Appendix O

Conceptual Design of

Waste Storage Facility

coffey mining
SPECIALISTS FROM BOARDROOM TO MINE FACE

Balmoral South Iron Ore Project, Conceptual Design of Waste Storage Design Facility, Cape Preston Western Australia

International Minerals Pty Ltd

9 December 2008

MWP00327AB-AC Conceptual Design of Waste Storage Facility Rev 0

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SPECIALISTS FROM BOARDROOM TO MINE FACE

12 December 2008

International Minerals Pty Ltd
Level 4, 5 Mill Street
PERTH WA 6000

Attention: Mr Ian Zlatnik

Dear Ian

RE: BALMORAL SOUTH IRON ORE PROJECT, CONCEPTUAL DESIGN OF WASTE STORAGE FACILITY, CAPE PRESTON WESTERN AUSTRALIA

Coffey Mining Pty Ltd is pleased to provide three (3) bound copies and three (3) electronic copies in PDF format on CD of our report (Rev 0) for the Conceptual Design of the Waste Storage Facility, more commonly known as an integrated waste landform (IWL) which incorporates the mine waste and filtered tailings for the Balmoral South Iron Ore Project, Cape Preston, Western Australia.

The final documents should be distributed to those organisations to which you have reporting obligations in respect to your tailings storage.

We trust this information meets your immediate requirements. Should you require clarification of any information, please do not hesitate to contact this office.

For and on behalf of Coffey Mining Pty Ltd

Christopher Lane
Senior Principal

Distribution:	3 hard copies and 3 PDF copies	International Minerals Pty Ltd
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Document Review

Christopher Hogg
Principal

Table of Contents

List of Figures

List of Appendices

1 INTRODUCTION

This document presents the details of the conceptual design for the waste storage facility for the Balmoral South Iron Ore Project (BSIOP). The waste storage facility comprises one structure, constructed from mine waste, which is co-disposed with filtered, dry stacked, tailings, to form an integrated waste landform (IWL). From a tailings management perspective the IWL can be simply defined as a tailings storage facility (TSF) that is located inside the waste rock storage[1].

This conceptual design broadly follows the Guidelines[2] of the Department of Industry and Resources (DoIR), Western Australia for design of tailings storage facilities and is to be included in the Balmoral South Iron Ore Project Public Environmental Review (PER) documentation.

This work was commissioned by Ian Zlatnik on behalf of International Minerals Pty Ltd (IM). This report is prepared and is to be read subject to the terms and conditions contained in our proposal dated 14 November 2008. Our advice is based on the information stated and on the assumptions expressed herein. Should that information or the assumptions be incorrect then Coffey Mining Pty Ltd shall accept no liability in respect of the advice whether under law of contract, tort or otherwise.

2 BACKGROUND INFORMATION

The following information was provided by IM for the preparation of the conceptual design for the IWL:

- Pages 2-1 to 2-34 of the Balmoral South Iron Ore Project Public Environmental Review (PER) prepared by URS, dated November 2008[3];
- Pages 4-1 to 4-17 of the Balmoral South Iron Ore Project Public Environmental Review (PER) prepared by URS, dated November 2008[3]
- A copy of six (6) unreferenced pages relating to Acid Rock Drainage;
- A copy of the EPA comments on 1 page titled Waste Dump / Tailings / Acid Rock Drainage (ARD);
- 3D DXF files for the proposed waste dump and topography; and
- An excel file with the schedules of ore, and mine waste.

It should be noted that this report for the conceptual design of the IWL has been prepared with reference to these documents and the preliminary tailings testwork and reporting undertaken by Coffey Mining Pty Ltd (coffey Mining) and reported in the letter reference MWP00327AA-AA let 01 dated 26 august 2008.

3 IWL DESIGN CRITERIA

3.1 Parameters

Parameters, and relevant comments, for the conceptual design of the IWL are presented in Table 1.

Table 1

Process Parameters

Parameter	Criteria	Comment
Mine life (years)	31	Years 1 to 3 are design and construction of Stage 1. Years 4 to 6 are design and construction of Stage 2
Plant feed years 4 to 6 (Mtpa)	40	Stage 1
Plant feed years 7 to 31 (Mtpa)	80	Stage 1 and Stage 2
Concentrate production years 4 to 6 (Mtpa)	12	Stage 1
Concentrate production years 7 to 31 (Mtpa)	24	Stage 1 and Stage 2
Tailings production years 4 to 6 (Mtpa)	28	Stage 1
Tailings production years 7 to 31 (Mtpa)	56	Stage 1 and Stage 2
Mine waste production years 4 to 6 (Mtpa)	40	Stage 1
Mine waste production years 7 to 31 (Mtpa)	80	Stage 1 and Stage 2
Process water salinity (TDS mg/L)	<1,500	
Tailings slurry pH	7	
% moisture at discharge	15	
Solids SG	3.31	

It should be noted that the western IWL will accommodate approximately 26.5% of the total waste (mine waste and filtered tailings) is on existing mine leases and the balance 73.5% will be stored in the eastern IWL which is in an area to the east of the pit where leases will need to be granted.

The processing of magnetite ore is primarily a mechanical process, involving minimal use of process reagents. The reagents employed in mineral processing and dewatering are non-hazardous biodegradable liquid and solid flocculants to assist settling in the thickeners. As the flocculant(s) exhibit a very low order of toxicity they are not classed as dangerous goods.

4 SITE CHARACTERISTICS

4.1 Location

The Balmoral South Iron Ore Project is located approximately 32 kms south of Cape Preston, approximately 12 kms west of the North West Coastal Highway. The regional centre of Karratha is located approximately 80 km northeast of the BSIOP mine site.

The IWL is located on Mining Leases numbers M08/126 and M08/127 and General Purpose lease G08/63. The approximate centre of the IWL on Australian Map Grid (AMG84) co-ordinates 7,705,000 m North and 407,000 m East.

4.2 Climate

Rainfall and evaporation data for the BSIOP area has been taken from the Bureau of Meteorology (BOM) Weather Stations located in Karratha Airport (20.71S,116.77E), Roebourne (20.78S,117.l5E) and Dampier Salt (20.73S,116.75E). For the conceptual design and operation of the IWL the following climatic data has been adopted:

(i) Estimated average annual rainfall of 340mm.

(ii) Average annual evaporation is estimated at 3,300mm/year (based on Roebourne data).

(iii) Rainfall intensity chart for the site indicates that the 1 in 100 year average recurrence interval 72 hour storm event is 430 mm.

4.3 Landform

The general topography of the area around BSIOP is related to the underlying geology and is characterised by gently undulating colluvial alluvial plains and low hills comprising sedimentary rocks with intruded volcanics. The majority of the site for the proposed western IWL mine-site area lies at an elevation of approximately 10 m to 20 m above the Australian Height Datum (AHD).

4.4 Geology and Soils

The IWLs within the BSIOP includes the weakly gilgaied, cracking clay plains, to the east with some alluvial deposits (clays, silts sands and gravels) in the stream beds and rugged jaspilite plateaus and ridges in the centre with colluvial slope wash and active floodplains to the west in the major rivers and creeks.

4.5 Hydrogeology

The major aquifers in the project area are the gravels of the Fortescue River alluvium and to a lesser extent the Yarraloola Conglomerate[3]. The alluvium is potentially a major source of fresh water and could support substantial pumping with hydraulic conductivity values in excess of 50 m/d and individual bore yields up to 900 kl/d have been demonstrated. Yarraloola Conglomerate is much less extensive than the shallower alluvium in the project area. Hydraulic conductivity values of less than 2 m/d have been indicated, although the water quality, where tested, appears to be as good, if not better than in the alluvium[3].

There are only minor secondary aquifer properties in the Proterozoic basement rocks, generally associated with fracturing.

4.6 Hydrological Characteristics

The IWL will only be subjected to incident rainfall directly onto the surface of the facilty.

5 GEOTECHNICAL CONDITIONS

5.1 General

No geotechnical investigations have been conducted for the IWL. It is expected that the geotechnical conditions for the western IWL will comprise a mixture of clays, silts, sands, gravels and cobbles of colluvial original on the eastern side and some alluvial materials, comprising a mixture of clays, silts, sands and gravels and jaspilite on the upper ridge levels. The surficial alluvial and colluvial materials are expected to overly rock at a relatively shallow depth, less than 2.5 m.

It is expected that the geotechnical conditions for the eastern IWL will comprise a mixture of clays, silts, sands, gravels with patches of Gilgai clay overlying rock.

5.2 Concentrator Plant Tailings

5.2.1 General

It is understood that tailings from the concentrator will comprise two streams; sand (< 3mm) produced by screening the rougher magnetic separator tailings at 0.7 mm and a filter cake produced by pressure filtering of the fine tailings stream. Production and particle size distribution of the tailings is currently:

- 2,600 t/hr with a P_{80} of 1.8 mm from the rougher magnetic separators (RMS);
- 3,900 t/hr with a P_{80} of 55 microns from the intermediate magnetic separators (IMS); and
- 500 t/hr with a P_{80} of 28 microns from the cleaner magnetic separators

The fine tailings are filtered in plate and frame pressure filters to recover water. The sands and filter cake are recombined and will have a loose dry density of approximately 1.70 t/m^3 with a moisture content of 15%.

Process waste (tailings) and mine waste will be combined and located into one facility adjacent to the proposed pits.

5.2.2 Tailings Testing

Samples of tailings were received by NATA registered Coffey Information Pty Ltd soil testing laboratories at 24 Hasler Road Herdsman in July 2008 from AMMTEC. The tailings were dry and labelled:

- RMS -0.71 mm;
- RMS +0.71 mm; and
- IMS Tails -75+38 micron.

The laboratory testwork comprised:

- Three (3) particle size distributions;
- Three (3) plasticity index tests;
- Two (2) Emerson Class Number (RMS-0.71 mm and IMS Tails -75+38 micron).

Results of these tests are presented in Appendix A.

5.2.3 Tailings Classification Tests

The results of the particle size distribution and plasticity index tests indicate the RMS-0.71 mm and IMS Tails -75+38 micron tailings are predominantly sandy silt, with 65% and 98% fines (material finer than 75 microns), respectively. The materials are non plastic, with a unified soil classification of ML.

The results of the particle size distribution and plasticity index tests indicate the RMS+0.71 mm tailings is a sandy gravel, with 2% fines (material finer than 75 microns). The materials are non plastic, with a unified soil classification of GP.

The results of the Emerson Class Number testing range from 4 (-0.71 mm) to 5 (IMS Tails -75+38 micron) indicating the materials are not dispersive.

5.3 Implications for Handling Tailings Materials

From a review of the test results, and from experience of performance of other similar materials, the following comments are made:

(i) The RMS-0.71 mm and IMS Tails -75+38 micron tailings are sandy silt, which are non plastic. The higher percentages of fines, 65% and 98% respectively, means that these tailings materials may not readily drain or release free water once wet, although this is only likely to occur infrequently during heavy rainfall events following deposition. This will impact on the methods used to both mine waste placement and place the tailings materials when they are partially saturated. It is however likely that consolidation of the materials, under load, will occur relatively quickly.

(ii) The RMS+0.71mm is a sandy gravel tailings with 2% non plastic fines. These tailings materials will readily drain or release free water once wet and consolidation under load will occur relatively quickly.

(iii) Whilst the materials are non dispersive, the lack of plasticity, indicates there is potential for these materials to generate dust when dry and exposed to wind. Covering these materials with other erosion resistant materials, or maintaining a moist surface will help to minimise dust generation.

(iv) Blending these materials (RMS+0.71mm, RMS-0.71 mm and IMS Tails -75+38 micron tailings) should improve the drainage characteristics of the combined materials.

The degree of saturation of the tailings, and the percentage of tailings in relation to the overall total mine waste, and characteristics of the mine waste, will need to be assessed to ensure that there is no impact on tip head stability if these materials are to be end dumped over an open tip face. It is recommended that these materials be randomly mixed with the mine waste rather than being concentrated into one tip head area. This will allow the IWL to take advantage of:

- The rapid drainage characteristics of the tailings materials which will assist in maximising the density of the tailing and mine waste; and
- The maximum density of the combined waste products will limit the potential for air and moisture entry and thus the development of acid rock drainage (ARD).

Concentration of the tailings materials may lead to localised instability of the tip face, with potential impacts for the safety of personnel and equipment.

5.4 Mineralogy

The mineralogy of the tailings comprises quartz, iron oxides and carbonates, with small quantities of sulphides. The static acid-base test results on tailings and waste samples indicate that the tailings and certain wastes may be acid generating. Key parameters are presented in Table 2.

Table 2
Geochemistry

Parameter	Unit	LIMS Tailings	RMS Tailings
Total Sulphur	%	0.03 / 0.06	0.03 / 0.06
Total Acid Producing Potential (TAPP)	kg H_2SO_4/t	0.92 / 1.83	0.92 / 1.83
Acid Neutralisation Capacity (ANC)	kg H_2SO_4/t	67.7 / 68.2	67.7 / 68.2
Net Acid Producing Potential (NAPP)	kg H_2SO_4/t	-67.29 / -65.87	1.021
Net Acid Generation (NAG)	kg H_2SO_4/t	Nil / Nil	Nil / Nil
Limestone Neutralising Value	%	8.26 / 9.19	8.26 / 9.19
Mine Waste	**% Potential ARD**	**% Non ARD**	
McRae Shale	1.47		
Dales Gorge BIF		0.74	
Whaleback Shale	4.13		
Joffre BIF		67.09	
Yandicoogina Shale		12.5	
Weeli Wolli BIF		2.85	
Weeli Wolli Dolerite		7.34	
Dolerite Dykes		3.87	

5.5 Engineering Parameters

The assumed engineering parameters for the design of the IWL based on the preliminary tailings testing of the filtered product from the proposed process plant, together with relevant comments in respect to the expected behaviour of the tailings materials are presented in Table 3.

Table 3
Engineering Parameters

Parameter	Result / PER data	Comment
Particle size distribution by Hydrometer		
P_{80} Coarse tailings (mm)	2	
P_{80} Filter cake tailings (microns)	70	
P_{80} Total tailings (microns)	800	
Tailings plasticity	NP	Tailings are non plastic.
Tailings permeability (m/sec)	1.0×10^{-8} – 1.0×10^{-9}	Very low permeability to practically impermeable.
Tailings loose dry density (t/m^3) @ 15% moisture content	1.70	1.90 (t/m^3) adopted for design purposes.
Tailings angle of internal friction (ϕ - degrees)	32^o	
Tailings cohesion (c – kPa)	5	
Mine waste dry density (t/m^3)	2.50	
Mine waste angle of internal friction (ϕ - degrees)	40	
Mine waste cohesion (c – kPa)	0 - 5	

6 IWL CONCEPT DESIGN

6.1 General Description

On the basis of the characteristics of the site and the assumed engineering parameters a conceptual design for the IWL has been developed based on dry stacking the tailings within the mine waste dump by co-disposal.

6.2 Dry Stacked Tailings

Dry stacked tailings have been used on a small number of sites around the world. A literature search revealed that the following are some sites which are using dry stacked tailings:

- Pogo Gold Project, Alaska;
- Raglan Mine, Canada.
- Greens Creek Mine (base metals project), Alaska;
- La Coipa Gold Project, Chile; and
- Skorpion Zinc Project, Namibia.

The benefits[4] of dry stacking tailings can be summarised as follows:

- Water conservation in arid environments where either water supply is scarce and/or expensive to procure.
- Tailings are more easily handled in cold regions.
- Recovery of metals from solution through the filtration process prior to stacking.

- Recovery of process chemicals from solution through the filtration process prior to stacking.
- Dry stacks are "essentially immune" to catastrophic failure and can be designed to withstand static and seismic forces.
- The unsaturated nature of the tailings means that they are resistant to saturation because the tailings stack becomes dense creating a hydrophobic high matric suction tailings surface.
- The footprint is smaller, when compared to other forms of tailings storage, because of the low moisture content and higher density of the stacked tailings.
- There is limited leachate production because the volume of moisture incorporated within the tailings is very small during initial deposition. Consolidation of the dry stacked tailings further reduces moisture during the operation of the stack.
- Allows progressive covering and rehabilitation for closure.
- Use of dry stacked tailings is seen as good environmental stewardship.

During the research of dry stacked tailings Coffey Mining was unable to find any site where tailings are being dry stacked either together with or surrounded by mine waste. In addition to the benefits outlined above the advantages of dry stacked tailings within mine waste, the IWL for the BSIOP are:

- Encapsulation of potential acid generating materials, both mine waste and tailings, within one structure.
- Lower longer term liability of the IWL compared to conventional above ground TSFs.
- Ability to co-dispose of waste materials within one structure.

6.3 IWL Construction

Given that commissioning issues are likely to be encountered during project start up and some trials will have to be undertaken to optimise the method of tailings and waste placement, Cell 1, within the IWL, will have initial embankments sufficient capacity to contain tailings for 3 years operation.

Figure 1 shows the conceptual design layout, with Cell 1 positioned within the northern end of the IWL footprint of the existing approved lease areas for the BSIOP. Cells 2, 3 and 4 are located to the south of Cell 1. The IWL is located to the west of mine pit. Figure 2 presents the sections and details for the IWL.

Details of the concept design are summarised in Table 4.

Table 4
IWL Concept Design – Western IWL

Parameter	Cell 1	Cell 2	Cell 3	Cell 4
Initial internal footprint (ha)	82.8	82.8	82.8	82.8
Initial external footprint (ha)	97.2	97.2	97.2	97.2
Final external footprint 4 Cells (ha)	592.4			
Starter embankment crest (RL mAHD)	21	22	23	24
Starter embankment height (min)	4	4.5	4.5	5
Starter embankment height (max)	8	7.5	7.7	7
End of Year 10 embankment crest (RL mAHD)	105	106	108	108
Final embankment height (min)	88	88.5	88.5	89
Final embankment height (max)	92	91.5	91.5	91
Outer embankment slope (V:H - degrees)	Concave varies from 15^{o} at toe level to 35^{o}at the top level			
Maximum length of perimeter (m)	8,600			
Underdrainage system	Upstream perimeter			
Storage volume (M m^3)	105.4	105.4	105.4	105.4

The design concepts for the IWL have the following construction features for Stage 1:

- Starter embankments averaging 6 m with the maximum and minimum heights shown in Table 4 from are designed as free standing structures, providing approximately 8 months initial storage.
- Mine waste placement is progressive over the life of the Project.
- An underdrainage system is constructed within the ground beneath each perimeter starter embankment.
- The starter embankments for Cells 1 to 4 are constructed using compacted sandy clay / clayey sand for the internal embankment with the surface, oxidised mine waste placed as a transition material and fresh mine waste on the downstream batter. These materials are removed as part of the initial prestrip operation and sourced from borrow areas.
- During the initial deposition tailings will be placed in layers and covered with mine waste dumped from trucks.
- Once the moisture content of the filtered tailings is optimised, at or below 15%, the tailings mix (coarse and fine tailings) is to be progressively placed in layers up to 3 m and allowed to dry sufficient to be covered with an initial thin, 0.5 m, layer of mine waste to prevent dust formation and provide a surface for heavy equipment to traffic.
- Mine waste is then progressively placed on the tailings and thin cover as each lift is constructed.
- The sequential placement of tailings and mine waste proceeds to forming a series of layers to the final design height throughout the mining operation.

- Mine waste is progressively placed around the outer perimeter embankment and internal embankments as each lift is constructed to the final design height throughout the mining operation.
- The downstream batter slopes can be rehabilitated as soon as possible after the mine waste is placed.

6.4 Water Recovery System

The primary method of water recovery is via the thickeners and filtration processes within the plant.

Water liberated from the filtered tailings can be collected in the underdrainage system located beneath the upstream toe of the perimeter embankments. Water recovered by this system can be returned to the process plant.

6.5 Seepage Management

No liners have been incorporated into the design of the IWL as the moisture content of the tailings product is not expected to exceed 15%. Once the tailings have dried and consolidated it is expected that the tailings will have a permeability in the range of 1.0×10^{-8} m/sec to 3.8×10^{-9} m/sec, and thus would by classified, according to Terzaghi and Peck (1967)[5] as being very low to practically impermeable. Seepage modelling would be undertaken during the detailed design stage.

It is reasonable to expect that seepage from Cell 1 may well occur during the commissioning and post commission stage until such time as the operation of the thickeners and filtration processes are optimised.

An underdrainage system is incorporated into the design, and it is positioned, at the toe of the upstream perimeter embankment, to collect any water seeping from the tailings such that it can be returned to the plant. An airlock will be incorporated into the design of the underdrainage to prevent the entry of air into the base of the deposited tailings. The presence of the underdrainage system will also assist with controlling (lowering) the position of phreatic surface within the tailings, since differential placement and consolidation of the tailings during deposition is likely to result in slightly different permeabilities between the tailings deposited near the perimeter embankment and those deposited near the centre of the each cell.

6.6 Stability analyses

No stability analyses have been undertaken at this stage. Detailed stability analyses will be undertaken as part of the work for the preparation of the MP. Factors of safety for these analyses will be in accordance with ANCOLD (1999)[6].

6.7 Design Floods

The IWL will be designed such that a 1 in 100 year average recurrence interval 72 hour storm event of 430 mm can be temporarily stored on the top of the facility. The design however assumes that the correct operational controls are adhered to and in particular that water is continually removed from the tailings during the thickening and filtration process, such that maximum freeboard allowances are easily maintained with dry materials.

A minimum operational freeboard (vertical height between the tailings beach and embankment crest) of 300 mm, together with a minimum beach freeboard of 200 mm, as per the DoIR[2] requirements, is recommended to be retained at all times.

7 IWL OPERATION

The IWL will have an operations manual prepared as part of the MP. The operational design of the IWL is aimed at:

- Optimising the removal of surface water from the facility,
- Maximising the tailings density and storage capacity by rotating the deposition, and;
- Reducing environmental impacts.

The following design considerations have been incorporated into the conceptual design of the IWL:

- Tailings in the form of a filtered solids will be discharged sub-aerially, and across the deposition surface by moving stacker or end dumped from trucks. Tailings will be deposited in discrete layers. The discharge point or dump face will be regularly moved to ensure an even development of the tailings surface. The length of time between successive depositions (i.e. drying time) on any one area will be maximised.
- Tailings will be covered with mine waste to prevent dusting and optimise consolidation and the insitu dry density of the tailings.
- The facility could contain a considerable body of water during a rainstorm. The minimum total freeboard volume is estimated at 1 m per cell in order to provide temporary storage of a 1 in 100 year average recurrence interval (ARI) 72 hour storm event.
- With the surface sealed, at closure of the IWL, there will be no freeboard volume requirement.
- On decommissioning the IWL will remain as a permanent feature of the landscape and will consolidate and drain to an increasingly stable mass. The top surface and the batters will be stabilised and will be rehabilitated as described in Section 9. Tailings stored within the IWL will be part of the overall waste dump facility.

8 INSTRUMENTATION AND MONITORING

Monitoring will comprise groundwater monitoring bores and vibrating wire piezometers placed under the tailings and waste stack and containment embankments. The water level data collected from the piezometers and monitoring bores and water quality data collected from the monitoring bores will be used to assess the IWL performance from a geotechnical and environmental perspective.

It is recommended that water levels within the piezometers and the groundwater monitoring bores be routinely checked and recorded monthly. Water sampling and laboratory testing of recovered water samples obtained from the monitoring bores would be conducted on a quarterly basis. Collected information will be reviewed regularly and reported in an annual audit and management review of the IWL.

9 CLOSURE AND REHABILITATION

9.1 General

A specific closure plan will have to be developed as the surface of the tailings approaches its final level and certainly within the last 5 years of operation. Given that the static acid-base test results on tailings samples indicate that the tailings may be acid generating the final surface will probably then require a “store and release cover” to:

- limit infiltration of incident rainfall;
- minimize oxidation of the tailings, and
- enable the IWL to be rehabilitated to conform, as far as practical, to the surrounding natural landscape.

The main objectives of the IWL cover will be to:

- Provide a robust long-term cover that will stabilise the surface of the IWL;
- Retain/store all rainfall from most precipitation events within the cover system for subsequent release by a combination of evaporation and evapotranspiration;
- Control the flow of any excess surface water across the IWL such that significant erosion does not occur; and
- Reduce long-term infiltration of moisture and ingress of oxygen into the IWL. An airlock in the underdrainage system will prevent entry of air into the base of the tailings stack.

The conceptual design of the capping is discussed in more detail in Section 9.2.

The downstream batters are being progressively rehabilitated as the embankments are raised. The staged upstream raising of the IWL will produce a concave batter slope with batters covered in hard durable rock to form an armour layer. No berms are proposed as these tend to concentrate runoff and contribute to erosion.

9.2 Capping Conceptual Design

The detailed design of the surface capping will be dependent on the geochemistry of the tailings and the geochemical and physical characteristics of the mine waste available prior to the time of decommissioning. A decommissioning and rehabilitation plan will be initiated to examine the most appropriate method of treatment.

However, the concept for the cover is a "store and release" system which stores the majority of the incident precipitation in the short wet season, and then releases this moisture through evapotranspiration during the prolonged dry season. If designed correctly, a "store and release" cover will limit the risk of the moisture stored in the cover system from infiltrating into the underlying waste, as well as providing optimum conditions for development and maintenance of a vegetative cover on the top of the IWL.

The capping system proposed above is considered appropriate at the conceptual design stage given the conditions of:

- a semi-arid to sub-tropical climate with two distinct seasons - the wet season where rainfall may occur from December to March, and generally dry conditions for the remainder of the year.
- tailings which are potentially acid forming (PAF, for feasibility planning purposes it can be conservatively assumed that a four-layer capping system maybe required, evolving from the tailings upwards).

At this stage the capping system is likely to comprise the following:

- A shaped and compacted final tailings surface to promote surface runoff.
- A 1.5 m to 2.0m thick well graded protection layer to form the “store and release” cover Detailed design, when characteristics of the production tailings and potential cover materials are better define the thickness of this layer;
- A 0.1m thick growth layer, to provide a zone for vegetation germination, which could include "rock mulch" or scavenged topsoil. Small shallow rooting plants should be selected for the final cover.

10 EMERGENCY ACTION PLAN

The Operations Manual for the IWL will provide a detailed description of the operating procedures for the tailings storage and include an 'Emergency Action Plan'. However, the likelihood of a failure of the IWL leading to an out rush of tailings and/or liquor with the potential to cause serious injury or death is considered to be a very low possibility, based on the following factors:

- The tailings will have minimal moisture when placed in a hot dry climate.
- The retention embankments will be engineered structures.
- The underdrainage system from the perimeter embankments will assist with drainage, even under extreme rainfall conditions.
- The hot dry climate will promote rapid drying following extreme rainfall conditions.
- The IWL is in very flat terrain, with no potential for significantly concentrating any outflow from a dam break incident.

11 REFERENCES

The following standards and references were used in the preparation of this report.

1. Lane J.C., (2007) *'Case histories of integrated waste landforms and in-pit deposition; what are the costs of these options?'*
2. DoIR (1999), *'Guidelines on Safe Design and Operating Standards for Tailings Storage'*.
3. URS (November 2008), *'Balmoral South Iron Ore Project, Public Environmental Review'.*
4. Davies M. P., Rice S., *'An alternative to conventional tailing management – "dry stack" filtered tailings'*.
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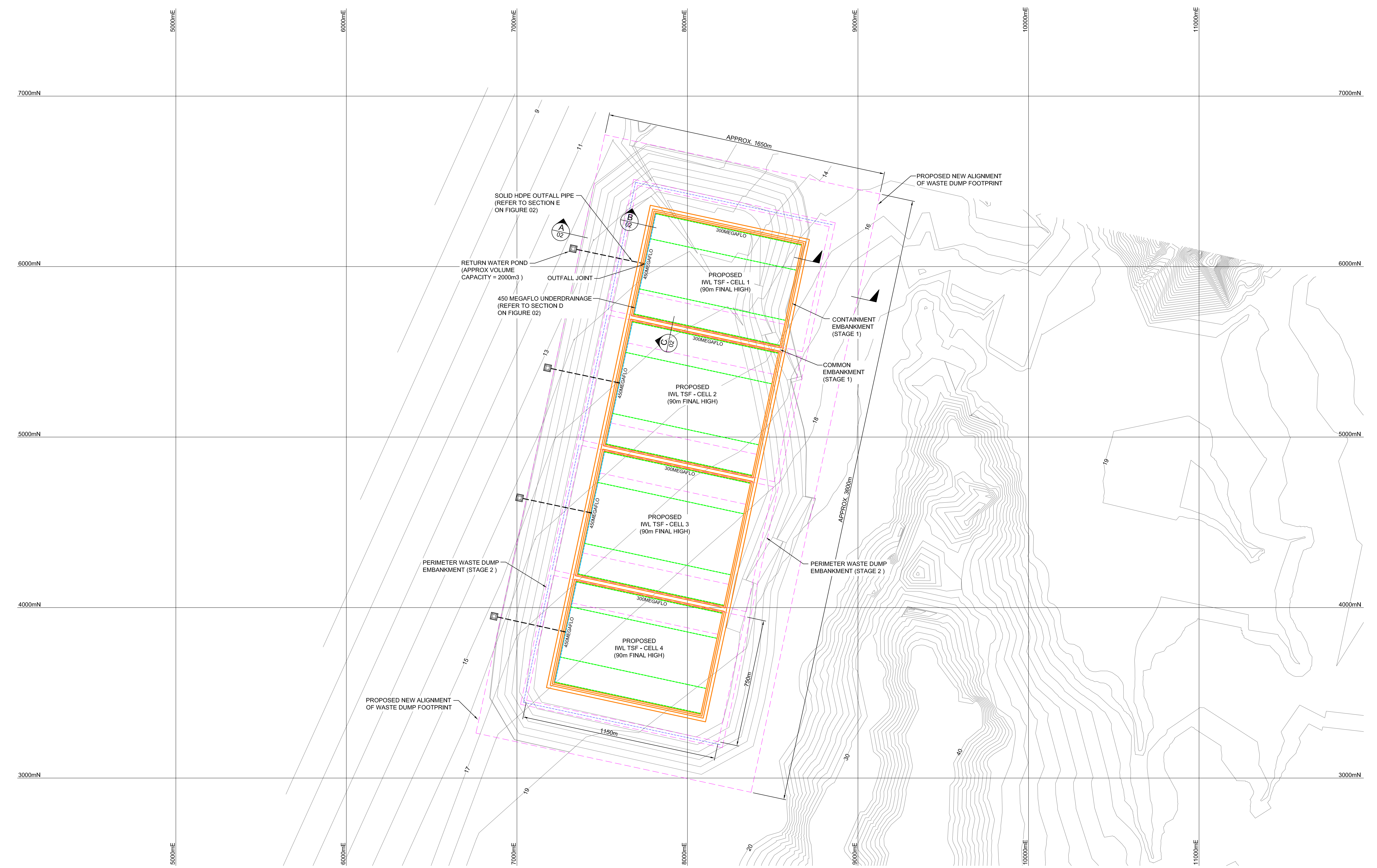
6. ANCOLD (1999) *'Guidelines on Tailings Dam Design, Construction and Operation'*.

Figures



NORTH

DATUM STATEMENT - AMG84 COORDINATES

LEGENDS:

- DENOTES STAGE 1 EMBANKMENT FOOTPRINT.
- DENOTES 450 MEGAFLO UNDERDRAINAGE (STAGE 1).
- DENOTES 300 MEGAFLO UNDERDRAINAGE (STAGE 1).
- DENOTES STAGE 2 EMBANKMENT FOOTPRINT.
- DENOTES 450 MEGAFLO UNDERDRAINAGE (STAGE 2).

NOTES:
1. REFER TO FIGURE 02 FOR CONCEPTUAL SECTIONS.

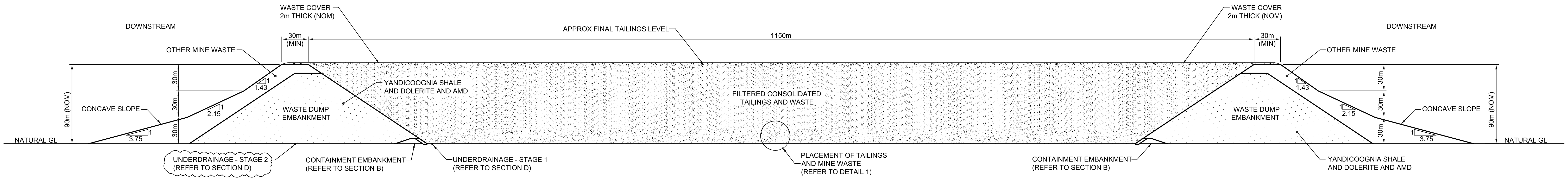
rev no	revision note	date	approved
0	DESIGN CONCEPT REVISED AND ISSUED WITH REPORT	12/11/08	CL
A	ISSUED FOR CLIENT REVIEW	09/12/08	CL

Drawn:	DN
Approved:	CL
Date:	05/12/08
Scale:	1:10 000
Original size:	A1

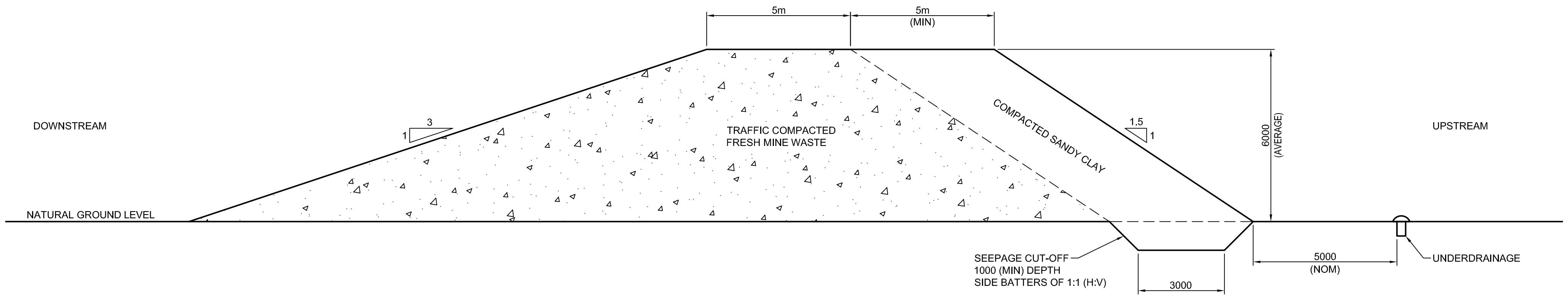
coffey mining
SPECIALISTS FROM BOARDROOM TO MINE FACE

Client:	INTERNATIONAL MINERALS PTY LTD
Project:	BALMORAL SOUTH WASTE STORAGE FACILITY DESIGN
Title:	GENERAL ARRANGEMENT
Project no:	MWP00327AB
Fig no:	FIGURE 1
Rev:	0

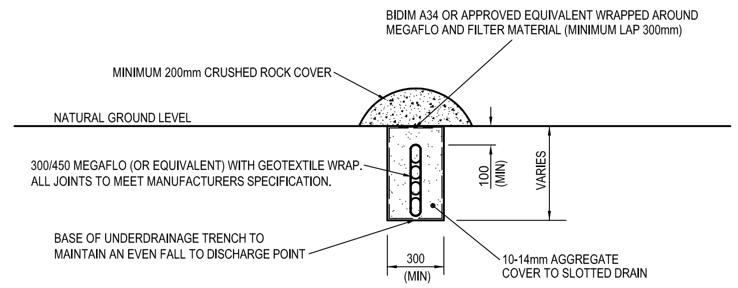
REF:
DWG: F:\MINE\PROJECTS\Australasian Resources Ltd\MINEWPER00327AB-Balmoral_South_Filtered_Tailings_Research\DWG\Archive\MWP00327AB-01 Rev0.dwg



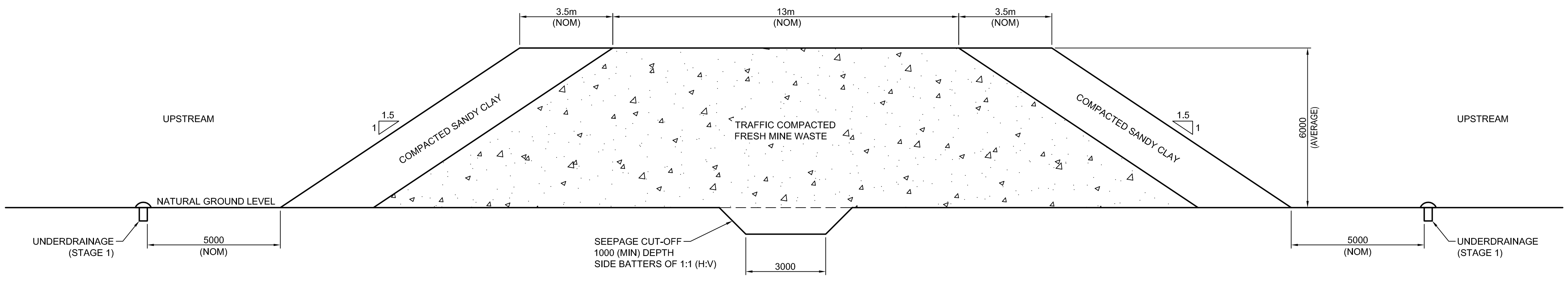
A / 01 WASTE DUMP EMBANKMENT (STAGE 2)
TYPICAL SECTION
SCALE: N.T.S



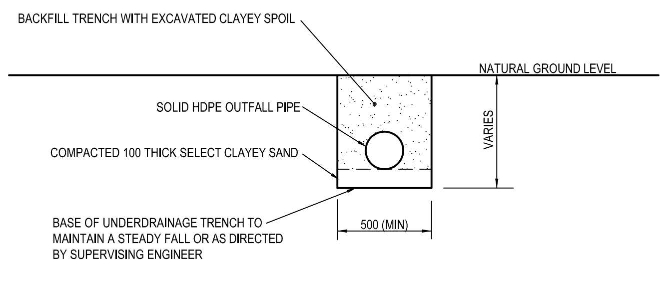
B / 01 CONTAINMENT EMBANKMENT (STAGE 1)
TYPICAL SECTION
SCALE 1:100



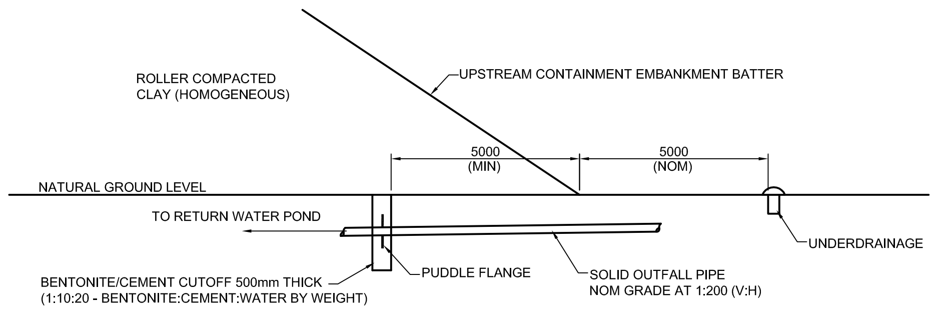
D / 01 MEGAFLO UNDERDRAINAGE
TYPCICAL SECTION
SCALE 1:20



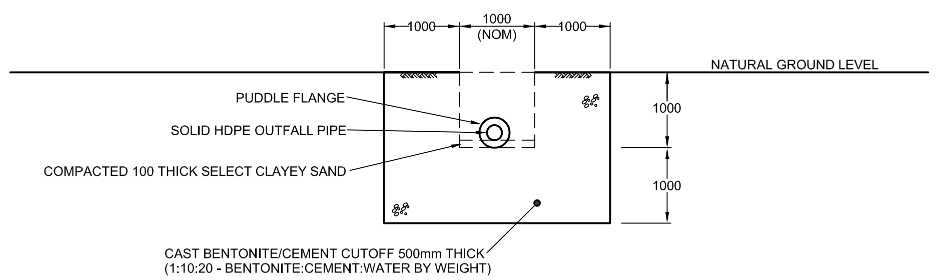
C / 01 COMMON EMBANKMENT (STAGE 1)
TYPICAL SECTION
SCALE 1:100



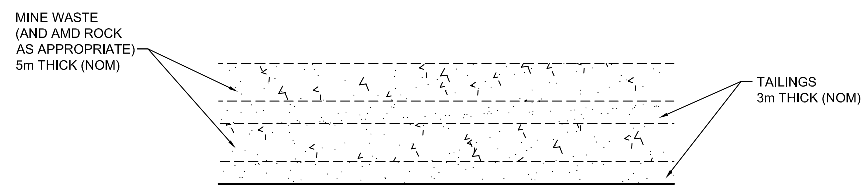
E / 01 OUTFALL PIPE TRENCH
TYPICAL SECTION
SCALE 1:20



F / - BENTONITE / CEMENT CUTOFF
LONG SECTION
SCALE 1:100



G / - BENTONITE/CEMENT CUTOFF
TYPICAL ELEVATION
SCALE 1:50



1 / - PLACEMENT OF TAILINGS AND MINE WASTE
DETAIL
SCALE 1:500

NOTES:
1. REFER TO FIGURE 1 FOR GENERAL ARRANGEMENT.

rev no	revision note	date	approved
0	DESIGN CONCEPT REVISED AND ISSUED WITH REPORT	11/12/08	CL
A	ISSUED FOR CLIENT REVIEW	08/12/08	CL

Drawn:	DN
Approved:	CL
Date:	05/12/08
Scale:	AS SHOWN
Original size:	A1

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SPECIALISTS FROM BOARDROOM TO MINE FACE

Client: INTERNATIONAL MINERALS PTY LTD
Project: BALMORAL SOUTH WASTE STORAGE FACILITY DESIGN
Title: SECTIONS AND DETAILS
Project no: MWP00327AB Fig no: FIGURE 2 Rev: 0

DWG: F:\MINE\PROJECTS\Australasian Resources Ltd\MINEWPER00327AB-Balmoral_South_Filtered_Tailings_Research\DWG\Archive\MWP00327AB-02 Rev0.dwg

Appendix A

Tailings Test Results

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24 Hasler Raod Herdsman WA 6017 Australia
PO Box 1530 Osborne Park BC 6916 Australia
T(+61) (8) 9347 0000 F (+61) (8) 9347 0099
www.coffey.com

TEST CERTIFICATE

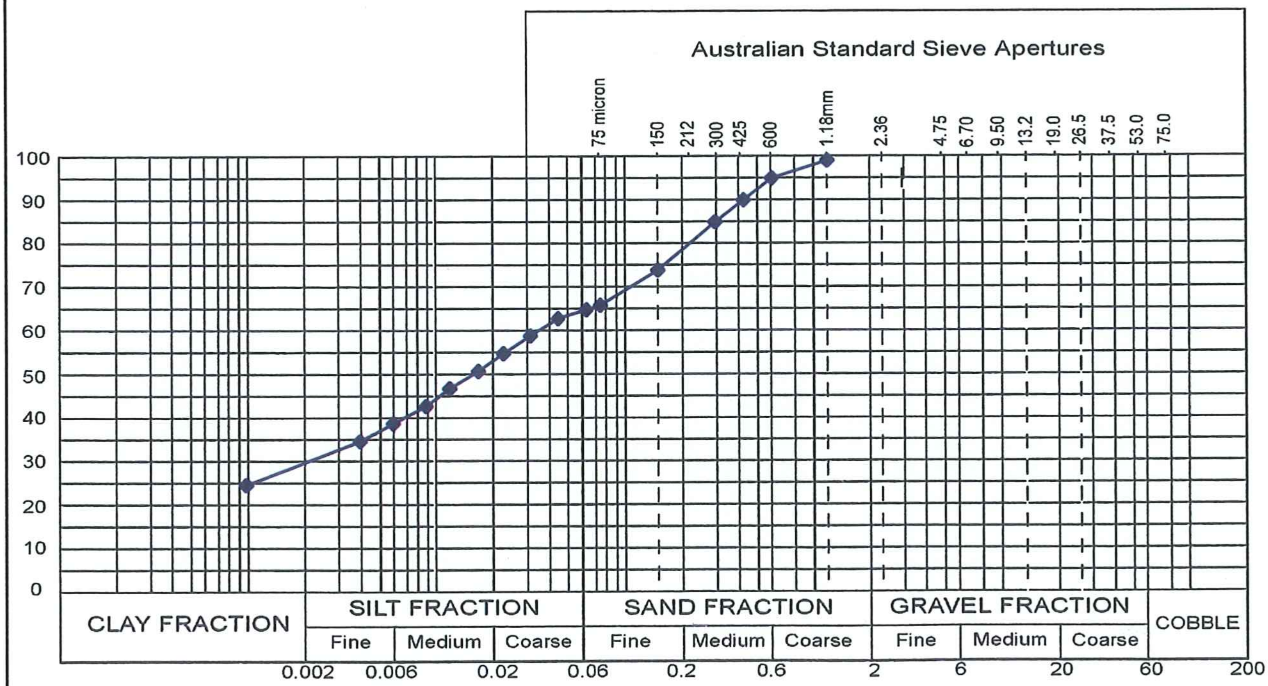
Client: Coffey Mining - MINEWPER00327AA
Principal: Promet
Project: South Balmoral Project
Location: -
Sample ID: RMS -0.71mm

Report No.: HERD08S-06757H
Job No.: INFOHERD00017AA
Date Tested: 20/07/2008

Particle Size Distribution of a Soil

Fine Analysis by using a hydrometer : AS 1289.3.6.2

Sieving				Hydrometer			
Sieve Size	%Passing	Sieve Size	%Passing	Diameter	%Passing	Diameter	%Passing
150.0mm		1.18 mm	98	63 micron	64	6 micron	38
75.0 mm		600 micron	94	45 micron	62	4 micron	34
37.5 mm		425 micron	89	32 micron	58	1 micron	24
19.0 mm		300 micron	84	23 micron	54		
9.50 mm		150 micron	73	17 micron	50		
4.75 mm		75 micron	65	12 micron	46		
2.36 mm				9 micron	42		



Remarks: Sampling Method/s - Submitted by client

Authorised Signature: R Deznan

Date: 28/07/2008

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TEST CERTIFICATE

Client: Coffey Mining - MINEWPER00327AA
Principal: Promet
Project: South Balmoral Project
Location: -

Report No.: HERD08S-06757
Job No.: INFOHERD00017AA
Date Tested: 22/07/2008

Atterberg Limits & Linear Shrinkage
AS 1289.3.1.2, 3.2.1, 3.3.1, 3.4.1

Laboratory Number	HERD08S-06757
Sample Identification	RMS -0.71mm
Liquid Limit (%)	Slips in Cup
Plastic Limit (%)	Not Obtainable
Plasticity Index (%)	Non Plastic
Linear Shrinkage (%)	-
Sample History	Oven Dried
Preparation Method	Dry Sieved
Nature Of Shrinkage	-

Remarks: Sampling Method/s - Submitted by client
No Linear Shrinkage requested by client

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Approved Signatory: [signature]
B Truslove
Date: 28/07/2008
NATA Acc. Laboratory No 431

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TEST CERTIFICATE

Client: Coffey Mining - MINEWPER00327AA
Principal: Promet
Project: South Balmoral Project
Location: -

Report No.: HERD08S-06757E
Job No.: INFOHERD00017AA
Date Tested: 18/07/2008

Emerson Class Number of a Soil
AS 1289.3.8.1

Laboratory Number	HERD08S-06757
Sample Identification	RMS -0.71mm
Emerson Class Number	4
Type of Water Used	Distilled
Temperature of Water Used Deg. C	19.00

Remarks: Sampling Method/s - Submitted by client
Due to nature of sample provided, air dried crumbs not available, therefore test commenced using remoulded material only.

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Date: 28/07/2008

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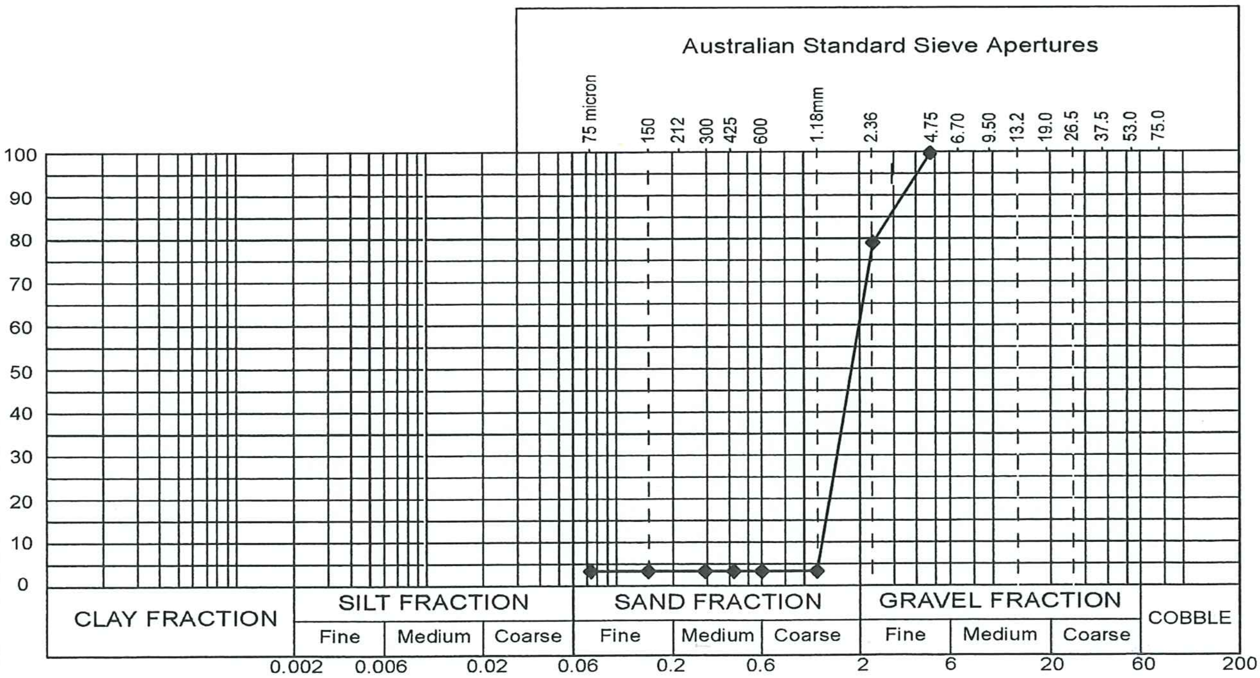
TEST CERTIFICATE

Client: Coffey Mining - MINEWPER00327AA **Report No.:** HERD08S-06758
Principal: Promet
Project: South Balmoral Project **Job No.:** INFOHERD00017AA
Location: -
Sample ID: RMS +0.71mm **Date Tested:** 21/07/2008

Particle Size Distribution & Atterberg Limits of a Soil

Partcle Size Distribution (AS1289 3.6.1)				**Atterberg Limits** (AS1289 3.1.2, 3.2.1, 3.3.1, 3.4.1)	
Sieve Size	% Passing	Sieve Size	% Passing		
150.0mm		1.18 mm	2	Liquid Limit (%)	Slips in Cup
75.0mm		600 micron	2	Plastic Limit (%)	Not Obtainable
37.5 mm		425 micron	2	Plasticity Index (%)	Non Plastic
19.0 mm		300 micron	2	Linear Shrinkage (%)	-
9.50 mm		150 micron	2	Nature Of Shrinkage	-
4.75 mm	100	75 micron	2	Sample History	Oven Dried
2.36mm	79			Preparation Method	Dry Sieved



Remarks: Sampling Method/s - Submitted by client
No Linear Shrinkage requested by client

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Approved Signatory: R Deznan

Date: 28/07/2008

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TEST CERTIFICATE

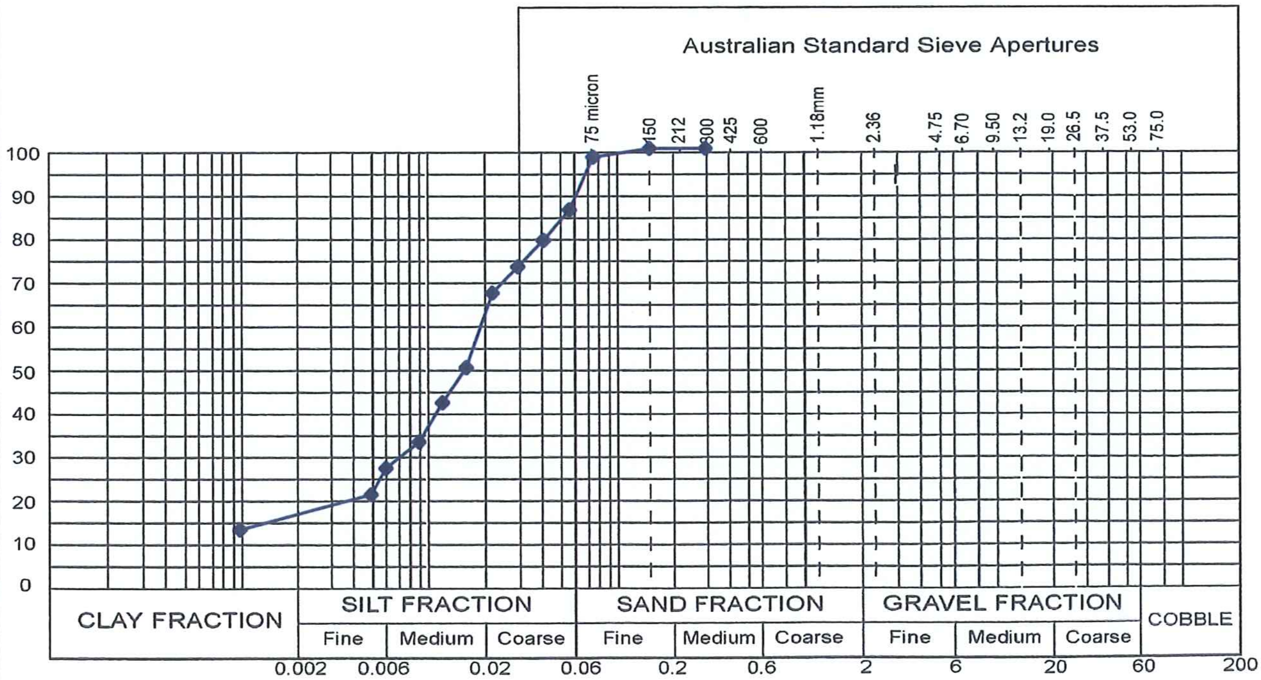
Client: Coffey Mining - MINEWPER00327AA
Principal: -
Project: South Balmoral
Location: -
Sample ID: LIMS TAILS -75+38 micron

Report No.: HERD08S-06593H
Job No.: INFOHERD00017AA
Date Tested: 4/08/2008

Particle Size Distribution of a Soil

Fine Analysis by using a hydrometer : AS 1289.3.6.2

Sieving				Hydrometer			
Sieve Size	%Passing	Sieve Size	%Passing	Diameter	%Passing	Diameter	%Passing
150.0mm		1.18 mm		56 micron	86	6 micron	27
75.0 mm		600 micron		41 micron	79	5 micron	21
37.5 mm		425 micron		30 micron	73	1 micron	13
19.0 mm		300 micron	100	22 micron	67		
9.50 mm		150 micron	100	16 micron	50		
4.75 mm		75 micron	98	12 micron	42		
2.36 mm				9 micron	33		



Remarks: Sampling Method/s - Submitted by client

Authorised Signature: R Deznan

Date: 13/08/2008

Coffey Information Pty Ltd ABN 92 114 364 046
24 Hasler Road Herdsman WA 6017 Australia
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TEST CERTIFICATE

Client: Coffey Mining - MINEWPER00327AA
Principal: -
Project: South Balmoral
Location: -

Report No.: HERD08S-06593LL
Job No.: INFOHERD00017AA
Date Tested: 12/08/2008

Atterberg Limits & Linear Shrinkage
AS 1289.3.1.2, 3.2.1, 3.3.1, 3.4.1

Laboratory Number	HERD08S-06593
Sample Identification	LIMS TAILS -75+38micron
Liquid Limit (%)	Slips in Cup
Plastic Limit (%)	18
Plasticity Index (%)	Non Plastic
Linear Shrinkage (%)	N.A.
Sample History	Oven Dried
Preparation Method	-
Nature Of Shrinkage	-

Remarks: Sampling Method/s - Submitted by client

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Approved Signatory: R. [signature]
R Deznan
Date: 13/08/2008
NATA Acc. Laboratory No 431

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TEST CERTIFICATE

Client: Coffey Mining - MINEWPER00327AA	**Report No.:** HERD08S-06593E
Principal: -	**Job No.:** INFOHERD00017AA
Project: South Balmoral	**Date Tested:** 29/07/2008
Location: -	

Emerson Class Number of a Soil
AS 1289.3.8.1

Laboratory Number	HERD08S-06593
Sample Identification	LIMS TAILS -75+38 micron
Emerson Class Number	5
Type of Water Used	Distilled
Temperature of Water Used Deg. C	20

Remarks: Sampling Method/s - Submitted by client

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Approved Signatory: R Deznan

Date: 13/08/2008

International Minerals Pty. Ltd.

Level 4, 5 Mill Street

Perth WA 6000