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COMSTOCK MINE
VISUAL WASTE ROCK CHARACTERISATION MANUAL

For
Zeehan Zinc Limited

September 2007
Revision 4

Project No: 1292.001

PREFACE

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FOREWORD

Function of the Visual Waste Characterisation Manual

The Visual Waste Characterisation Manual (VWCM) has been prepared as a public document for submission to the Department of Primary Industries, Water, and Environment (DPIWE). The reports provides, but it not limited to, a detailed review of the rock types and their acid producing nature identified at the Comstock Mine. In addition, the report includes:

- A summary of the results of all waste characterisation tests undertaken at the Comstock Mine and interpretation of the results;
- A description of the appropriate disposal procedures to be followed for each rock type;
- Provides advice on the possible uses for each rock type; and
- Fulfills the requirements of Condition 7a of Environmental Protection Notice 684/1 (EPN 684/1).

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ABBREVIATIONS

ABA	Acid Base Account
Ag	silver
AMD	Acid and Metalliferous Drainage
AMIRA	Australian Mineral Industry Research Association
ANC	Acid Neutralising Capacity
BPEM	Best Practice Environmental Management
DPEMP	Development Proposal and Environmental Management Plan
EC	Electrical Conductivity
ELMS	Environmental Land Management System
EMP	Environmental Management Plan
EPN	Environment Protection Notice
ha	hectares
H_2SO_4	Sulfuric acid
kg	kilograms
MPA	Maximum Potential Acidity
NAG	Net Acid Generation
NAG pH	Net Acid Generation pH
NAF	Non-Acid Forming
NAPP	Net Acid Production Potential
PAF	Potentially Acid Forming
Pb	lead
SEMF	SEMF Pty Ltd
VWCM	Visual Waste Characterisation Manual
Zeehan Zinc	Zeehan Zinc Limited
Zn	zinc

1 INTRODUCTION

1.1 PURPOSE OF THE VISUAL WASTE CHARACTERISATION MANUAL

This manual has been developed to assist Zeehan Zinc Limited (Zeehan Zinc) in achieving Best Management Environmental Management (BPEM) with regard to the management of waste rock material at the Comstock Mine site, and to comply with Condition 7a of EPN 684/1.

The Visual Waste Characterisation Manual (VWCM) has been designed to be used by Zeehan Zinc staff in the field for waste rock classification, and to become part of routine operations at the Comstock Mine.

The VWCM provides:

- A description of the waste rock types identified to occur at the Comstock Mine site;
- Provides a summary of the characteristics of the waste rock types with regard to their acid generating and acid buffering (neutralising) capacities;
- Presents the analytical results from previous analysis (2000-2006) of waste rock samples; and
- Outlines appropriate handling and disposal techniques, including routine analysis of segregated waste rock material.

1.2 THE PROPONENT

Zeehan Zinc Ltd (Zeehan Zinc) is a Tasmanian owned company and is currently developing an open cut mine and processing operation at the Comstock Mine, west of Zeehan, Tasmania. The Comstock Mine is based on a zinc (Zn), lead (Pb), and silver (Ag) deposit, with mining leases being located along Trial Harbour Road. A mill for ore processing was installed at the mine site in 2001/2002 and consists of a crushing, screening, and gravity separation plant.

Oceania Tasmania Pty Ltd (Oceania Tasmania) is a fully owned subsidiary of Zeehan Zinc. Zeehan Zinc, through its subsidiary Oceania Tasmania, currently holds the mining lease that covers the Comstock Mine (5M/2007).

Zeehan Zinc has been operating under the guidelines of its Development Proposal and Environmental Management Plan (DPEMP), Environmental Land Management System 6194 (ELMS 6194), and Environmental Protection Notice 684/1 (EPN 684/1).

1.3 SITE LOCATION AND OPERATIONS

1.3.1 Site Location and Mineral Resource Mining Area

The Comstock mine is located approximately 5km west of the township of Zeehan, on the west coast of Tasmania (Figure 1).

The mining lease 5M/2007 held by Oceania Tasmania covers the Comstock mine operations.

All current and proposed operations by Zeehan Zinc related to the Comstock Mine are limited to the area covered by the mining lease (Figure 1).

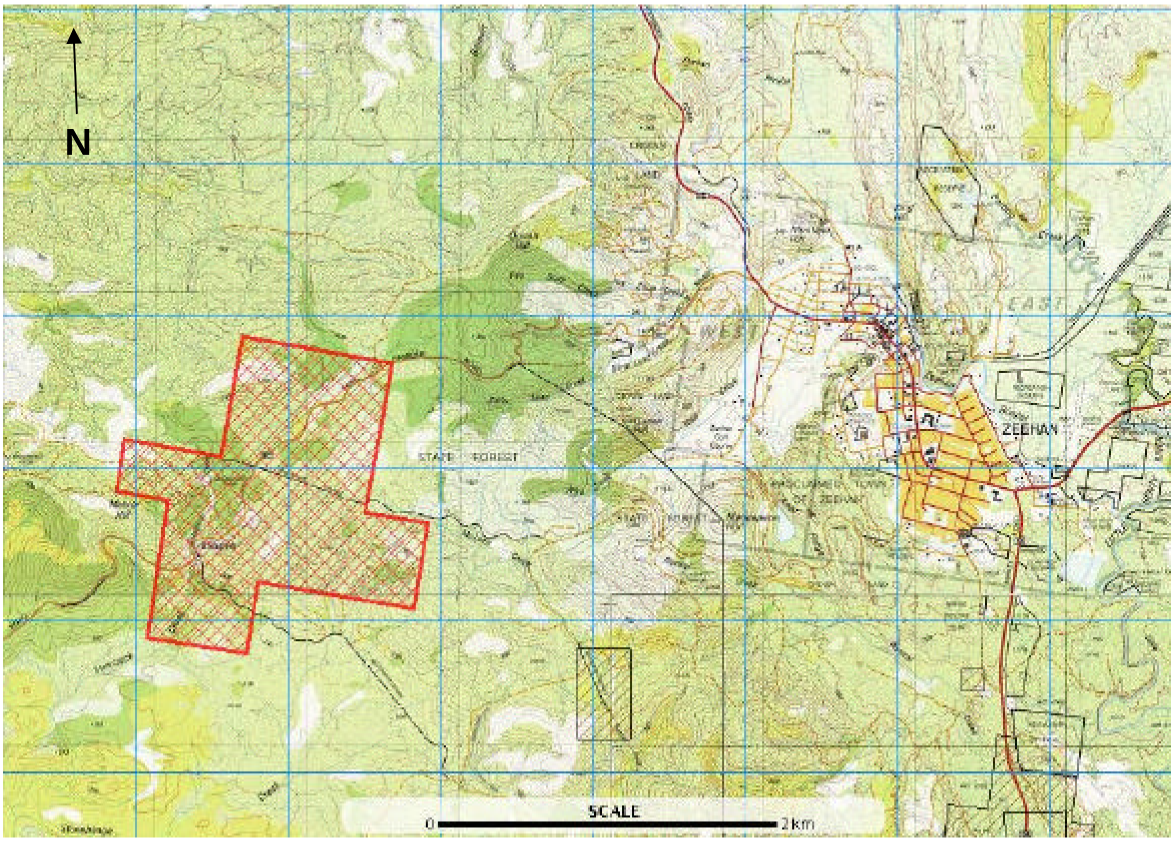

Figure 1: Location of mining lease 5M/2007 (shaded in red) relative to the township of Zeehan.

1.3.2 Operations

The Comstock Mine has previously operated under mining leases ML 123M/1947, ML 43M/1985, ML 19M/1995, ML 9M/2002, and under permits ELMS 6194 and EPN 684/1. Presently, the Comstock mine is approved as a Level 2 activity, permitting 200,000 tonnes of ore to be extracted each year (ELMS Permit 6194, Condition 1, 2001).

In 2007, mining leases ML 123M/1947, ML 43M/1985, ML 19M/1995, and ML 9M/2002 were consolidated into mining lease 5M/2007.

Previous operations extracted approximately 3,300 tonnes high-grade ore (21.5% Zn, 14.5% Pb, 540 Ag g/t), which is currently stockpiled and has not been processed. Ore is not currently being mined, and exploration aimed at further definition of ore reserves has been the primary focus of mine operations during the last 4 years.

Ore concentrate production using the existing mill facility is planned for 2007.

The major site features are illustrated in Figure 2.

THE COMSTOCK MINE

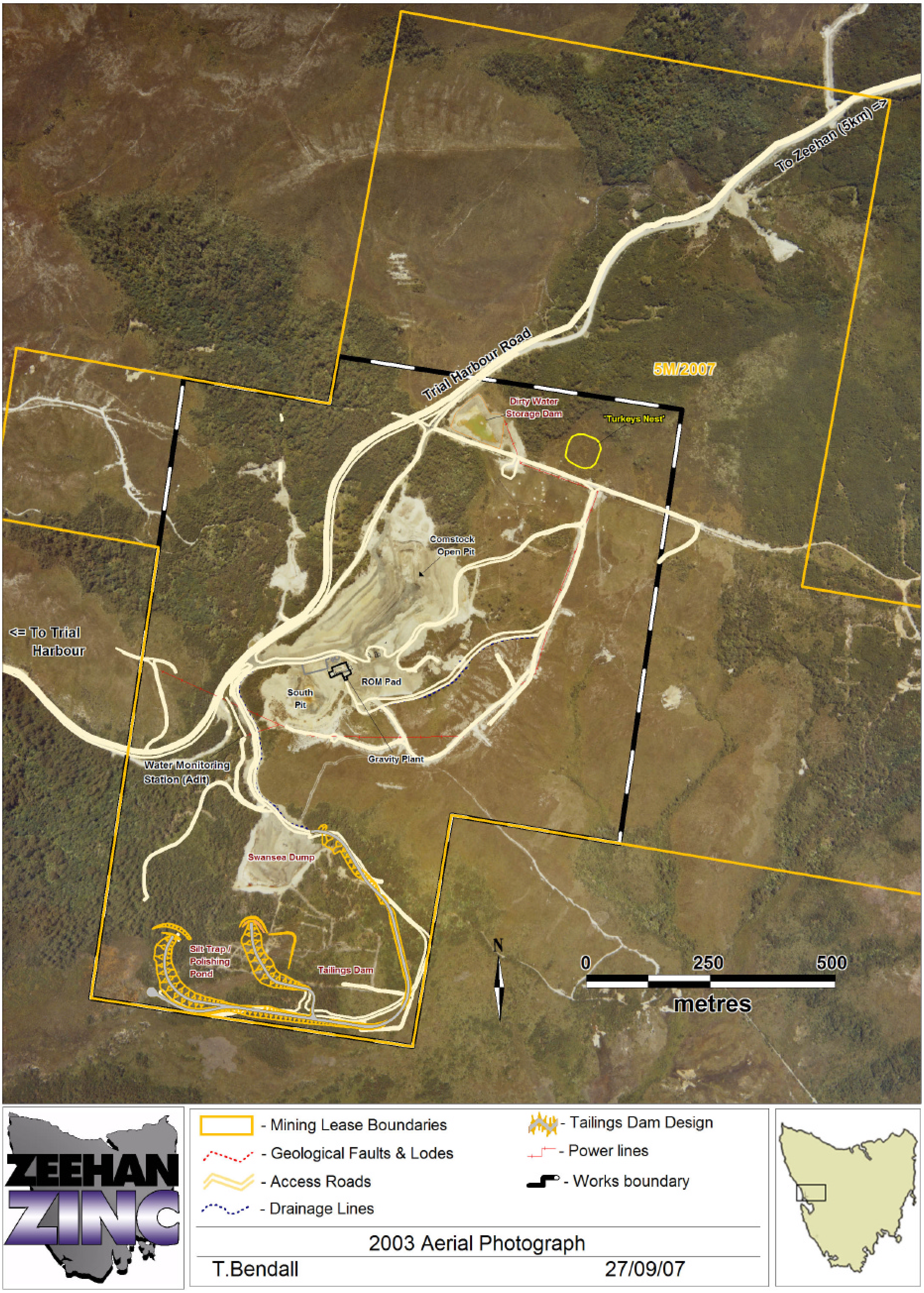

Figure 2: Major features of the Comstock Mine site.

1.4 STRUCTURE OF THIS REPORT

A brief description of the structure of this report is provided in Table 1 below.

Table 1: Brief description of the Visual Waste Rock Characterisation Manual.

Section Heading	Brief Description of the Information Provided
Foreword	A brief description of the function of the Visual Waste Rock Characterisation Manual.
1.0 Introduction	Description of the purpose of this report, the proponent and a brief site history.
2.0 Waste Rock Characterisation	Describes the terms used in the report, the waste rock characterisation techniques, provide photographs of the waste rock types and the relevant disposal procedures.

2 WASTE ROCK CHARACTERISATION

2.1 INTRODUCTION

This section outlines the Visual Waste Characterisation Manual (VWCM) that will be utilised by Zeehan Zinc during future mining operations.

An illustrated summary of the relevant terms, dominant waste rock types, their acid producing nature, and appropriate disposal procedure in line with current environmental permits (ELMS 6194 and EPN 684/1) is provided.

2.2 GLOSSARY OF TERMS

This section presents terms that are commonly used in waste rock characterisation and provides a brief explanation of each term.

- Acid-Base Account (ABA) - Evaluates the balance between acid generation processes and acid neutralising processes.
- Acid and Metalliferous Drainage (AMD) - Produced when sulphide bearing mine waste is exposed to atmospheric oxygen and water. Potential sulphide bearing materials include waste rock from overburden, interburden or partings and processed ore. AMD can cause major long-term environmental problems on the immediate and wider environment. AMD usually occurs as runoff or seepages from waste rock stockpiles, tailings impoundments, underground mine working via adits or shafts or seep from open pit walls where groundwater is intercepted.
- Acid Neutralising Capacity (ANC) - Expressed in kg H_2SO_4/tonne. Determined by titration with hydrochloric acid (HCl).
- Best Practice Environmental Management (BPEM) - Environment Australia (1997) has described BPEM for sulphidic mine wastes as a risk management approach by primarily focusing on prevention of acid generation, minimising oxidation rate by isolating high risk wastes from exposure. It also focuses on minimising potential for transport of oxidation products from source to receiving environment and containing and treating acid drainage to minimise risk of significant off-site impacts.
- Maximum Potential Acidity (MPA) - Determined from the sample sulfur content.
- Net Acid Generation (NAG) - Sulphide oxidation with hydrogen peroxide, expressed in kg H_2SO_4/tonne.
- Non-Acid Generating pH (NAG pH) - Final pH of solution following sulphide oxidation with hydrogen peroxide.
- Net Acid Producing Potential (NAPP) - Based on sulfur and ANC results, expressed in kg H_2SO_4/tonne.

2.3 WASTE ROCK CHARACTERISATION TECHNIQUES

2.3.1 Introduction

There are various procedures to determine the acid forming characteristics of mine waste materials. The most commonly used processes for waste rock characterisation are Acid-Base Account (ABA) and the Net Acid Generation (NAG) test (AMIRA 2002). These tests involve single measurement in time and are referred to static tests. In order to assess the other AMD issues like sulphide reactivity, oxidation kinetics, metal solubility, and the leaching behaviour of test materials, kinetic tests are required (e.g. kinetic NAG and leach column tests).

The majority of waste rock samples from Comstock Mine samples have undergone static testing. In 2000, Meskanen conducted leach tests on waste rock extracted from and in close proximity to the Allison's decline at the Comstock Mine, and concluded that there was no lag-time prior to acid generation.

2.3.2 Waste Rock Analysis Techniques

The common methods used for characterising the relative acid forming potential of mining wastes are (AMIRA 2002):

- $pH_{1:2}$ and Electrical Conductivity $(EC)_{1:2}$ test;
- Total sulfur determination;
- Acid Neutralising Capacity (ANC) test;
- Net Acid Producing Potential (NAPP) calculation; and
- Single Addition Net Acid Generation (NAG) test.

ABA theoretically calculates the potential of a sample to generate AMD by representing the difference between the capacity of a sample to generate acid (or Maximum Potential Acidity, MPA) and its inherent Acid Neutralising Capacity (ANC). Net Acid Producing Potential (NAPP) is calculated as follows:

$$NAPP = MPA - ANC$$

A negative value of NAPP means the sample may have enough ANC to prevent acid generation and a positive value means that the sample may be acid generating. Based on the above calculation, the sample (waste rock) is then categorised as one of the following:

- Non-acid forming (NAF);
- Potentially acid forming (PAF); or
- Uncertain (UC).

Table 2 provides a basis for classification of samples in regards to acid production (based on Miller 1998).

Table 2: Classification of waste rock samples with regard to acid production (Miller 1998).

Primary geochemical waste type	Final NAG pH	Static NAG value (kg H_2SO_4/tonne)	NAPP (kg H_2SO_4/tonne)
Potentially Acid Forming	<4.5	>5	Positive
Potentially Acid Forming – Low Capacity	<4.5	≤5	Positive
Non Acid Forming	≥ 4.5	0	Negative
Acid Consuming	≥ 4.5	0	Less than -100
Uncertain	≥ 4.5	0	Positive
Uncertain	> 4.5	>0	Negative

Refer to the Waste Rock Management Plan (GHD 2007) for details on sampling frequency and analysis (Appendix A).

2.4 CLASSIFICATION OF COMSTOCK MINE WASTE ROCK SAMPLES

2.4.1 Waste Rock Types Identified

The current Allison's open pit comprises four rock types that form part of the Upper Oonah Formation:

- Carbonaceous shales;
- Siliceous shales;
- Sandstones, and

- Talcose altered dolomites.

The talcose altered dolomites host the Zn-Pb-Ag sulphide bodies that are the object of mining operations at the Comstock Mine. The talcose dolomite unit outside the sulphide zone is barren in visual sulphides and forms the vast majority of the waste rock that will be removed during mining operations. Drilling investigations have indicated that the geochemical nature of waste rock could alter as the open pit develops (Thompson and Brett 2003).

Plates 1-4 illustrate the dominant waste rock types found within Allison's Decline, Comstock Mine, *in situ* and soon after excavation where possible. These images are provided as a guide to assist in the training of Zeehan Zinc staff with regard to waste rock classification.

During the initial development of the tailings storage facility below the Swansea Tramway Waste Rock Dump (STWRD) in 2007, a further three new waste rock types were identified. These include:

- Gabbro,
- Grey shale; and
- Weathered volcanic rocks.

Plates 5-7 illustrate the dominant waste rock types found within the tailings storage facility area, *in situ* and soon after excavation where possible. These images are provided as a guide to assist in the training of Zeehan Zinc staff with regard to waste rock classification.

Plate 1: Ore hanging in Allison's open pit (inside the ore zone).

Plate 2: Talc in Allison's open pit (outside ore zone).

Plate 3: Phyllite / black shale (Allison's open pit).

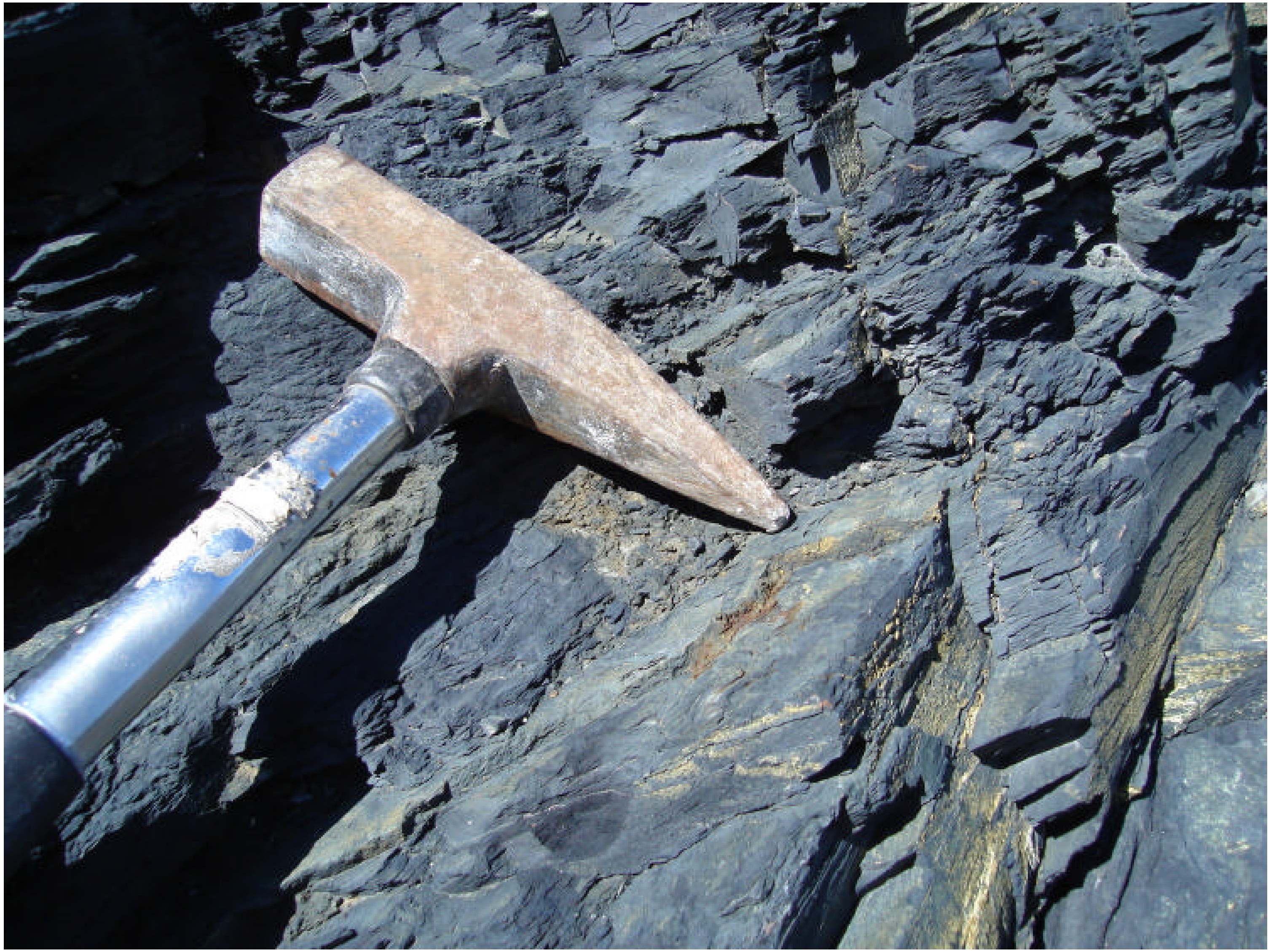

Plate 4: Pod of high grade ore (Allison's open pit).

Plate 5: Gabbro exposed near the tailings storage facility.

Plate 6: Grey shale exposed near the tailings storage facility.

Plate 7: Weathered volcanic material exposed near the tailings storage facility.

Further field training with a competent geologist familiar with the local rock types is essential, as the physical appearance of the waste rock types could differ from that illustrated in this manual.

2.4.2 Waste Rock Geochemical Nature

The limited mining operations that have occurred to date have indicated that the waste rock material removed from the open pit is reasonably soft and is expected to have a relatively low permeability once compacted in a waste rock dump (Thompson and Brett 2003). This characteristic will be used to allow for selective dumping of waste rock material and treatment to isolate more reactive materials.

Investigations into the acid producing nature of waste rock and mineralised rocks has been undertaken during 2000-2006 (Appendix B). A summary of these results is provided in Table 3, where the nature of the main rock types is described (non-acid forming (NAF) or potentially acid forming (PAF)), and the examples of the rock types are illustrated in Plates 8 and 9.

Analysis of the waste rock types and the potential for acid production, has identified that the black shale at the Comstock Mine is acid producing (and contains visible pyrite), while the carbonate, talcose and siliceous materia found outside the ore zone is not acid producing (Oceania Tasmania 2003).

Analysis of material from the Central Waste Rock Dump (CWRD) and the STWRD indicated the presence of PAF rock types, and analysis of water seeping from the waste rock dumps revealed that material within the dumps were oxidising and leading to the formation of AMD. As a result, the CWRD was capped with a minimum of 1m of clay and rehabilitation works have been undertaken. Management of the AMD on the Comstock Mine site is currently being improved, with the advice from water specialist Lois Koehnken (Technical Advice on Water) sought.

Analysis of waste rock material from the tailings storage facility has not yet been conducted, with a detailed waste rock sampling program currently being developed.

Plate 8: High grade ore in host rock.

Plate 9: Dominant rock types *in situ*.

Table 3: Summary of waste rock characterisation performed at the Comstock Mine (2000-2006).

Date Sampled	Sample Type	Location	Rock Type	Nature
2000	CWRD (CMD1)	Within ore zone	composite	PAF
	CWRD (CMD2)	Within ore zone	composite	PAF
	STWRD 1	Within ore zone	talc, black shale and low grade ore	PAF
	STWRD 2	Within ore zone	talc, black shale and low grade ore	PAF
2002	Waste Rock 01-02	Outside ore zone	carbonate (silicate-micrite-talc)	NAF
	Waste Rock 02-02	Outside ore zone	carbonate (silicate-micrite-talc)	NAF
	Waste Rock 03-02	Outside ore zone	carbonate (silicate-micrite-talc)	NAF
	Waste Rock 04-02	Outside ore zone	carbonate (silicate-micrite-talc)	NAF
	Waste Rock 05-02	Outside ore zone	carbonate (silicate-micrite-talc)	NAF
	Waste Rock 06-02	Outside ore zone	carbonate (silicate-micrite-talc)	NAF
	Waste Rock 07-02	Outside ore zone	carbonate (silicate-micrite-talc)	NAF
	Waste Rock 08-02	Outside ore zone	carbonate (silicate-micrite-talc)	NAF
	Waste Rock 09-02	Outside ore zone	carbonate (silicate-micrite-talc)	NAF
	Waste Rock 10-02	Outside ore zone	carbonate (silicate-micrite-talc)	NAF
	Waste Rock 11-02	Outside ore zone	carbonate (silicate-micrite-talc)	NAF
	Waste Rock 12-02	Outside ore zone	carbonate (silicate-micrite-talc)	PAF
	Drill core SY021 (2-3M)	Outside ore zone	carbonate (silicate-micrite-talc)	NAF (with acid buffering capacity)
	Drill core SYO21 (8-11M)	Outside ore zone	black shale	PAF
	Drill core SYO22 (1.3-6.2M)	Outside ore zone	carbonate (silicate- micrite-talc)	NAF
	Drill core STO22 (6.2-10.8M)	Outside ore zone	carbonate (silicate- micrite-talc)	NAF
	Drill core SYO22 (13-14M)	Within the ore zone	black shale	PAF
2003	STWRD 1	-	composite	PAF
	STWRD 2	-	composite	PAF
	Main Lode Comstock Creek (R1)	Within the ore zone	carbonate (silicate-micrite-talc)	NAF
	Main Lode Comstock Creek (R2)	Within the ore zone	carbonate (dolomite)	NAF (with acid buffering capacity)
2004	STWRD	-	composite	PAF
2005	STWRD 1	-	composite	PAF
	STWRD 2	-	composite	PAF
2006	Drill core SYO33 0-1 (W)	Within the ore zone	pink clay (weathered dolomite)	NAF
	Drill core SYO33 3-4 (W)	Within the ore zone	pink clay (weathered dolomite)	NAF
	Drill core SYO33 28-29	Within the ore zone	carbonate (dolomite)	NAF (with acid buffering capacity)
	Drill core SYO34 1-2 (W)	Within the ore zone	pink clay (weathered dolomite)	NAF
	Drill core SYO34 12-13 (W)	Within the ore zone	carbonate (dolomite)	NAF (with acid buffering capacity)
	Drill core SYO41 1-2 (W)	Within the ore zone	pink clay (weathered dolomite)	PAF

Date Sampled	Sample Type	Location	Rock Type	Nature
	Drill core SYO41 2-3 (W)	Within the ore zone	pink clay (weathered dolomite)	PAF
	STWRD - Upper	-	composite	PAF
	STWRD - Lower	-	composite	PAF

2.5 WASTE ROCK DISPOSAL

Based on the results of waste rock characterisation tests, an appropriate identification and disposal procedure has been developed. The photographs provided in this report should be used as a visual guide for the relevant rock types, in conjunction with consultation with a competent geologist:

As per Condition 8a of EPN 684/1, all PAF producing waste rock material will be disposed off in the STWRD, and on commencement of closure and rehabilitation of the dump, the PAF material will be capped with a minimum of 1m of clay, applied as per BPEM methods.

NAF material can be disposed of to the South Comstock Pit (SCP), which is an approved dump for NAF (refer to the EMP Review 2007).

NAF material will also be utilised in the operation of the tailings co-disposal facility (refer to the EMP Review 2007).

Alternatively, the NAF waste rock could be stockpiled and utilised as a road base material for use within the mine site area, or used to maintain the appropriate ratio of PAF and NAF in the waste rock dumps.

2.6 VERIFICATION OF VISUAL CHARACTERISATION METHOD

In order to confirm the reliability of the visual characterisation method during mine development, Zeehan Zinc will collect regular sample of all waste rock type prior to and after waste rock segregation for analysis of the acid producing potential.

Should waste rock material classified as being NAF return results indicating that it is PAF, the VWRCM will be revised and the reason for the change in acid producing nature investigation.

In accordance with Condition 8b of EPN 684/1, a record of the waste rock source, type and disposal location of all waste rock generated on site during operations will be maintained.

2.7 SUMMARY OF VISUAL WASTE ROCK CHARACTERISATION METHOD

Figure 3, provides a summary the visual characterisation method outlined in this report.

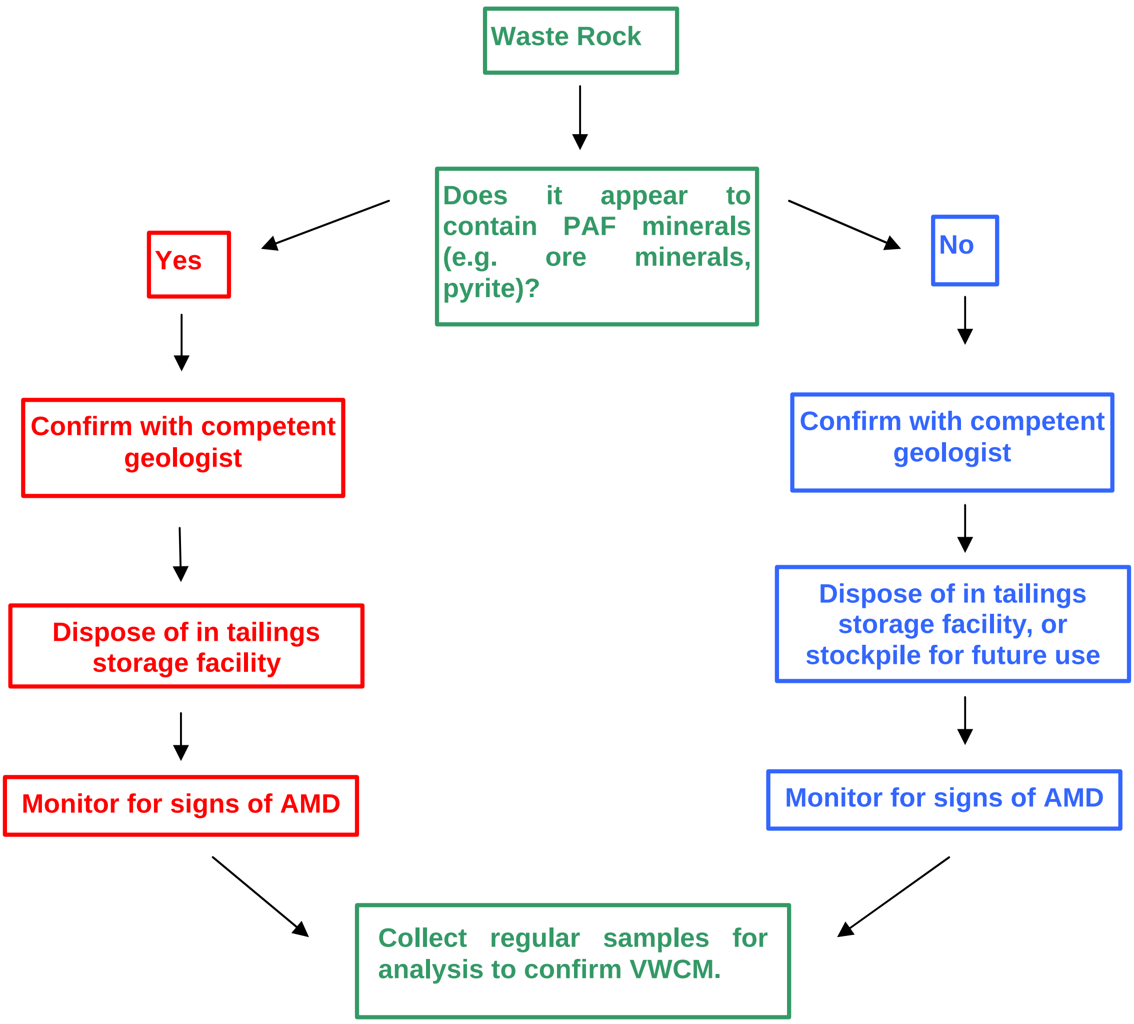

Figure 3: Summary of visual waste characterisation procedure.

3 REFERENCES

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APPENDICES

Appendix A:

Comstock Mine Waste Rock Management Plan – GHD Pty Ltd (2007)

CLIENTS | PEOPLE | PERFORMANCE

Zeehan Zinc Pty Ltd

Report for Waste Rock Management Plan

Placement and Sampling Plan

October 2007

INFRASTRUCTURE | MINING & INDUSTRY | DEFENCE | PROPERTY & BUILDINGS | ENVIRONMENT

Contents

1. Introduction

This document details the Waste Rock Disposal Management Plan for Zeehan Zinc Ltd Comstock Mine. The purpose of this document is to detail the following;

- Waste Rock Sampling Program
- Define On-Site Waste Rock Test Methods to be adopted
- Waste Rock Management and Placement in Tailings Storage Facility (TSF)
- Tailings Sampling Program

A recent report by Coffey Geosciences Pty Ltd 2005 defines Allison's Pit contains approximately 141,000 bcm of waste rock, of which approximately 6,400 bcm is Potentially Acid Forming (PAF) material.

Waste rock is proposed to be disposed of in the TSF, with the embankment formed from the waste rock material throughout the various stages of construction. The characterization and correct placement of the waste rock is critical to the success of the TSF development, to ensure future environmental problems associated with Acid or Metalliferous Drainage (AMD) do not develop.

The concept of the co-disposal TSF is detailed in the Thompson & Brett Report "Co-disposal Management Plan" 2004, a cross section of the co-disposal TSF is shown in Appendix B. The initial concept for the co-disposal storage involved constructing a WRD cell, which forms the TSF embankment. High-capacity potential acid forming (PAF-HC) material is encapsulated by soft, non acid forming material (NAF) or low-capacity potential acid forming material (PAF-LC), collectively referred to as Low-NAG, capable of being compacted to achieve a maximum permeability of $1x10^{-7}$m/s. A clay cap will be used if the low permeability requirement is not met by Low-NAG material alone.

2. Waste Rock Sampling Program

The table below has been extracted from the Coffey Geosciences Pty Ltd report on the current Allison's Open Pit. Of the total 140,500m^3 of waste rock, 6,500m^3 of this contains PAF phyllite. A summary table from the Coffey report on waste rock quantities is included in Appendix A.

There are currently no Tasmanian or national guidelines for the number of samples taken for testing for AMD potential. There is, however, a draft guideline from the Queensland Environmental Protection Agency (QLDEPA) which suggests, as an approximate guide 26 samples taken for <1,000,000t of rock excavated for preliminary testing.

This seems a reasonable figure to adopt and may be reduced as rock classification skills of the Zeehan Zinc staff develop. However, as the mine is new to rock classification and limited testing and training has been undertaken, a program of 26 samples of waste rock are to be taken per year for classification testing. This will also assure that adequate classification of waste rock is achieved, as this is essential to the construction of the TSF. This is discussed further in Section 4.

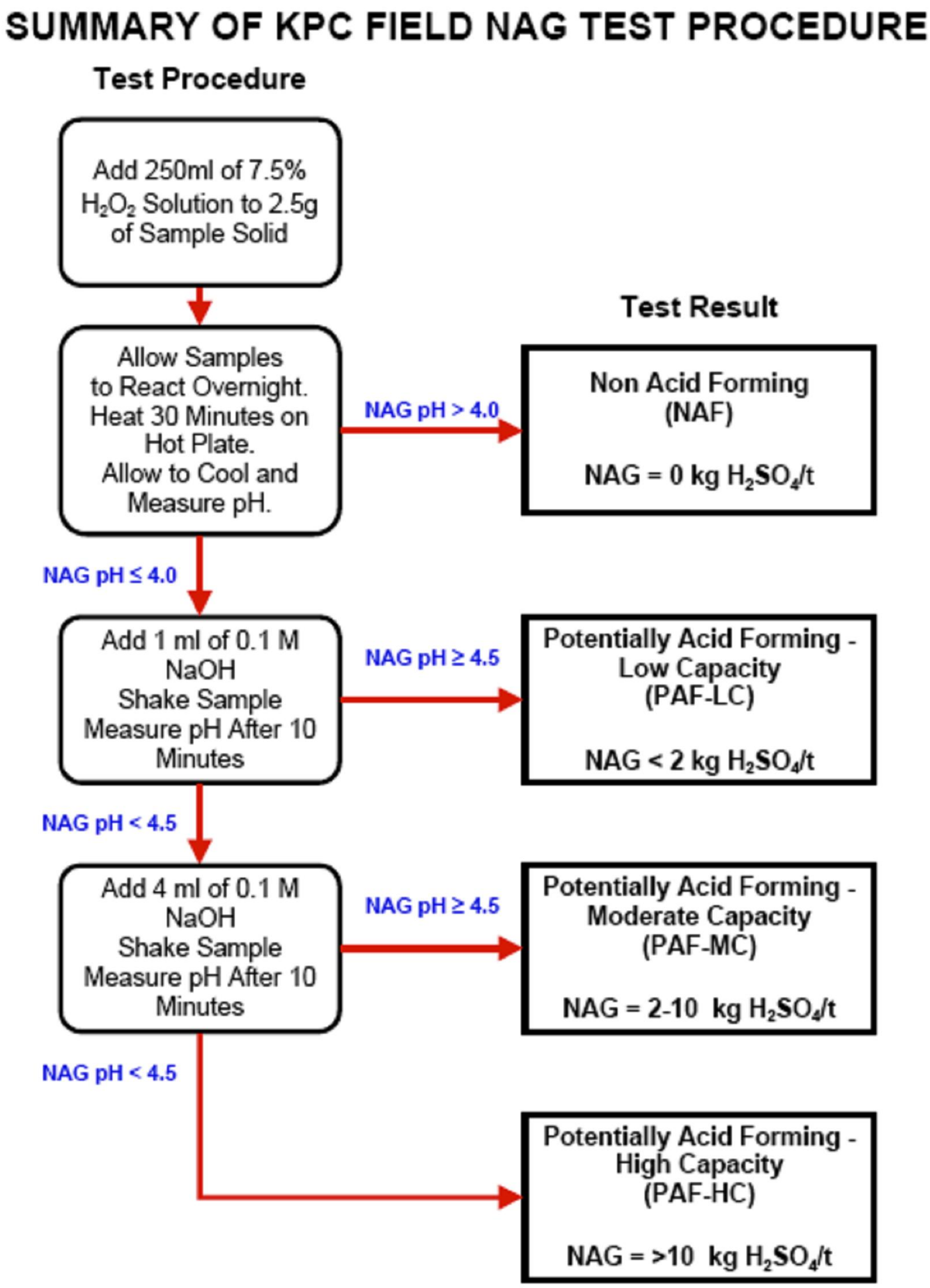
The samples taken are recommended to be tested using static test methods to characterise the rock in terms of acid producing potential.

The suggested sampling program does not include testing of new rock types or variations of the previous identified types. Any new rock types identified should be tested.

2.1 Field NAG Testing

A basic NAG field test, outlined in Stuart (2004), may be suitable as a supplement to formal laboratory testing. While it is not a substitute for formal laboratory assessment and reporting, it will be a useful adjunct to visual classification and laboratory analysis. The results of field NAG testing should be regularly validated against formal laboratory analyses. For the Comstock mine, only PAF-LC and PAF-HC classifications have been used.

Figure 1 Field NAG Procedure



2.2 Laboratory Analyses

These static classification tests are set out in the Amira (2002) ARD Test Handbook. Selected samples can be further tested using kinetic tests methods if it is deemed necessary by Zeehan Zinc geologists.

As mentioned above, the suggested number of samples to be taken for preliminary testing for less than 1,000,000 tonnes for rock excavated is 26. The static tests to be undertaken are listed below;

» pH 1:2 and EC 1:2;

» NAG (at pH 4.5 a pH 7);

» NAGpH;

» ANC;

» Total Sulfur; and

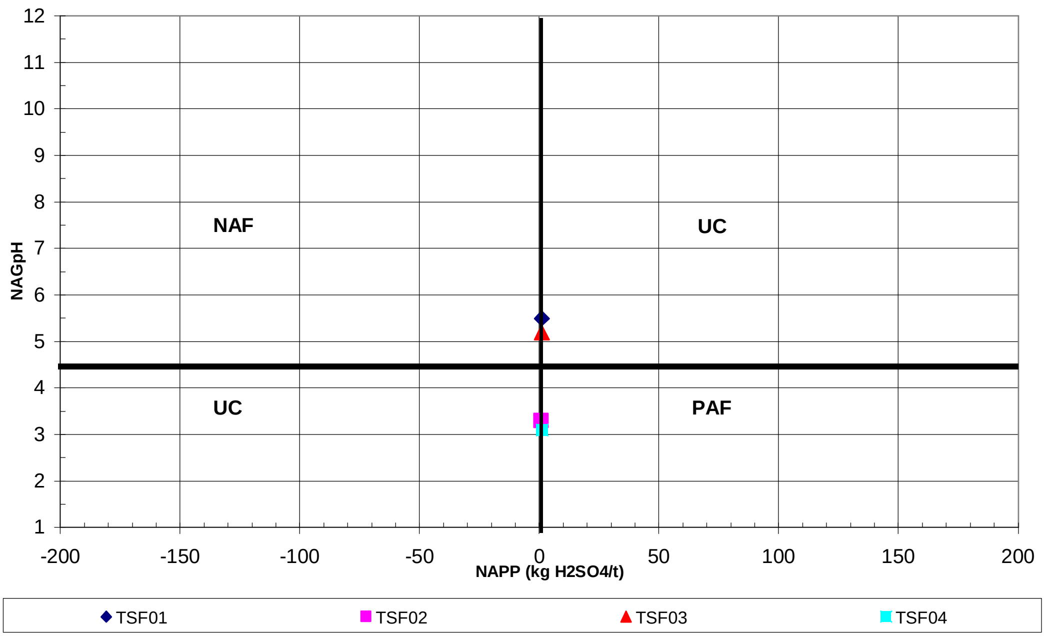
» NAPP (derived from total sulfur and ANC)

The results of the analyses should be presented as NAGpH Vs NAPP plots and ANC Vs MPA plots and compared with historical data, to determine the appropriate geochemical classification. An example of such a plot is shown below in Figure 2.

Materials with a NAGpH <4.5 and NAPP > 0 are considered PAF, whereas materials with a NAGpH > 4.5 and NAPP <0 are considered NAF. PAF materials with a NAG of less than 5 kgH_2SO_4/t are considered low-capacity (PAF-LC) and greater than 5 kgH_2SO_4/t are considered high-capacity (PAF-HC).

Samples with either NAG > 4.5 and NAPP <0 or NAGpH<4.5 and NAPP < 0 could be either NAF or PAF and are classed as "uncertain" (UC) and require further characterisation, using methods such as kinetic testing. Kinetic NAG testing or Acid Buffering Capacity Curve (ABCC) testing, at a rate of 1 kinetic test for every 10 static tests should be done for confirmation of material classed as LCPAF or UC.

Figure 2 Waste Rock Classification of TSF Rock Borrow Samples



3. Waste Rock Management

3.1 Overall Rock Classification Plan

Classification of the waste rock starts in the open pit prior to extraction. An overall plan for a chain of responsibility is proposed below;

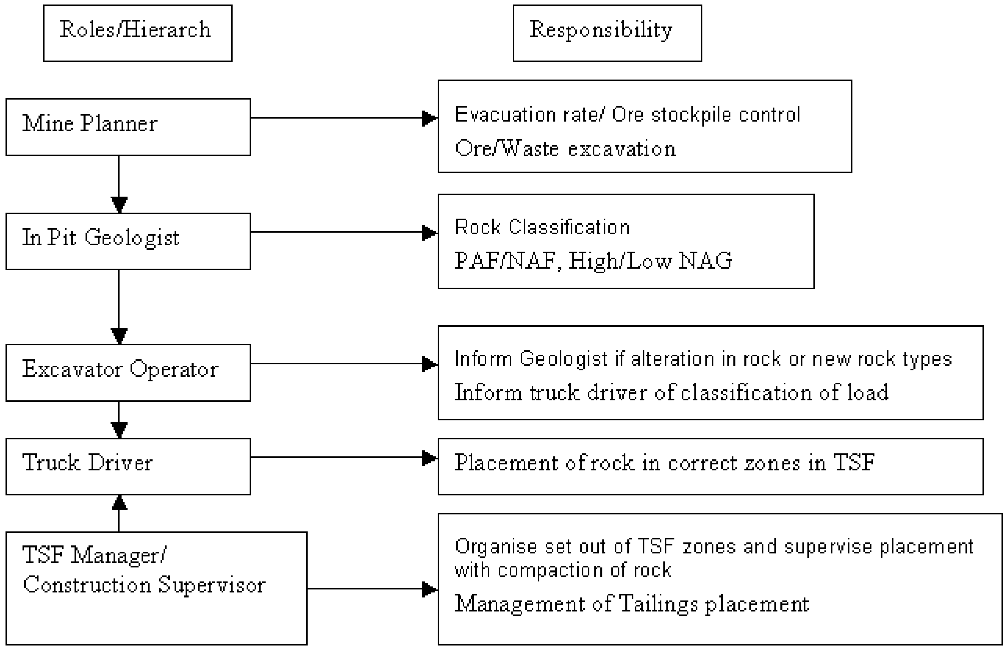
1. Rock to be excavated in the pit should be initially classified by the Geologist prior to excavation.
2. The type of waste rock being excavated should be relayed to the Excavator Driver.
3. The excavator driver should then inform the Truck Driver as to what type of rock has been loaded with.
4. The Truck drivers are responsible to know what types of rock are to be placed where. In particular which zones in the TSF are nominated Low and High NAG.

The proposed procedure is shown in Figure 3.

The geologist should be very familiar with the SEMF "Visual Waste Characterisation Manual" 2006 which identifies various rock types at the pit and their acid producing potential. The geologist should also be familiar with the testing required to identify the acid producing potential the waste rocks. Any new rock types identified as the pit develops should be tested and classified.

The procedure can be improved as the mine develops, it has been assumed Zeehan Zinc will have similar personal to the roles suggested of Mine Planner and In Pit Geologist. The intension is that the excavator operators will eventually have the ability to identify rock types in terms of acid producing potential. The excavator operators will refer any new rock types or alterations to the geologist to identify and test if classification is uncertain.

Figure 3 Roles and Responsibility of Waste Rock Extraction



4. TSF Construction

4.1 Co-Disposal Concept

A cross section and plans of the stages of the co-disposal TSF is shown in Appendix B.

The co-disposal storage involves constructing a Waste Rock Dump (WRD), which forms the TSF embankment. High NAG rock is encapsulated by soft low NAG rock (maximum required permeability of $1x10^{-7}$m/s) with a clay cap if the permeability requirement is not met.

Initial tailings from the gravity plant are expected to be coarse and of low sulfide content (low AMD potential), once the flotation plant is operational, the tailings streams will be separated with the higher sulfide tailings discharged first, which are then covered by the coarser gravity tails.

4.2 Initial Waste Rock Placement

A roller trial of the proposed low NAG rock is to be completed within the following weeks

As Zeehan Zinc has not yet tested the low-NAG rock it is proposing a roller compaction trial of the low-NAG rock be completed. Until this can be completed and tested, it is proposed the TSF WRD low-NAG, soft rock zone be replaced with compacted clay (minimum 5m width). This will enable proper encapsulation of high-NAG hard rock immediately. The clay can be placed alongside the high-NAG rock and rolled at the same time. It is envisaged this may continue until the TSF WRD has reached Stage 2 at RL220m.

4.3 Routine TSF Construction Method, Materials & Testing

GHD are also assisting Zeehan Zinc to review and implement its WRC manual and setup an on-site visual waste rock characterisation museum and testing regime. This will enable simple visual characterisation of various rock types, which will be verified through on-site testing.

As discussed in Section 4.2, if the on-site testing is not implemented in the initial stages of waste rock extraction, rock will be treated as high-NAG and place in the WRD at the TSF and capped with a 5m minimum, compacted clay cap.

Once the low-NAG rock is proven to be able to meet the specification for a successful capping material, the routine rock placement can begin. This involves the following:

» Low-NAG waste rock is placed downstream and compacted in layers of maximum compacted thickness of 300 mm.

» A downstream batter slope of 1V:2.5H and minimum of a 10m wide crest of the Low-NAG material is required at the crest of each lift.

» High-NAG rock can be placed upstream of the low-NAG rock and rolled and compacted at the same time.

» The crest of each raise of High-NAG material should be 20m wide (this can be reduced if required due to more Low-NAG rock being encountered in the pit).

» High-NAG rock is also to be dumped and compacted over the tailings. This rock forms a firm base for upstream construction.

Table 1 below shows the quantities of High/Low NAG waste rock and tailings for the various stages of construction.

It should be noted that Low-NAG rock can be substituted for High-NAG rock and disposed of within the embankment, but High-NAG waste can never be substituted for Low-NAG waste rock in the capping layer.

Table 1 Waste Material Volumes In TSF

TSF Stage (RLm)	Waste Material in TSF (m^3)			Tailings Storage Cumulative	
	Low NAG	High NAG	Tailings	(m^3)	Tonnes (@1.5t/m^3)
(2)RL220m	69,000	124,000	134,000	134,000	201,000
(3)RL230m	86,000	111,000	270,000	404,000	606,000
(4)RL240m	71,000	139,000	315,000	719,000	1,078,500
(5)RL250m	73,000	134,000	220,000	939,000	1,408,500
Total	**299,000**	**508,000**	**939,000**	**939,000**	**1,408,500**

4.4 Operator Training

Operators removing rock in the pit need to be trained and familiar with the SEMF WRC Manual. A copy of the SEMF WRC manual and this manual should be given to the operators nominated for the extraction of rock from the pit prior to placement in the TSF.

To assist Zeehan Zinc in training future Geologists and operators it is proposed to set up a waste rock characterisation museum. The museum will initially contain a photo and physical labelled sample of each rock type currently identified on site (all of which are listed in the SEMF WRC manual). Additional samples of new rock types and alterations should be added after classification.

The museum will also provide a historical record and aid in Zeehan Zinc's knowledge retention of the rock types and classifications. A logbook containing of results and photos of samples tested could also be kept with the museum for historical record.

A sample photo of a similar museum is shown in Appendix C.

5. Tailings Sampling Program

5.1 Requirements

The following requirements have been requested by the Department of Tourism Arts and the Environment (DTAE) and must be met by Zeehan Zinc to have processing of ore approved.

- Initially 1 m of water cover over the tailings is required.
- The tailings are also to be discharged subaqueously (discharged under water).
- Representative samples of tailings are to be taken for geochemical analysis weekly (min 1 per week).

The above requirements will be enforced until the tailings are tested to characterise their acid producing potential.

5.2 Sampling Program

The following sampling program for the tailings is proposed to meet the above requirements;

Following the initial discharge, 2 representative samples of tailings will be collected from the TSF (prior to caustic dosing of the TSF)

From these samples, 2 long-term column leach tests and 2 static tests will be undertaken. The column leach tests will be continued for a minimum 6 month period, at which point the continuation of the test will be assessed

The static tests will give an initial indication of the acid producing potential of the tailings. It is proposed the static tests can be undertaken on-site using the same static tests for the waste rock classification.

6. References

Amira . 2002. *ARD Test Handbook.* Project P387A Prediction & Kinetic Control of Acid Mine Drainage. Amira International Limited, Melbourne.

Stuart W. 2004. *Development Of Acid Rock Drainage Prediction Methodologies For Coal Mine Wastes*. Submitted In Fulfilment of the Requirements for the Degree of Doctor of Philosophy in Applied Science (Minerals and Materials) Ian Wark Research Institute, University of South Australia

Thompson & Brett Pty Ltd. 2004. *Waste Management Plan.*

SEMF 2006. *Comstock Mine Visual Waste Characterisation Manual.* Project No. 1292.001

Coffey Geosciences Pty Ltd 2005. Mine Design Report – Allison's Pit *Comstock Mine Zeehan – West Tasmania HZ00017/01-AD.*

Appendix A

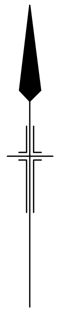
Allison's Pit Quantities

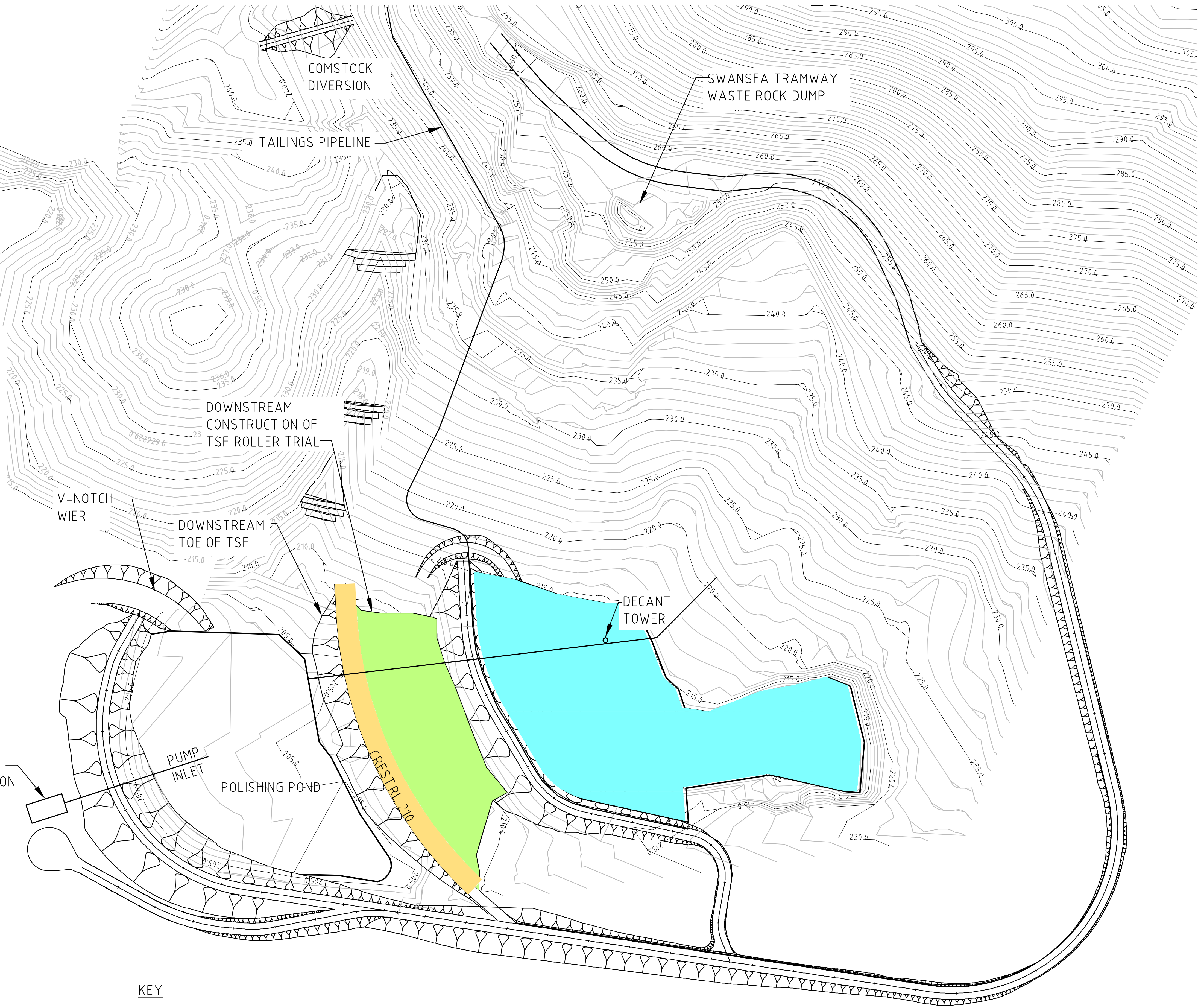
Table 3.1 Allison's Pit Inventory and Ore Resource Tonnage

Elevation	TOTAL	Talc/ Dolomite		Phyllite		ORE		Zn	Pb	Ag	Avg. StripR
Interval	*Volume*	*Volume*	*Tonnes*	*Volume*	*Tonnes*	*Volume*	Tonnes	*%*	*%*	*g/t*	*(t/bcm)*
299.0-301.0	4,688	4,688	9,564		-						
297.0-299.0	10,231	10,231	20,871		-						
295.0-297.0	12,800	12,800	26,112		-						
293.0-295.0	15,850	15,850	32,334		-						
291.0-293.0	13,619	13,272	27,075		-	347	1,145	2.56	0.92	23.8	0.09
289.0-291.0	12,500	11,500	23,460		-	1,000	3,300	5	1.28	28.5	0.29
287.0-289.0	12,509	10,775	21,981		-	1,734	5,723	5.68	1.43	30.2	0.53
285.0-287.0	13,663	11,338	23,130		-	2,325	7,673	5.55	1.52	30.8	0.68
283.0-285.0	13,400	10,775	21,981		-	2,625	8,663	5.48	1.53	30.4	0.80
281.0-283.0	10,269	7,335	14,963		-	2,934	9,683	5.55	1.53	30.9	1.32
279.0-281.0	9,306	6,012	12,264		-	3,294	10,869	5.04	1.25	24.4	1.81
277.0-279.0	9,744	5,797	11,826	34	92	3,913	12,911	4.76	1.03	20.1	2.21
275.0-277.0	10,813	5,675	11,577	138	374	5,000	16,500	5.13	1.08	22.8	2.84
273.0-275.0	8,925	3,237	6,603	2,025	5,488	3,663	12,086	4.51	1	21.3	2.30
271.0-273.0	7,753	3,312	6,756	2,719	7,368	1,722	5,682	3.6	0.81	17.4	0.94
269.0-271.0	3,681	1,668	3,403	1,475	3,997	538	1,774	2.58	0.58	13	0.56
Grand Total	**169,751**	**134,265**	**273,901**	**6,391**	**17,320**	**29,095**	**96,009**	**4.96**	**1.2**	**24.7**	**0.68**

Appendix B

TSF Figures 01-06





TAILINGS DISCHARGE NOTES

1. TAILINGS TO BE DISCHARGED FROM EASTERN ABUTMENT TO FILL FURTHEST EXTENT OF ROCK BORROW.
2. RETRACT DISCHARGE TOWARDS NORTHERN ABUTMENT AS TAILINGS NEAR POND SURFACE.
3. TAILINGS TO BE SUBMERGED WITH MIN 1m WATER COVER UNTIL APPROVAL IS GIVEN TO EXPOSE.
4. TAILINGS STORAGE TO FILL STAGE 1 TO RL212.8m. THIS ALLOWS FOR 5ML STORM RETENTION CAPACITY, 0.6m FREEBOARD AND 1m OF WATER COVER.

CONSTRUCTION NOTES

1. BEGIN CONSTRUCTING DOWNSTREAM RAISE TO TSF USING WASTE ROCK. REFER TO FIG06 FOR SECTION.
2. RAISE DECANT TOWER AS REQUIRED.
3. CONSTRUCT DECANT TOWER FOR STAGE 2 WHEN STAGE 1 EMBANKMENT COMPLETED.
4. BACKFILL STAGE 1 DECANT TOWER. CONSTRUCT AND COMMISSION STAGE 2 DECANT TOWER.

KEY

- LOW NAG WASTE ROCK
- HIGN NAG WASTE ROCK
- DECANT POND

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OCEANIA TASMANIA
ZEEHAN ZINC TAILINGS MANAGEMENT
STAGE 1

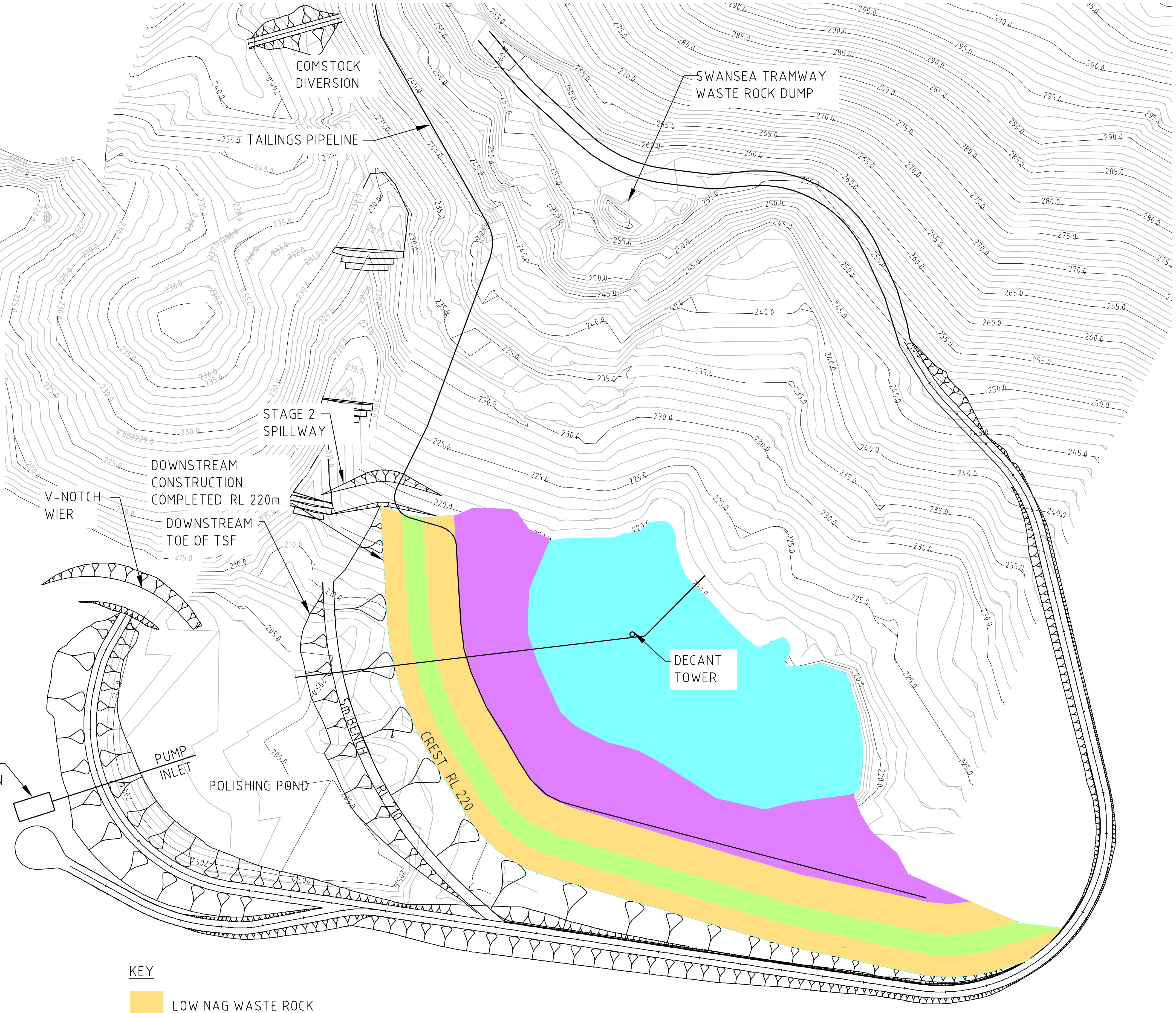
scale 1:2000 for A3 date SEPT 2007

job no. 32-13467
rev no. A

Figure 01

162 Macquarie Street Hobart TAS 7000 Australia T 61 3 6210 0600 F 61 3 6223 8246 E hbamail@ghd.com.au W www.ghd.com.au

Plot Date: 03 October, 2007 - 8:19 AM Cad File No: G:\32\13467\CADD\Drawings\ 32-13467-FIG01.dwg



TAILINGS DISCHARGE NOTES

1. TAILINGS TO BE DISCHARGED FROM EASTERN ABUTMENT.
2. RETRACT DISCHARGE TOWARDS NORTHERN ABUTMENT AS TAILINGS REACH CREST. DISCHARGE POINT RELOCATION EVERY 1 WEEK MIN.
3. TAILINGS TO BE SUBMERGED WITH MIN 1m WATER COVER UNTIL APPROVAL IS GIVEN TO EXPOSE.
4. AS TAILINGS DISCHARGE IS RETRACKED NORTH, PLACE HIGH NAG WASTEROCK FROM UPSTREAM CREST INTO TSF IN PREPERATION FOR UPSTREAM CONSTRUCTION.
5. ONCE DISCHARGE REACHES NORTHERN ABUTMENT RESUME DISCHARGE AT EASTERN END OF TSF. CHANGE DISCHARGE POINT FEQUENTLY TO MINIMISE EXPOSURE TIME OF BEACH.
6. RETRACT DISCHARGE TOWARDS NORTHERN ABUTMENT AS TAILINIGS REACHES CREST OF UPSTREAM LIFT.
7. MAX DECANT POND LEVEL FOR STAGE 2 EMBANKMENT IS RL217.8m (ALLOWS FOR STORM RETENTION AND 0.6m FREEBOARD)

CONSTRUCTION NOTES

1. UPSTREAM LIFTS TO BE 2.5m IN HEIGHT.
2. ONCE WASTE ROCK IS PLACED INTO TSF, UPSTREAM CONSTRUCTION TO COMMENCE FROM EASTERN ABUTMENT. FOR SECTION SEE FIG06.
3. DECANT TOWER TO BE RAISED AS REQUIRED.
4. AT COMPLETION OF STAGE 2, CONSTRUCT DECANT TOWER FOR STAGE 3 AND BACKFILL EXISTING DECANT TOWER.
5. STRIPPING OF MATERIAL IN TSF INUNDATION AREA TO BE STOCKPILED FOR TSF EMBANKMENT REHABILITATION

KEY

- LOW NAG WASTE ROCK
- HIGN NAG WASTE ROCK
- EXPOSED TAILINGS
- DECANT POND

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OCEANIA TASMANIA
ZEEHAN ZINC TAILINGS MANAGEMENT
STAGE 2

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Figure 02

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Plot Date: 03 October, 2007 - 8:21 AM Cad File No: G:\32\13467\CADD\Drawings\ 32-13467-FIG02.dwg

TAILINGS DISCHARGE NOTES

1. TAILINGS TO BE DISCHARGED FROM EASTERN ABUTMENT.
2. RETRACT DISCHARGE TOWARDS NORTHERN ABUTMENT AS TAILINGS REACH CREST. DISCHARGE POINT RELOCATION EVERY 1 WEEK MIN.
3. TAILINGS BEACH TO BE DEVELOPED. CHARGE DISCHARGE POINT WEEKLY, AS PER BELOW PROCEDURE.
4. AS TAILINGS DISCHARGE IS RETRACED, PLACE HIGH NAG WASTE ROCK FROM UPSTREAM CREST INTO TSF IN PREPARATION FOR UPSTREAM CONSTRUCTION.
5. ONCE DISCHARGE REACHES NORTHERN ABUTMENT RESUME DISCHARGE AT EASTERN END OF TSF. CHANGE DISCHARGE POINT FEQUENTLY TO MINIMISE EXPOSURE TIME OF BEACH.
6. RETRACT DISCHARGE TOWARDS NORTHERN ABUTMENT AS TAILINGS REACHES CREST OF UPSTREAM LIFT.
7. MAX DECANT POND LEVEL FOR STAGE 3 EMBANKMENT IS RL227.8m (ALLOWS FOR STORM RETENTION AND 0.6m FREEBOARD)

CONSTRUCTION NOTES

1. UPSTREAM LIFTS TO BE 2.5m IN HEIGHT.
2. ONCE WASTE ROCK IS PLACED INTO TSF, UPSTREAM CONSTRUCTION TO COMMENCE FROM EASTERN ABUTMENT. FOR SECTION SEE FIG06.
3. DECANT TOWER TO BE RAISED AS REQUIRED.
4. AT COMPLETION OF STAGE 3, CONSTRUCT DECANT TOWER FOR STAGE 4 AND BACKFILL EXISTING DECANT TOWER.
5. STRIPPING OF MATERIAL IN TSF INUNDATION AREA TO BE STOCKPILED FOR TSF EMBANKMENT REHABILITATION

KEY

- LOW NAG WASTE ROCK
- HIGN NAG WASTE ROCK
- EXPOSED TAILINGS
- DECANT POND

GHD CLIENTS | PEOPLE | PERFORMANCE

OCEANIA TASMANIA
ZEEHAN ZINC TAILINGS MANAGEMENT
STAGE 3

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Figure 03

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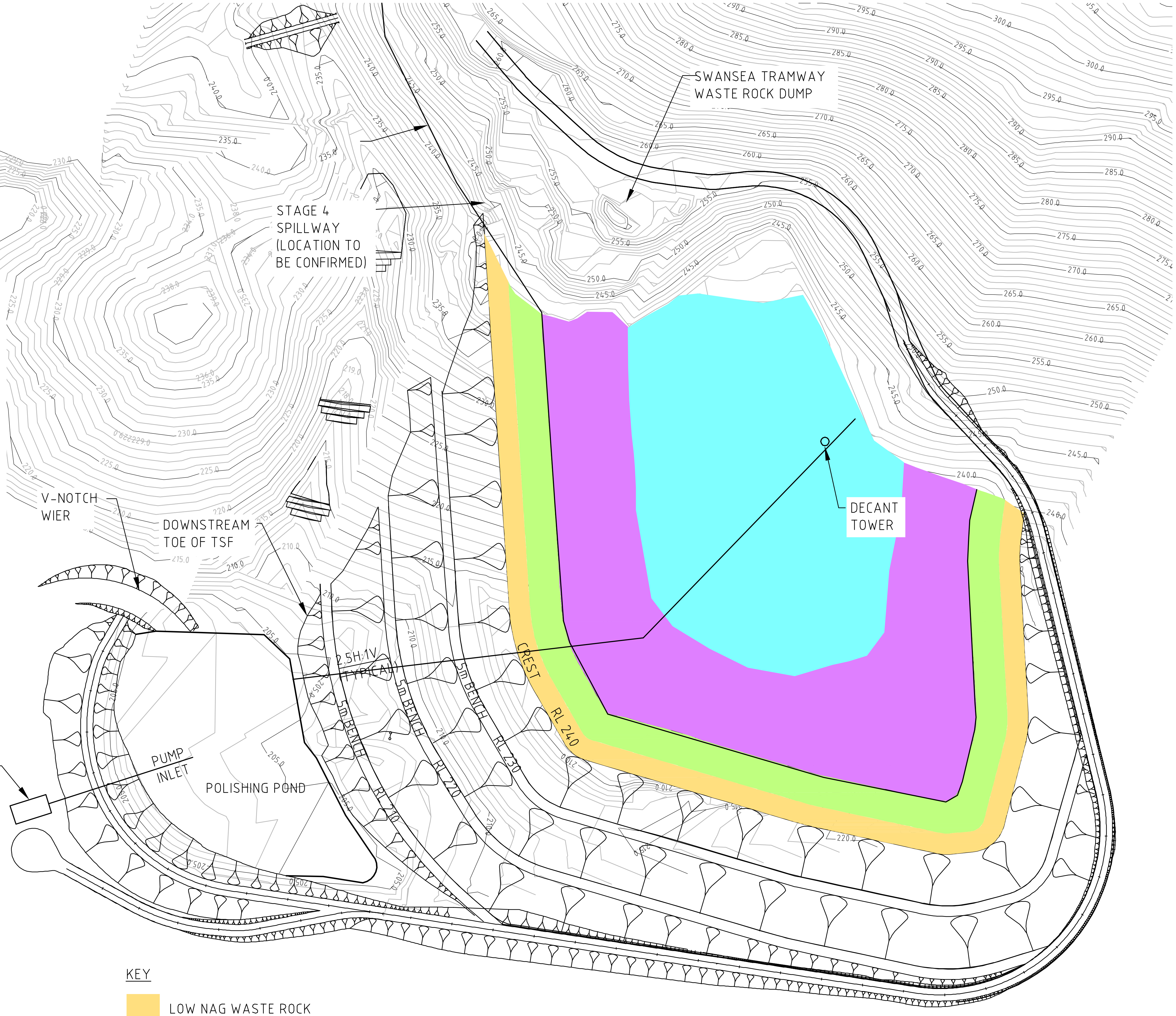
TAILINGS DISCHARGE NOTES

1. TAILINGS TO BE DISCHARGED FROM EASTERN ABUTMENT.
2. RETRACT DISCHARGE TOWARDS NORTHERN ABUTMENT AS TAILINGS REACH CREST. DISCHARGE POINT RELOCATION EVERY 1 WEEK MIN.
3. TAILINGS BEACH TO BE DEVELOPED. CHARGE DISCHARGE POINT WEEKLY, AS PER BELOW PROCEDURE.
4. AS TAILINGS DISCHARGE IS RETRACED, PLACE HIGH NAG WASTE ROCK FROM UPSTREAM CREST INTO TSF IN PREPARATION FOR UPSTREAM CONSTRUCTION.
5. ONCE DISCHARGE REACHES NORTHERN ABUTMENT RESUME DISCHARGE AT EASTERN END OF TSF. CHANGE DISCHARGE POINT FEQUENTLY TO MINIMISE EXPOSURE TIME OF BEACH.
6. RETRACT DISCHARGE TOWARDS NORTHERN ABUTMENT AS TAILINGS REACHES CREST OF UPSTREAM LIFT.
7. MAX DECANT POND LEVEL FOR STAGE 4 EMBANKMENT IS RL238.8m (ALLOWS FOR STORM RETENTION AND 0.6m FREEBOARD)



CONSTRUCTION NOTES

1. UPSTREAM LIFTS TO BE 2.5m. IN HEIGHT.
2. ONCE WASTE ROCK IS PLACED INTO TSF, UPSTREAM CONSTRUCTION TO COMMENCE FROM EASTERN ABUTMENT. FOR SECTION SEE FIG06.
3. DECANT TOWER TO BE RAISED AS REQUIRED.
4. AT COMPLETION OF STAGE 4, CONSTRUCT DECANT TOWER FOR STAGE 5 AND BACKFILL EXISTING DECANT TOWER.
5. STRIPPING OF MATERIAL IN TSF INUNDATION AREA TO BE STOCKPILED FOR TSF EMBANKMENT REHABILITATION

KEY

- LOW NAG WASTE ROCK
- HIGN NAG WASTE ROCK
- EXPOSED TAILINGS
- DECANT POND

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ZEEHAN ZINC TAILINGS MANAGEMENT
STAGE 4

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Figure 04

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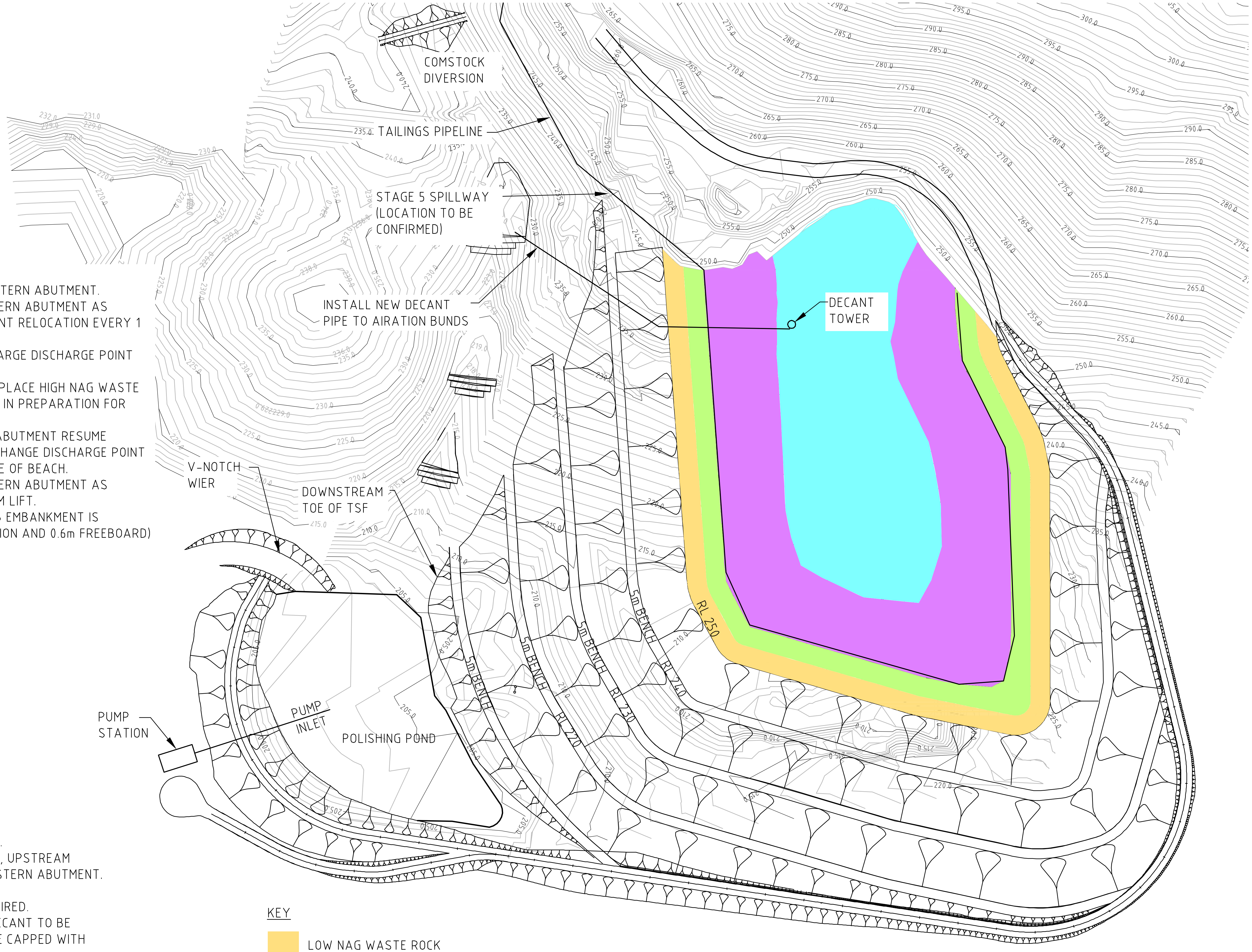
TAILINGS DISCHARGE NOTES

1. TAILINGS TO BE DISCHARGED FROM EASTERN ABUTMENT.
2. RETRACT DISCHARGE TOWARDS NORTHERN ABUTMENT AS TAILINGS REACH CREST. DISCHARGE POINT RELOCATION EVERY 1 WEEK MIN.
3. TAILINGS BEACH TO BE DEVELOPED. CHARGE DISCHARGE POINT WEEKLY, AS PER BELOW PROCEDURE.
4. AS TAILINGS DISCHARGE IS RETRACED, PLACE HIGH NAG WASTE ROCK FROM UPSTREAM CREST INTO TSF IN PREPARATION FOR UPSTREAM CONSTRUCTION.
5. ONCE DISCHARGE REACHES NORTHERN ABUTMENT RESUME DISCHARGE AT EASTERN END OF TSF. CHANGE DISCHARGE POINT FEQUENTLY TO MINIMISE EXPOSURE TIME OF BEACH.
6. RETRACT DISCHARGE TOWARDS NORTHERN ABUTMENT AS TAILINGS REACHES CREST OF UPSTREAM LIFT.
7. MAX DECANT POND LEVEL FOR STAGE 5 EMBANKMENT IS RL248.8m (ALLOWS FOR STORM RETENTION AND 0.6m FREEBOARD)



CONSTRUCTION NOTES

1. UPSTREAM LIFTS TO BE 2.5m. IN HEIGHT.
2. ONCE WASTE ROCK IS PLACED INTO TSF, UPSTREAM CONSTRUCTION TO COMMENCE FROM EASTERN ABUTMENT. FOR SECTION SEE FIG06.
3. DECANT TOWER TO BE RAISED AS REQUIRED.
4. AT COMPLETION OF FILLING TAILINGS DECANT TO BE COVERED AND EXPOSED TAILINGS TO BE CAPPED WITH LOW NAG ROCK.

KEY

- LOW NAG WASTE ROCK
- HIGN NAG WASTE ROCK
- EXPOSED TAILINGS
- DECANT POND

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ZEEHAN ZINC TAILINGS MANAGEMENT
STAGE 5

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Figure 05

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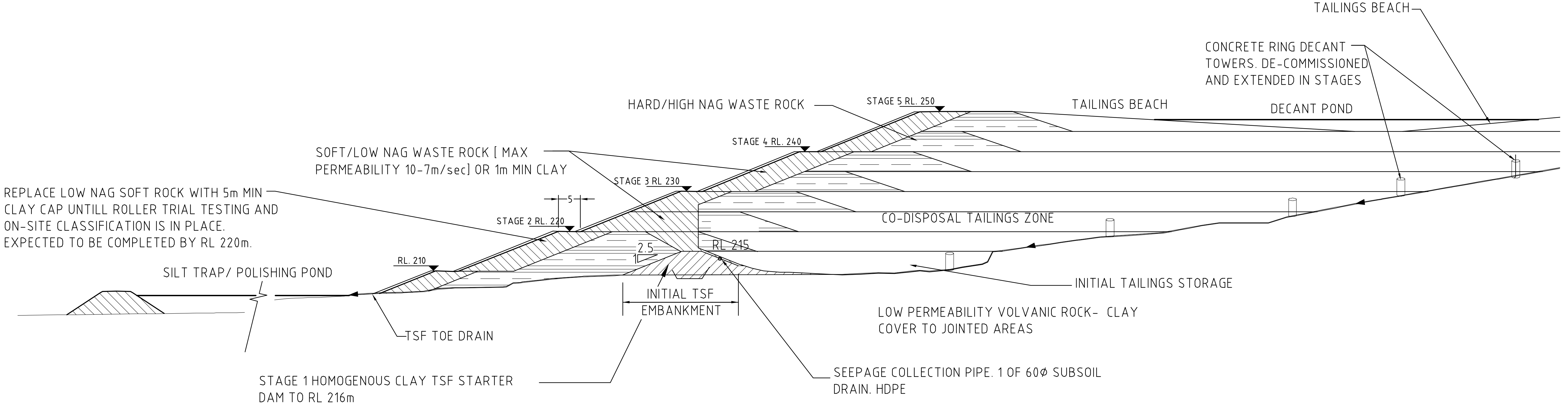

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TYPICAL SECTION

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Figure 06

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Appendix C

Waste Rock Museum

Example Waste Rock Museum

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Document Status

Rev No.	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
0	R.Longey	R.Virtue	**R.Virtue*	J.Burgess	[signature]	2/10/07

Appendix B:

Analytical Results of Waste Rock Characterisation Tests – Zeehan Zinc (2006)

Analytical results of waste rock characterisation tests conducted by Zeehan Zinc

Results provided by Paul Heath (Zeehan Zinc) in March 2006.

Date Sampled	**Sample Type**	**Sample**	**NAPP**	**NAG**	**NAG pH**	**ANC% $CaCO_3$**	**% S**
6 October 2000	CWRD (CMD1)	CWRD (CMD1)	63	50	2.5	11	2.6
	CWRD (CMD2)	CWRD (CMD2)	56	47	2.6	8.2	2.3
	STWRD 1	SWD 1	66	59	2.4	0.6	2.4
	STWRD 2	SWD 2	94	81	2.3	1.4	3.3
30 August 2002	Waste Rock 01-02	WR01-02	-1.78	1.96	6.1	0.4	0.10
	Waste Rock 02-02	WR02-02	-0.97	2.69	3.3	0.3	0.29
	Waste Rock 03-02	WR03-02	-1.08	1.47	6.3	0.4	0.09
	Waste Rock 04-02	WR04-02	-0.20	1.23	4.9	0.3	0.15
	Waste Rock 05-02	WR05-02	-6.03	5.64	3.7	0.1	0.13
	Waste Rock 06-02	WR06-02	0.50	2.2	6.2	0.2	0.03
	Waste Rock 07-02	WR07-02	-0.37	0.74	6.6	0.2	0.03
	Waste Rock 08-02	WR08-02	-0.37	0.74	6.7	0.1	0.03
	Waste Rock 09-02	WR09-02	-4.98	3.18	3.8	0.1	0.08
	Waste Rock 10-02	WR010-02	-2.15	1.96	5.5	0.1	0.03
	Waste Rock 11-02	WR11-02	-0.78	3.43	5.8	0.1	0.05
	Waste Rock 12-02	WR12-02	4.61	102.9	2.4	0.1	4.35
	Drill core SY021 (2-3M)	SY021 (2-3M)	-88.52	<0.5	8.2	11.6	1.44
	Drill core SYO21 (8-11M)	SYO21 (8-11M)	10.48	88.2	2.4	0.4	4.28
	Drill core SYO22 (1.3-6.2M)	SYO22 (1.3-6.2M)	-2.27	1.47	4.1	0.2	0.12
	Drill core STO22 (6.2-10.8M)	STO22 (6.2-10.8M)	-4.87	<0.5	9.3	1.3	0.03
	Drill core SYO22 (13-14M)	SYO22 (13-14M)	13.18	98.98	2.3	0.3	4.04
30 September 2003	STWRD 1	STWRD 1	4.1	33.31	2.1	0.1	2.98

Date Sampled	Sample Type	Sample	NAPP	NAG	NAG pH	ANC% $CaCO_3$	% S
	STWRD 2	STWRD 2	1.6	31.2 9	2.3	0.1	1.11
	Main Lode Comstock Creek (R1)	Main Lode Comstock Creek (R1)	3.3	2.52	6.7	0.4	0.02
	Main Lode Comstock Creek (R2)	Main Lode Comstock Creek (R2)	-213.3	<0.5	9.8	42.9	0.08
20 May 2004	STWRD	STWRD	7.6	24	2.8	-	0.95
2 August 2005	STWRD 1	STWRD 1	-	<0	3.6	-	-
	STWRD 2	STWRD 2	-	29.4	2.4	-	-
15 February 2006	Drill core SYO33 0-1 (W)	SYO33 0-1 (W)	0.19	5.88	3.45	0.14	1250ppm
	Drill core SYO33 3-4 (W)	SYO33 3-4 (W)	0.63	6.86	3.30	0.13	2680 ppm
	Drill core SYO33 28-29	SYO33 28-29	-47.1	<0.5	7.81	14.3	2.84
	Drill core SYO34 1-2 (W)	SYO34 1-2 (W)	-1.09	2.94	3.64	0.16	1770 ppm
	Drill core SYO34 12-13 (W)	SYO34 12-13 (W)	0.78	<0.5	9.36	5.59	3490 ppm
	Drill core SYO41 1-2 (W)	SYO41 1-2 (W)	0.53	2.45	3.82	0.18	1680 ppm
	Drill core SYO41 2-3 (W)	SYO41 2-3 (W)	-0.93	3.43	3.93	0.28	1630 ppm
	STWRD - Upper	STWRD - Upper	-14.0	3.92	3.63	0.06	-
	STWRD - Lower	STWRD - Lower	-4.08	15.7	2.9	0.06	-