falls outside Minemakers' current exploration licences and covers cultural exclusion zones. These zones will be excluded from exploration activities; at the request of Traditional Owners they cannot be shown on Figure 5.5.

Based on current understanding, future drilling will not adversely impact on groundwater, as the target phosphate horizon lies above the water table. In addition, other than some minor vegetation clearing that will be rehabilitated, no significant impacts on surface water are expected due to future exploration activities at Wonarah.

5.3 Geology and Resources

5.3.1 Deposit Geology

Regional Geology

The project is located within the Georgina Basin, a sedimentary basin containing lower and middle Palaeozoic sediments. The Georgina Basin is subdivided into several sub-basins that primarily reflect the thickness of Cambrian deposition. Within the region of the Wonarah phosphate deposit two sub-basins occur, the Brunette and the Undilla, which are made up of Middle Cambrian sediments and volcanics.

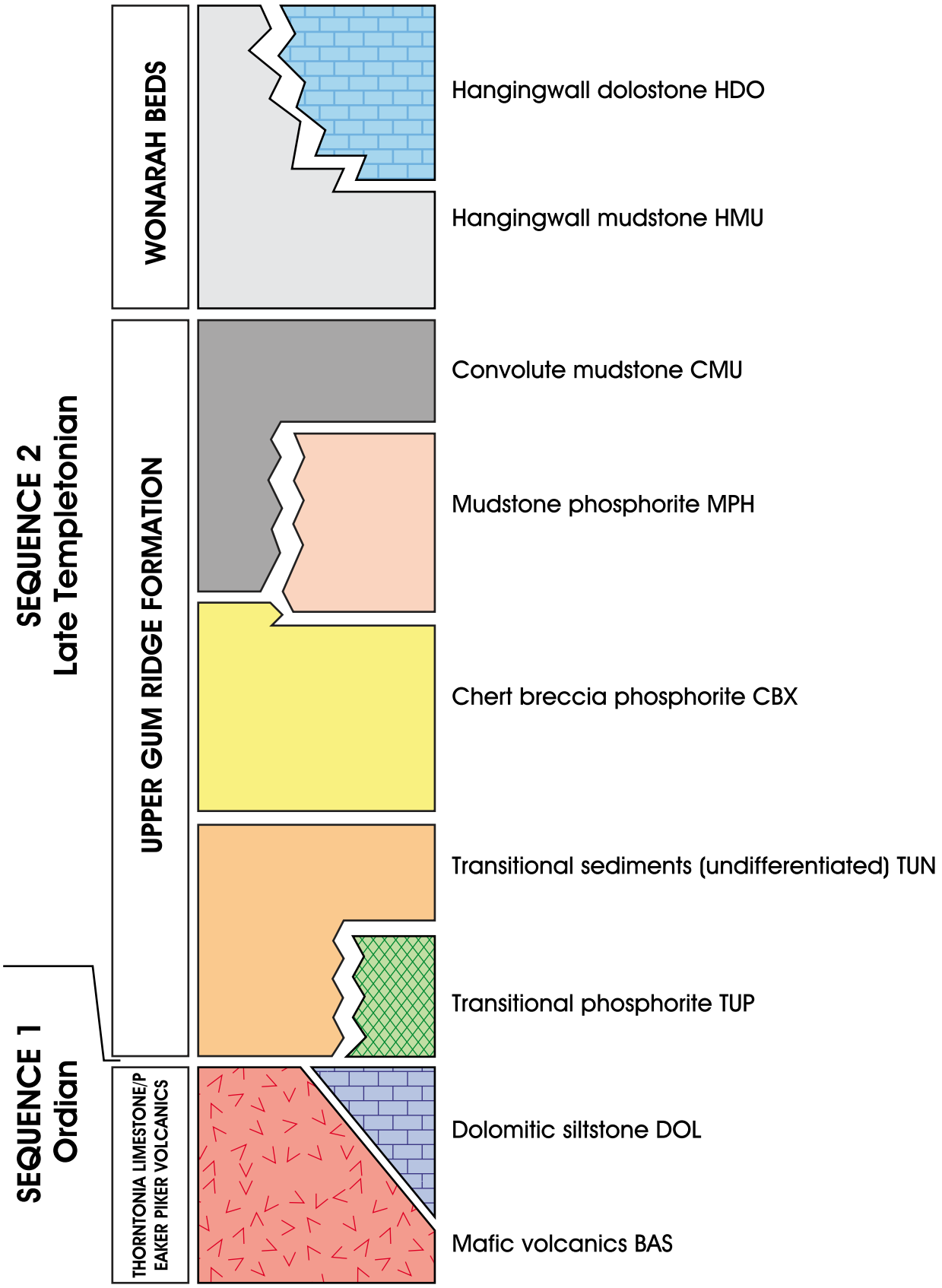
Within these two sub-basins, two geological sequences (the Ordian and the Late Templetonian) have been identified. The Ordian sequence consists of Thorntonia Limestone (dolomites, dolomitic siltstones and shales) overlying the basalts, dolerites, and volcanogenic sediments of the Peaker Piker Volcanics. The Late Templetonian sequence includes the phosphate-bearing Upper Gum Ridge Formation which consists of (from bottom to top of formation): the erratically distributed high grade Transitional Phosphorite and overlying Transitional Sediments (clay rich mudstone and siltstone, phosphorite, and minor sandstone); the Chert Breccia Phosphorite, a chert-rich phosphorite; the Mudstone Phosphorite which is comprised of medium to high grade friable and indurated phosphorite; and the weakly-phosphatic Convolute Mudstone. The Upper Gum Ridge Formation is overlain by the Wonarah Beds and these are represented by the non-phosphatic mudstones and siltstones of the Hangingwall Mudstone Unit within the project area. Some dolomitic or calcareous rocks, the Hangingwall Dolostone, are present within the Wonarah Beds in the southwestern part of the project area. A stratigraphic column of the regional geology is shown in Figure 5.6.

Arruwurra Geology

At the Arruwurra deposit the phosphate mineralisation occupies a broad northeast to southwest trending shelf that slopes gently to the southwest. The shelf drops away sharply at the western end and along the southeastern edge. Mineralisation outcrops in the northeast before petering out against the basement high to the north.

A long section through the Arruwurra deposit is shown in Figure 5.7.

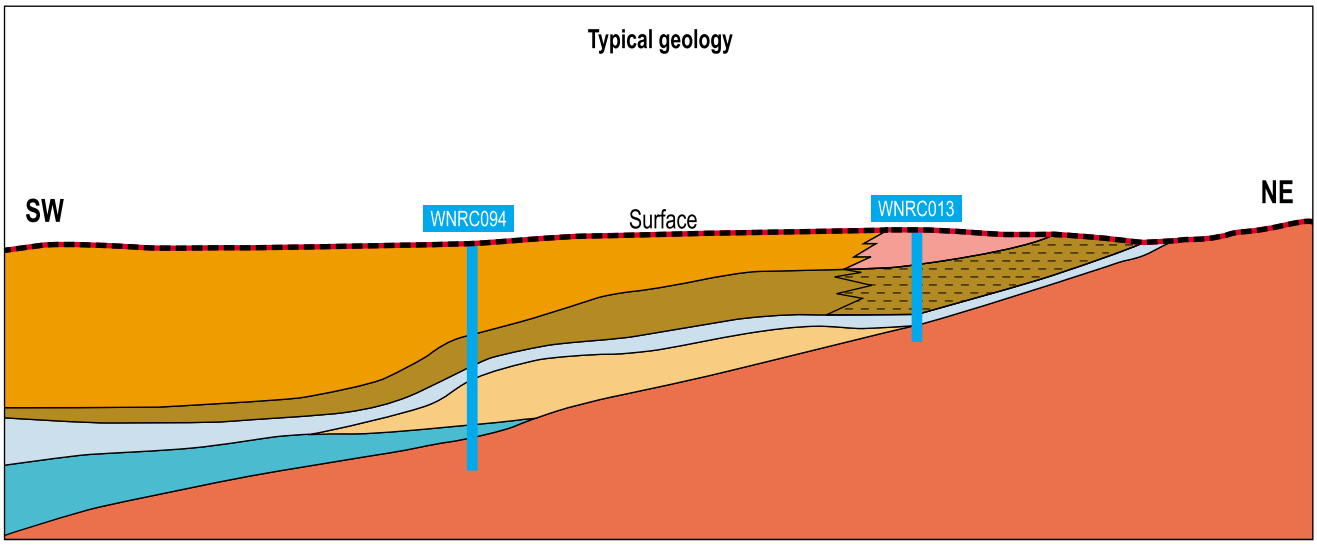
The basement at Arruwurra is a weathered basalt of the Peaker Piker Volcanics. Thorntonia Limestone equivalent dolomites and dolostones overlay the basalt along the south-eastern and southern margin of the deposit. An abrupt change in lithology and depth to the basalt basement



Source: Rio Tinto

coffey natural systems	Job No: ne09014	Minemakers Australia Pty Ltd	MINEMAKERS AUSTRALIA PTY LTD	Stratigraphic column of the regional geology	Figure No: 5.6
	File Name: 9014_07_F05.06_GL	Wonarah Phosphate Project			

Typical geology

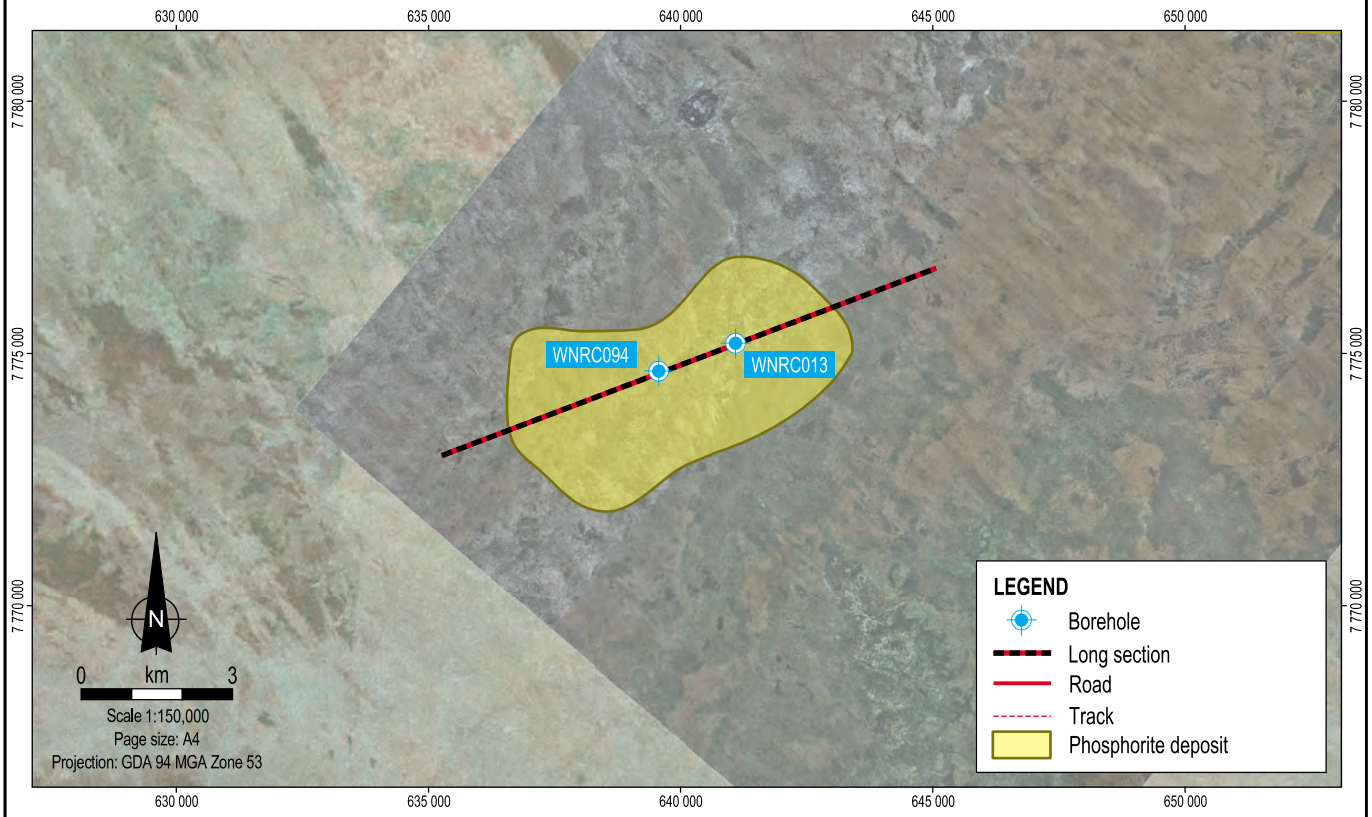


Not to scale

LEGEND

- Borehole
- Long section
- Hanging wall carbonate unit
- Hanging wall mudstone
- Upper phosphorite
- Transitional sediments (phosphatic)
- Lower phosphorite unit (DSO)
- Footwall dolomite
- Basalt
- Calcareous

Location of long section



coffey natural systems	Job No: ne09014	Minemakers Australia Pty Ltd	MINEMAKERS LIMITED	Long section through Arruwurra deposit	Figure No: 5.7
	File Name: 9014_07_F05.07_GL	Wonarah Phosphate Project			

indicates a probable fault which has thrown the deposit side upwards. A karst surface is present on some of the dolomite.

The Upper Gum Ridge Formation at Arruwurra is somewhat attenuated in comparison to the Main Zone. The stratigraphic equivalent of the high grade Transitional Phosphorite is called the Basal Phosphorite at Arruwurra and is the main unit of economic importance. It is a strongly indurated, very high grade brown phosphorite mudstone which averages approximately 2 m in thickness and is developed throughout the northeastern part of Arruwurra. The overlying Transitional Sediments are thinner than in the Main Zone and are comprised of 1 to 3 m of mudstone, siltstone and phosphorite. The Chert Breccia Phosphorite is absent at Arruwurra and the overlying Arruwurra Phosphorite is the stratigraphic equivalent of the Mudstone Phosphorite. The Arruwurra Phosphorite is grey to yellow and is more chert-rich that the Mudstone Phosphorite at the Main Zone. The unit varies in thickness from 1 to 6 m and is thickest along a northeast trending axis through the centre of the deposit.

The Convolute Mudstone is absent at Arruwurra. The Hangingwall Mudstone unit is similar to the Main Zone except in the far east of Arruwurra where dolomitic and calcareous units, the Hangingwall Dolomite, are present.

Main Zone Geology

The basalt basement in the Main Zone area is also comprised of the Peaker Piker Volcanics. The top of the basalt is extremely weathered and has a ferruginous and manganiferous duricrust. Some dolomitic rocks of the Thorntonia Limestone equivalent are present above the basalt at the southeastern extremity of the Main Zone. To the east and the south the carbonate rocks are extensively developed.

A long section through the Main Zone deposit is shown in Figure 5.8.

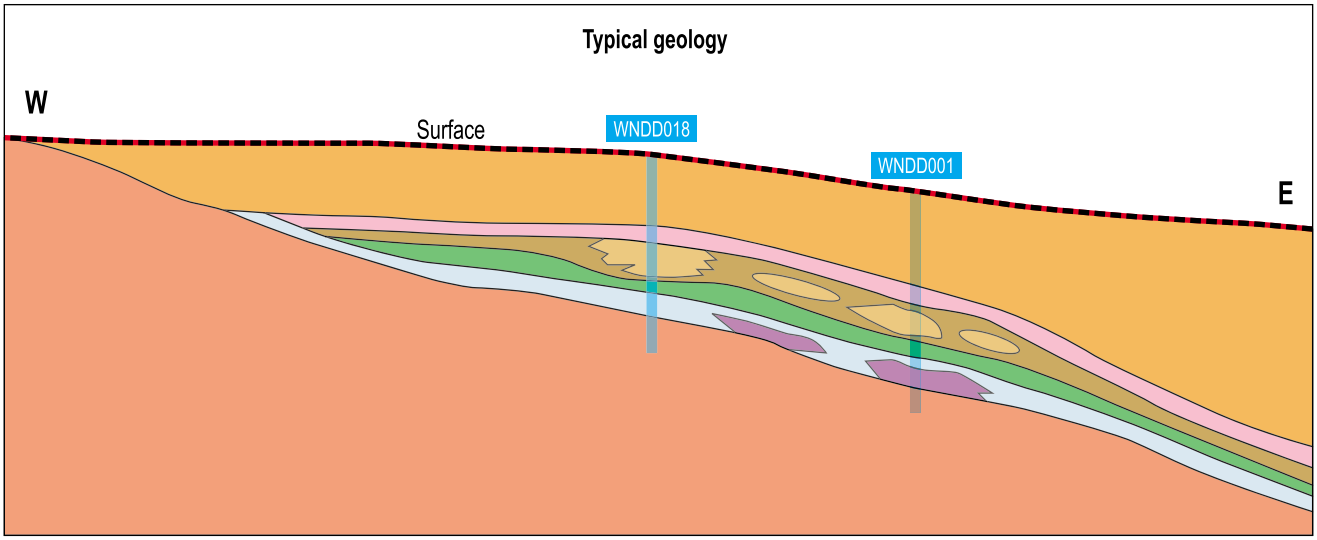
The overlying phosphate-bearing Upper Gum Ridge Formation is divided into four main units: Basal Undifferentiated Transitional Unit sediments, Chert Breccia Phosphorite, Mudstone Phosphorite and Convolute Mudstone.

The basal Transitional Phosphorite is a laterally discontinuous high grade indurated phosphorite up to 3 m thick developed throughout the eastern and southern part of the Main Zone. The Transitional Sediments are laterally continuous, 4 to 8 m thick and comprised of clay-rich mudstone and siltstone with minor phosphorite, dolomite, sandstone and basal epiclastics.

The Chert Breccia Phosphorite is comprised of up to 70% dark grey angular chert within a low to high grade phosphorite matrix which varies from friable to strongly indurated. The unit is present throughout most of the Main Zone, although thinning to the north, and is 2 to 6 m thick. The contact with the overlying Mudstone Phosphorite is mostly sharp and the Mudstone Phosphorite is essentially medium to high grade yellow to pink mudstone phosphorite which varies in texture from friable to strongly indurated. This unit varies in thickness from 1 to 10 m. At the Main Zone, the Mudstone Phosphorite is the economic unit of prime importance. The Mudstone Phosphorite is overlain by the Convolute Mudstone which is comprised of weakly phosphatic clay-rich mudstones.

The Hangingwall Mudstone overlies the Convolute Mudstone and is comprised of mudstone and siltstone with minor chert. This unit thickens towards the east and south away from the basement

Typical geology

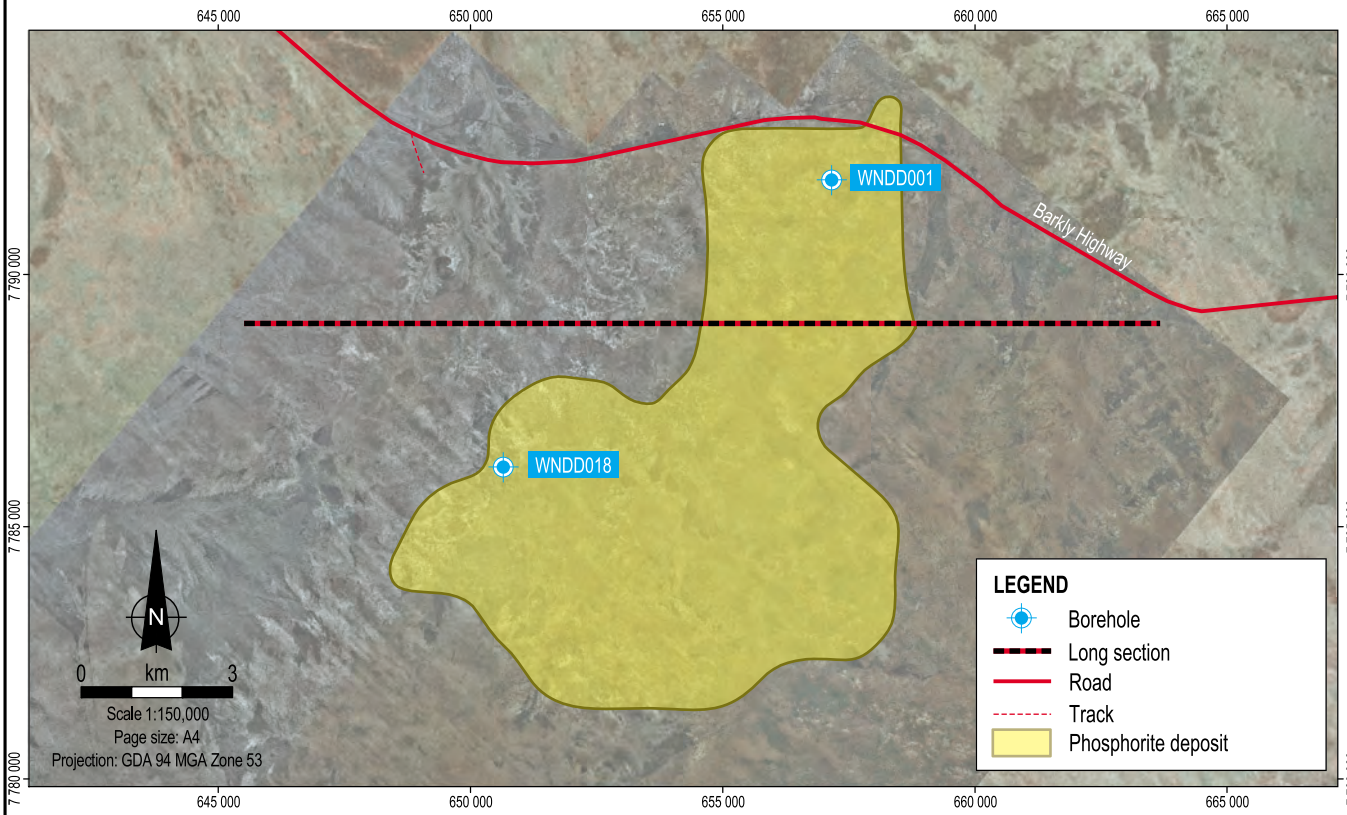


Not to scale

LEGEND

- Borehole
- Long section
- Hanging wall carbonate unit
- Convolute mudstone
- Indurated Phosphorite (DSO)
- Mudstone Phosphorite
- Chert Breccia Phosphorite
- Transitional sediments
- Transitional Phosphorite
- Basalt

Location of long section



coffey natural systems	Job No: ne09014	Minemakers Australia Pty Ltd	MINEMAKERS AUSTRALIA PTY LTD	Long section through Main Zone deposit	Figure No: 5.8
	File Name: 9014_07_F05.08_GL	Wonarah Phosphate Project			

high that defines the western fringe of the Main Zone. Dolomitic units of the Hangingwall Dolostone are present east and south of the Main Zone.

The phosphatic units thin out towards the basement high which trends in a northeast to southwest direction towards Arruwurra. To the east and south the phosphatic units, although still present with grade and thickness, are too deep to be of economic interest at this time.

5.3.2 Resource Estimates

The project has a Joint Ore Reserves Committee (JORC) compliant indicated resource estimate of 399 Mt at 21% phosphate (P_2O_5) (based on a 15% cut-off grade). Table 5.3 details the current resource estimate.

Table 5.3 Wonarah phosphate project inferred resources

Deposit Description	Tonnage (Mt)	P_2O_5 grade (%)
Main Zone:	306	21.0
Comprising:		
- Mudstone phosphorite	*(233)*	*(21.5)*
- Chert breccia phosphorite	*(59)*	*(17.8)*
- Transitional phosphorite	*(14)*	*(27.0)*
Arruwurra	93	19.0
Total	**399**	**21.0**

5.3.3 Deposit Geochemistry

Geochemical characterisation has been carried out on representative samples of the waste rock for both the Arruwurra and Main Zone deposits and the non-DSO by Environmental Geochemistry International Pty Ltd and is provided as Appendix 6. All samples tested were classified as non-acid forming (NAF) and about 40% of the waste rock composites were also barren with respect to sulfur (S) and acid neutralising capacity (ANC), having a total sulfur content of less than or equal to 0.05% and ANC less than or equal to 5 kg sulfuric acid (H_2SO_4) per tonne.

Elemental analysis of selected waste rock composites indicated that phosphorous (P) and beryllium (Be) were enriched in most samples from the Arruwurra and Main Zone deposits. Phosphorous enrichment is to be expected given the mineralogy of the deposit and although beryllium was enriched when compared against median soil concentrations, the actual concentrations were not enriched compared to mean crustal abundance. Other elements showing significant enrichment in some samples were silver (Ag), calcium (Ca), cadmium (Cd), copper (Cu), magnesium (Mg), lead (Pb), thallium (Tl), uranium (U) and zinc (Zn).

Testing showed that all the non-DSO samples were highly enriched in phosphorous and beryllium and half of the samples were also significantly enriched in calcium and uranium. The actual concentration of U in the low grade ore is lower than typically observed in rock phosphate ore. In addition, silver, cobalt (Co), lead and strontium (Sr) were enriched in some samples (see Section 5.3.4).

Water extractions carried out on waste rock and non-DSO samples indicated only low solubility of dissolved constituents and that the majority of the environmentally significant elements were

either at low concentrations or below the detection limit. Phosphorous showed very low solubility. However, there was some solubility of fluorine (F) in the samples. Fluorine is typically associated with phosphate and leaching of fluorine would be expected in these samples.

Overall, the geochemical characterisation showed that acid rock drainage (ARD) will not be a concern for the project. However, there are some elements that occur at elevated concentrations in waste rock and non-DSO. Although their solubilities are expected to be low, phosphate, fluorine and beryllium will be included in site water quality monitoring programs.

5.3.4 Radiation

As elevated radiation levels are sometimes associated with phosphate rock deposits, a suite of uranium assays have been undertaken on the lithologies of the deposit and routine radiometric logging has been undertaken, on a per metre basis, of every sample drilled. The results demonstrate that radiation levels are uniformly low for sediments in general and particularly so for sedimentary phosphates or phosphorites.

A total of 292 uranium assays have been completed and include samples in both the Arruwurra and Main Zone deposits (Attachment 3). The uranium assays show maximum recorded uranium concentration of 75 parts per million (ppm), with an average of 18 ppm. The assays from the Main Zone deposit had a maximum uranium concentration of 75 ppm with an average of 26.2 ppm. The Arruwurra deposit had a maximum concentration of 50 ppm and an average concentration of 10.2 ppm.

Uranium is therefore present at background levels only, usually less than 20 ppm, which is typical for normal weathered and leached sedimentary rocks.

The data collected indicates that while some uranium is present it is not in quantities above normal or ‘safe’ background levels; therefore, as no concentration or beneficiation of ore is proposed no specific management procedures are planned or warranted for the ore or waste materials.

5.4 Project Components

The major components of the project and their proposed footprints are identified in Table 5.4 and described in detail in the following sections. Planning and design of all project components has incorporated the principles of the Northern Territory government’s Guidelines for preventing mosquito breeding sites associated with mining sites (Whelan and Warchot, 2005), this includes design of surface water management structures and drainage to minimise any standing water and breeding sites. The proposed project layout and location of related infrastructure is shown in Figures 5.1, 5.2 and 5.3.

The general principles guiding the location of project infrastructure have been to:

- Centre infrastructure around the Main Zone deposit, which is a larger deposit than Arruwurra and will produce more ore, to minimise overall haulage distances.
- Build on higher ground where possible to avoid inundation of infrastructure by flood waters.
- Utilise natural topography where possible to minimise earthworks and pumping requirements (i.e., make use of gravity).

- Place infrastructure such as the aerodrome and village in areas under which drilling to date has indicated that no phosphate is present so as not to sterilise a potential resource.
- Place the accommodation village sufficient distance from the potential mining areas so as to minimise the potential impacts of noise and dust.
- Minimise disturbance by placing infrastructure, such as temporary stockpiles, haul roads and the treatment plant, in areas that will be disturbed by subsequent mining.
- Ensure access to the site is controlled for safety reasons by locating the office near the site entrance.

Table 5.4 Project components and approximate footprints

Component	Approximate Total Disturbance Area (ha)
Arruwurra pits (4 pits)	114.0
Main Zone pits (19 pits)	482.0
Crushing and screening plant	6.0
Product stockpile	10.0
Run-of-Mine stockpile	2.0
Waste rock storage – assuming 0% backfilling	1,376.0
(Waste rock storage – assuming 38%backfilling)	(713.0)
Access road	32.3
Mine haul roads (mining area only)	117.0
Other site roads	44.2
Aerodrome	28.2
Borefield	6.0
Water supply pipeline	75.0
Offices	4.0
Explosives magazines	1.0
Power station	1.0
Mining contractors area	2.0
Accommodation village	10.0
Sewage treatment facility	3.0
Putrescible waste disposal site	3.0
Borrow pits	8.9
Total	**2,325.6**

5.5 Mining Process

The Arruwurra and Main Zone deposits will be developed using a combination of conventional shallow open pit and strip mining methods, which allow for progressive rehabilitation to occur. Up to 23 open pits will be mined, up to 4 in the Arruwurra deposit and up to 19 in the Main Zone (see Figure 5.1). A number of pits will be operated concurrently to allow blending of ore types to achieve optimum blends for market requirements.

Smaller pits will be mined using conventional open pit methods. For these pits, the extent to which they will be backfilled will be dependent upon the mining schedule and the economic viability of backfilling. Generally, final voids associated with open pits will be larger than those that remain for pits mined via the strip mining process.

Conventional shallow open pit mining will simply involve the removal of waste from the area being mined, with this then placed in stockpiles adjacent to the pit and the ore removed. With a number of smaller open pits being mined, there may be insufficient room within some of these pits to accommodate backfilling during their operation. However, backfilling may occur later as an adjacent pit is mined; the waste from the pre-strip of an adjacent pit could be placed into the void created by a previously mined open pit. However, in many cases, the haulage distance between successive pits is significant and backfilling will be less cost effective than constructing waste rock storages adjacent to the pits.

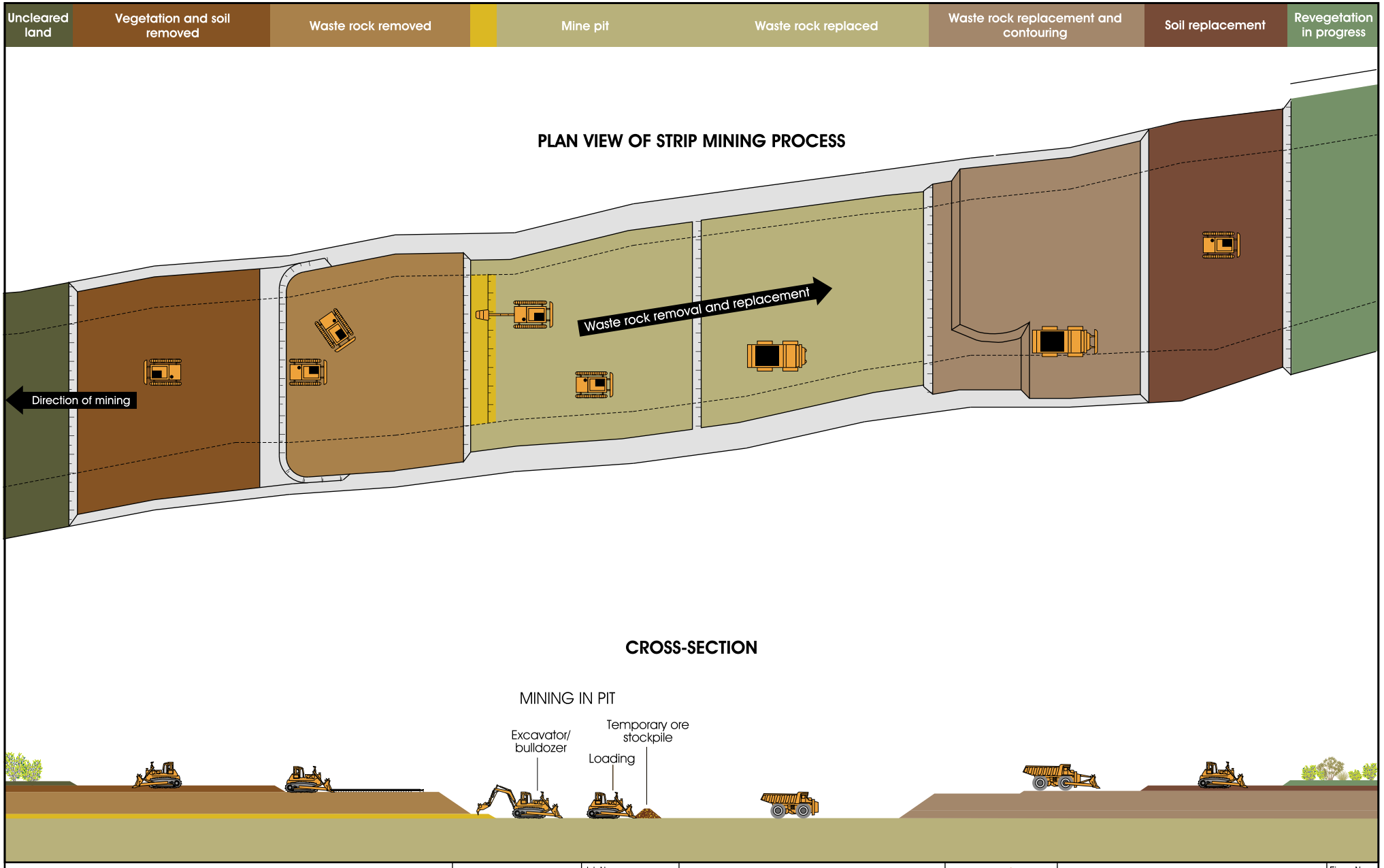
The strip mining process will involve the excavation of waste and ore in progressive strips. After the initial strip or cut has been mined, the waste rock for subsequent strips will be placed in the void created from the first strip (Figure 5.9). This technique will enable areas to be progressively rehabilitated once mining has advanced to the next strip. Contouring of the replaced waste rock will occur ahead of topsoil placement and revegetation.

Typically, the strip mining process will commence with removal of topsoil from all areas to be disturbed for the initial box cut and waste rock removal. A slot will be opened from the initial wedge shaped box cut and then extended along the full strike extent of the pit. The initial box cut will be positioned mid-strike of the DSO grade zone and mining will advance along strike for the full extent of one half of the initial slot before commencing on the other half. The development and mining of the Main Zone will be deeper than that of the Arruwurra deposit as the depth to the deposits (i.e., or the amount of waste rock overlying the deposits) varies, as does the thickness of the deposits. For the Main Zone, the depth to the deposit ranges from 20 m at its shallowest point to 50 to 60 m at its deepest point and the thickness of the phosphate deposit is typically around 4 m. The depth to the Arruwurra deposit ranges from 10 to 15 m at its shallowest point to 25 to 30 m at its deepest point. The thickness of the Arruwurra phosphate deposit typically ranges from 1 to 3 m.

Mining will be undertaken by excavator, face shovel or mobile miner. Blasting may be used to loosen the waste rock and ore ahead of mining. The mined ore will be loaded into haul trucks and transported to a temporary ore stockpile adjacent to each pit. The footprint of each temporary ore stockpile will cover an area of approximately 2 ha. Wherever possible, these stockpiles will be located within the footprint of the final pit and advanced ahead of mining in order to minimise total land disturbance.

During the mining process temporary bunds will be placed at a distance of at least 5 m from the edge of the pits to prevent accidental access to the pit. For pits that are backfilled, these bunds will be removed and replaced progressively as the pits advance.

The process of waste rock removal, phosphate mining and filling of the void will be repeated until the economic or geological limit of the DSO in the pit is reached. At completion of mining the final void will be left unfilled. Bunds will be formed around the final void at a distance of at least 25 m to prevent accidental access to the edge of the void. A bund will also be formed across the haul road to prevent access.



	coffey natural systems	Job No: ne09014	Minemakers Australia Pty Ltd	MINEMAKERS AUSTRALIA PTY LTD	Strip mining process	Figure No: 5.9
		File Name: 9014_07_F05.09_GL	Wonarah Phosphate Project			

Table 5.5 outlines the proposed pit details, including the total maximum disturbance area and the percentage to which the pits will be backfilled.

Table 5.5 Pit details

Pit	Total Extraction Volume (m^3)	Total Disturbance Area (ha)	Percentage Backfilled (%)	Remaining Volume (m^3)	Remaining Disturbance Area (ha)	Year Complete
Arruwurra						
Pit 1	13,424,932	74	40	8,069,323	51.8	2013
Pit 2	821,589	6	0	821,589	6.0	2013
Pit 3	3,110,480	26	78	684,041	8.3	2013
Pit 4	727,568	7	100	0	0.0	2011
Main Zone						
Pit 1	12,398,912	39	35	8,098,393	49.2	2018
Pit 2	2,507,912	11	0	2,507,912	11	2017
Pit 3	3,314,222	14	80	649,866	5.8	2014
Pit 4	3,744,335	14	0	3,744,335	14	2019
Pit 5	16,128,146	49	44	9,007,220	36.8	2015
Pit 6	25,392,041	80	62	9,750,265	18.6	2016
Pit 7	4,124,352	14	0	4,124,352	14	2018
Pit 8	5,078,658	16	0	5,078,658	16	2017
Pit 9	5,207,406	18	0	5,207,406	18	2018
Pit 10	2,158,076	9	0	2,158,076	9	2015
Pit 11	9,323,137	27	83	1,623,106	4.8	2017
Pit 12	3,901,878	14	100	0	0.0	2018
Pit 13	6,797,239	20	66	2,339,697	15.3	2018
Pit 14	2,024,905	9	0	2,024,905	9	2019
Pit 15	4,200,356	14	57	1,823,891	23.2	2019
Pit 16	7,116,354	24	0	7,116,354	24	2017
Pit 17	4,550,130	21	0	4,550,130	21	2015
Pit 18	4,413,889	20	0	4,413,889	20	2012
Pit 19	20,554,265	70	25	15,512,893	64.5	2014

Any apparent errors are a consequence of rounding.

Mined ore will be transported via haul trucks to the run of mine (ROM) stockpile adjacent to each of the mobile crushing and screening plants located at Arruwurra and Main Zone. Each plant will be moved periodically to minimise the haul distance from the pits in operation.

Mining will also generate non-DSO which will be stockpiled within discrete zones of designated waste rock storages, identifiable for later treatment as part of Stage 2. If Stage 2 does not proceed, the non-DSO material will be shaped into a stable landform, spread with topsoil and revegetated, as part of the rehabilitation of waste rock storages.

Drilling and blasting may occur infrequently. Based on observation of drill core and other geological information it is anticipated that about 10% of the waste rock and 50% of ore, at most, will require blasting. The actual drill and blast requirements will be adjusted as dictated by

operational requirements, although at this time a high proportion of material suitable for free digging is anticipated.

5.6 Waste Rock Storage

Waste rock from the mining activities will be stockpiled in waste rock storages immediately adjacent to the pits, when opportunistic backfilling is not possible (see Figure 5.1 and Table 5.6). The waste rock storages will be contoured into a low hill with a height above the natural ground level of approximately 20 m and final batter slopes of no more than 18^{o}. They will be constructed in two 10 m lifts with a 5 m wide berm between lifts. The final waste rock storages will be covered using stockpiled topsoil, and will be ripped and seeded to promote regrowth of vegetation.

Table 5.6 Waste rock storage details

Waste Rock Storage Number	Footprint (ha)	Year Completed
Arruwurra		
AS1	168	2013
AS2	41	2013
AS3	21	2011
Main Zone		
MZS1	250	2019
MZS 2	31	2019
MZS 3	61	2019
MZS 4	59	2019
MZS 5	61	2019
MZS 6	78	2018
MZS 7	45	2018
MZS 8	41	2015
MZS 9	90	2017
MZS 10	160	2018
MZS 11	35	2017
MZS 12	40	2015
MZS 13	42	2015
MZS 14	153	2015

The waste rock storages are designed to a maximum height of 20 m above the natural ground level. A height of 20 m is considered appropriate to maximise waste rock storage capacity and minimise the resultant disturbance area.

Vegetation and topsoil removed from disturbance areas in the course of surface clearing for pits, waste rock storages and infrastructure will be harvested for future rehabilitation work. The vegetation and topsoil will be removed together to a nominal depth of 0.3 m below the topsoil surface. Combined vegetation and topsoil stockpiles will be constructed in designated zones at the edge of the disturbance areas at a height of no more than 2 m.

5.7 Treatment Process

At each crushing and screening plant the ore will be reclaimed from the ROM stockpile by front end loader and fed to the primary crusher where the size will be reduced to 75 mm. The crushed product will be screened on a double deck screen and then fed into the secondary crusher where the ore will be crushed to a particle size less than 2 mm. The secondary crusher product will be screened to ensure the product is less than 2 mm in size and any oversized material will be returned for further processing. The initial capacity of each crushing and screening plant will be 0.5 Mt/a and will be expanded as necessary to meet marketing and mining requirements. The treatment process consists of dry crushing and screening and requires no other liquids or gasses to be added to the process.

Once ore has passed through the crushing and screening process, it will be stockpiled ready to be transported to market. Stockpiles will occasionally be lightly watered to prevent wind losses. Infrastructure associated with the crushing and screening plant includes a warehouse, phosphate storage areas and truck loading facilities. The total area occupied by the ROM pad, crushing and screening plant and stockpile areas at each location will be approximately 3 ha.

5.8 Water Management

5.8.1 Surface Water Management

The project area is located in a semi-arid climate and there are no significant watercourses or drainage lines present on the site; however, during heavy rainfall the area is prone to flooding. Watercourses that drain the region are ephemeral and only flow after significant rain.

Mine infrastructure will be located to minimise deviation of natural surface water flow paths, to avoid inundation of the open pits and to prevent erosion and siltation and adverse impacts on water quality downstream of the project area.

Site surface water management will be based on three broad goals:

- Reduce the potential risk of loss of life, health hazards and property damage.
- Preserve the environment.
- Conserve social and financial resources.

The management of surface water on site will involve minimising the potential changes to natural surface water flows, diverting clean surface water runoff away from disturbed areas, and intercepting runoff from disturbed areas and directing it through sediment control structures prior to discharge to the downstream environment.

A detailed description of the site water management structures is contained within Appendix 10B; these structures will include:

- Flood protection measures (including constructed berms, strategically placed waste rock storages, stockpiles and above-grade haul roads). Flood protection measures will be designed for a 1 in 100 year average recurrence interval (ARI) runoff event and will be located at the Arruwurra mining area.
- Diversion ditches. Diversion ditches will be designed for a 1 in 10 year ARI runoff event. Diversion ditches will be located at:

  - The Arruwurra mining area to divert water from an undisturbed catchment away from the mine services area.
  - Two sections on the northeast side of the aerodrome to divert water from an undisturbed catchment away from the aerodrome.

- Arterial drainage channels and culverts. Arterial drainage channels will be required at both the Arruwurra and Main Zone mining areas to collect runoff from the various mine facilities and convey it to sedimentation ponds and, if suitable, off-site. Arterial drainage channels will be designed for a 1 in 10 year ARI runoff event. Approximately 12 to 15 culvert crossings will be required along the haul road from the Main Zone to Arruwurra.
- Sedimentation ponds. Four sedimentation ponds will be located on site (two at Main Zone and two at Arruwurra) to allow treatment of water with potentially high suspended solid concentrations from ore stockpiles and waste rock storages and oily water from the mine services areas. Sedimentation ponds that receive water from mine services areas will have oily water separators (OWS) upstream of their inlets as they will receive runoff from workshops and fuel storages. Sedimentation ponds will be designed for a 1 in 10 year ARI runoff event and all ponds will have emergency spillways/outlets in order to safely pass flow volumes greater than 10 year ARI magnitude around the ponds and off-site.

5.8.2 Water Use

It is anticipated that peak water requirements (i.e., when operating at 3 Mt/a) will be approximately 9.6 ML/d for all purposes including dust suppression and potable water for domestic use. The total water demand during construction is estimated to peak at 15 L/s during the final phase of construction. Water will be required during the operational phase of the project for dust suppression on roads and mining areas, water for the crushing and screening plant operations and potable water demand. The peak water demand during the operational phase, while construction continues to be completed, is estimated to be 67 L/s. Once construction is complete, operational water demand is expected to vary between 60 L/s during the dry season and 32 L/s in the wet season.

Table 5.7 provides a summary of the water requirements for the project.

Table 5.7 Water requirements

Component	Average Water Requirements (m^3/d)	Peak Water Requirements (m^3/d)
Access road	804	1003
Haul roads	1997	2492
Other site roads	2,204	2,750
Mining contractors area	218	272
Arruwurra pit operating area	240	299
Main Zone pit operating area	654	816
Run-of-Mine stockpile	872	1,088
Crushing and screening plant and product stockpile	85	85
Potable water	27	27
Total	**7,678**	**9,553**

Treating borewater in a reverse osmosis plant will produce potable water. The potable water will be reticulated to the crushing and screening plants, administration offices, contractors' offices and workshops and the accommodation village. Water storage will comprise a main tank of approximately 20,000 L capacity and a 0.5 ML water pond.

5.8.3 Borefield

To meet the water requirements for the project a two stage supply is planned. The first stage will provide approximately 10 to 15 L/s for the start of construction, using five lower yielding bores in the Arruwurra area (WNWB002, WNWE056, WNWE057, WNWE061 and WNWE068). This first stage of water supply will be required for approximately three months.

During this initial construction period the second stage of water supply will be developed. This will consist of constructing the northern borefield comprising five bores (WNWB003, WNWB004, WNWB005, WNWB006 and WNWB007) (see Figure 5.2), approximately 27 km northwest of the Mineral Lease. A water supply pipeline will carry the water from the borefield to the Mineral Lease (a distance of approximately 30 km). From the Mineral Lease boundary, the water supply pipeline will follow the site access road to the water treatment facility. Once the northern borefield is operational, the Arruwurra borefield will no longer be required.

Modelling of the northern borefield suggests that by using the combined production of the borefield an overall production rate of 75 L/s over the 10 year mine life is readily achievable.

5.9 Transport Infrastructure

During the construction phase of the project, materials required for construction and operation will be transported to the site from Tennant Creek, Darwin or Mount Isa via a combination of rail and road. Upgrades to existing transport infrastructure will not be required for construction; however, some upgrades of existing roads and intersections along the transport route from the mine site to the multi-user hub will be required prior to transport of ore to market.

5.9.1 Access Road

An access road of approximately 8.5 km in length will be constructed from the Barkly Highway to the crushing and screening plant. The area of disturbance for the road will typically be 35 m wide including shoulders and provision for drainage. The access road may be sealed at a later date and the sealed width will be 8 m.

The access road corridor will also host a power line over a distance of 3 km from the power station to the office complex and from the power station to the crushing and screening plant. The corridor will also host water supply and reticulation pipelines.

The total cleared width at any part along the route may be up to 35 m to allow for statutory clearances from overhead power lines. The maximum area of disturbance is anticipated to be 32.3 ha.

5.9.2 Haul Roads and Other Site Roads

Approximately 179 km of road network of varying standards will be established to provide access around the site. Roads will provide access to the aerodrome, magazines, accommodation village, northern borefield and putrescible wastes landfill.

The general site roads will typically be formed to a width of approximately 8 m, with a disturbance width up to 35 m to allow for statutory clearances, shoulders and drainage. The total area potentially disturbed by such roads is approximately 193.5 ha. The road corridor may also host water supply and reticulation pipelines either from the northern borefield or the treatment plant. All pipes will be laid within the disturbed area of the road.

Haul roads will be established to connect each pit to the nearest ROM stockpile as well as allow mining equipment and other vehicle to travel between pits and back and forth from the workshop and office area. Wherever possible, these haul roads will be formed on areas that will later be disturbed by future mining. Haul roads that cease to be of use and will not be subsequently mined will be rehabilitated.

Water will be sprayed onto unsealed roads to suppress dust using a water cart. Where practicable and economically viable, proven, environmentally benign surfactants may be used on road surfaces to reduce the water demand for dust suppression.

5.9.3 Aerodrome

An aerodrome will be constructed to the southwest of the accommodation and office complex (see Figure 5.2). The aerodrome will be orientated approximately southeast to northwest to accommodate the prevailing wind direction. It will be constructed and marked in accordance with the Civil Aviation Regulations for aircraft landing areas. The runway will be 2 km long with a taxiway to an aircraft parking and refuelling area located at least 50 m from the edge of the runway.

Typically, aircraft of 20 to 30 seats will be used for shift changes for workers on a fly-in-fly-out roster. Emergency lighting will be available at the aerodrome to enable the Royal Flying Doctor Service to land and take off at night, should the need arise.

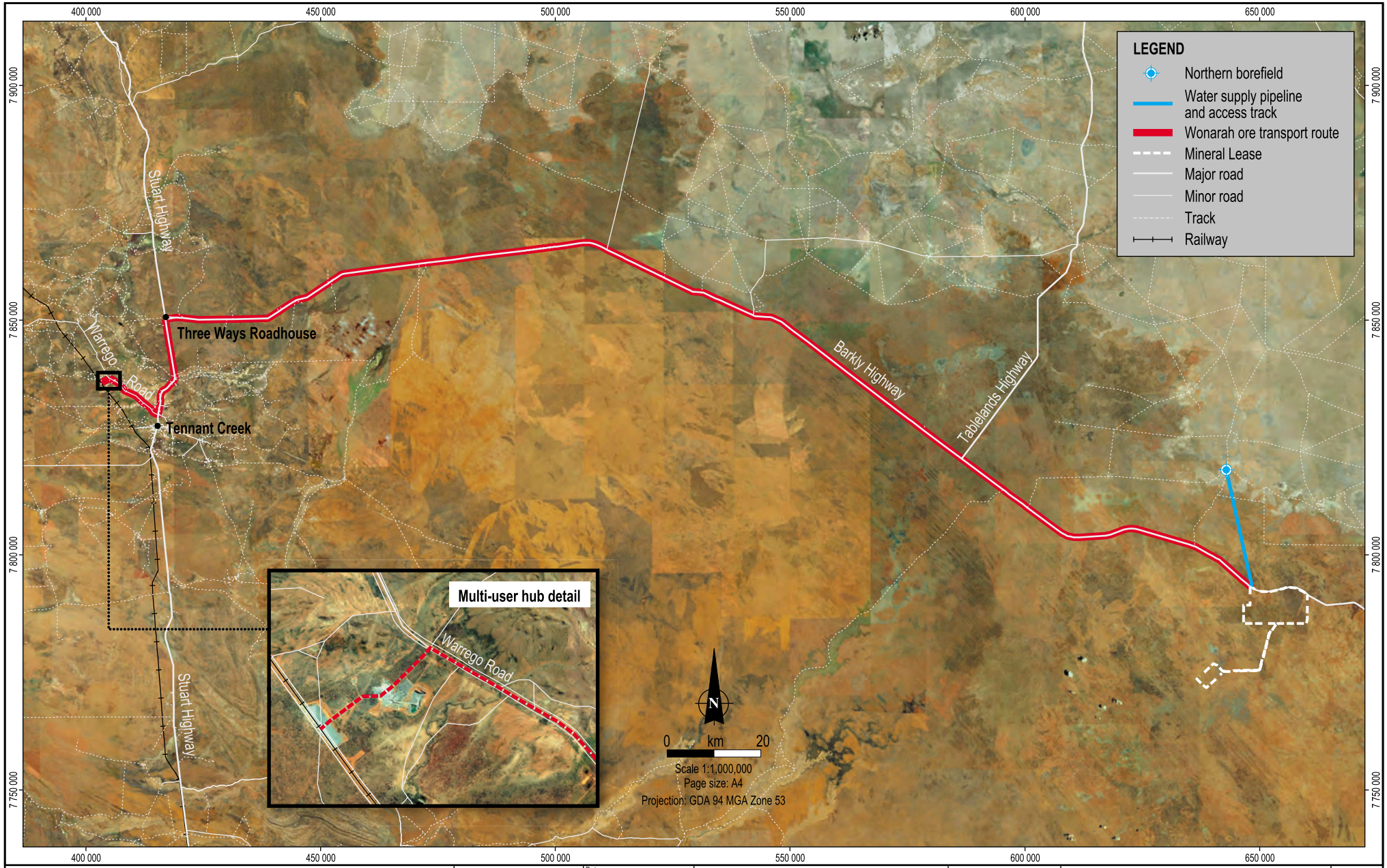
The total cleared area of the aerodrome will be approximately 28.3 ha.

5.10 Ore Storage and Transport to Market

Once processed through the crushing and screening plant, the ore will be stored on a designated stockpile area on the mine site prior to transport to the multi-user hub to be constructed by Global Port Solutions outside and to the north of Tennant Creek. Ore will be transported from the mine site to the multi-user hub by triple side tipper road trains along the following route (Figure 5.10):

- 8.5 km access road from the ore stockpile to the Barkly Highway.
- 260 km along the Barkly Highway to the intersection with the Stuart Highway at Threeways.
- 22 km along the Stuart Highway to the intersection with the Warrego Road.
- 16 km along the Warrego Road to the multi-user hub.

Should construction of the multi-user hub, outside and to the north of Tennant Creek, be delayed a number of other alternatives have been considered. These include:



Source:
Place names, roads, tracks and railways from GEODATA 250k (optimum scale 1:250,000).
Cadastre from NT DPI. Proposed mineral lease tenure from DMETIS.
Mine infrastructure from GHD.
Wonarah ore transport route from CNS.
Imagery from Google Earth (15/07/2009) approximate georeferencing only

coffey natural systems

Date: 09.11.2009
MXD: Minemakers_Wonarah_GIS.mxd
File Name: 9014_07_F05.10_GIS_HB

Minemakers Australia Pty Ltd

Wonarah Phosphate Project

MINEMAKERS AUSTRALIA PTY LTD

Wonarah Phosphate Project ore transport route to multi-user hub

Figure No: **5.10**

- Using the existing rail siding south of Tennant Creek. The siding has limited surplus capacity and would only be useful for very small quantities of rock in containers.
- Road Haulage to Mt Isa. Although more expensive, this could provide a short term alternative. However, capacity on the Mt Isa Townsville rail line is limited.
- Road Haulage to Darwin. Although being practically feasible this is financially punitive.
- Working with FreightLink to build a siding within the rail reserve adjoining the proposed multi-user hub site.

Transport of ore will be carried out 24-hours per day with truck movements gradually increasing from 31 round trips per day (when the mine is operating at 1 Mt/a) to 91 round trips per day (when the mine is operating at 3 Mt/a). This equates to approximately one truck every 23 minutes increasing to one truck every 8 minutes, during peak operations, in either direction. Ore will be transported 365-days a year; however, an allowance for two weeks of road closures due to flooding or other reasons has been made when calculating the expected ore transport requirements.

5.10.1 Tennant Creek

The road trains will deliver the phosphate to the multi-user hub to be constructed outside and to the north of Tennant Creek. Ore will be stored in stockpiles at the multi-user hub prior to being loaded on to the train for transport to the East Arm Port in Darwin.

The multi-user hub will be the subject of a separate approvals process and as such is not addressed in this EIS.

Turning circles and approach diversion lanes compatible with triple road train operation will need to be developed to Northern Territory Standards.

The railway line between Tennant Creek and East Arm Port in Darwin is a single track with four passing loops en route. Rail upgrades required as a result of the project include two new train-length tracks within Tennant Creek to accommodate transfers to and from rail. An additional four passing sidings may be required on the railway between Tennant Creek and East Arm Port to maintain train turnaround with the increased traffic generated on the line.

5.10.2 East Arm Port

Storage and transport to East Arm Port will utilise existing infrastructure where possible, however construction of a specific storage facility at the port will be required. This facility will be the subject of a separate approvals process and as such is not addressed in this EIS.

5.11 Other Mine Infrastructure

5.11.1 Borrow Pits

Construction of the site roads will require the mining of borrow pits to produce material suitable for road base and formation. Borrow pits will generally be located adjacent to the access road. Each borrow pit will be mined to a depth of approximately 3 m below natural ground surface.

Rehabilitation of the borrow pits will comprise battering of slopes to form stable landforms that allow safe ingress and egress and re-spreading of disturbed areas with stripped topsoil.

5.11.2 Administration and Maintenance Areas

An office complex covering approximately 4 ha and comprising site reception, administration, technical services, meeting and training rooms will be located adjacent to the site access road (see Figure 5.2).

Located in the same area will be the occupational health and safety, first aid and rescue centre and a maintenance workshop for both mechanical and electrical work with the site store, laydown area and vehicle parking areas.

To prevent unauthorised entry to site along the access road, a gate-house will be located close to the administration area. All traffic entering or leaving the site will have to pass through the gatehouse. Site security will be supplemented by area patrols and closed circuit television (CCTV) where considered necessary.

5.11.3 Power Station

A power station generating approximately 4 MW will be located approximately 4 km from the Main Zone crushing and screening plant and 1 km from the office complex (see Figure 5.2).

The power station will be dual fuelled (diesel and gas) with fuel storage located immediately adjacent to the power station. A buffer zone of approximately 50 m surrounding the power station will be cleared to minimise fire risk and to allow access for refilling of fuel storage vessels and for heavy vehicle access for removal and replacement of the power generating units.

The power station will be designed to prevent the emission of sparks from the engine exhausts by fitting each with spark arrestors.

5.11.4 Water Treatment Facility

A reverse osmosis water treatment facility will be located adjacent to the sewage treatment facility, approximately 1 km southwest of the office complex. The water treatment facility will treat water from the borefield to enable its use as potable water on site.

5.11.5 Explosives Magazine

A licensed explosives magazine will be established in accordance with the Northern Territory's *Dangerous Goods Act*. Storage capacity will be of the order of 10 t of explosive and up to 10,000 detonators.

The explosive magazine will be located approximately 8.5 km southwest of the office complex (see Figure 5.2) and access to the magazines will be strictly controlled.

5.11.6 Accommodation Village

An accommodation village covering an area of approximately 5.5 ha will be constructed approximately 2 km to the southwest of the office (see Figure 5.2).

The village will be sized to accommodate approximately 120 persons, including full time employees and contractors as well as short-term contractors and visitors.

Accommodation will be demountable units that typically comprise four rooms to each 12 m by 3 m unit. All units will have potable water reticulation, an en suite bathroom and will be plumbed into a centralised modular sewage system. Each room will be fitted with air-conditioning, satellite TV, broadband internet and telephone.

The accommodation village will be landscaped and provided with a network of paths to enable easy access (Figure 5.11). Facilities such as a laundry block and a central kitchen and dining room will form part of the accommodation village. The kitchen drains will incorporate grease traps for the collection and removal of grease prior to delivery to the sewage treatment facility.

The accommodation and administration areas will be located as far from standing water bodies as practical and will have appropriate screens installed to prevent mosquito intrusion.

Water storage tanks of approximately 60,000 L, sufficient to meet normal use and emergency fire fighting needs, will be located at the village. Power will be supplied via overhead powerlines running from the power station and adjacent to the main access road and village access road.

An accommodation village will also be constructed close to the multi-user hub and will be used to accommodate the road haulage workforce. The accommodation village will consist of demountables with a kitchen diner complex and recreational facilities. Locating an accommodation village close to the multi-user hub will enable easy movement of the workforce from the multi-user hub to the accommodation village using light vehicles and provide for the staggering of shift start and finish times. Any approvals required for the construction and operation of the road haulage accommodation village will be the subject of a separate approvals process and as such are not addressed in this EIS.

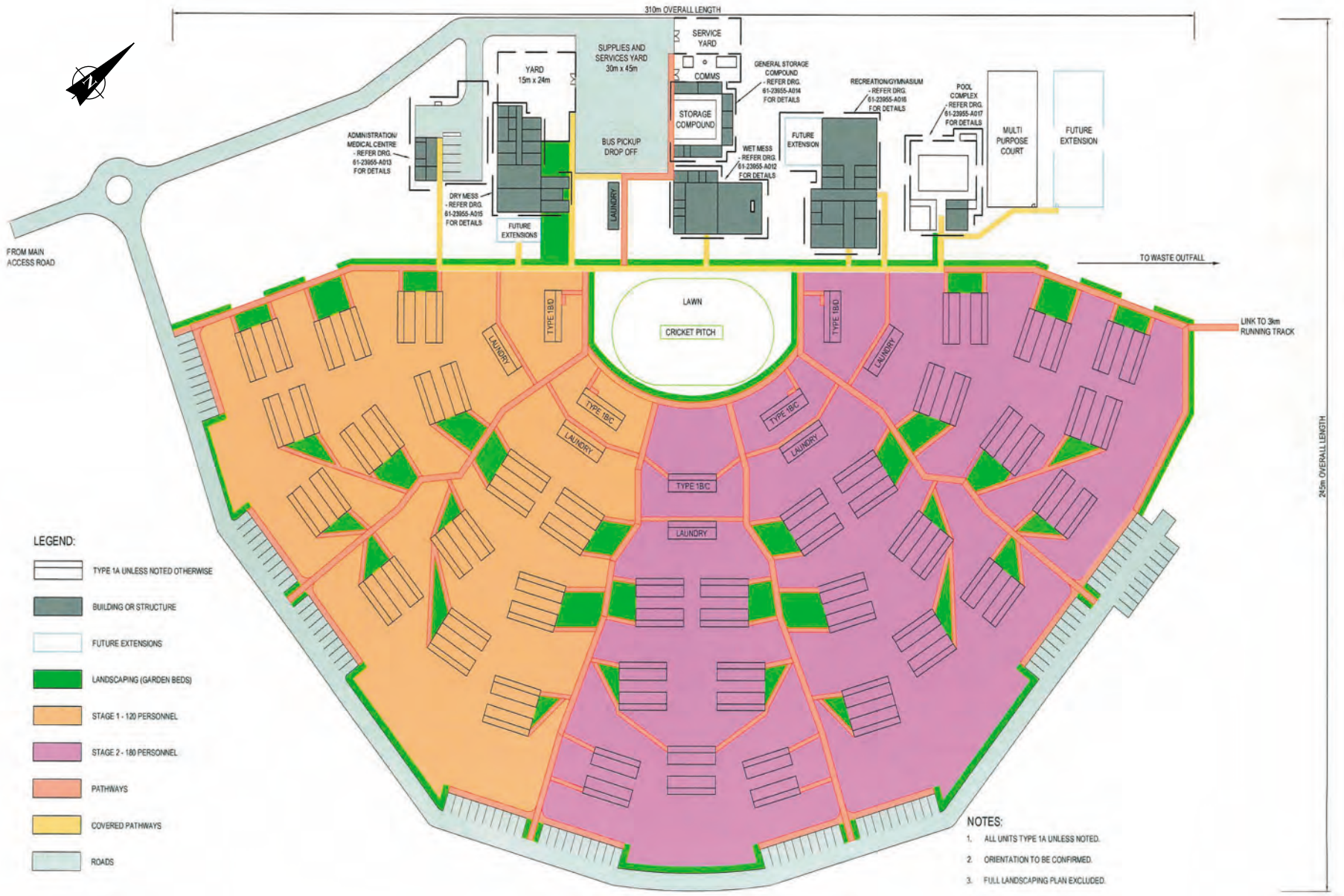
5.11.7 Communications

Telephone, internet and intranet will be available on site. Delivery will be via the fibre optic cable that runs beside the Barkly Highway. It is most likely that there will be no mobile phone coverage on site. As a back-up, the site will have at least one satellite phone for use in emergency such as a complete power or communications failure.

The site will operate an ultra high frequency (UHF) two-way radio system to allow communication around the site. All mobile equipment and light vehicles will be equipped with a UHF radio transmitter/receiver. The administration office, contractors' office/workshop, aerodrome and village will be equipped with base stations. Repeater stations and towers to approximately 20 m height will be located to ensure whole of site coverage. These are likely to be located adjacent to the site administration office and at Arruwurra.

5.11.8 Sewage Treatment Facility

A modular sewage treatment plant, comprising a package membrane bio-reactor process design (as opposed to a pond design) will be located approximately 500 m from the village (see Figure 5.2). It will comprise a number of above ground modules to process sewage waste from the accommodation village and offices. Suitable systems will likely include both aerobic and



	coffey natural systems	Job No: ne09014	Minemakers Australia Pty Ltd	MINEMAKERS AUSTRALIA PTY LTD	Layout of accommodation village	Figure No: 5.11
		File Name: 9014_07_F05.11_HB	Wonarah Phosphate Project			

anaerobic reactors and clarification systems. Processing capacity will be approximately 10,000 L per day.

All modules or tanks for the plant will be covered to mitigate any potential for entry by mosquitoes. As waste water treatment will be achieved using a membrane bio-reactor, there will be no permanent standing waste water ponds.

The treated and clarified effluent will be discharged via irrigation sprays into a fenced area of approximately 3 ha a further 500 m away; it is also possible that this water may be used as dust suppression on roads. An area of approximately 1 ha within the larger 3 ha discharge area will be set aside for bio-remediation pads for the treatment of soils contaminated by hydrocarbons.

Four pads, each of dimensions of around 20 by 30 m, will be formed for the remediation of soils. Contaminated soil will be spread over the floor of each pad and irrigated with effluent water. The soils will be turned occasionally until hydrocarbon removal is successfully achieved. The remediated soil will then be returned for use in rehabilitation.

Each pad will drain to a centralised sump for settling of solids before discharge by overflow into the adjoining fenced area. The bioremediation facility will be bunded, with bunding designed to prevent a 1 in 10 year ARI storm event.

5.12 Plant and Machinery Requirements

Plant and equipment requirements will vary with the tonnage of product produced. However, as an indicative guide the following plant and machinery is anticipated for 0.5 Mt/a DSO scenario. A contractor may present alternative options that also meet the mine schedule and ore selectivity requirements and that differ from the equipment listed below:

- One 350 t class excavator (waste mining).
- One 110 t class excavator (ore mining)
- Six 150t class dump trucks.
- One D10 track bulldozer.
- One 844 rubber tyred dozer.
- One 16H grader.
- One 773 water truck.
- One six wheeler service truck.

In addition, the following plant and machinery will be required for the general mining operation:

- Two 773 water trucks for general dust suppression.
- Two 988 front end loaders to load the road trains.
- One Franna yard crane.
- Two IT28 Integrated tool carriers.
- Thirty four wheel drive vehicles.
- Two 20-seat buses.

Other miscellaneous ancillary equipment such as lighting plants, pumps, generators will also be required.

5.13 Waste Management

5.13.1 Waste and Hazardous Material Generation

During the construction, operation and maintenance of the mine and associated infrastructure, domestic and industrial hazardous and non-hazardous wastes will be generated. This waste will require disposal to keep the mine area tidy and safe, and to prevent land and water contamination. Minemakers will actively promote the waste minimisation priorities of avoid, reuse, reduce, recycle, treat and dispose in all aspects of its activities.

Putrescible and domestic waste generated by the living areas and offices will be collected and disposed of in a designated waste landfill. The waste landfill will be fenced to prevent wind blown spread of waste and access by animals. Deposited waste will be covered with waste rock weekly.

Wherever practically and economically viable all waste materials will be recycled. Metals such as steel, manganese wear parts and copper wire will be collected in designated areas prior to removal from site for recycling. Plastic pipe including high-density polyethylene (HDPE), polyvinyl chloride (PVC) and acrylonitrile-butadiene-styrene (ABS) will be reused wherever possible. Used tyres will be collected and periodically dispatched to off-site recyclers or a retread facility.

Recyclable waste will be periodically delivered to various recycling facilities or end users as back loads on regular truck schedules, therefore not impacting potential traffic volumes. It is envisaged that there will be no hazardous materials that will require off-site disposal during the Stage 1 of the project.

Where inert industrial wastes cannot be practically or economically disposed of off-site they will be co-disposed with the waste being placed in the mining void. Burial will be at least 3 m below final surface. Empty drums will be cleaned and squashed flat by a bulldozer prior to burial.

Any hazardous materials will require specific transport, storage, handling and disposal procedures to comply with the relevant legislation, codes and manufacturer's material safety data sheet (MSDS). Minimum practical bulk quantities of fuel and other hazardous wastes will be ordered and stored in drums and tanks with impervious bunds to contain spillages.

Hazardous materials and chemicals stored on site will be minimal during this Stage 1 of the project, with notable items being explosives, fuel, and sundry lubricants and cleaning chemicals. Only appropriately trained and licensed operators will handle explosives, which will be stored in secure, licensed magazines away from direct heat and ignition sources.

Estimated volumes of fuel to be stored on-site include 15,000 L of Jet A1 to be stored at the aerodrome and 550,000 L of diesel (330,000 L at the Main Zone and 220,000 L at Arruwurra). The estimated storage of fuel will be maintained as close to capacity as possible, especially approaching the wet season. Fuel is therefore expected to be delivered to site at intervals ranging between three days and one week.

Table 5.8 summarises the waste management procedures for each type of waste that will be on site.

Table 5.8 Solid waste management procedures

Waste Type	Minimise	Reuse/ Recycle	Treatment/ Destruction	Comments
Putrescible/ biodegradable litter	Minimise over-ordering.		Collect in lidded 200-L drums located at designated points around site before collection and burial in on-site landfill.	Lidded drums will prevent ingress of water and deny access to animals and birds. Drums will be colour-coded to differentiate contents.
Packaging, paper, plastic, recyclable cans, containers, glass	Purchase in bulk.	Separate paper and PET–HPDE, glass, plastic, cans and collect for recycling.	Collect in lidded 200-L drums located at designated points, transfer to holding point then send off site for recycling.	Drums will be colour-coded to differentiate contents.
Scrap steel	Minimise over-ordering.	Collect for recycling.	Store at designated site and periodically send off site for recycling.	
Tyres	Maintain vehicles and equipment.	Collect for recycling.	Store at workshop and periodically send off site for recycling (or dispose by burying in the waste rock dumps).	
Hazardous wastes	Minimise over-ordering/ purchase in bulk. Minimise spills.	Where possible hazardous wastes and packaging is returned to supplier for recycling.	Store in designated areas with periodic collection/disposal by registered contractor (or supplier).	-

5.13.2 Putrescible Waste Disposal Site

A landfill for putrescible and biodegradable waste will be constructed on site in accordance with the Northern Territory Environmental Protection Authority (EPA) landfill guidelines (EPA, 2003). The putrescible waste disposal site will be located in the southeastern corner of the Main Zone Mineral Lease area.

5.14 Workforce

The construction phase of the project is expected to employ 50 to 100 people over a period of approximately eight months. During initial operations, the mine will accommodate workforce of approximately 110 positions, including project management, ore treatment staff and contractual mining workforce. A road haulage workforce of approximately 80 positions and support staff is expected to be based in Tennant Creek.

As mining operations increase to 3 Mt/a, the mine workforce will be increased to approximately 120 positions and the road haulage workforce will increase to approximately 180 positions.

Preference in employment will be given to the Traditional Owners and Tennant Creek residents where they have the appropriate skills, knowledge and experience.

Minemakers will sign a Mining Agreement with the Traditional Owners that will include a framework for the training of Traditional Owners to enable them to acquire skills, knowledge and experience relevant to the operation and management of the mine and allow them to take up permanent employment positions within the operation.

Both the mine and road haulage workforce will be predominantly a fly-in, fly-out workforce and will operate on a two weeks on, one week off (or similar variant) roster. The mine workforce will fly-in and fly-out of the aerodrome located within the Mineral Lease. The road haulage workforce will fly-in and fly-out of the Tennant Creek airport.