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Orica Australia Pty Ltd

Orica Management Plans

Soil Management Plan

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Revision 0

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

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List of Abbreviations

ANZECC	Australian & New Zealand Environment and Conservation Council
ARMCANZ	Agriculture and Resource Management Council of Australia and New Zealand
ASS	Acud Sulfate Soils
BTEX	Benzene, Toluene, Ethyl Benzene, Xylenes
CLM Act	Contaminated Land Management Act 1997
DECCW	Department of Environment, Climate Change and Water
EIL	Ecological Investigation Level
EPA	NSW Environment Protection Authority
EPL	Environmental Protection Licence
HBSIL	Health Based Soil Investigation Level
HIL	Health Investigation Level (relating to defined land use scenario)
IARC	International Agency for Research on Cancer
JSERA	Job Safety and Environmental Risk Analysis
mg/kg	Milligrams per kilogram (generally equivalent to parts per million)
mg/L	Milligrams per litre (generally equivalent to parts per million)
µg/L	Micrograms per litre (generally equivalent to parts per billion)
NATA	National Association of Testing Authorities of Australia
NEHF	National Environmental Health Forum
NEPC	National Environment Protection Council
NEPM	National Environment Protection (Assessment of Site Contamination) Measure (1999)
NHMRC	National Health and Medical Research Council
OCP	Organochlorine Pesticide
PAH	Polycyclic Aromatic Hydrocarbon
PCB	Polychlorinated Pesticde
RAP	Remediation Action Plan
TC	Threshold Concentration – see definitions
TPH	Total Petroleum Hydrocarbons
VOC	Volatile Organic Compounds

1. Introduction

1.1 Project Background

Orica Australia Pty Ltd (Orica) has obtained approval from the NSW Minister for Planning for the expansion of its existing Ammonium Nitrate Production Facility located on Kooragang Island.

The proposed expansion of the ammonium nitrate facility would primarily require:

- An additional Nitric Acid Plant (NAP4).
- An additional Ammonium Nitrate Plant (ANP3).
- Modification of the existing Ammonia Plant.
- Additional storages for nitric acid, solid ammonium nitrate and ammonium nitrate solution.
- Upgrading of existing infrastructure such as cooling towers, air compressors, loading facilities, electrical systems, effluent treatment systems and the steam system.

Currently, ammonium nitrate (AN) is produced onsite as a precursor for use in the manufacture of commercial explosives for the mining and quarry industries. AN product is produced either in solution form or as one of three solid forms. Minor quantities of ammonia and nitric acid from the facility are also sold.

The Orica Kooragang Island Facility is located on the south-eastern most part of Kooragang Island, within the Port of Newcastle. The surrounding area is industrial. The nearest residential premises are located at Stockton, approximately 800m to the east of the facility.

1.2 Project Description

The proposed expansion includes the following:

- An upgrade to the existing Ammonia Plant to increase its capacity from 295 ktpa to 360 ktpa.
- Construction and operation of an additional Nitric Acid Plant (NAP4), which would produce approximately 260 ktpa of nitric acid, increasing the total capacity of the facility from approximately 345 ktpa to 605 ktpa.
- Construction and operation of an additional Ammonium Nitrate Plant (ANP3) to produce increased volumes of Ammonium Nitrate Solution (ANS) and the solid prilled product Nitropril®. The third Ammonium Nitrate Plant would enable the facility to increase its maximum capacity from 500 ktpa to 750 ktpa.
- Construction and operation of additional storages for nitric acid, solid ammonium nitrate and ammonium nitrate solution.
- Some additional infrastructure such as cooling towers, effluent treatment system and boiler.

The proposed expansion also includes construction of additional minor storage facilities and improvements to product loading facilities for road. There are also current investigations into the resumption of rail for transporting materials.

1.3 Purpose

This Soil Management Plan (SMP) forms part of the Construction Safety Environmental Management Plan (CSEMP) for the Project. The SMP has been prepared to provide guidance for the construction of the Project with respect to the management of potentially contaminated soils and groundwater that may be disturbed during the works or potential acid sulfate soils (ASS).

Where possible, construction works will be designed to minimise the potential to intersect groundwater or potentially contaminated or acid sulfate soils.

1.4 Objectives

The key objectives of this plan are to identify the following:

- Occupational Health and Safety (OH&S) and environmental management requirements for dealing with contaminated soils or acid sulfate soils.
- Requirements for the management of soil and soil stockpiles, including:
  - Procedure for handling and treatment of expected contaminated or acid sulfate soils (such as segregation of soil types, suitable areas for stockpiling, additional sampling).
  - Contingency plan to deal with unexpected discovery of contaminated soils or acid sulfate soils.
  - Requirements for the management of groundwater during excavations.
  - Requirements for waste disposal and classification of surplus soil to be disposed off site.

The procedures described in this section are a minimum requirement for any applicable works.

2. Potential Issues

2.1 Potential Contaminants of Concern

Groundwater and soil investigations have been undertaken at the Orica facility since the late 1990's. The main potential contaminants of concern identified at the facility are arsenic, ammonia/ammonium and nitrate/nitrite.

Arsenic contamination has previously been identified within the Former Sludge Disposal Pit, located approximately 200 metres west of the Ammonia Plant, which was reportedly used for the storage of arsenic sludge and runoff from the Ammonia Plant. The pit was decommissioned in 1997 with remaining waste material removed and treated. Low levels of arsenic contamination were identified in the Ammonia Plant area and a former pit in the Nitrates area (AECOM,2009). Groundwater investigations conducted by HLA prior to 2000 identified concentrations of arsenic in these areas above guideline concentrations (AECOM, 2009). Remediation works have subsequently been undertaken in the vicinity of the Former Sludge Disposal Pit. Investigation and remediation activities are continuing to address residual contamination associated with the pit and these are being undertaken in accordance with a Voluntary Management Agreement (VMA) with the Department of Environment, Climate Change and Water (DECCW).

Ammonia contamination has also been previously reported across the site in a number of locations. The primary source of ammonia contamination is believed to have been the Ammonia Storage Scrubber, where liquids resulting from water scrubbing of ammonia vapour were discharged to the subsurface (AECOM, 2009). Remediation works were completed in early 2005 and monitoring of the natural attenuation of the contamination is continuing to be undertaken.

In addition, ammonium nitrate contamination of groundwater was identified in the vicinity of the Ammonium Nitrate Despatch Area, Borrow Pit (located south of the Nitrates Effluent Pond) and associated with the storage of ammonium nitrate in the southern area of the site. Source control activities were undertaken to address the source of the ammonium nitrate and periodic monitoring of the natural attenuation continues to be undertaken.

Drawing 10-20000-19 in Appendix A, shows the locations of known contamination issues, both existing and the subject of completed source control activities, at the Orica site.

2.2 Acid Sulfate Soil

The Newcastle Acid Sulfate Soil (ASS) Map describes Kooragang Island as "Disturbed Terrain". The Department of Land and Water Conservation (DLWC) (1997) Acid Sulfate Soil – Planning Mapping identifies five classes of land based on the probability of the occurrence of ASS for planning purposes. The Kooragang Island site falls within Class 2 on the Potential Acid Sulfate Soils Planning Map (DLWC, 1997). Areas with Class 2 soils require development consent for any works below the ground surface or for works that may lower the groundwater table.

ASS screening tests were undertaken in one borehole during Geotechnical Investigation undertaken by Douglas Partners (2009). The screening tests undertaken suggest that soils from this single borehole are unlikely to be ASS.

3. Relevant Guidelines and Polices

Construction works on the site are required to be undertaken in accordance with various environmental legislation and government guideline documents. The primary Acts, Regulations and Guidelines are listed below with a brief summary of their applicability. Please note, however, that this list is not intended to be a comprehensive listing of acts and regulations and their specific requirements. The Environmental Officer and contractors are required to satisfy themselves that all applicable permits and licences have been obtained and their conditions satisfied.

3.1 Relevant Environmental Legislation, Guidelines and Policies

Protection of the Environment Operations Act 1997 (POEO Act)

The POEO Act aims to protect, restore and enhance the quality of the environment. Under the Act, it is an offence to pollute the environment. The Act has consolidated several pieces of previous environmental legislation. The Act administers a number of related regulations, and also controls the transport and disposal of wastes.

Protection of the Environment Amendment (Scheduled Activities and Waste) Regulation 2008

This regulation contains general environmental obligations for waste activities, waste facilities and waste transporters, and special provisions relating to matters such as contaminant immobilisation approvals and the management of particular wastes (including asbestos waste).

Contaminated Land Management Act 1997 (CLM Act)

The CLM Act controls the assessment of contamination and requirement for remediation of soils and groundwater. The act also contains guidance for the duty to report contamination and and allows for accreditation of Site Auditors.

Water Act 1912 and Water Management Act 2000

These Acts include requirements for licensing and approval for groundwater extraction.

Waste Avoidance and Resource Recovery Act 2001 (WARR Act)

The WARR Act replaced the *Waste Minimisation and Management Act 1995* and controls waste generation and waste reduction.

Environmentally Hazardous Chemicals Act 1985 (EHC Act)

The EHC Act contains guidance for waste classification and disposal of some waste types. It also provides for the licensing of related activities.

State Environmental Planning Policy (SEPP) 55 'Remediation of Land'

SEPP 55 relates to the decision making process in undertaking remediation of land and making planning decisions in regard to contaminated and potentially contaminated land.

NSW DECC Waste Classification Guidelines 2009

Provides practical guidance in the relevant requirements of the POEO Act and the Waste Regulations.

ANZECC/ARMCANZ Australian and New Zealand Guidelines for Fresh and Marine Water Quality 2000

Sets water quality guidelines for discharges into fresh and marine water resources.

National Environment Protection (Assessment of Site Contamination) Measure 1999

This measure sets guidelines for the assessment of land contamination. It includes recommended soil and groundwater assessment criteria for a variety of land uses.

Occupational Health and Safety Act 2000

This is the overarching Act for NSW setting law relating to employee health and safety and employer responsibilities.

Occupational Health and Safety Regulation 2001

This regulation sets Regulations and details the duties for employers to achieve required employee health and safety performance.

Polychlorinated biphenyl (PCB) chemical control order 1997

This order provides specific requirements for the management control, storage, transport and disposal of PCB containing materials and waste.

ASSMAC, 1998. *Acid Sulfate Soil Manual*, Acid Sulfate Soil Management Advisory Committee

This manual sets guidelines for the assessment and management of acid sulfate soils.

3.2 Environment Protection Licence

The Orica Kooragang Island site holds an Environment Protection Licence (EPL No. 828) that includes several conditions that need to be considered in the management of contaminated soil and groundwater and potential acid sulfate soils, including water and waste management. The EPL shall be consulted in the development of specific management plans.

3.3 Minister for Planning's Conditions of Approval (MCoA)

The Minister for Planning's Conditions of Approval (MCoA) No. 08-0129 requires that the project meet the following requirements in relation to the management of soil during construction activities:

Contamination

38 Prior to construction of the Project, the Proponent shall provide the Director-General a detailed Project Site Plan showing the location of known soil and groundwater contamination issues. If the plan identified that construction of the Project is likely to impact on known contamination areas, the Proponent shall prepare and implement a Remedial Action Plan (RAP), or update the existing RAP, to manage and remediate contaminated material in accordance with the requirements of the *Contaminated Land Management Act 1997* and the recommendations of the RAP.

39 Prior to construction of the Project, the Proponent shall prepare an Acid Sulfate Soil Management Plan in accordance with the Acid Sulfate Soil Manual, Acid Sulfate Soils Management Advisory Committee 1998.

4. Roles and Responsibilities

The personnel responsible for the implementation of this SMP, to ensure compliance with regulatory requirements and to ensure safe and effective management of contaminated soil and groundwater and acid sulfate soils at the site are specified in Table 4-1.

Table 4-1 Parties Involved in this SMP and Associated Responsibilities

Title	Responsibility
Project Manager	The Project Manager is responsible for: ◗ Reviewing this plan. ◗ Providing sufficient resources to ensure the SMP practices are implemented. ◗ Continual monitoring of project environment performance to ensure compatibility and continued effectiveness with the policy and objectives.
Site Project Manager	The Site Project Manager is responsible for: ◗ Implementing this plan. ◗ Liaising with the Project Environmental Representative to manage issues associated with contaminated soil/groundwater and acid sulfate soils.
Project Environmental Representative	The Project Environmental Representative is responsible for: ◗ Maintaining and updating this plan. ◗ Educating relevant staff and contractors to ensure all are aware of their obligations under this plan. ◗ Coordinating any investigations required under this plan. ◗ Being the first point of contact in relation to contamination and acid sulfate soil issues.
Other personnel	Other staff and contractors of the proponent are responsible for: ◗ Being aware of their obligations under this plan. ◗ Being aware of the potential existence of contamination and acid sulfate soils in their work area and specific actions required under this plan with regards to handling, storage and disposal. ◗ Immediately inform their supervisor should any contamination impacts be identified.

5. Preliminary Assessment for Contamination and ASS

5.1 Preliminary Soil and Groundwater Contamination Assessment

Where possible, a preliminary investigation shall be undertaken prior to the commencement of construction excavation activities to identify whether soil or groundwater contamination is likely to be encountered. This shall include the sampling of soil and/or groundwater in the area to be excavated, analysis of the samples and comparison of the results with National Environment Protection Council's investigation levels detailed in *Schedule B(1) Guildeline on the Investigation Levels for Soil and Groundwater National Environment Protection* (NEPC, 1999a). If the excavated material is to be taken offsite then the results shall be compared with the DECCW's *Waste Classification Guidelines: Part 1 Classifying Waste* (DECCW, 2009).

Analytes to be investigated will be identified during the development of the preliminary investigation and may include arsenic, cadmium, chromium, copper, lead, nickel and zinc for soils and groundwater. For groundwater samples further analysis for pH, nitrate/nitrite and ammonia may be undertaken. Additional analytes may be identified depending upon the location of the proposed works, such as BTEX, TPH, VOC's and PAH's.

This preliminary review will identify whether their specific management plans or controls are to be implemented during the construction activities, with Section 6.1 detailing guidelines for the development of requirements.

5.2 Preliminary Acid Sulfate Soil Assessment

5.2.1 Sampling Plan

Prior to construction a soil sampling program will be employed to assist in characterising the potential extent and severity of ASS at the Site. The number of boreholes to be drilled will be in accordance with the ASSMAC guidelines (1998) as shown in Table 5-1. The depth of each borehole should extend to 1 m below the maximum depth of excavation.

Table 5-1 Minimum Number of Sampling Holes

Area of Site	Number of Holes
Up to 1 ha	4 holes
1-2 ha	6 holes
2-3 ha	8 holes
3-4 ha	10 holes
>4 ha	2 holes/ha

Soil samples will be collected at intervals of 0.5 m or change in strata at each borehole and tested in accordance with ASS field screening methods as outlined in Appendix 1 of the ASSMAC guidelines (1998). Field screening tests will assist in determining whether ASS are present at the Site and will assist in the selection of samples for further laboratory testing as required. Field screening and the selection of samples for further laboratory testing will be undertaken by a suitably qualified person in accordance with ASSMAC guidelines (1998). Laboratory testing to confirm the presence and severity of ASS will consist of SPOCAS (Suspension Peroxide Oxidisable Combined Acidity and Sulphide).

5.2.2 Assessment Criteria

The ASSMAC action criteria for treatment of ASS are presented in Table 5-2. These action criteria relate to soil disturbances and the requirement for soil treatment regimes and management plans. If the Net Acidity values from laboratory SPOCAS testing exceed the nominated action criteria an ASSMP will be prepared.

Table 5-2 Action Criteria for Treatment of ASS

Soil Texture	Clay Content %	< 1000 Tonnes Disturbed		> 1000 Tonnes Disturbed	
		Sulphur Content %	Acid Trail mol/tonne	Sulphur Content %	Acid Trail mol/tonne
Coarse (sands-gravels)	≤ 5	0.03	18	0.03	18
Medium (sandy loam-light clay)	5 - 40	0.06	36	0.03	18
Fine (medium to heavy clays, silty clays)	≥ 40	0.10	62	0.03	18

6. Management Measures

6.1 Contaminated Soil and Groundwater Management

In the event that potentially contaminated soil and groundwater is identified a management plan will be developed to ensure that the material is managed in accordance with regulatory requirements. This management plan will include arrangements to address the following issues:

6.1.1 General Site Controls

All personnel, including Orica employees, contractors and sub-contractors are required to meet the requirements detailed below:

Site Access

The construction area shall be securely fenced and designated work areas (excavation and stockpile zones) controlled to prevent unauthorised persons from accessing the work area. This includes preventing access to excavations or stockpiles, and subsequently gaining direct access to contaminated soils or groundwater, or to areas of operating machinery.

Access arrangements to the work area shall be identified and shall include a specific induction, or equivalent briefing, on the requirements for accessing any area with potential contamination.

Induction

All personnel working or entering an area where potential contamination has been identified shall be provided with additional information, during the specific induction or equivalent briefing, on the requirements of the SMP including (but not limited to) the following topics:

- Identification of the type and locations (area and depth) of identified contamination.
- Identification of hazards associated with contaminated soil and waste materials and risk control measures.
- Site specific safety rules for contamination.
- Accident, emergency and evacuation procedures for incidents involving contamination and knowledge of any associated equipment on site.

Records

For each person likely to be exposed to a hazardous substance, records shall be kept for the following:

- Results of occupational hygiene monitoring or health assessments will be retained in accordance with Orica standard requirements.
- Records of specific inductions or equivalent briefings on the site-specific training undertaken by the person.

6.1.2 Soil Management

Excavation

The following sequence of steps shall be determined prior to commencing any excavation operations on the site:

- The boundaries of the area to be excavated.
- The expected depth of excavation.
- The manner in which materials are to be excavated and stockpiled.
- In the event that dewatering of the area is required, the expected depth of the dewatering and the management of the water shall be identified.
- The areas where stockpiling of excavated material and imported fill material can take place.
- The importance of separating fill and natural soils and identifying and segregating any potentially contaminated material during excavation and stockpiling operations.

- Prior to the commencement of excavations in the given area erosion and sediment control measures, as identified in the Erosion and Sediment Control Plan shall be implemented.
- All excavation works shall be carried out in a manner that minimises the mixing of different material types, i.e. contaminated fill and “clean” underlying natural soils. Potentially contaminated material shall be segregated and stockpiled separately.
- Removal of any in-ground or underground structures should be undertaken in conjunction with, or following excavation of contaminated soil, to avoid potentially mixing contaminated and uncontaminated materials. Removal of these structures may reveal additional areas of contamination requiring remediation.
- All excavated material that will require off-site disposal will be classified and appropriate disposed off-site in accordance with the *POEO Act 1997* and NSW DECC Waste Classification Guidelines, 2009 (DECCW, 2009).
- Upon completion of the excavation the plant and equipment shall be cleaned and decontaminated.

Stockpiles

Stockpiles will be managed in accordance with the requirements detailed in the Erosion and Sediment Control Plan:

- All stockpiles shall be sampled and analysed for potential contaminants of concern which may include nitrate/nitrite, ammonia, total petroleum hydrocarbons (TPH), benzene, toluene, ethyl benzene and xylene (BTEX), heavy metals (As, Cd, Cr, Cu Ni, Pb, Zn), polycyclic aromatic hydrocarbons (PAHs). Sampling and analysis shall be undertaken in accordance with the EPA Sampling Design Guidelines (EPA 1995) and NEPM 1999. Sampling will generally be at a rate of one sample per 25 m^3, or a minimum of 3 samples per “batch” of material.

Re-use of Material Onsite

Material proposed to be re-used on site in areas where it was not originally excavated from shall be validated to ensure it is suitable for the proposed land use from a contamination perspective and will not impact adversely on the drainage of the site. All material re-used on the site should be validated by sampling and analysis of the material in accordance with the EPA Sampling Design Guidelines (1995) and NEPM 1999 to ensure that the material is not contaminated. Sampling will generally be at a rate of one sample per 25 m3, or a minimum of 3 samples per “batch” of material. Samples are to be analysed for contaminants of concern based on the previous site usage / site history of the source site. Potential contaminants of concern may include but are limited to nitrate/nitrite, ammonia, TPH, BTEX, heavy metals (As, Cd, Cr, Cu Ni, Pb and Zn) and PAHs.

Disposal of Soils

Where soil is to be removed from site, it must be classified for waste disposal purposes, and disposed in accordance with the requirements of the *Protection of the Environment Operations Act 1997* and the *Protection of the Environment Operations Amendment (Scheduled Activities and Waste) Regulation 2008 made under the POEO Act 1997* and the *NSW DECC, Waste Classification Guidelines*, *July 2009.*

An experienced environmental consultant should be engaged to oversee the classification of the waste. The material shall be transported in accordance with regulatory requirements and disposed of at an appropriately licensed landfill.

Transport of Material

Transportation of contaminated material shall be undertaken in accordance with the following procedures:

- All the works, including vehicle movements and traffic controls, will be in accordance with the Traffic Management Plan.
- Wastes shall only be removed for off-site treatment or disposal after the material has been classified and written approval has been received for the disposal of the contaminated soil at the nominated treatment or disposal site.
- Waste tracking shall be undertaken in accordance with DECCW requirements. Under the requirements of the POEO Act 1997, special monitoring and reporting requirements apply to wastes classified as hazardous (liquid and non-liquid), industrial, or group A liquid wastes.
- Records of the transport of contaminated materials shall be maintained, including:
  - The transporter’s name and address.
  - The transporter’s DECCW licence number where applicable.
  - The registration number of the vehicle.
  - The type and quantity of waste.
  - The name and address of the person or company the waste was delivered to (the consignee).
  - The date the waste was delivered to the consignee.

  This information may not meet DECCW’s Waste Tracking requirements for the waste types noted in the preceding bullet point. DECCW guidelines must be referred to for such wastes.
- A copy of the waste depot's weight-bridge docket (and corresponding DECCW docket - if relevant) for each load delivered shall be retained. This will ensure material tracking can be maintained.

- Any vehicles used to transport contaminated materials from the site must be operated by a waste transporter who is licensed in accordance with DECCW licensing requirements for the class of waste transported.
- All trucks carrying contaminated materials off-site shall have the exterior of the vehicle, including wheels, thoroughly cleaned down after it has received its load and prior to the vehicle leaving the site. Only vehicles which have clean exterior bodywork and which will not pollute the off-site transportation corridors shall be permitted to leave the site.
- All drivers transporting fill materials from the site should be given a safety instruction brief, detailing the procedures to be followed should spillage of loads or other incidents occur.

Importation of Fill

Fill imported on to the site (if required) shall be assessed, classified and managed in accordance with the NSW DECC Waste Classification Guidelines, Part 1: Classifying Waste (*NSW DECC 2009*). Imported fill is shall also be validated with reference to the NSW Department of Environment and Conservation Guidelines for the NSW Site Auditor Scheme (2nd edition) (*NSW DEC 2006*) to ensure it is suitable for the proposed land use from a contamination perspective and will not impact adversely on the drainage of the site. All fill imported onto the site should be validated by either one or both of the following methods:

- Imported fill should be accompanied by documentation from the supplier which certifies that the material is not contaminated based upon analyses of the material or the known past history of the site where the material is obtained; and/or
- Sampling and analysis of fill material should be in accordance with the EPA *Sampling Design Guidelines* (1995) to ensure that the material is not contaminated with samples analysed for chemicals of concern based on the previous site usage / site history of the source site. As a minimum samples should be analysed for TPH, BTEX, heavy metals (As, Cd, Cr, Cu Ni, Pb, Zn and Hg), PAHs, OCPs and PCBs.

6.1.3 Groundwater Management / Excavation Pump-Out

Groundwater should not be extracted for use without assessment for that particular purpose. Any discharge of groundwater extracted for construction purposes must be managed to prevent unacceptable environmental impacts.

Any work below the water table or other work involving groundwater extraction will require a licence from the NSW Office of Water, under part 5 of the *Water Act 1912*, and the *Water Management Act 2000*. These works include any extraction including excavation pump out. All dewatering works shall be undertaken in accordance with Orica's Construction Safety and Environmental Management Plan and GHD's Acid Sulfate Soil Management Plan.

Options for the management of groundwater recovered from excavation pump out include:

- Recharging of the water table through infiltration of the groundwater in a designated location onsite.
- Discharge of the water to the site effluent system if water quality meets the requirements of the EPL (No. 828) and any associated regulatory requirements.
- Off-site disposal by a liquid waste transporter for treatment/disposal to an appropriate waste treatment/processing facility.

All excavation pump-out water shall be analysed periodically during the pump-out, with analytes potentially including suspended solids, pH, ammonia, nitrates/nitrites, heavy metals (As, Cd, Cr, Cu Ni, Pb and Zn), PAHs, TPH, BTEX.

A plan will be developed for each excavation requiring dewatering to identify the approach to be implemented to manage the groundwater.

6.1.4 Hazardous Materials

- Hazardous and/or intractable wastes arising from the construction works shall be removed and disposed of in accordance with the requirements of the DECCW and WorkCover Authority.

Under the *Protection of the Environment Operations Act 1997* the transportation of Schedule 1 Hazardous Waste is a scheduled activity and must be carried out by a transporter licensed by DECCW.

6.1.5 Remedial Action Plan

The MCoA requires that a Remedial Action Plan (RAP) be prepared, or the existing RAP updated, in the event that construction impacts on known soil and/or groundwater contamination. The DECCW will be consulted in the development or updating of the RAP to ensure that the issue is managed in accordance with regulatory requirements.

6.2 Acid Sulfate Soil Management

This plan outlines the preferred management strategy for dealing with any potential excavated acid sulfate soils and acidified waters generated on the Site during construction activities.

6.2.1 Preferred Neutralising Agents

Soil Treatment

Fine agricultural grade lime with a pH of approximately 8.2 is recommended for the treatment of excavated ASS, due to its high effective neutralising value, stability, high reactive surface area, low concentrations of impurities and lower potential risk to the environment and those handling the agent. If other neutralising agents are used such as dolomite or non-agricultural grade lime it should be noted that dosage rates will need to be recalculated as per the ASSMAC guidelines (1998).

Water Treatment

Hydrated lime is the preferred neutralising agent for the treatment of acidified water as it is more soluble than other forms of lime. Hydrated lime is, however, highly soluble and very alkaline (pH 12) posing potential risks to the surrounding environment and those individuals handling the agent.

Depending upon further investigations and monitoring of the water being removed from excavations or collected from soil stockpiles, a suitable mixing technique adequate for the volumes and quality of water to be treated will be implemented. The hydrated lime must be thoroughly mixed with the water to be treated, and preferably completely dissolved in a smaller aliquot of water prior to addition to the total volume. Further mixing may be encouraged by agitation of the water.

6.2.2 Calculation of Liming Rates

Soil Treatment

The rate of lime application is calculated to neutralise the maximum amount of acid that can be theoretically generated by the complete oxidation of disturbed soil. The amount of pure lime is directly determined from the average of Net Acidity values. In calculating soil liming rates, a safety factor of two times the theoretical liming requirements is recommended. This safety factor accounts for the slow rate of lime reactivity and the possibility of non-homogeneous mixing. A combined correction factor will also need to be applied to typical commercial lime owing to impurities, variations in particle size and moisture content.

Calculations of the liming rates required are to be undertaken in accordance with the methodology provided in the Acid Sulfate Soil Manual (ASSMAC, 1998).

Important Note on Liming Rates

These recommended liming rates require that the lime used for the treatment of ASS must at the least meet the following specifications:

- Neutralising values (NV) of 95.
- 95% of particles < 0.3 mm.
- Moisture content of 5%.
- Fine agricultural lime with pH 8.2.

Water Treatment

Water will be treated to meet the natural pH of the receiving environment (as defined by monitoring), and should meet the relevant water quality guidelines when it is to be released from site.

Any acidic groundwater removed from excavations may require treatment prior to being returned back to the water table. Ideally water pumped out during construction works should be first directed into either impermeable basin or storage containers to be treated prior to release into the environment. Note any pumping of groundwater will require a Groundwater Extraction Licence.

It is recommended that the more soluble hydrated lime be used to neutralise waters rather than agricultural lime. The liming rate for water must be carefully calculated to avoid ‘overshooting’ the desired pH range. The addition of too much hydrated lime can result in severe environmental damage to natural waterways. When neutralising acidified water no safety factor is employed, although monitoring of water should be routinely undertaken during treatment. Liming rates should be based on the mean of a minimum of three pH readings for any storage/treatment basin and ensuring adequate mixing etc, and measurements should be taken at varying depths. If the pH of stored watered “overshoots” the desired pH range an acid such as citric acid, or sulphuric acid should be used to adjust the pH.

Calculations of the liming rates required are to be undertaken in accordance with the methodology provided in the Acid Sulfate Soil Manual (ASSMAC, 1998).

6.2.3 Mitigation Measures- Soil Stockpiles

Soil Management

All ASS material excavated will be transported to the nominated stockpile areas for treatment and containment. Stockpiles shall be kept away from inlet pits to the stormwater network. Due to the location of the site, all stockpiles will be more than a 100m away from creeks, wetlands and other sensitive habitats.

Within the stockpile and treatment area a number of bunded treatment pads will need to be created. The stockpiles should be placed upon treatment pads consisting of an impervious liner (eg. geomembrane liner, concrete slab, or compacted clay) or guard layer (a layer of aglime spread out prior to the placement of soil on the pad to intercept any significant acidity that may leach out of the treatment pile) to prevent acid leaching into the subsurface. If an impervious liner is used a layer of crushed agricultural limestone should be added on top of the impervious liner prior to the placement of excavated material. If a guard layer is used instead of an impervious liner, a layer of compacted non-ASS (0.3 to 0.5m thick) should be placed on the surface of the treatment pad and below the guard layer to restrict the infiltration of leachate from the treated material into the underlying ground surface. The amount of lime to be used in the guard layer should be calculated as outlined in the Queensland Acid Sulfate Soil Management Guidelines (Dear et al., 2002). Reapplication of the guard layer may be necessary under temporary treatment pads, if the guard layer is disturbed or removed with the treated soil.

Upon arrival at the stockpile all acidic soils will be thoroughly mixed with fine agricultural lime at the calculated rate. Lime should be spread over stockpiled material of a manageable size, and placed in layers of a workable depth (approximately 0.3 m), which will allow thorough mixing using mechanical application methods, such as rotary hoeing or tillage. Alternatively, excavated material could be treated in batches in a pugmill.

Where possible, ASS stockpiles shall be covered with a water proof cover to prevent the infiltration of rain water. Erosion and sediment control structures will be constructed to prevent the migration of AAS or treated soils.

Water Management

Where stockpiling of acidic soil is necessary a leachate collection and treatment system will be established including the following:

- Placing the stockpile on an impervious surface.
- Establishing diversion banks upslope to prevent run-off water.
- Stockpile liming areas should be appropriately bunded with non-acidic soils to prevent the migration of leachate and stormwater runoff.
- Establishing catch drains down slope to capture any runoff water.
- Establishing basin or enclosed storage tank to ensure all potentially contaminated water is contained.
- Pumping water that has accumulated at the bottom of excavations to an adjacent basin or enclosed storage tanks and treating with hydrated lime (or equivalent) prior to release back to the water table.

The pH, EC and turbidity of all runoff and leachate water collected from the stockpiles and excavation areas shall be monitored. Water will be treated, where required, to achieve acceptable water quality before being released.

If the quality of water collected from excavations or dewatering spears is within the required water quality parameters set for discharge, this water can be released without the need for treatment or storage.

6.2.4 Monitoring

A monitoring program suitable for the level of environmental risk and the objectives of the mitigation measures shall be developed. The monitoring program is designed to ensure that the proposed mitigation strategies are effective in minimising negative environmental impacts due to acid generation.

The key components of the monitoring program are discussed below.

ASS Management

Where soils have been identified as AAS or potential ASS the following monitoring programme shall be undertaken: The key components of the acidic soil monitoring program are as follows:

- Stockpiled soils should be monitored regularly for pH to ensure acid generation is not occurring and that the liming treatment is adequate. To measure pH approximately 10 g of soil should be mixed with approximately 10 mL of deionised or tap water to make a soil paste from which a pH reading can be taken. It is recommended that a minimum of five locations per 1000 m^3 of stockpile be tested.
- If the average pH of treated stockpile soils is below pH 5.0, further laboratory testing will be required to determine how much additional aglime will be required to neutralise the acidity to below appropriate ASS action criteria (see Table 5.2) (Note: the pH of treated soil should not exceed 8.5). It is recommended that a minimum of three (3) bulk core soil sub-samples from every 1000 m^3 of excavated soil be mixed together to form one bulk sample to be analysed for SPOCAS. If SPOCAS tests indicate that stockpiled soils have not been adequately neutralised, stockpiles must be re-worked and additional lime added until the minimum required standard is meet. This minimum standard is no greater than the appropriate action criteria (see Table 5.2). Aglime quantities should be calculated as detailed in the ASSMAC Guidelines (1998). SPOCAS analysis typically takes up to 10 working days, during which time excavated soils will need to be stockpiled as per Section 6.2.3. If the average soil pH exceeds 5.5 (but below pH 8.5), further SPOCAS testing is not required as the soil is considered neutralised and suitable for re-use /disposal.
- Onsite reuse of soils may be undertaken once soils return a SPOCAS measurement that is below the appropriate action criteria (see Table 5.2). Those treated soils that are not reused onsite should be classified in accordance with the *Waste Classification Guidelines* (NSW DECC, 2009) and the *National Environment Protection (Assessment of Site Contamination) Measure* (NEPC, 1999) to determine offsite disposal/reuse options.
- If at any time during the construction works ASS are thought to have been encountered in areas thought not to be affected by ASS then field pH and peroxide testing will be undertaken to assess the need for mitigation measures.

Acidified Water Management

All water to be discharged from the Site, whether from stockpiles or excavations, will comply with the relevant ANZECC guidelines and EPA licence requirements (if relevant) before being released. It is important to note that secondary reactions, including metal induced hydrolysis and ferrous iron oxidation, may produce additional acidity in acidic soil affected waters. Hence it is important to ensure that waters are not released until pH consistently remains within the specified targets.

The key components of the acidified water monitoring program are as follows:

- Water removed from excavations or stockpile areas and stored in appropriate containment structure/basins should be monitored regularly for pH.
- Where the pH of the collected water falls below the natural pH of the receiving waters, hydrated lime should be added according to the dosage rates calculated.
- If the pH of stored watered “overshoots” the desired pH range a sample should be collected and laboratory analysed to determine the quantity of acid that will be required to neutralise excess alkalinity.

6.2.5 Occupational and Environmental Risk Management

The more soluble, strongly alkaline neutralising agents such as hydrated lime may carry a significant risk to the environment and workers. The risks associated with lime must be controlled and managed as outlined below.

Lime Spillage

Any spillage of the lime during transport to the site, transfer or handling must be contained and cleaned up immediately in accordance with the procedures consistent with the product Material Safety Data Sheet (MSDS).

Adequate spill containment and clean-up equipment must be provided at all locations where lime is being used or stored.

Lime Handling

Prior to the delivery of any chemicals the supplier must provide a MSDS that identifies all of the safety precautions that must be taken when handling the lime.

All workers involved in the handling of the lime must be made aware of these safety precautions and adequate safety equipment and training must be provided.

6.3 Contingency Plan

6.3.1 Initial Response

A Contingency Plan to be followed in the event of unexpected situations involving contaminated soil and groundwater and the identification of acid sulfate soils is required.

Should any unexpected situations be encountered, the following procedures should be followed:

- Stop work and make the area secure.
- Notify the Project Environmental Representative.

- A contingency plan shall be prepared detailing the controls to be implemented to manage the identified issue. This may require the preparation or updating of a Remedial Action Plan.
- The Job Safety and Environmental Risk Analysis (JSERA) and any associated plans will be updated and personnel will be made aware of these changes prior to the recommencement of the activity.

6.3.2 Acid Sulfate Soil Contingency Plan

If the procedures outlined in this ASSMP fail to prevent impacts caused by the excavation of acidic soil at the Site, the following contingency plan must be implemented. The contingency plan is split into two phases: Remedial Action and Restoration Action. The Project Environmental Representative must be notified immediately of the need for either of these actions.

Remedial Action

Immediate remedial action will be required if monitoring results indicate that the performance indicators or quality requirements as specified in this ASSMP are not being achieved.

Remedial action will involve the addition of additional lime and an increase in the frequency of monitoring. More lime should be added where and when necessary.

Restoration Action

When the specified remedial actions fail or if monitoring results identify severe failure of the management strategy to meet the specified criteria, the construction works will cease and all attempts be made to contain the affected soils or water to minimise the possible spread of acidity to non-impacted areas. If additional liming fails to treat the generated acidity, a Restoration Action Plan should be implemented, which will restore conditions back to a pre-construction equivalent.

Prior to the implementation of Restoration Actions an assessment of the Site should be undertaken by a qualified environmental scientist to determine is the reasons for the ineffectiveness of the management strategies.

If the assessment demonstrates the need for the modification of any part of the ASSMP, the Site Project Manager will be notified of all proposed changes prior to the recommencement of the construction activities.

6.4 General Requirements

6.4.1 Personal Protective Equipment

All personnel will be required to wear Orica's standard PPE when working on the site. In addition, in the event of identification of contaminated soil and groundwater or acid sulfate soils the JSERA will be reviewed and additional PPE requirements developed. Depending upon the nature of the issue this may include:

- Disposable coveralls (when working in direct contact with contaminated soils/groundwater).
- Disposable Nitrile Gloves (when working in direct contact with contaminated soils/groundwater).
- Safety goggles and/or faceshields when handling chemicals.
- Dust mask or respirator.

7. Mitigation Measures

Environmental Management Control	Responsibility	Timing
Preliminary investigations to identify the likelihood of encountering contaminated soil and groundwater or acid sulfate soils shall be undertaken in accordance with Section 5 of the SMP.	Site Project Manager/ Project Environmental Manager	Pre-excavation
A management plan shall be developed if the preliminary investigation, or assessment during the excavation, identifies that potentially contaminated groundwater or soil or acid sulfate soils are potentially present in a work area. The plan is to include the relevant requirements of Section 6.1 and Section 6.2 of the SMP.	Project Environmental Manager	Pre-excavation/ Excavation
Materials for the management of ASS shall be maintained onsite if preliminary testing indicates that ASS could be encountered during construction activities.	Site Project Manager	Pre-excavation
A licence shall be obtained for groundwater extraction at the site to enable dewatering to be undertaken.	Project Environmental Manager	Pre-excavation
A Remedial Action Plan shall be developed, or the existing one updated, if construction of the Project is likely to impact on known contamination areas.	Project Environmental Manager	Pre-excavation
If, during the course of the construction activities, additional contaminated groundwater, soil or acid sulfate soil is identified then a contingency plan shall be developed to manage the issue.	Project Environmental Manager	Pre-excavation
Information shall be provided to all personnel involved in the relevant construction activities in the event that contaminated groundwater, soil or acid sulfate soils are identified. This will include information as required in Sections 6.1 6.2 and 6.4 of the SMP.	Project Environmental Manager	Pre-excavation

8. Review

The Soil Management Plan shall be reviewed on an annual basis, or as required, to ensure that appropriate requirements for the management of this issue are in place. The Project Environment Representative shall co-ordinate the review of the plan.

9. References

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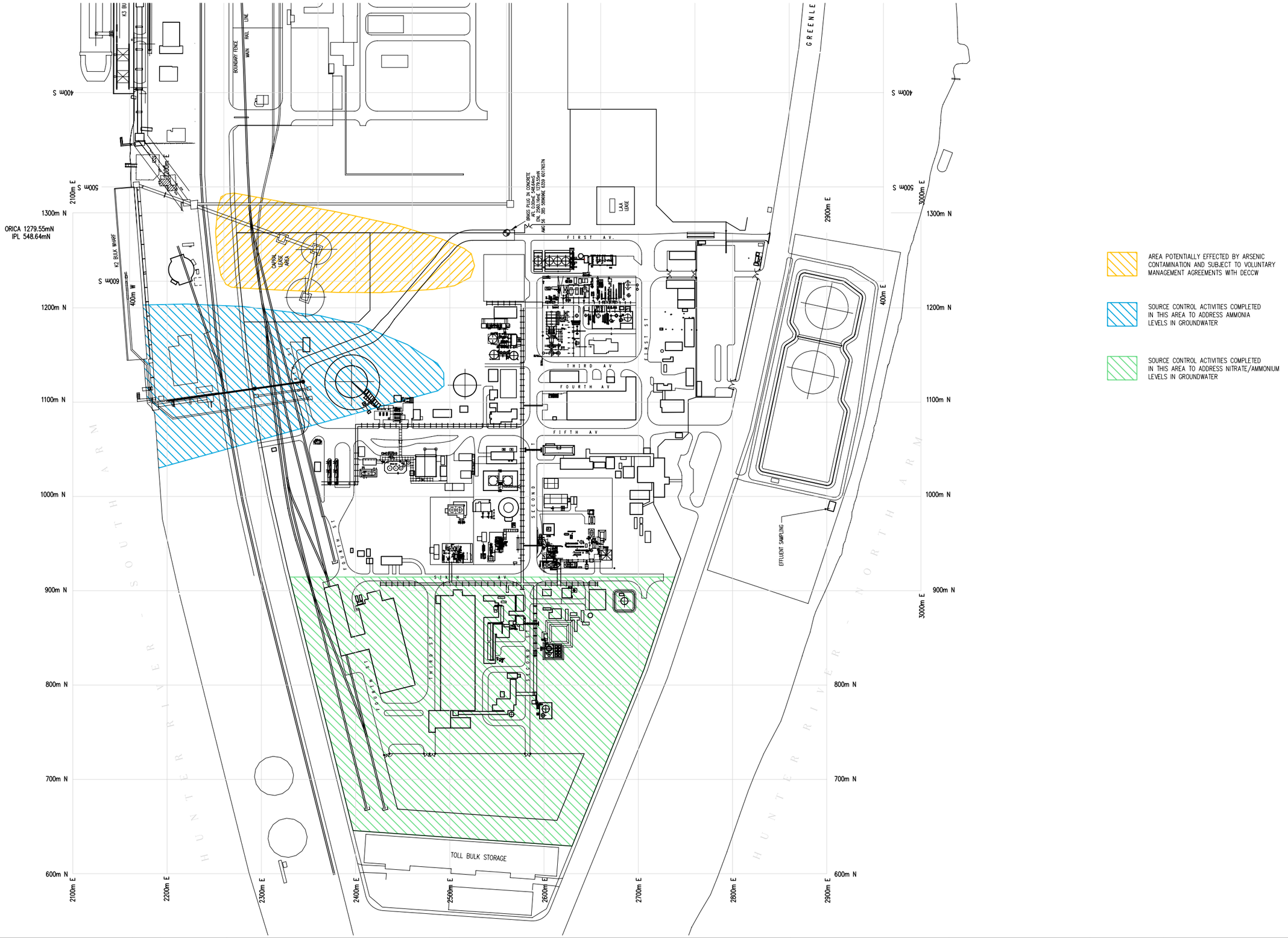
Appendix A

Drawings



AREA POTENTIALLY EFFECTED BY ARSENIC CONTAMINATION AND SUBJECT TO VOLUNTARY MANAGEMENT AGREEMENTS WITH DECCW

SOURCE CONTROL ACTIVITIES COMPLETED IN THIS AREA TO ADDRESS AMMONIA LEVELS IN GROUNDWATER

SOURCE CONTROL ACTIVITIES COMPLETED IN THIS AREA TO ADDRESS NITRATE/AMMONIUM LEVELS IN GROUNDWATER

REV	REVISIONS	DRAWN	APP	DATE	REFERENCE DRAWINGS	DRG.No.

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DRAWN: G Strutt	DATE 04.06.09	SITE KOORAGANG ISLAND	ORICA MINING SERVICES — Kooragang Island Newcastle N.S.W
DESIGNED:	DATE	PLANT SITE GENERAL	TITLE: SITE LAYOUT SITE EMERGENCY DATA REMEDIATION AREAS
CHECKED:	DATE	SECTION DATA SHEETS	
PASSED:	DATE	PROJECT – WO No	SHEET SIZE A1 841 x 594 — DWG No 10-20000-19 — REV
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Document Status

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