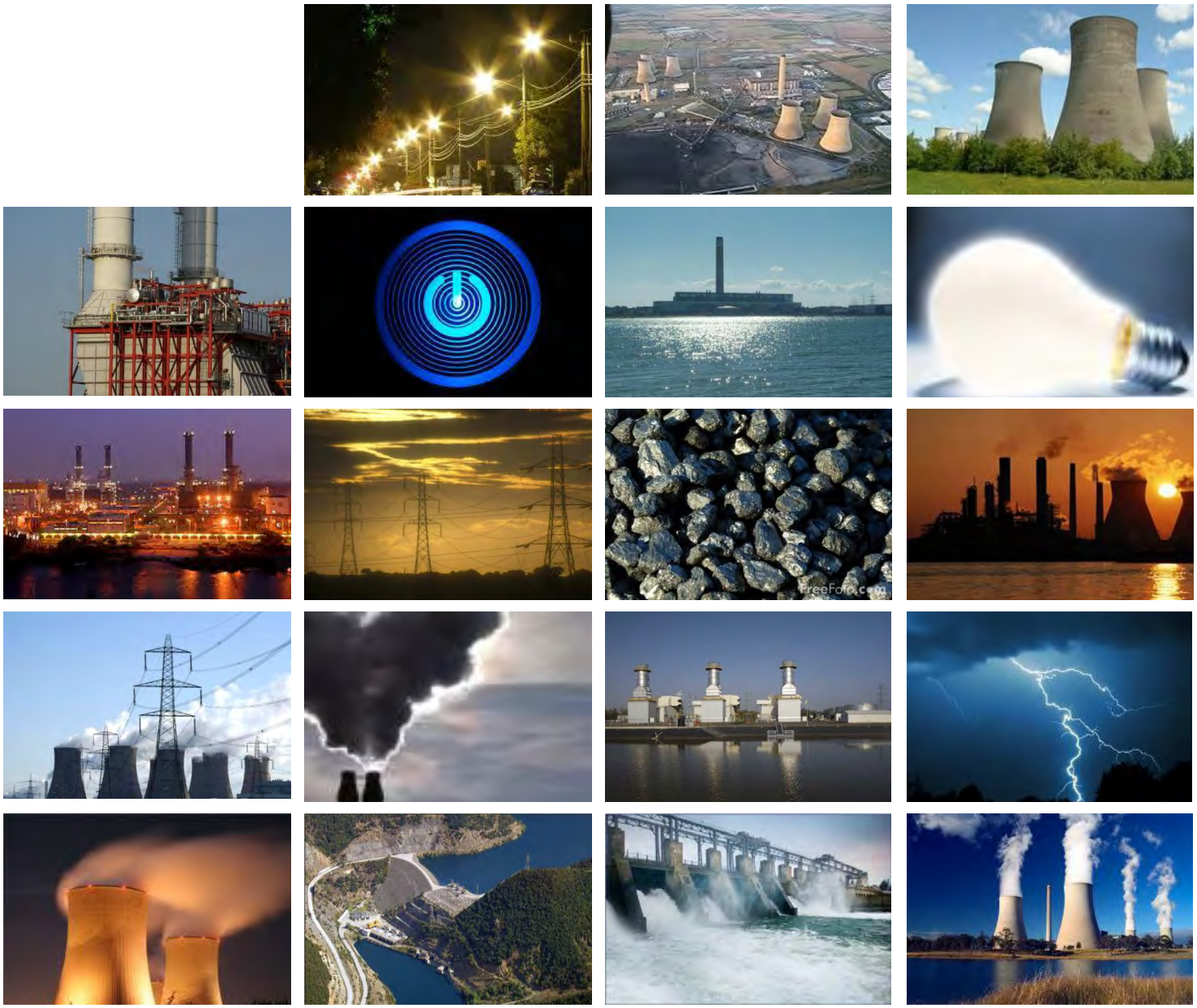

COMMERCIAL IN CONFIDENCE

Delta Electricity – Project Symphony

Vales Point Power Station

Preliminary Environmental Site Assessment

Ref: 0227637RP01_Final

5 February 2014

The world's leading sustainability consultancy

ERM

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Date:	5 February, 2014
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Environmental Resources Management Australia Pty Ltd Quality System

Vales Point Power Station

Preliminary Environmental Site Assessment

Delta Electricity - Project Symphony

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0227637RP01_Final

CONTENTS

CONTENTS

CONTENTS

LIST OF TABLES

EXECUTIVE SUMMARY

ERM was engaged by Delta Electricity to provide advice in relation to potential soil and groundwater contamination issues which may be relevant to the sale of the Vales Point Power Station.

The specific objectives for this stage of ERM's scope of works were to:

- *assess the nature and extent of potential soil and groundwater contamination issues which may be present at the Site;*
- *develop a preliminary Conceptual Site Model; and*
- *develop an abridged Sampling, Analysis and Quality Plan (SAQP) for the future intrusive investigations required to establish a baseline of soil and groundwater conditions present at the Site to support the potential sale of the Site.*

ERM has undertaken this Preliminary Environmental Site Assessment (ESA) which includes background research from a variety of sources as well as management and staff interviews and site visits.

The Preliminary ESA identified a number of potential contamination sources, of which several were determined as Areas of Environmental Concern (AECs) as follows in no particular order:

- *Power Block (B Station);*
- *A Station demolition area;*
- *generator transformer areas;*
- *main store – dangerous goods storage area;*
- *contaminated water treatment plant;*
- *waste oil storage area;*
- *fuel oil installation;*
- *vehicle refuelling depot;*
- *water treatment area;*
- *chlorine plant;*
- *coal storage area;*
- *mobile plant maintenance and refuelling;*

- *sewage treatment plant;*
- *Ash Dam (seepage and discharge to groundwater and surface water receptors);*
- *six asbestos landfills*
- *asbestos pipeline carrying ash slurry*
- *Lake Macquarie sediments (sediments may have accumulated contaminants from Vales Point Power Station drainage and discharges over a lifetime of station operation).*
- *Rail coal unloader area, rail infrastructure and coal transfer lines; and*
- *fly ash plant area.*

In addition, the Preliminary ESA identified potential offsite sources of contamination in association with the Mannering Colliery and Chain Valley Colliery, which are *leased from Delta Electricity for the purpose of coal mining operations.*

Based on the results of the Preliminary ESA undertaken by ERM and consideration of Delta Electricity's intended approach to establishing a baseline of soil and groundwater contamination, a programme of intrusive (Stage 2) assessment of potential soil and groundwater contamination issues is provided.

The most appropriate sampling design is considered to be a judgemental (targeted) sampling of soil, groundwater, surface water and sediments at the established AECs for the Site, which is also considered to provide suitable spatial coverage to act as a baseline assessment.

LIST OF ABBREVIATIONS

AEC	Area of Environmental Concern
ACM	Asbestos Containing Materials
AFFF	Aqueous Film Forming Foam
AHD	Australian Height Datum
ANZECC	Australia and New Zealand Environment Conservation Council
ARMCANZ	Agriculture and Resource Management Council of Australia and New Zealand
ASLP	Australian Standard Leaching Procedure
AST	Above-ground Storage Tank
BTEX	Benzene, Toluene, Ethylbenzene and Xylenes
CEC	Cation Exchange Capacity
COPC	Contaminant of Potential Concern
DNAPL	Dense, Non-Aqueous Phase Liquid
DP	Deposited Plan
DQO	Data Quality Objective
EC	Electrical Conductivity
EDD	Environmental Due Diligence
EIL	Ecological Investigation Level
EPL	Environment Protection Licence
ERM	Environmental Resources Management
ESA	Environmental Site Assessment
ESL	Ecological Screening Level
HIL	Health Investigation Level
HSL	Health Screening Level
LDPE	Low-Density Polyethylene

LEP	Local Environmental Plan
LGA	Local Government Area
LNAPL	Light, Non-aqueous Phase Liquid
m bgl	metres below ground level
m btoc	metres below top of casing
MF	Microfiltration
MGA	Map Grid of Australia
NATA	National Association of Testing Authorities
NEPC	National Environment Protection Council
NEPM	National Environment Protection Measure
NSW	New South Wales
OEH	Office of Environment and Heritage
PAH	Polycyclic Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyls
PFOA	Perfluorooctanoic Acid
PFOS	Perfluorooctane Sulfonate
PID	Photo-ionisation Detector
PRP	Pollution Reduction Plan
PSH	Phase Separated Hydrocarbon
QA/QC	Quality Assurance and Quality Control
RIVM	Netherlands National Institute of Public Health and the Environment
RO	Reverse Osmosis
SEPP	State Environmental Planning Policy
SAQP	Sampling, Analysis and Quality Plan
SOC	State-Owned Corporation
SOP	Standard Operating Procedure

SPR	Source-Pathway-Receptor
SVOC	Semi-Volatile Organic Compound
SWL	Standing Water Level
TCLP	Toxicity Characteristic Leaching Procedure
TDS	Total Dissolved Solids
TOC	Total Organic Carbon
TRH	Total Recoverable Hydrocarbons
UPSS	Underground Petroleum Storage System
UST	Underground Storage Tank
VEDD	Vendor Environmental Due Diligence
VOC	Volatile Organic Compound

1 INTRODUCTION

1.1 BACKGROUND

On 24 November 2011, the New South Wales (NSW) State Government (Government) announced that it would divest certain State-owned electricity generation assets.

In order to support the sale of certain electricity generation assets owned and operated by Delta Electricity (a State Owned Corporation – SOC), ERM were engaged as the Site Contamination Environmental Adviser (the 'Adviser') to provide advice in relation to potential soil and groundwater contamination issues which may be relevant to the transaction. The subject of this report is Vales Point Power Station (the 'Site').

1.2 OBJECTIVE

The specific objectives for ERM's scope of works were to:

- assess the nature and extent of potential soil, sediment, surface water and groundwater contamination issues which may be present at the Site and relevant receiving environments; and
- identify what additional works may be required to establish a baseline of soil, sediment, surface water and groundwater conditions present at the Site to support the potential sale of the asset.

This Preliminary Environmental Site Assessment (ESA) comprises Stage 1 of the overall assessment, with Stage 2 (if required) comprising a detailed ESA in order to achieve the overall project objectives stated above.

1.3 SCOPE OF WORK

The scope of this Preliminary ESA was presented in the ERM proposal dated 21 November 2013 and included the following key elements:

- development of a site history via interviews with employees and review of information such as:
  - relevant documents identified by employees;
  - the database managed by the NSW Office of Environment and Heritage for information on notices issued by the NSW EPA under the *Protection of the Environment Operations Act 1997* and the *Contaminated Land Management Act 1997*;

  - aerial photographs; and
  - civil engineering works records.
- review of existing soil and groundwater reports;
- desktop assessment of the environment in which the Site is set such as site drainage, geology, hydrogeology and soil conditions at the Site and surrounding areas;
- inspection of the Site;
- identification of actual and/or potential soil and groundwater Areas of Environmental Concern (AECs) via:
  - identification of past and present potentially contaminating activities at, and adjacent to, the Site;
  - identification of potentially impacted areas;
  - identification and assessment of the Chemicals of Potential Concern (COPCs) that may have been associated with historical and current use of the Site;
  - evaluation of the possible migration pathways of the COPCs;
  - assessment of the sensitivity of surrounding areas and/or property; and
  - compiling a preliminary Conceptual Site Model (CSM).
- Identifying where Stage 2 intrusive investigations are necessary on the site; and
- Developing a detailed scope-of-works for Stage 2 investigations at each site.

Spatially, the scope of ERM's assessment was limited to those areas shown within the Site boundary presented in *Figures 1* and *2* of *Annex A*.

1.4 MATERIAL THRESHOLD

ERM adopts a technically rigorous approach to assessing potential risks and liabilities during Environmental Due Diligence (EDD), and typically focuses on what is *material* to the transaction. In this situation, a material threshold was applied to items contained within the EDD reports.

Based on ERM's experience of similar projects and discussions with the Client, ERM adopted a material threshold of $0.5M (+ GST if applicable) per contamination source.

In other words, in identifying contamination sources, ERM sought to define actual or potential sources where costs of remediation or management of a source as required by regulators would exceed $0.5M (+ GST if applicable). Remediation or management includes additional assessment, environmental monitoring, management, containment or other remediation measures.

In addition, any issue that ERM considers could have the potential to lead to prosecution by the regulatory authorities that could lead to significant business disruption or reputational impact will be considered material.

1.5 APPROACH AND METHODOLOGY

ERM's approach to the assessment was to break the work down into individual tasks as presented in the following sections.

1.5.1 Review of Existing Data

Relevant environmental information on Vales Point Power Station was made available to ERM via an electronic data room.

In addition, ERM conducted background research using publicly available information on the Site. Background research included those items identified in *Section 3*, and *Annex D*. Following discussions with Delta Electricity and given the timescale of this assessment, the large number of lots comprising the Site, the good level of information available on the history of the Site available from both knowledgeable Delta Electricity personnel and a review of historic aerial photography (refer to *Section 3.2*) a search of historic land titles and S. 149 certificates has not been undertaken.

A site setting review was also undertaken to understand both the sensitivity of the surrounding area to environmental impact and the potential impact on the Site resulting from neighbouring activities, past and present. Key areas addressed included site description and activities, site history, geology, hydrogeology and hydrology (refer to *Section 2*).

1.5.2 Site Visits and Management Interviews

ERM mobilised to Site and completed interviews with Site management and a site inspection on 9 and 11 December 2013.

The assessment focussed on potentially material contamination issues that were considered likely to require further assessment relevant to Bidders and to identify where a baseline assessment may be required. Topics that were evaluated as non-material were not assessed in detail.

During the site visit, discussions and interviews were undertaken with the following staff:

- Environmental Manager – Mr. Bryan Beudeker;
- Project Support Officer – Mr. Atul Verma;
- Environmental Officer – Mr. Greg Sellers
- Environmental Officer – Mr. Shannon Bruce
- Chemical Plant Specialist – Mr. Alex Liddel

1.5.3 Preparation of Stage 1 ESA Report

This Stage 1 ESA Report was prepared in general accordance with the *Guidelines for Consultants Reporting on Contaminated Sites* (NSW OEH, 2011).

In preparing this report, (and in particular the proposed scope of work for Stage 2 assessments) ERM utilised a combination of experience gained in the planning and delivery of similar vendor due diligence projects for government, professional judgement of suitably qualified contaminated land professionals and reference to relevant guidelines made or approved under the *Contaminated Land Management Act 1997*, the National Environment Protection Council (NEPC) (2013) National Environment Protection Council (NEPC) (April 2013) *National Environment Protection (Assessment of Site Contamination) Measure 1999,* NEPC, Canberra*, the* Australian and New Zealand Environment and Conservation Council (ANZECC) (2000) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* and guidelines and technical notes relating to the *Protection of the Environment Operations (Underground Petroleum Storage Systems) Regulation* 2008 (made under the *Protection of the Environment Operations Act 1997*).

1.6 REPORT STRUCTURE

This report has been structured in order to align generally with the requirements for a Preliminary Environmental Site Assessment outlined in NSW EPA (2011) *Guidelines for consultants reporting on contaminated sites.* Where necessary, minor additions and modifications to the structure have been made to accommodate the fact that this assessment is being undertaken for a specific purpose (that being Vendor Environmental Due Diligence - VEDD).

2 SITE DESCRIPTION AND SURROUNDING ENVIRONMENT

2.1 SITE IDENTIFICATION

Vales Point Power Station is owned and operated by Delta Electricity, a State Owned Corporation (SOC) that manages two electricity generating assets located on the Central Coast of NSW, Australia.

Vales Point Power Station is situated adjacent to the southern shore of Lake Macquarie, near the township of Mannering Park, approximately 35 km south of Newcastle, NSW. The approximate coordinates of the Power Station are 33°09'58.08"S and 151°32'34.09"E.

The Site encompasses land contained within two local government areas: the Wyong and Lake Macquarie Local Government Areas. The Lot and Deposited Plan (DP) information relevant to the Site, along with the current land zoning for the various parcels of land as per the Wyong Shire Council Local Environmental Plan (1991) and Lake Macquarie Local Environmental Plan (2004), is outlined in *Section 3.3*. The Lot and DP information relevant to the Site is summarised in *Annex C*. A Site Location Map is provided as *Figure 1*, and the Site boundaries are provided as *Figure 2* of *Annex A*.

A number of parcels of land within the Delta Electricity property boundaries are subject to mining leases and have been excluded from the PESA scope of works. These areas have been considered to be potential offsite sources of contamination, for the purposes of this assessment. These areas include;

- The Mandalong coal unloader;
- The Mannering Colliery; and
- The Chain Valley Colliery.

These areas are detailed in *Figure 2 of Annex A*.

The Microfiltration (MF) Plant is located at the Mannering Park Sewage Treatment Plant, immediately to the east of the Vales Point Site. It is understood that the MF Plant site is leased from the Wyong council but that Delta Electricity owns the Plant equipment. This area has also been excluded from the PESA scope of works.

2.2 SITE DESCRIPTION

2.2.1 Overview

The total Site area of the Vales Point Power Station is approximately 1700 hectares (ha), which includes water canals, but excludes areas for associated mines. The Power Station operational area itself occupies approximately 180 ha.

The majority of the Site is undeveloped and comprises 'buffer' lands which separate the surrounding residential areas from the Power Station. The layout of the Site operational areas is provided as *Figure 3*. Photographs of the Site are presented in *Annex B*.

2.2.2 Site Layout

Vales Point Power Station was built in the 1960s as a four-unit station ("A Station"). These generating units were decommissioned in the late 1980s. Vales Point now operates two 660 MW generating units, with a total generating capacity of 1,320 MW of electricity ("B Station").

At the time of ERM's Site inspection in December 2013, Delta Electricity was removing the aboveground A Station structures from the Site. The demolition project commenced in late August 2011 and was scheduled for completion in early 2014. The demolition project involves the removal of the turbine house, four boilers, cladding, concrete and steel from the Site. The existing Vales Point B Station will remain operational.

Further information on electricity generation and distribution processes is presented in *Section 4*.

The Site is composed of the following key features:

- Vales Point Power Station and associated infrastructure;
- Ash Dam and associated pipelines for ash slurry and return water;
- coal storage area, including a truck wash down area, refuelling and maintenance area and settling ponds;
- conveyors transporting coal from nearby mines to the Site;
- waste disposal areas, including six former asbestos dumps;
- several water treatment systems, including a demineralised water plant, a chlorine plant, a reverse osmosis plant and an oil and grit trap;

- buffer lands surrounding the infrastructure described above, this includes State Environmental Planning Policy (SEPP) 14 listed wetlands to north and west of the Site;
- the Rail coal unloader and Rail to Vales Point RV conveyor system, located to the north west of the operational area;
- a fly ash loading plant, operated by Morgan Ash, to the south east of the operational area.

Plant process water is supplied from Chain Valley Bay and discharged into Wyee Bay.

2.3 TOPOGRAPHY

The Site is located on the coast of Lake Macquarie, in between Wyee Bay and Chain Valley Bay. The Site and immediate surrounds, including the Ash Dam area, are generally flat, although the local topography slopes to the north east, towards Lake Macquarie.

2.4 GEOLOGY

Based on a review of the *Gosford – Lake Macquarie 1:100 000 Provisional Geology Sheet* (Geological Survey of New South Wales, 2003), the Site operational area, including coal storage facility is located on the late Permian to early Triassic Munmorah Conglomerate formation of the Clifton Subgroup, Narrabeen Group. The Munmorah Conglomerate formation is comprised of conglomerate and medium to coarse-grained sandstone with minor siltstone and claystone (Geoscience Australia, 2014). The area comprising the Ash Dam was underlain by man-made fill, identified as comprising dredged estuarine sand and mud, demolition rubble, industrial and house hold waste. Areas immediately surrounding Mannering Bay and Wyee Bay tributaries are located on Quaternary sediments comprised of gravel and sand.

Extensive underground coal mining activities are present in the region with target coal seams occurring in the late Permian Newcastle Coal Measures (a predominantly sandstone and coal sequence with lesser siltstone) that underlie the Clifton Subgroup. The Mannering Colliery, which undermined sections of the Site, targets the Great Northern and Fassifern coal seams. The Great Northern seam, which overlies the Fassifern seam, is located between approximately 140 to 155 metres below ground level (m bgl) in the area (Centennial Coal, 2009).

Based on a review of borehole logs provided in the David Lane Associates (DLA Environmental) groundwater monitoring well installation report (July 2012) site-specific geology was identified as sand fill (0.1 metres thick) overlying orange sandy clay to 4.8 metres (at least). This groundwater monitoring well installation report was specifically relevant to the vehicle refuelling area, located on the south western part of the Site.

2.5 HYDROGEOLOGY

From a hydrogeology perspective, the sedimentary deposits can be categorised into the following units:

- Moderately permeable Quaternary sediments. While the geological map indicates that the sediments consist predominantly of sand and gravel, the available information from the limited intrusive works conducted at the Site indicate that there is a relatively high degree of fine grained material within the sediments which would constrain the permeability of the sediments.

- Moderate to relatively highly permeable conglomerate and sandstone, with permeability largely governed by the degree of fracturing in the conglomerate and sandstone.

- Low permeability siltstone and claystone.

- Moderate to relatively highly permeable coal seams within the Newcastle Coal Measures, with permeability governed by the degree of cleat development and fracturing within the coal seams.

Regional groundwater flow is expected to be towards Lake Macquarie, which is generally located to the north and north east of the Site. Temporal and localised variations in the direction of groundwater flow is not considered unlikely given the low lying nature of the area and the presence of tidally influenced lakes, and the effects of increased hydraulic head created by the wet disposal ash dam. The dykes further present potential localised barriers to groundwater flow.

Four groundwater monitoring wells were installed in June 2011 in the area surrounding the vehicle refuelling compounds. These monitoring wells were installed to facilitate Underground Petroleum Storage System (UPSS) monitoring works. Results of the latest round of monitoring (DLA, June 2013) recorded Standing Water Level (SWL) between 1.1 and 1.22 m bgl, with the approximate hydraulic gradient inferred to be towards the north east.

2.6 GROUNDWATER USE

The alluvial aquifers and shallow conglomerate and sandstone aquifers are the prime aquifers used in the region for stock and domestic supplies and on which aquatic ecosystems may be dependent. Mining activities have extensively impacted the deep coal seam aquifers with extensive depressurisation of the coal seams having taken place in the region. Use of the coal seams aquifers are further restricted by the general high salinity of groundwater within the coal seems (Centennial Coal, 2009).

The NSW Natural Resource Atlas online bore register (accessed 17 December 2013) identifies six groundwater bores within a 5 km radius of the Vales Point Power Station.

One groundwater bore, located approximately 700 m north of the Site in Mannering Park, is reported used for domestic purposes. The Standing Water Level (SWL) was recorded in this well at 5.5 m bgl. One groundwater bore, located approximately 1 km south west of the Power Station operational area and 600 m north of the Ash Dam is reported used for stock (poultry) watering purposes. The remaining groundwater bores were reported to have been installed for testing purposes. SWL was recorded in three of these bores at 6 m bgl.

Annex D provides a detailed summary of the results obtained from the online bore register.

2.7 HYDROLOGY

The Site is located in the Lake Macquarie catchment area, with Lake Macquarie identified as the main local hydrological feature. Local waterways can be summarised as follows:

- Chain Valley Bay, located immediately to the north east of the Site;
- Mannering Bay with Wyee Bay immediately beyond, located immediately north of the Site;
- The Vales Point cooling water canal, which enters the Site at Chain Valley Bay and exits the Site at Wyee Bay;
- Chain Valley Retention Pond (also known as Lake Roddham), located approximately 300 m north east of the operational area, forms a part of the Site contaminated water management system;

- Wyee Creek and the Wyee Creek diversion channel is located along the north western site boundary and function as part of the Ash Dam overflow system;
- Mannering Lake, which forms part of the Vales Point Ash Dam;
- Colongra Lake, located approximately 4 km south of the Site operational area;
- Lake Munmorah located 4 km south east of the Site;
- Three settling ponds associated with the sewage treatment works on Site, located 500 m north west of the operational area; and
- Five settling ponds associated with the coal storage area, approximately 700 m south west of the operational area.

Operational use of the dams and ponds listed above are outlined in *Section 4.7*.

2.8 SURROUNDING ENVIRONMENT

The Site is surrounded by residential properties, remnant bushland and industrial properties.

Key industrial uses in the area include:

- Chain Valley Colliery, approximately 750 m south east of the operational area of the Site;
- Mannering Colliery, approximately 1.8 km south of the operational area of the Site;
- The Mandalong coal mine located approximately 5 km to the north west;
- A municipal sewerage treatment plant, located approximately 1 km south west of the operation, or immediately west of the Site boundary.

The closest residential areas to the Site include:

- Mannering Park, located north of the Site approximately 600 m from the operational area;
- Doyalson East, located approximately 300 m south of the Ash Dam
- Kingfisher Shores, approximately 2 km south east of the operational area and 1.6 km north east of the Ash Dam; and
- Wyee, located approximately 150 m east of the Ash Dam;

- Wyee Point, located directly to the east of the north western leased mine area.

Rural residential properties are also located immediately to the north of the Ash Dam area and to the south of the Ash Dam area along Wyee Rd.

The Site is surrounded by areas of remnant bushland, with some limited recreational land use. Ecological or recreational areas of note surrounding the Site include:

- SEPP 14 protected wetlands are located along the northern and eastern perimeter of Mannering Lake. The wetlands located on the eastern perimeter of Mannering Lake are also located within approximately 100 m of the Ash Dam toe drain system;
- SEPP 14 protected wetlands are also located on either side of Wyee Creek, approximately 1 km north of the Ash Dam;
- Tom Barney Oval is located immediately to the south west of the operational area. Based on discussions with the Site Environmental Officer, this oval is occasionally booked out for sporting events, and is regularly accessed by the public;
- Chain Valley Bay Reserve is located 1 km south of the operational area. Public use of this area appeared to be limited based on the lack of amenities and cleared areas; and
- Recreational fishing and boating activities are also undertaken in Lake Macquarie, including Mannering Bay, Chain Valley Bay and Wyee Bay.

2.9 SENSITIVE RECEPTORS

The sensitive receptors identified in association with the Site include:

- indoor and outdoor human health receptors in the form of onsite and offsite workers;
- intrusive maintenance workers both on and onsite;
- offsite residential receptors, living in the vicinity of the operational area or Ash Dam;
- recreational users of Mannering Bay, Wyee Bay and Chain Valley Bay;
- recreational users of Tom Barney Oval;

- aquifers beneath the Site and nearby potable and stock watering wells; and
- ecological receptors, including those in Mannering Bay, Wyee Creek, Wyee Bay and Chain Valley Bay.

Onsite water bodies that are used for operational purposes, including the Ash Dam, the cooling water canal and the various water retention, treatment and settling ponds are not considered to be ecological receptors.

3 SITE HISTORY AND REGULATORY SETTING

3.1 SUMMARY OF SITE HISTORY

Information provided by Delta Electricity management and a review of aerial photographs (*Section 3.2*) indicates that prior to construction of the Vales Point Power Station, the Site and surrounds were primarily occupied by a mixture of farms and native vegetation.

Construction of the Power Station commenced in the 1963 (A Station) and completion was in the early 1980s (B Station). The layout of the Power Station and surrounding buffer lands has stayed largely consistent since 1975 (at least). Ancillary additions have been made to the Power Station since construction was completed, including the construction of sewage treatment area and additional settlement ponds.

3.2 SUMMARY OF HISTORICAL AERIAL PHOTOGRAPHS

A review of historic aerial photographs was conducted by ERM and is summarised in *Table 3.1* (below). Copies of the photographs reviewed are included in *Annex D*.

Table 3.1 Summary of Historical Aerial Photographs

Year	Site	Surrounding Area
1950	The Site appears appear to be undeveloped, vegetated land. This image is of poor resolution and the Site boundaries are not easily discernable.	The Site surrounds appear to be largely undeveloped, vegetated land. Some cleared, rural properties were also observed in the aerials. These properties were likely used for grazing, with minimal crop cultivation observed.
1966	The Vales Point Power Station is present in these images, and construction appears to have been completed on the "A Station" portion of the operational area and on the switch yard located to the north of the Site. The Site surface appears to be exposed or excavated Site soils, which suggested that Site construction, may have still been underway on other parts of the Site. The cooling water canal and Ash Dam are also present on the Site. With deposition of ash material present on the western portion of the Ash Dam. A coal stockpile was located north east of the current coal storage area, immediately south of what is now the administration and amenities building.	The Site was largely surrounded by undeveloped, vegetated land. Two coal mines were present south east of the Site. Residential development was underway in Mannering Park and Kingfisher Shores.

Year	Site	Surrounding Area
	The two ASTs were present in the north western corner of the Site.	
1975	Construction of the A Station portion of the Site appears to be complete, whilst B Station construction appears to be underway. The sewage treatment plant is visible west of the switchyard. The coal storage area appears to be larger than in the 1966 photograph. A stockpile is also visible further south west, in the footprint of the current coal storage area. Ash deposition appears to cover a great extent of the Ash Dam.	The Site surrounds continue to comprise largely of undeveloped, vegetated land with two coal mines present south east of the Site. Residential development continues in Mannering Park and Kingfisher Shores.
1984	Construction of both the A Station and B Station appears complete, and both parts appear operational. The two fuel ASTs are present south of the operational area. Development of the Site has also expanded east of the operational area, with several small buildings observed in this area. These smaller buildings are likely storage sheds or other ancillary facilities associated with main Site operations.	The Site surrounds are largely undeveloped, vacant land with coal mining activities to the east and south east.
1994	The Site layout and infrastructure appears to be the same as previously identified, and generally consistent with the current Site layout. Coal storage activities still extend further northwards, toward the operational area than the current coal storage stockpile Chain Valley Retention Pond (Lake Roddham) is present in the north east site corner. Ash deposition covers most of the Ash Dam facility.	The Site surrounds appear the same as previously identified, however the municipal sewage plant is also present east of the Site.
2001	The Site layout and infrastructure appears to be consistent with the current site layout. The coal storage facility is consistent with the layout observed during the site walkover and described in the current Site layout plans.	The Site surrounds appear to be the same as previously identified and consistent with the extent of the surrounds observed during the Site visit.
2006	The Site layout and infrastructure appears to be consistent as previously identified and consistent with the current Site layout.	The Site surrounds appear to be consistent with that previously identified.

3.3 ZONING & LAND USE

The total Site area, including the operational area, Ash Dam, coal storage facility and vegetated buffer zones, is approximately 10 070 ha. Land holdings occur within the Lake Macquarie and Wyong Local Government Authority (LGA).

Under the Wyong Local Environmental Plan (LEP) 2012, most of the Site including the operational area, is zoned SP2 - Electricity Generating Works. Small portions of the Site, immediately south of Wyee Bay, are zoned E2 – Environmental Conservation. Areas designated W2 – Recreational Waterways are also located along the shoreline immediately north east and north west of the Site.

Under the Lake Macquarie LEP 2004, most of the Site is zoned 4(1) – Industrial (core). Areas on the periphery of the Site are zoned 9 – Natural Resources. Areas immediately surrounding Mannering Lake are zoned 7(1 and 2) – Conservation (primary and secondary) and 9 – Natural Resources. Properties zoned 1(1) – Rural were also located south west of Mannering Lake.

Zoning maps, sourced from Lake Macquarie LGA and Wyong LGA are presented in *Annex D*.

3.4 ENVIRONMENTAL LICENSES AND MANAGEMENT

Delta Electricity operates under a range of State and Commonwealth Government environmental legislation. It is noted that whilst a comprehensive review of planning approvals and general environmental management was beyond ERM's scope of work for this assessment, in some instances these approvals and management systems provide context for potential contamination sources (e.g. ash disposal) and hence a summary of salient points in relation to these issues has been presented in the following sections.

3.4.1 *Environmental Protection Licences*

The Site holds Environmental Protection Licence (EPL) No. 761 (issued under *Section 55* of the *Protection of the Environment Operations Act 1997)* for the premises described as Vales Point Power Station and Coal Unloader, Vales Point Road, Mannering Park NSW 2259.

The EPL authorises the generation of electrical power from coal (> 4,000 GWh generated), a scheduled activity under the *Protection of the Environment Operations Act 1997*.

The EPL applies to all activities conducted at the Site, including the listed ancillary activities:

- petroleum products storage;
- general chemical storage;
- crushing, grinding or separating works;
- coal works; and
- sewage treatment processing by small plants.

The latest version of the EPL is dated 13 November 2013 and is due for review in January 2014.

The EPL includes load-based licensing provisions, monitoring requirements and/or setting of concentration limits for emissions of pollutants discharged to air, water and land (for various locations), although predominantly relates to emissions to air. The EPL includes a range of conditions, from the general requirement to operate in a "proper and efficient" manner to specific conditions such as methods for monitoring and analysis.

The EPL includes a requirement to complete a Pollution Reduction Program (PRP) relating to Ash Dam Seepage to groundwater. This groundwater assessment should investigate background groundwater quality particularly concentrations of metals (including arsenic and selenium), pH and conductivity, compare the background groundwater quality with data collected at monitoring bores VPGM/D6, VPGM/D3 and VPGM/D5 from January 2008 to September 2013 and identify any mitigation measures to be carried out to reduce the levels of any elevated concentrations identified. This report is due to the NSW EPA by 31 January, 2014.

A desktop audit was undertaken by the NSW EPA to assess the requirements to publish pollution monitoring data (dated 31 January, 2013). Non-compliances recorded in this audit were limited to do minor data quality issues for air monitoring data and reporting requirements.

Non-compliances reported under EPL 761 identified on the NSW EPA website (accessed 21 December, 2013) which are considered to represent potential contamination of on Site soil and groundwater or the surrounding environment, are outlined in *Table 3.2* (below).

Table 3.2 ***Summary of Environmental Non-Compliance relevant to Potential Contamination Issues***

Licence Condition Number	Details of Non-Compliance	Number of Times Occurred	Date Received
R3.3	Discharge from ash dam to Wyee Creek due to high rainfall in catchment. Internal investigation undertaken & upgrade work to return water pumps in progress, dams to be kept at lower levels. (Incident report 11/2/11 DECCW)	5.	28 February 2011

There was limited data available in the data room with respect to the planning approvals and as such a review of the planning approvals relating to the Site has not been undertaken as a part of this assessment.

3.4.2 Environmental Management

Delta Electricity maintains an ISO14001 certified Environmental Management System (EMS) for Vales Point Power Station which is audited on an ongoing basis.

A number of environmental plans for Vales Point Power Station have been developed under the EMS and/or in response to regulatory requirements, however the assessment of the implementation of these has not been completed as part of this assessment.

A recent Environmental Compliance Audit undertaken by GHD in November 2010 (GHD, 2010) generally found that Delta Electricity has achieved a high level of compliance with the conditions of the Development Approvals and EPL. The main issues identified in this audit revolve around the system for dealing with public complaints and errors in the number of samples collected and the analytes measured during individual surface water monitoring events.

Challenges associated with the management of licensed discharges from the Vales Point Power Station, which could result in contamination include;

- potential overflows from the Ash Dam to Wyee Creek, which flow into Mannering Bay
- potential seepage from the Ash Dam into Mannering Bay and the nearby SEPP1 4 wetland.

4 OPERATIONS

The following sections present an overview of Site operations in order to provide context to the subsequent assessment of potential for contamination. A brief description of key activities is provided including, in particular, chemical and waste storage.

4.1 INVENTORY OF CHEMICALS

Various chemical and dangerous goods stores are located throughout the Site, with the largest quantities of dangerous goods stored at the water treatment plants, transformer areas, and fuel depots An inventory of significant storage facilities is provided in *Annex E*, based on the Site's most recent Dangerous Goods Notification (November 2013 - NDG015072).

The Site holds a variety of bulk (>1,000 L) chemical storage:

- Petrol;
- Refrigerated carbon dioxide;
- Diesel;
- Transformer oils;
- Ammonia;
- Turbine oils;
- Waste oils;
- Hydrogen;
- Hypochlorite;
- Sodium hydroxide;
- Sulfuric acid; and
- Sulfur.

The storage and contamination potential of these chemicals are discussed in detail in *Section 6*.

4.2 COAL SUPPLY AND STORAGE

4.2.1 Coal Supply

Chain Valley and Mannering Collieries are located within the footprint of the Vales Point Power Station to the east of the operational area. Coal is delivered to the Power Station via dedicated overland conveyor.

Coal is also delivered to the Power Station via truck from local mines and via the Rail to Vales Point (RV) coal conveyor network.

The Rail unloader is located adjacent to the Ash Dam and the Main Northern Rail Line between Wyee and Morisset, approximately 4.5 km to the north west of the main power block. Coal is delivered by rail to the Rail Unloader where it is then transferred to the Vales Point conveyor system. Coal from the Mandalong Mine, which is located approximately 2 km to the north of the Rail unloader, is also loaded onto the Delta Electricity conveyors at this facility.

ERM was unable to access this facility during the December 2013 Site inspection but understands that it comprises a series of hoppers, feeders and transfer points and a dust suppression system based on the use of water.

The majority of the RV coal conveyor system is at ground level with graduated elevation of conveyors at the entry into the transfer towers. Conveyors are covered to reduce the potential for dust emissions.

4.2.2 Coal Storage

The Vales Point Coal Plant area is located on the southern side of the power block. Stockpiled coal can either be fed directly to the Power Station bunkers or deposited in the storage area for later use.

4.2.3 Truck Wash-down Area

Truck washing facilities are located within the coal plant area. The truck washing facilities consist of an automatic drive through wheel and under body washer.

The truck washing facility uses reclaimed water supplied from a settling pond within the Coal Storage Area. All dirty water is collected and drained to a settling pit with an overflow weir designed to retain coal and dirt particles. Excess water is directed via an underflow weir designed to retain any oil to the dirty water drain, where after passing through a number of silt traps flows and flows into Settling Pond 3, prior to discharge to the Ash Dam (*Section 4.7*).

4.2.4 Mobile Plant Maintenance and Refuelling

A maintenance and refuelling area for the mobile equipment associated with coal stockpiling is located to the north of the coal stockpile area. Within this area, mobile equipment can be refueled from a 35,000 L diesel Above-ground Storage Tank (AST). The diesel AST is filled by road tanker. The Coal Handling Plant workshop also houses a refuse oil AST, a lubricants station and a parts cleaning facility

4.3 ELECTRICITY GENERATION UNITS

4.3.1 Main Generating Plant Area (B Station)

The main generating plant area of the Vales Point Power Station operates two 660 MW generating units (B Station) and associated infrastructure;

- coal feed systems;
- two coal-fired boilers;
- turbine house incorporating two steam turbines;
- two 660 MW generator units (units 5 and 6);
- emergency diesel generator; and
- one chimney stack (serving two boilers).

Electricity is produced using pulverised coal-fired boilers. The coal is ground in pulverising mills before being blown into the boiler in a steam of pre-heated air. The coal burned in the boiler furnace chamber produces the heat necessary to convert water circulating in the boiler tubes into high-pressure steam.

The electricity generation process involves high pressure steam passing through cylinders and spinning the shaft of each generator and inducing alternating current. After use, the steam is condensed back to water and is recycled.

4.3.2 Transformer Area

There are four transformer vessels present on the Site, containing significant quantities of insulating oil. Spare transformers 1 and 2 and the temporary turbine oil storage ASTs, with a capacity of 115,000 L are also located immediately to the east of the transformer vessels. Refuse oil storage AST No. 2, with a capacity of 35,000 L is also located to the east of the transformer vessels.

Due to the age of the facility, Polychlorinated Biphenyl (PCB) additives would have historically been used in insulating oils in transformers, capacitors and light fittings. Data room documents indicate that low concentrations of PCBs (up to 4.1 µg/g) were detected in transformer oil samples collected from the vessels by Aurecon in 2012 and 2013.

An environmental compliance audit undertaken in 2010 (GHD, 2010) indicated that while there was a PCB register showing all equipment that has been tested for PCBs, there was no defined plan showing where PCB containing equipment is located and how this material is to be managed when oils from this equipment are replaced.

4.3.3 Turbine Area

Both Unit 5 and Unit 6 contain a battery room, which stores wet batteries filled with up to 20,000 L of acid. Turbine oil storage tanks with a capacity of up to 50,000 L are also located within both units.

4.3.4 Transmission

The Vales Point switchyard is located to the north of the power block and is owned and operated by TransGrid. The output from Vales Point Power Station is stepped up in voltage by generator transformers before passing to the switchyard and being transmitted at 330 kV into TransGrid's high-voltage supply system.

4.3.5 Emergency Generator

The emergency diesel generator, located on the north side of the power block, is used to provide emergency electrical supplies to safely shut down plant in the event of a station shutdown and disconnection from the power grid.

The generator runs on diesel, supplied from an AST (5000 L) located within a concrete bunded area on the western side of the building. The AST is filled by road tanker.

4.3.6 Ammonia Supply

Aqueous Ammonia is required at the Site to supply the generating units. A generating unit typically requires a transfer of ammonia every 2-3 days to refill the chemical injection tanks.

Historically, aqueous ammonia was stored in ASTs located in the vicinity of the Chain Valley Retention Basin but these facilities have been decommissioned. A new aqueous ammonia storage facility was developed in 2011 and is situated near the demineralised water plant. This facility consists of two ASTs; one main tank of 25,000 L and one back up tank of 1,000 L.

Aqueous ammonia is supplied as a 25% solution from a road tanker. There is a truck filling station for the main tank and ammonia can subsequently be transferred to the small tank. The ammonia is diluted to either 4.5% or 10% as it is transferred to the chemical injection tanks.

4.3.7 Hydrogen Supply

Hydrogen is used as a coolant for the generators. The hydrogen system comprises a hydrogen manufacture plant and bulk store located to the north of the power block and the hydrogen cooling system for the generator. The hydrogen generating plant is no longer in service.

Hydrogen is currently stored within banks of cylinders within the hydrogen generating plant area and is transferred to the hydrogen control panels within the generator via pipes.

4.3.8 Historical Operations at A Station

Vales Point A Station was built in the 1960s as a four-unit station. These generating units were decommissioned in 1989 and have undergone partial dismantling, with most of the internal plant items removed. At the time of ERM's Site visit in December 2013, the A Station buildings were undergoing demolition and removal offsite.

Prior to the decommissioning and demolition of A Station, this facility was comprised of;

- four coal-fired boilers;
- a turbine house incorporating four steam turbines;
- four 660MW generator units (units 1 to 4);
- an auxiliary bay; and
- two chimney stacks (serving four boilers).

ERM understands that once the demolition is complete, the A Station basement level concrete will remain and in other areas the ground surface will be covered with recycled crushed concrete and left vacant.

4.4 WORKSHOPS, STORES AND COMPOUNDS

The Main Store is located on the western side of the operational area and houses flammable gases, corrosive liquids and 200 L drums of flammable liquids, including lubricants and greases.

The Greaser Shed, located to the south of the boiler units is used to store up to 10,000 L of oil in drums.

Small quantities of dangerous goods, including oils and solvents are stored within a number of workshops located throughout the operational area. These smaller volumes of chemicals are generally stored within cabinets.

4.5 VEHICLE REFUELLING AREA

The Vehicle Refuelling Area is located adjacent to the Administration Building and consists of two Underground Storage Tanks which are used to store unleaded petrol and diesel, connected to two bowsers.

A single decommissioned underground storage tank is also located approximately 10 m to the north of the operational refuelling facilities and two decommissioned underground storage tanks and bowser plinth are located approximately 30 m north-west of the operational refuelling facilities. Information regarding the type of fuel historically stored within these tanks or the method of decommissioning was not available during the assessment.

4.6 AUXILIARY FUEL STORAGE

Vales Point Power Station uses diesel as auxiliary fuel for boiler ignition. The Fuel Oil Installation is located on the southern side of the main operational area and consists of two 1.2 ML tanks in a bunded area.

4.7 WATER SUPPLY AND TREATMENT

4.7.1 Licensed Discharges to Water

There are four licensed discharge points for water from the Power Station under EPL 761, including;

- LDP 1 - Cooling Water outlet to Wyee Bay;
- LDP 2 - Discharges to the cooling water outlet from the ash water recycle system;
- LDP 4 – Release of seepage from Ash Dam rehabilitated area at the v-notch weir located at the toe of the Dam; and
- LDP 18 – Over boarding of the Ash Dam into the Wyee Creek diversion channel and Wyee Creek.

4.7.2 Cooling Water

Water for the Vales Point Power Station is drawn into the inlet canal at Chain Valley Bay. The cooling water system at the Power Station is a 'once through' system, which pumps water from Lake Macquarie, through the condensers in the Power Station and discharges it at an elevated temperature back into the Lake. The outfall canal discharges into Wyee Bay.

Heat liberated during the power generation process is carried away by the cooling water passing through condensers. To ensure that the condensers remain operable, chlorine produced at the onsite plant is added to the system. The Power Station generates free chlorine on site through an electrolytic process using seawater sourced from Lake Macquarie. The chlorine plant is located to the north west of the power block and includes the bulk storage of hydrochloric acid, sodium hypochlorite and hypochlorite in ASTs.

When required, additional cooling water is sourced through the attemperation pumps and mixed with the cooling water within the outlet canal prior to its release. Excess water from the Ash Dam is also discharged into the outfall canal under conditions of the EPL 761 (see *Section 4.8*).

Due to the turbulence created by the mixing of water within the outfall canal, direct dosing with an antifoaming agent is carried out to prevent excessive foaming. Just prior to discharging into Wyee Bay a skimming system operates to reduce foam and remove oil that may be present on the surface. Pumps collect the skimmed water that is piped to a settling pond, which then discharges back into Wyee Bay.

4.7.3 Process Water

A number of treatment plants are present on the site to treat water used in Power Station plant processes. These include the Demineralisation Plant, Polishing Regeneration Plant and Water Reclamation Plant.

Process water is treated in the Demineralisation Plant to remove soluble impurities. The Demineralisation Plant is located to the south west of the power block and uses anion and cation exchange resin beds to purify the raw water. The raw water treated in the demineralisation plant is sourced primarily from the Water Reclamation Plant.

Bulk chemical storage associated with the Demineralisation Plant includes storage tanks for acid regeneration (sulphuric acid), storage tanks for caustic regeneration (sodium hydroxide) and storage tanks for flocculation (ferric sulphate).

The Water Reclamation Plant has two components:

- The Microfiltration (MF) Plant located at the Mannering Park Sewage Treatment Plant (STP), immediately to the east of the Vales Point Site. It is understood that the MF Plant site is leased from the Wyong council but that Delta Electricity owns the Plant equipment.

- The Reverse Osmosis (RO) Plant, located adjacent to the Demineralisation Plant.

The bulk storage of hypochlorite and ammonia are associated with both the MF

The condensate polishing plant is located adjacent to the demineralisation plant. This plant removes both particulate and dissolved contaminants to minimise the amount of contaminants entering the boiler water cycle in the feedwater. The resin used in the polishing process is regenerated in separate vessels. The bulk storage of sulfuric acid and sodium hydroxide are associated with the condensate polishing process.

Wastewater generated during the water treatment processes are disposed to the effluent sump ('Wolfy Pit'), located to the south of the power block. The effluent sump is then pumped to the Coal Settling Pond 3 and subsequently discharged to the Ash Dam.

4.7.4 Domestic Supply and Firewater

Water for domestic use and firefighting is taken from the Wyong Shire Council reservoir at Doyalson and stored within reservoirs at the Site.

The B Station reservoir is approximately 72,000 kL and is located near the coal stockpile.

There are two reservoirs located at the intersection of Vales Road and the Station Main Entrance Road. Both these reservoirs were previously the main water supply to A Station but with the decommissioning of A Station, the reservoir closest to the Station Main Entrance Road is now used as a head tank for the ash and dust return water system. The reservoir which is the furthest from Station Main Entrance Road is used as the water supply to Tom Barney Oval and fire hydrants along the Station Main Entrance Road.

4.7.5 Sewage

The Vales Point Sewage Treatment system is located outdoors to the west of the operational area and consists of an Imhoff tank with sedimentation compartment and sludge compartments and three treatment ponds, with a mechanical aeration system.

The effluent from the third pond in this system is pumped to an initial holding pond (Retention Pond 1) within the Ash Dam area via a tortuous watercourse. The effluent is then gravity fed via piping into a secondary holding pond (Retention Pond 2).

Over boarding from Retention Pond 2 flows into a reed bed and concrete drain. At the base of the drain there us a final holding pond (Retention Pond 3). This runoff is then filtered through the Mannering Creek Retention Basin on the northern side of the Ash Dam. Both Retention Pond 2 and retention Pond 3 also receive runoff from the wider Ash Dam area.

4.7.6 Stormwater

Operational Areas

All B Station drains are ultimately directed via the Chain Valley Retention Basin A ('Lake Rodham') prior to discharge to Chain Valley Bay. The drainage system within Station B is separated into water drained from areas where accidental oil spillage could occur (green drains) and general stormwater runoff (red drains).

The green stormwater drains are concentrated in the north eastern portion of the operational area and drain areas including the transformer bays, turbine house, auxiliary generator basement drains and chemical injection pumping area. Drainage captured by green drains is directed to the oil and grit separator ("hairy ropes"), located in the north eastern corner of the site. Waste generated in the facility is trucked from the site and the treated water is directed into the Chain Valley Retention Basin.

The red stormwater drains collect runoff from areas including the Power Station rooves, building floors, workshops and boiler house. This water is directed to the Chain Valley Retention Basin A prior to direct discharge to Chain Valley Bay, via an unlicensed discharge point. The Chain Valley Retention Basin contains an under/over weir at the discharge point and oil slick monitors are fitted to the discharge point to alarm operators if oil is detected.

The boiler house basement area, dust plant and ash plant which may receive spillage of dust, coal pyrites or oil, have their drains directed to trenches that discharge to the ash sluice for disposal to the Ash Pit.

Information regarding the historic or proposed future drainage infrastructure for the A Station area was not available during this assessment

Coal Storage and Handling Areas

The coal stockpile area is surrounded by a system of concrete drains that collect runoff from the stockpiles. These drains discharge to settling ponds (Coal Settling Ponds 1 to 3) to trap sediment and coal particulates and excess water from these ponds is piped to the Ash Dam via Settling Pond 3. Settling Ponds 1-3 are located to the north east of the Coal Plant area. Overflow from these settling ponds is discharged into the outfall canal.

The remaining coal plant area outside of the coal stockpile, drains into separate open concrete lined drains and is discharged into Coal Settling Pond 4 and 5. Coal Settling Ponds 4 and 5 are located to the north east and north west of the Coal Plant Area respectively. The water from these settling ponds is delivered directly into the outfall canal via underground drains.

The refuelling/maintenance facilities within the Coal Handling Area are covered in concrete hardstand equipped with bunding. Runoff collected from within the bunded area is directed via an oil separator and silt settling ponds into Settling Pond 2. Water collected from around the maintenance and workshop area is drained into Settling Pond 5.

4.8 ASH DAM

4.8.1 Ash Placement

The Vales Point Power Station uses coal as the fuel source to generate electricity and as a consequence produces a significant amount of by–product ash including furnace ash and fly ash. A large proportion of the ash which is produced from the Power Station is transported by wet sluicing via a water pipeline to the Ash Dam. The disposal of ash within the Ash Dam is approved under the current Vales Point Power Station EPL (Clause P1.3 of EPL 761).

The Ash Dam was initially established in the 1960s and has been expanded since this time to accommodate the additional capacity requirements of the Power Station.

The central areas of the Ash Dam, known as Pond 4, 5A and 5B, are currently active and receiving wet sluice from the Power Station. Ash settles in these upper reaches of the dam and the water is pumped back to the Power Station via ash return water pumps. The Ash Dam return water system comprises 3 pumps; with two pumps in service and one pump undergoing maintenance at any given time

A selenium demonstration plant was under construction at the time of ERM's Site inspection in December 2013, on a 0.15 ha area at the western end of the Ash Dam. The purpose of this facility is to test the ability of the plant to actively remove selenium and other trace elements from ash dam water. It is understood that the treatment process involves running ash water through steel troughs that have steel plates and steel wool installed to generate iron oxides (rust) for the treatment process. The steel wool will be disposed of within the ash dam and water will be returned to the dam.

4.8.2 Water Management

Water collected within the Ash Dam is returned to the Power Station for use in ash and dust transport. Excess ash dam water as a result of rainfall is discharged into the cooling water outfall canal (EPL DP2). The cooling water outfall canal subsequently discharges into Wyee Bay (EPL DP1).

The release of seepage water from the Ash Dam occurs via a v notch weir, which is a licensed discharge point (EPL DP4). A seepage return system is installed to collect seepage water from the Ash Dam embankment and pump it back to the storage.

Seepage from the Ash Dam and runoff from the Ash Dam area is also controlled by a man-made artificial wetland designed to prevent these flows from discharging directly into Lake Macquarie. This area is located on the northern side of the Ash Dam and occupies and area of approximately 5.3 ha. It is separated from Lake Macquarie by a levy that is approximately 2 m high, upon which a conveyor and road are constructed. It is not clear to what extent the water contained within this area is able to percolate through the levy into Lake Macquarie.

There are also discharges associated with discharges from the Ash Dam into Wyee Diversion Channel and subsequently into Wyee Creek, following extended periods of wet weather (EPL DP18). The Wyee Diversion Channel is a man-made channel that enters Wyee Creek approximately 3.6 km upstream of Mannering Bay. The design of Vales Point Ash Dam, allows for flows to Wyee Creek via the Wyee Diversion Channel, either as a result of overflows from the off-take tower or via overflows from the spillway.

The Wyee Creek diversion was originally licenced and operated as the main Ash Dam discharge from around 1982 until 1996. In 1996 it was decided to stop discharging into Wyee Creek following concerns about selenium levels in fish in Wyee Bay. From this time a return water system was installed to discharge water in the Vales Point outfall canal, where it is diluted before entering Lake Macquarie. Currently, discharges from the ash dam to the Wyee Creek Diversion are controlled by minimising water levels as far as practicable using the return water system but discharges still occur during periods of high rainfall.

In recent years, the dam has operated under a higher maximum storage level than was intended in the original design, to keep the exposed ash in the upper reaches of the dam moist and to minimise dust releases. This increased storage level has also however been associated with an increased risk of over boarding. A letter dated 16 August 2013, between Delta Electricity and the EPA indicated that a release from the Ash Dam to Wyee Creek occurred as recently as June 2013.

Licensed discharge point EPL3 relates to the ash dam effluent area on the eastern side of the ash dam. Historically, effluent was used for effluent irrigation to manage dust suppression.

4.8.3 Rehabilitation and Ash Reuse

The northern portion of the Ash Dam has been filled to capacity, capped and rehabilitated. The rehabilitation process involves the draining of the water within the pond and the progressive capping of the area using Virgin Excavated Natural Material (VENM) and Excavated Natural Material (ENM) to a nominal depth of approximately 450 mm. Once this layer has been compacted, a layer of topsoil, approximately 150 mm thick is added to the area and mulch is spread over the top of the capping layer. Vegetation is then established from seed.

A significant Ash reuse operation is undertaken from the Ash Dam by third party contractors. The ash recycling loading area is located in the north eastern corner of the Ash Dam area.

4.8.4 Waste Disposal

The *Central Coast Power Stations Ash Dam Management Plan 2009* (Aurecon, 2009) notes that six dump sites were located within the catchment of the Ash Dam. Information regarding the nature of the material contained within these dumps was not available at the time of the assessment but it is understood that it included asbestos.

These dump sites were closed in approximately 1995, covered and fenced off. Four of the dump areas (Dumps 1-4) have been surveyed and are fenced off. Dump 5 is located entirely within the active area of the Ash Dam. Dump Area 6 is located predominantly within the active area of the Ash Dam, with a small portion located in bushland to the east of the active portion of the Ash Dam. The locations of these areas are shown in *Figure 4*.

All current refuse is now sent offsite, with the exception of material approved for disposal within the Ash Dam by the EPA. The existing conditions for waste disposal at the Site under EPL 761 allow the disposal of a variety of waste materials within the Ash Dam. These materials are currently stockpiled at various locations throughout the Ash Dam Site.

4.9 FIRE SUPPRESSION SYSTEM

The fire suppression system uses a combination of water (obtained primarily from the domestic supply) and gas suppression. A water sprinkler and deluge system is located throughout the power block, with hydrants and hose reels present in the administration area and throughout the remainder of the Power Station.

Carbon dioxide (CO_2) gas is supplied to portions of the turbine generators from large CO_2 storage vessels.

A foam and deluge system is present in the fuel oil storage tank area. Information on the type of foam used in this system was not available at the time of the assessment.

5 SITE CONTAMINATION HISTORY

5.1 OVERVIEW

Information regarding the contamination status of Vales Point Power Station is limited, due to a general absence of previously conducted intrusive environmental assessments at the Site.

The current processes being undertaken at the Site have generally not changed significantly since operation of the Site commenced in 1960s, with the exception of the decommissioning and demolition of the A Station. As such, potential areas of contamination can be assessed based upon current operations, in conjunction with a review of chemical and waste inventories (*Section 4.1*), spill and incident information, a review of the limited soil and groundwater investigations completed to date (*Section 5*) and discussions with Delta Electricity staff.

Potential and actual AECs identified at the Site are presented in *Section 6*.

5.2 NSW EPA CONTAMINATED SITE RECORDS

The *Contaminated Land Management Record of Notices* is a public database of information regarding significantly contaminated land in NSW and is managed by the NSW EPA under the *Contaminated Land Management Act 1997*. At the time of this assessment (December 2013), Vales Point Power Station was not listed on the record and no sites within a 5 km radius of the Site were listed on the record.

NSW landowners and occupiers who believe that their sites may be contaminated above the levels specified in the *Contaminated Land Management Act 1997* must notify the NSW EPA of the suspected contamination. The contamination may or may not be significant enough to warrant regulation by the EPA. Following notification, the EPA conducts an assessment process to determine whether regulation is required. The *NSW EPA List of Contaminated Lands Notified to the EPA* describes these sites.

At the time of this assessment, Vales Point Power Station has not been notified to the NSW EPA as being potentially contaminated. However the following nearby properties were identified as being potentially contaminated:

- Mannering Colliery, Rustles Road, Doyalson. Listed as EPA Site Management Class A, which indicated that assessment of the Site by the EPA was still in progress.

- Mannering Park Mini Mart, 70 Vales Road, Mannering Park. This property was identified as a service station. Listed as EPA Site Management Class B, which indicated that initial assessment of the Site by the EPA was still in progress.

- Parkview General Store, 2 Vales Road, Mannering Park. This property was identified as a former service station. Listed as EPA Site Management Class B, which indicated that initial assessment of the Site by the EPA was still in progress.

Sites which have yet to be determined as significant enough to warrant regulation may result in no further regulation under the *Contaminated Land Management Act 1997*.

5.3 PRODUCT SPILL AND LOSS HISTORY & OTHER DISCHARGES

The history of the Site as a Power Station encompasses over 40 years; as such, a comprehensive listing of spills and inadvertent released was not available as part of this assessment. ERM reviewed available information on spills, leaks and unplanned discharges in the data room and through discussions with Delta Electricity management. Specific information relevant to identifying AECs is presented in *Section 6*.

5.4 PREVIOUS ENVIRONMENTAL INVESTIGATIONS

The Site has undergone a limited amount of intrusive soil and groundwater assessments to date as summarised below. Works were generally completed to achieve compliance with EPL requirements and Underground Petroleum Storage System (UPSS) regulations. No comprehensive or systematic intrusive assessment of Site conditions has been undertaken.

The following section summarises the relevant reports reviewed by ERM.

5.4.1 Groundwater Monitoring Down-gradient of the Ash Dam (Aurecon, 2013)

At the time of ERM's Site inspection in December 2013, there were three (3) groundwater monitoring wells installed to the north of the Ash Dam.

The existing groundwater monitoring wells have been monitored since 2008 and are generally monitored on a quarterly basis. A qualitative review of this data indicates that the groundwater is saline and slightly acidic and that measured concentrations of copper, lead, nickel and zinc consistently exceed the ANZECC (2000) trigger values for marine water quality.

Site representatives indicated that a small number of additional groundwater monitoring wells were being installed by Aurecon in this area in late December 2013 in response to an EPA request for an additional investigation in form of a Pollution Reduction Programme (PRP) of this issue before the end of January 2014. This PRP relates to the elevated metal concentrations identified in groundwater.

5.4.2 Compliance Monitoring Associated with Licensed Surface Water Discharges

As a condition of EPL 761, Delta Electricity is required to undertake monitoring of surface waters, in associated with licensed discharges. The monitoring points are as follows;

- EPA 1 - Cooling water outlet to Wyee Bay – temperature and chlorine;
- EPA 2 - Discharges to the cooling water outlet canal from the ash water recycle system – pH, Total Suspended Solids (TSS), metals, nitrates/nitrites and phosphorus.
- EPA 4 - Seepage from ash dam rehabilitated area – TSS, metals, nitrites and phosphorus.

The surface water quality within Lake Macquarie, including pH, salinity, dissolved oxygen, temperature, water clarity and zooplankton is also monitored on a monthly basis.

A review of the data collected during these monitoring events indicates general compliance with license conditions and the ANZECC (2000) trigger values for marine water quality.

Delta Electricity is also required to monitor the quality of the discharges associated with any over boarding from the Ash Dam into Wyee Creek that exceed 2 hr duration. A review of the data collected in association with discharges from the Ash Dam into Wyee Creek indicates some exceedances of the ANZECC (2000) trigger values for marine water for lead. An ANZECC (2000) marine water quality trigger value is not available for selenium, but selenium concentrations in excess of the fresh water trigger value (11 ug/L for the protection of 95% of species) were frequently identified.

5.4.3 Investigations Associated with the Protection of the Environment Operations (Underground Petroleum Storage Systems) Regulation 2008 (UPSS Regulations)

A groundwater investigation was undertaken by David Lane Associates in July 2010 in relation to the UPSS.

The investigation included the installation and sampling of four (4) groundwater monitoring wells within the UPSS area. Visual and/or olfactory evidence of hydrocarbons were not noted within the wells and concentrations of Total Recoverable Hydrocarbons (TRH) and Benzene, Toluene, Ethylbenzene and Xylene (BTEX) were below the adopted ANZECC (2000) guidelines for freshwater quality in three of the four monitoring wells. A TRH (C_{10} – C_{36}) concentration of 2,540 µg/L was measured in a well installed to the north of the UPSS.

In September 2011, Douglas Partners completed a groundwater investigation in relation to the UPSS. This investigation involved the installation of six additional groundwater monitoring wells and the monitoring of all 10 wells. The results of the investigation indicated that the depth to groundwater ranged from 1.07 – 1.42 m below ground level and groundwater concentrations of BTEX, PAH and lead were all below the adopted ANZECC (2000) guidelines for marine water quality and TRH was not detected in any of the samples analysed.

David Lane and Associates completed groundwater investigations between 2011 and 2013, in relation to UPSS. The investigations involved the installation of four (4) new groundwater monitoring wells (in June 2011) and an assessment of the presence/absence of hydrocarbon sheen in these wells using a visual check and an interface probe (in July 2012 and July 2013). Hydrocarbon sheens were not detected in these investigations.

5.4.4 Preliminary Baseline Contamination Assessment & Duty To Report Contamination Central Coast Region - Vales Point Power Station, Munmorah Power Station And Colongra Gas Turbine (GHD, January 2012).

The objectives of the GHD report were to undertake the following:

- Provide an updated risk assessment and report on Delta's obligations to report under the CLM Act, including identification of contamination risks requiring further assessment; and

- Provide a preliminary baseline assessment of site contamination issues at each of the sites, including a preliminary contamination risk ranking and documentation of recommended or current contamination assessment, remediation or site management measures being implemented by Delta to address these.

Results for the Vales Point Power Station state that according to the '*data reviewed as part of this baseline assessment does not indicate that notification is required*'. The report also identifies 14 AECs at Vales Point, namely:

- cooling water outlet;

- aboveground fuel storage;
- refuelling area
- turbine oil tank;
- emergency diesel generator;
- Ash Dam;
- settling ponds;
- coal handling area;
- heavy vehicle wash bay;
- sewage treatment plant;
- transformer operations;
- former asbestos landfills;
- oil water separator; and
- cooling water inlet.

No intrusive investigation was undertaken as part of the GHD assessment.

6 PRELIMINARY CONCEPTUAL SITE MODEL

A Conceptual Site Model (CSM) is a qualitative description of the plausible mechanisms ('pathways') by which humans or sensitive environmental areas ('receptors') may be exposed to site contamination ('sources'). A 'Source-Pathway-Receptor' exposure mechanism is referred to as a 'SPR linkage' throughout this report.

The development of a CSM is an iterative process, staring with a review of background data for the Site and any available data from previous intrusive investigations. The CSM is refined by identifying data gaps and undertaking additional investigation to address these gaps, often in a staged approach. Typically the CSM is based on a 'lines-of evidence' approach where multiple data sources are used in the assessment of actual and potential risks to human health and the environment.

The preliminary CSM for the Site is derived from an assessment of the information reviewed to date and presented in the preceding sections of this report. The SPR linkages are specifically addressed in the following sections and a graphical representation of the preliminary CSM is presented in *Annex F*.

The first step in defining the potential the SPR linkages for a Site is to identify the Areas of Environmental Concern (AECs) which may give rise to potential contamination issues. Following a review of Site data and Site visits, a number of AECs were identified where further investigation is required to allow ERM to assess current risk (environmental, financial or regulatory). The following sections describe AECs that are considered to represent data gaps in the CSM that warrant further assessment. The location of the AECs is shown on *Figure 4* of *Annex A*.

6.1 AREAS OF ENVIRONMENTAL CONCERN

6.1.1 Main Generating Plant Area (B Station)

B Station Power Block

The main area of the Power Station contains the two power generating units previously described. The primary source of potential contamination identified in this area is potential leaks of lubricating oil and fuel at various points around the plant. Observations during the Site visit confirmed this oil loss in various areas. In particular, surface staining and/or oily surface water was noted in the area of the emergency generator diesel tank and fuel unloading area for the turbine oil storage tanks.

A major fire event fire also occurred in the 5A Air Heater in November 2011. The potential use of firefighting foam during this fire indicates that perfluorooctane sulfonate (PFOS) and/or perflurooctanoic acid (PFOA) are Chemicals of Potential Concern (COPC) for this area, as these chemicals are components of Aqueous Film Forming Foam (AFFF), which is a component of firefighting foam.

Within the power block, leaks and spills are generally captured in internal contaminated water drains and transferred to the to the oil and grit separator and Chain Valley Retention Basin, located in the north eastern corner of the site; however larger spills which pool on the ground surface below various infrastructure and from the drainage system have the potential to directly impact underlying soil and groundwater by migration through cracks in concrete or via damaged drains.

No investigation has previously been completed within the immediate area of the power generating units due to access and safety limitations.

Workshops and Minor Dangerous Goods Storage Areas

Various small workshops are present throughout the power block which service specific areas. Many of these workshops hold small quantities of lubricating oils, solvents and similar chemicals. During the Site visit, dangerous goods were generally observed to be appropriately stored within bunded or contained areas. However, staining of the concrete surface in various areas of the workshops was observed, which indicates the potential for pooled spills and leaks to penetrate the concrete through cracks and joints into the subsurface.

No investigations are known to have been undertaken to date which specifically target the small workshops within the power block.

Power Block Drainage Network

The network of drains which runs beneath the power block represent a potential contamination source to soil and groundwater due to the subsurface nature of this network and the various COPCs (including corrosive chemicals) likely to be currently present or having been historically present as a result of the collection and conveyance of spills and leaks in various areas. In addition to the dedicated stormwater and contaminated water drainage systems, a sluiceway which transports ash and coal fines collected in various surface drains in the power block runs through the power block, eventually discharging into the Ash Dam.

No investigations are known to have been undertaken to date which specifically target the drainage network within the power block.

Power Block Investigation Approach

Conducting intrusive investigations within the B Station power block is not considered safe or possible due to the operational nature of this area. The investigations of this AEC will therefore focus on identifying COPC (of a material nature), if any, that may have migrated from this AEC.

It is considered that data collected from around the perimeter of the power block, supplemented with investigation data from other AECs, will be sufficient in terms of spatial coverage to assess the migration of COPCs from this AEC.

6.1.2 A Station

A Station Area

Vales Point A station historically contained four power generating units and associated infrastructure. At the time of ERM's Site visit, the A Station buildings were undergoing demolition and removal and ERM was unable to access the area during their December 2013 Site inspection, due to safety concerns. Site personnel indicated that this demolition process would be completed in early 2014.

The primary sources of potential contamination within the A Station area are associated with historic lubricating oil and fuel leaks at various points around the plant.

Intrusive investigations have not previously been completed within the A Station due to access and safety limitations.

Power Block Investigation Approach

The completion of intrusive investigations within the B Station power block is not considered safe or possible due to the demolition activities being undertaken. Intrusive investigations are also not considered to be possible following the completion of the demolition activities, due to the high probability of encountering unmarked subsurface utilities historically associated with the operation of the facility. The investigations of this AEC will therefore focus on identifying COPC (of a material nature), if any, that may have migrated from this AEC.

It is considered that data collected from around the perimeter of the A Station area, supplemented with investigation data from other AECs, will be sufficient in terms of spatial coverage to assess the migration of COPCs from this AEC.

6.1.3 Transformer Area

The Transformer Area houses the main transformers for the Site and is located immediately west of the B Station power block. In addition to the potentially contaminating activity of transformer operation, also located within this area are two temporary turbine oil storage ASTs and refuse oil storage AST No. 2.

The transformers are contained within bund systems that drain to the oil and grit separator. Waste generated in the oil and water separator is trucked from the site and the treated water is directed into the Chain Valley Retention Basin prior to discharge into Chain Valley Bay.

Based on verbal information supplied by Delta Electricity personnel during the site visit, ERM understands that a PCB removal program has been undertaken at the Site. Low concentrations of PCBs have been detected in transformer oil samples collected in 2012/2013.

In November 2006 the Vales Point Unit 6A 330/22kV Generator Transformer failed, resulting in an explosion and fire. A large volume of water and fire retardants were reported to have been used in the emergency operations associated with this event. This event is likely to have released transformer oil to the surrounding area. The potential use of firefighting foam during this fire also indicates that PFOS and/or PFOA are also COPC.

No investigations are known to have been completed within this AEC to date.

Transformer Area Investigation Approach

Conducting intrusive investigations within the Transformer Area is not considered safe or possible due to the operational nature of this area. The investigations of this AEC will therefore focus on identifying COPC (of a material nature), if any, that may have migrated from this AEC.

It is considered that data collected from around the perimeter of the power block, supplemented with investigation data from other AECs, will be sufficient in terms of spatial coverage to assess the migration of COPCs from this AEC.

6.1.4 Main Store - Dangerous Goods Storage Area

The Main Store compound is located on the south western edge of the operational area of the Power Station and comprises a covered section and an open lay-down area covered in concrete hardstand. This area is used for storage of various materials used throughout the Power Station, including dangerous goods.

The Main V1 Store Building houses minor quantities (< 200 L) of flammable liquids and oils in cabinets. An outdoor compound area is located to the south of the Main Store and has a roofed enclosure used to house drums of lubricants and greases. A storage area located within a brick structure to the south east of the Main Store is used to house gases and corrosive liquids.

No investigations are known to have been completed within this AEC to date.

Main Store Area Investigation Approach

Given the lack of investigation data in this AEC and the potential sources of contamination, further investigation is considered to be required to provide a baseline for this area and to assess potential material issues associated with soil and groundwater contamination.

6.1.1 Contaminated Water Treatment System

The oil-water separation facility treats the water captured by the contaminated water drain system at the Power Station. Water entering the facility could contain a range of potential contaminants including fuels, chemicals, coal and ash.

All the elements of the oil-water separation facility are located to the north east of the operational area. The facility comprises a sediment basin with an oil skimmer ('hairy ropes') and a separate secondary oil water separation section. Waste generated in the facility is trucked from the site for offsite disposal.

After passing through the oil-water separator, water discharges into the Chain Valley Retention Basin, located immediately to the north east. The Chain Valley Bay Retention basin contains a series of booms to further isolate oil that may enter the pond. Water from the pond enters a pit before discharge into Chain Valley Bay. The pit contains isolation valves and the outlet pipe is covered with a membrane filter as a final screen for oil and other detritus.

Visual inspection of the oil-water separation facility during ERM's site visit in December 2013 identified an oily layer of Light Non-Aqueous Phase Liquid (LNAPL) on the water within the sediment basin. While oily residue was not observed in the holding pond, dissolved phase impact may still be present in water held within the pond.

Groundwater and surface water are not monitored in the immediate vicinity of the oil-water separation system.

Contaminated Water Treatment Area Investigation Approach

Given the lack of groundwater characterization data collected in the vicinity of this AEC, coupled with the potential for impact from the oily residues and contaminated water, further investigation would be required to assess potential material environmental issues associated with soil and groundwater conditions.

6.1.1 Waste Oil Storage Area

Waste oil in drums and containers and oily rags are stored in the waste oil collection area to the south of the oil and grit trap. This area also temporarily stores new oil drums for use in the Power Station. The area is bunded and collected stormwater from this area is pumped into the oil-water separation facility.

During ERM's site visit in December 2013, the grate in the corner of the bunded area was covered in oil at the time of the inspection. It was not clear whether this grate was attached to a sump or discharged directly to the oil-water separator.

Groundwater and surface water are not monitored in the immediate vicinity of the waste oil storage area.

Waste Oil Storage Area Investigation Approach

Given the lack of groundwater characterization data collected in the vicinity of this AEC coupled with the potential for impact from the waste oils and contaminated runoff, further investigation would be required to assess potentially material environmental issues associated with soil and groundwater conditions.

6.1.2 Fuel Oil Installation

The Fuel Oil Installation comprises two 1.2 ML steel ASTs, which are used for the storage of diesel. This installation is located outside the station inner security fencing and the bulk fuel oil supplies are delivered by road tanker. The volume of fuel being stored and transferred from this facility to the Site represents a significant source of potential contamination.

The ASTs are bunded with drainage from the bund discharging to the No. 1 Settling Basin for disposal to Ash Dam. Delta Electricity personnel indicated that the integrity of the bunds is regularly assessed.

No information was available at the time of assessment regarding procedures for reconciling delivery and usage volumes. Regardless of this data gap, given the limitations of wet stock reconciliation when dealing with such large volumes, there is a potential for leaks or spills to have caused the migration of contaminants to the underlying soil and groundwater.

There have been no soil and groundwater investigations completed in the area of the Fuel Oil Installation or adjacent to any of the associated pipework.

Fuel Oil Installation Investigation Approach

Given the absence of previous environmental investigations undertaken in association with this AEC, the age of infrastructure, volume of stored and transferred fuel, and the potential for historic release events to impact soil and groundwater receptors, further investigation would be required to assess potential material environmental issues associated with soil and groundwater conditions.

6.1.3 Vehicle Refuelling Depot

The Vehicle Refuelling Area is located adjacent to the Administration Building and consists of two Underground Storage Tanks (USTs) which are used to store unleaded petrol and diesel, connected to two bowsers. Data room documents indicated that a single decommissioned underground storage tank is also located approximately 10 m to the north of the operational refuelling facilities and two decommissioned USTs and bowser plinth are located approximately 30 m north west of the operational refuelling facilities.

Tank integrity test results were not available for review during this assessment.

Soil and groundwater investigations have been completed in the areas of underground tank infrastructure to ensure compliance with relevant UPSS legislation. Four groundwater monitoring wells were installed in the UPSS area in 2010 and an additional six (6) wells were installed in 2011. In 2010, TRH(C_{10} – C_{36}) was identified at a concentration of 2,540 µg/L, in a well installed to the north of the UPSS but TPH was not detected in any of the ten (10) wells sampled in 2011. In 2011, four (4) new groundwater monitoring wells were installed and these have been subsequently assessed for the presence/absence of hydrocarbon sheen using a visual check and an interface probe. Hydrocarbon sheens were not detected in these investigations.

Vehicle Refuelling Depot Investigation Approach

Based on the previous investigation results, it is considered that material contamination related to the presence of the USTs and aboveground fuel dispensing infrastructure does not appear to be present. However, it is recommended that the existing groundwater wells are sampled to provide up-to-date baseline data in this area.

During ERM's Site visit in December 2011, Delta Electricity personnel indicated that only three (3) groundwater monitoring wells were currently present in the vicinity of the vehicle refuelling depot. It is unclear whether any of the additional wells installed between 2010 and 2011 are still present at the Site. Additional wells may therefore also need to be installed within this area.

6.1.4 Water Treatment Plant Areas

The Demineralisation Plant, Reverse Osmosis Plant and Polisher Regeneration Plant are located to the south west of the B Station power block. Significant quantities of sulphuric acid, sodium hydroxide, hypochlorite, ammonia and ferric sulphate are stored in ASTs in this area.

The water treatment plant area is bunded but potential damage to the bunds or bund linings surrounding some of the ASTs or corrosion of the associated pipework may have led to uncontrolled releases of chemicals to stormwater or directly to the subsurface via cracks or other preferential pathways.

Overall, the likelihood of receptors being exposed to contaminants originating from the water treatment plant area is considered to be low but no investigations are known to have been completed within this AEC to date.

Water Treatment Area Investigation Approach

Soil and groundwater investigations within the Water Treatment Area are not considered safe or possible due to the operational nature of this area. The investigations of this AEC will therefore focus on identifying COPC (of a material nature), if any, that may have migrated from this AEC.

It is considered that data collected from around the perimeter of the Water Treatment Area, supplemented with investigation data from other AECs, will be sufficient in terms of spatial coverage to assess the migration of COPCs from this AEC.

6.1.5 Coal Storage Area

The coal storage area is located to the south west of the power block and is used for stockpiling of coal prior to being transferred via conveyor to the coal mill and boilers. Truck washing facilities are located within this area and large area was formerly used to store biomass (primarily wood chips).

Potential contamination sources include dirty water from the truck washing facility and contaminated stormwater runoff from this area, which are captured by a system of concrete drains that discharge into the settling ponds located in the northern portion of the stockpile area. Water from the retention ponds is discharged to the Ash Dam and overflow from these settling ponds is discharged into the outfall canal. Leaching of contaminants from the coal stockpiled on open ground may also affect groundwater.

No soil or groundwater investigations are known to have been completed within this AEC to date.

Coal Storage Area Investigation Approach

Given the absence of previous environmental investigations, the volume of stored and transferred coal, and the runoff and leaching to impact soil, groundwater and surface water receptors, further investigation would be required to assess potential material environmental issues associated with this AEC.

6.1.6 Mobile Plant Maintenance and Refuelling

Mobile plant associated primarily with the coal storage area are serviced and refuelled in this area, located directly to the north of the coal storage area. This area also houses a diesel AST, refuse oil AST, a lubricants station and a parts cleaning facility. The refuelling/maintenance facilities are contained within a bunded area and runoff from this area is directed via an oil separator into a settling pond.

Potential contamination sources in this area include contaminated stormwater runoff from this area and leaks or spills of oils and solvents.

No soil or groundwater investigations are known to have been completed in the vicinity of the mobile plant facilities.

Mobile Plant Area Investigation Approach

Given the absence of previous environmental investigations conducted within this AEC, the storage of fuel, oils and solvents in this area and the potential for historic release events to have impacted soil and groundwater, further investigation would be required to assess potential material environmental issues associated with soil and groundwater conditions within this AEC.

6.1.7 Sewage Treatment Plant

The Vales Point Sewage Treatment system is located outdoors to the west of the operational area and consists of an Imhoff tank with sedimentation compartment and sludge compartments and three treatment ponds, with a mechanical aeration system. The effluent from the third pond in this system ultimately discharges to the Retention Basin on the northern side of the Ash Dam.

Sewage can contain a variety of contaminants, including nitrates, metals, trace concentrations of toxic chemicals and salts. Potential contamination sources in association with the sewage treatment plant include leakage from the sewage treatment systems, associated pipework or retention basin into the underlying soil or groundwater

No soil or groundwater investigations are known to have been completed in the vicinity of the sewage treatment plant facilities.

Sewage Treatment Plant Area Investigation Approach

Given the absence of previous environmental investigations in the vicinity of the sewage treatment plant facilities and the potential for leakage to have impacted soil and groundwater, further investigation would be required to assess potential material environmental issues associated with soil and groundwater conditions within this AEC.

6.1.8 Chlorine Plant

The Power Station generates free chlorine on site through an electrolytic process using seawater sourced from Lake Macquarie. The chlorine plant is located to the north west of the power block and includes the bulk storage of hydrochloric acid and sodium hypochlorite in ASTs.

The water treatment plant area is bunded but potential damage to the bunds or bund linings surrounding some of the ASTs or corrosion of the associated pipework may have led to uncontrolled releases of chemicals to stormwater or directly to the subsurface via cracks or other preferential pathways.

It is also noted that the transformer oil storage filtration building, associated with the TransGrid Switchyard is located immediately adjacent to the Chlorine Plant.

Overall, the likelihood of receptors being exposed to contaminants originating from the chlorine treatment plant area is considered to be low but no investigations are known to have been completed within this AEC to date.

Chlorine Plant Investigation Approach

Given the absence of previous environmental investigations in the vicinity of the chlorine plant and the potential for leakage to have impacted soil and groundwater, further investigation would be required to assess potential material environmental issues associated with soil and groundwater conditions within this AEC.

The data collected within this AEC could also be used to evaluate COPCs associated with the operation of the adjacent transformer oil storage filtration building.

6.1.9 Rail and Mandalong Coal Unloader Area

The Rail unloader is located adjacent to the Ash Dam and the Main Northern Rail Line between Wyee and Morrisset, approximately 4.5 km to the north west of the main power block. A network of coal conveyors links this facility to the coal storage area, adjacent to the operational area of the Site.

ERM was unable to gain access to this area during the December 2013 site inspection and there is limited information available in the data room about the nature of operations in this area.

ERM understands that the facility comprises a series of hoppers, feeders and transfer points and a dust suppression system based on the use of water. Two retention ponds are located to the west of the unloader area. The *Land Management Manual Central Coast* (GHD, 2012) indicates that coal wastes are present within a bunded area in the vicinity of the conveyor loop.

A review of recent aerial imagery relating to this area indicates the presence of 9 ASTs. No information was available at the time of the assessment on the contents of these vessels. A cleared area and retention pond are present in the eastern portion of this area, approximately 600 m to the south east of the conveyor loop.

The majority of the RV coal conveyor system is at ground level with graduated elevation of conveyors at the entry into the transfer towers. Conveyors are covered to reduce the potential for dust emissions.

No soil or groundwater investigations are known to have been completed in the vicinity of the rail unloader or conveyor network.

Rail Unloader Area and Conveyor Network Investigation Approach

Given the absence of previous environmental investigations in the vicinity of the rail unloader and the potential for leakages or contaminated runoff to have impacted soil and groundwater, further investigation would be required to assess potential material environmental issues associated with soil and groundwater conditions within this AEC.

The conveyor network is considered unlikely to be a source of material soil or groundwater contamination. On this basis, an intrusive investigation along the length of this infrastructure is not recommended at this stage of the assessment. A more detail inspection along the length of this network, with the aim of identifying any visual signs of contamination, would be required to determine the requirement for any intrusive investigations.

6.1.10 Ash Dam

The Ash Dam is located to the south-west of the Vales Point Power Station and covers an area of approximately 150 ha. The northern portion of the Ash Dam (Ponds 1, 2 and 3) have been filled to capacity and rehabilitated.

The Ash Dam receives ash from Vales Point via slurry pipelines and dirty water from the coal handling area and effluent pit in the Power Station. Prior to Munmorah Power Station ceasing operations, the Vales Point Ash Dam was also used for the storage of fly ash produced at Munmorah Power Station Various other solid wastes are also directed to the Ash Dam. The waste material approved for disposal in the Ash Dam under the EPL include ash, coal fines, mill pyrites, residual detergents and oil sheens, sand, concrete products, boiler blowdown, minor chemical spill residues, chemicals for environmental control, ash dam water treatment plant residues, dust returned from the ash recovery plant, marine growth, debris, seaweed, chemical cleaning solutions, oil and chemically impacted soil, desilting of settling basins, dredge spoil, waste wood, wood chips, dirty water drains, treatment plant discharges, coal handling plant stormwater, neutralised demineralisation effluent, polisher plant effluent, spent ion exchange resins, chlorine plant storage vessel precipitates, cable tunnel drainage, fabric filter bags, coal chitter and soil capping materials, coal mine dewatering discharges. Asbestos Containing Material (ACM) was also historically disposed within the dam.

Three existing groundwater monitoring wells installed to the north of the Ash Dam have been monitored since 2008 to assess seepage from the Ash Dam. Data collected from these wells indicates that seepage from the ash dam has the potential to be saline and contain elevated concentrations of heavy metals (specifically copper, lead, nickel and zinc). As a result, the EPA has requested additional groundwater investigations in this area, in form of a PRP.

Ash Dam Investigation Approach

While some environmental assessment has been undertaken in this area, it is not considered that suitable characterisation of environmental conditions has been established, and further investigation would be required to confirm soil and groundwater conditions within this AEC.

Intrusive soil and groundwater investigations within the active or rehabilitated areas of the Ash Dam are not considered necessary, as it is already acknowledged that these areas are impacted with waste materials. The investigations of this AEC will therefore focus on identifying COPC (of a material nature), if any, that may have migrated from this AEC towards sensitive receptors. Data collection within this AEC will therefore focus on the boundary areas, with a particular focus on the downgradient areas.

6.1.11 Asbestos Landfills

Six dump sites are located within the catchment of the Ash Dam. These dump sites were closed in approximately 1995. Four of the dump areas (Dumps 1-4) have been closed and covered, revegetated, surveyed and fenced. Dump 5 is located entirely within the active area of the Ash Dam. Dump Area 6 is located predominantly within the active area of the Ash Dam, with a small portion located in bushland to the east of the active portion of the Ash Dam.

Detailed information about the waste materials disposed within the landfills was not available for review as a part of this assessment but it is understood that the material disposed within these areas included asbestos. The waste materials contained within the landfill areas have the potential to impact the conditions of underlying soil and groundwater.

No soil or groundwater investigations are known to have been completed in the vicinity of the asbestos landfill areas.

Asbestos Landfill Investigation Approach

Given the absence of previous environmental investigations and the potential disposal of a variety of materials within the landfill areas, further investigation would be required to assess potential material environmental issues associated with soil and groundwater conditions surrounding this AEC.

Intrusive soil and groundwater investigations within the asbestos landfills is not considered safe or necessary, as it is already acknowledged that these areas are impacted with waste materials. The investigations of this AEC will therefore focus on defining the extent of the waste areas and identifying COPC (of a material nature), if any, that may have migrated from this AEC towards sensitive receptors. Data collection within this AEC will therefore focus on the boundary areas.

6.1.12 Asbestos-containing Pipeline

Site personnel indicated that an aboveground dust pipeline transferring dust from the operational area of the Site and the Ash Dam contains asbestos. The asbestos register for the Site indicates that approximately 7 km of dust pipes at the Site contain asbestos.

Site personnel indicated that the pipe had been treated with paint to minimise the release of ACM to the environment but very limited information was available regarding the condition or maintenance of the pipeline and surface paint layer, at the time of the assessment. The potential exists for soil in the vicinity of the pipeline to have been impacted by asbestos fibres, from the degradation of this equipment.

The asbestos register for the Site identified ACM in buildings, plant, electrical equipment and fire services equipment across the operational areas of the Site.

Asbestos Investigation Approach

Given the absence of previous environmental investigations in the area of the asbestos containing pipeline, the significant length of this pipeline and the limited available information pertaining to its condition, further investigation would be required to assess potential material environmental issues associated with soil conditions surrounding this AEC.

An assessment of the potential for widespread asbestos contamination to be present across the Site would also be required to assess potential material environmental issues associated with the ACM in buildings, plant, electrical equipment and fire services equipment across the operational areas of the Site. This assessment can be undertaken in association with the investigations undertaken within AECs located across the Site.

6.1.13 Wyee Creek and Lake Macquarie Sediments

Lake Macquarie sediments and surface water have been identified as a potential AEC due to the discharges that the Lake receives from the Power Station, which include:

- cooling water that has passed through the plant and therefore:
  - has been treated with biocides and anti-scale chemicals;
  - is heated;
  - may contain traces of oil;
  - has potentially elevated salts and metals due to concentration created by evaporation.
- treated effluent from the oil-water separator associated with the operational site drainage network;
- overflow and potential seepage from the Ash Dam and associated tributary streams;
- stormwater runoff from across the Site; and
- groundwater from across the Site.

Surface water samples are collected from Lake Macquarie on a regular basis, as a part of the EPL conditions associated with the operation of the Site but the parameters analysed generally have not include metals.

Discharges to Wyee Creek are also monitored when they exceed 2 hr duration. These monitoring events have identified exceedences of the ANZECC (2000) trigger values for marine water for metals and elevated concentrations of selenium.

Wyee Creek and Lake Macquarie Investigation Approach

While some environmental assessment has been undertaken in this area, it is not considered that suitable characterisation of environmental conditions has been established.

Given the absence of available previous detailed environmental characterisation work at the Site, the numerous discharge points and sources of potential contaminants, and the presence of recreational users of the Lake, further investigation of selected depositional areas would be required to provide a baseline for this area and to assess potential material issues associated with impacts to sediment and surface water at the Site.

6.1.14 TransGrid Switchyard

The TransGrid Switchyard, although not operated by Delta Electricity, is a potential AEC due to the storage/use of transformer oil which may have historically contained PCBs. The Switchyard is located on the western side of the cooling water canal from the power block, adjacent to the chlorine plant, hydrogen plant and Site canteen.

It is also noted that the Vales Point Fire Training Area is located adjacent to the TransGrid Switchyard to the south east.

No investigations are known to have been completed within this AEC to date.

Transformer Area Investigation Approach

Conducting intrusive investigations within the Switchyard Area is not considered safe or possible due to the operational nature of this area. The investigations of this AEC will therefore focus on identifying COPC (of a material nature), if any, that may have migrated from this AEC.

It is considered that data collected from around the perimeter of the Switchyard, supplemented with investigation data from other AECs, will be sufficient in terms of spatial coverage to assess the migration of COPCs from this AEC. This perimeter data will also be used to evaluate COPCs in soils and groundwater that is associated with the vales Point Fire Training Area.

6.1.15 Fly Ash Plant Area

The Vales Point Fly Ash Plant is located next to the Power Station for the purpose of reusing the fly ash that is produced as a by-product of generating power.

ERM was unable to gain access to this area during the December 2013 site inspection and there is limited information available in the data room about the nature of operations in this area

It is understood that the fly ash is pumped directly into overhead silos located above a weighbridge and trucks are then filled from overhead while stationed on the weighbridge. The fly ash is then trucked from the Site.

No investigations are known to have been completed within this AEC to date.

Fly Ash Plant Area Investigation Approach

Given the absence of previous environmental investigations within this AEC and the limited information available at the time of this assessment regarding the nature of the operations in this area, further investigation would be required to assess potential material environmental issues associated with soil and groundwater conditions within this AEC.

6.1.16 Acid Sulfate Soil Areas

Potential Acid Sulfate Soil (PASS) conditions have been identified in a number of areas of the Site. In particular, PASS conditions are located to the north of the Ash Dam and north east of the Power Block. In the event that areas of PASS are disturbed by excavation activities or similar, Acid Sulfate Soil (ASS) conditions can occur. Acid sulfate soil conditions have the potential to adversely affect environmental receptors through the mobilisation of heavy metals.

A detailed delineation of PASS and ASS conditions within the Site is outside the scope of this assessment. During detailed environmental characterisation works undertaken across the Site however, field and laboratory indicators of ASS and PASS in soil, surface water and groundwater can be recorded.

6.2 SENSITIVE RECEPTORS

Approximately 400 ha of the Site are actively used for Site operations. Lands surrounding these active areas are maintained as buffer zones of native vegetation to segregate the Site from surrounding residential communities.

The Vales Point Land Management Plan (GHD, 2012) identified a number of threatened floral communities within the buffer zone. State Environmental Planning Policy No. 14 (SEPP 14) wetlands are located in the vicinity of the Site; immediately to the north of the Ash Dam toe drain around the fringes of Mannering Bay, on the northern edge of Mannering Bay and along the waterways within the northern buffer zones.

The sensitive receptors identified in association with the Site include;

- indoor and outdoor human health receptors in the form of onsite and offsite workers;
- intrusive maintenance workers both on and onsite;
- offsite residential receptors, living in the vicinity of the operational area or Ash Dam;
- recreational users of Mannering Bay, Wyee Bay and Chain Valley Bay;
- recreational users of Tom Barney Oval;
- aquifers beneath the Site and nearby potable and stock watering wells; and
- ecological receptors, including those in Mannering Bay, Wyee Creek, Wyee Bay and Chain Valley Bay.

Onsite water bodies that are used for operational purposes, including the Ash Dam, the cooling water canal and the various water retention, treatment and settling ponds are not considered to be ecological receptors

6.3 EXPOSURE PATHWAYS

There are several potential exposure pathways in which contaminants may impact sensitive receptors:

- transport via the site drainage system into surface waters;
- leakage from the site drainage system into groundwater;
- seepages of spilt chemicals/fuels direct to ground;
- leaching of metals from soil into groundwater;
- dermal contact and incidental ingestion of contaminated soils/sediments;
- inhalation of vapours related to impacted soils/groundwater (e.g. in presence of high concentrations of volatile contaminants or LNAPL);
- seepage from the Ash Dam, into local creeks;
- inhalation of asbestos fibres; and
- groundwater flow into surface water bodies (e.g. Lake Macquarie).

7 RECOMMENDATIONS FOR STAGE 2 ASSESSMENT

Based on the results of the Preliminary ESA undertaken by ERM and consideration of Delta Electricity's intended approach to the assignment of liability relating to soil and groundwater contamination issues, a programme of intrusive (Stage 2) assessment of potential soil, groundwater, sediment and surface water contamination issues is proposed to assess current conditions at the Site and relevant offsite receiving environments.

The following sections set out the proposed scope for the Stage 2 works in general accordance with the requirements set out in NSW EPA (2011).

It is noted that the Stage 2 ESA scope of work presented herein is preliminary, and the final agreed scope of works for the Stage 2 ESA will be detailed in a separate Sampling Analysis and Quality Control Plan (SAQP) which should be viewed in conjunction with this report. It is noted that the proposed sampling locations are only indicative and will be confirmed through a Site inspection and ground-truthing process. A level of redundancy is inherent in the proposed sampling design, to account for the fact that not all of the sampling points are likely to be able to be installed on the Site due to access and safety considerations at individual locations.

The primary objective for the Stage 2 ESA is to gather data from applicable environmental media in order to develop a baseline assessment of environmental conditions at the Site and immediate surrounding receiving environments (including water, land and sediments), at the time of the transaction. Data obtained during completion of the Stage 2 ESA will also be used to assess whether there are contamination issues present which will exceed the material threshold and may also be used to inform future management of contamination issues both at the Site and in relation to the relevant receiving environments.

7.1 DATA QUALITY OBJECTIVES

Prior to commencement of the Stage I works, Data Quality Objectives (DQOs) were established for the project in line with the requirements and process outlined in NSW DEC (2006) *Guidelines for the NSW Site Auditor Scheme (2nd edition).*

These DQOs were developed to define the type and quality of data required from the site assessment program to achieve the project objectives outlined in *Section 1*. The DQOs were selected with reference to relevant guidelines published by the NSW Environmental Protection Authority (EPA), ANZECC and the NEPC, which define minimum data requirements and quality control procedures. The application of the seven-step DQO approach identified in NSW DEC (2006) is presented in full in *Annex H*.

7.2 *SAMPLING RATIONALE*

Based on a review of the available data, and the establishment of AECs, the most appropriate sampling design to achieve the stated project objectives is considered to be primarily based on a judgemental (targeted) sampling program, with additional sampling undertaken to provide spatial coverage for low risk areas of the Site (e.g. buffer lands) or to fill material data gaps within the CSM.

It is noted that intrusive investigations may be limited to areas where access and site activities enable investigations to occur without unacceptable health and safety risks to personnel and / or unacceptable disruption to Site operations. The sampling plan will be discussed with site management prior to the commencement of works to assess this risk. As such, the sampling design currently proposed is considered indicative, and subject to minor alteration.

Given the scale of the Site, different sampling densities are proposed to be adopted relative to the contamination risk and logistical constraints in different areas of the Site. The sampling approach is generally in accordance with the NSW EPA (1995) *Sampling Design Guidelines*. The NSW EPA (1995) guidelines do not recommend a minimum number of sampling points for sites larger than 5.0 hectares. The Site has been divided into smaller areas of concern based on a review of historical activities and identified potentially contaminating activities as recommended in the NSW EPA (1995) guidelines.

The proposed sampling locations are provided in *Figures 5-1* to *5-7* of *Annex A*, with information on rationale, constituents of potential concern and number of investigation locations provided in *Table 7.1* (over).

Table 7.1 Proposed Sampling Approach

Area of Environmental Concern	AEC ID	Issue	Analytes	Proposed Boreholes & Monitoring Wells
B Station Power Block	VA	Contamination of soil and groundwater from spills and leaks of various chemicals	Standard Suite* plus VOCs, PCBs & PFOS/PFOA	• 4 soil bores • 8 monitoring wells • Supplemented with additional investigation locations from other surrounding AECs
A Station	VB	Contamination of soil and groundwater from spills and leaks of various chemicals	Standard Suite* plus VOCs, PCBs & PFOS/PFOA	• 3 soil bores • 7 monitoring wells • Supplemented with additional investigation locations from other surrounding AECs
Transformer Area	VC	Contamination of soil and groundwater from spills and leaks of various chemicals	Standard Suite* plus VOCs, PCBs & PFOS/PFOA	• 2 soil bores • 5 monitoring wells • Supplemented with additional investigation locations from other surrounding AECs
Main Dangerous Goods Store	VD	Contamination of soil and groundwater from spills and leaks of various chemicals	Standard Suite* plus VOCs	• 2 soil bores • 5 monitoring wells • Supplemented with additional investigation locations from other surrounding AECs
Contaminated Water Treatment Plant	VE	Contamination of soil and groundwater from contaminated water from operational areas	Standard Suite* plus VOCs and PCBs	• 1 soil bores • 3 monitoring wells
Waste Oil Storage Area	VF	Contamination of soil and groundwater from leaks and spills of various waste oils and chemicals	Standard Suite* plus VOCs and PCBs	• 3 monitoring wells • Supplemented with additional investigation locations from other surrounding AECs
Fuel Oil Installation	VG	Contamination of soil and groundwater from loss of fuel and oil	Standard Suite*	• 4 monitoring wells • Supplemented with additional investigation locations from other surrounding AECs

Area of Environmental Concern	AEC ID	Issue	Analytes	Proposed Boreholes & Monitoring Wells
Vehicle Refuelling Depot	VH	Contamination of soil and groundwater from loss of fuel (UPSS)	Standard Suite*	• 10 monitoring wells • Supplemented with additional investigation locations from other surrounding AECs
Water Treatment Plant Area	VI	Contamination of soil and groundwater from spills and leaks of chemicals used in water treatment processes	Standard Suite* plus pH, major cations/anions	• 2 soil bores • 3 monitoring wells
Coal Storage Area	VJ	Potential leaching of contaminants from stockpiled coal, retention ponds and truck wash facilities	Standard Suite* plus 13 metals and boron, molybdenum, thallium and selenium	• 4 soil bores • 10 monitoring wells
Mobile Plant Maintenance and Refuelling Area	VK	Contamination of soil and groundwater from fuel storage/dispensing, waste oil tank and cleaning/lubricating facilities	Standard Suite*plus VOCs	• 2 soil bores • 7 monitoring wells
Sewage Treatment Plant	VL	Potential leaching of contaminants from sewage treatment facilities or retention ponds	Standard Suite*	• 1 soil bore • 3 monitoring wells
Chlorine Plant	VM	Contamination of soil and groundwater from spills and leaks of chemicals used in water treatment processes and the adjacent transformer oil storage and filling station	Standard Suite* plus pH, major cations/anions, and PCBs	• 1 soil bore • 5 monitoring wells
Rail Coal Unloader Area and Coal Conveyors	VN	Contamination of soil and groundwater from transfer line gearbox oil leaks, fugitive coal fines, current and historic fuel and coal storage, locomotive maintenance, and rail infrastructure activity.	Standard Suite* plus 13 metals and boron, molybdenum, thallium and selenium	• 5 soil bores • 12 monitoring wells • Visual inspection of coal transfer lines to assess the need for further investigation
Ash Dam	VO	Contamination of soil and groundwater from ash dam leachate, waste disposal and ash slurry/return water lines with ACM.	Standard Suite* plus 13 metals and boron, molybdenum, thallium and selenium, pH, major cations/anions	• 3 soil bores • 21 monitoring wells
Asbestos Landfills	VP	Contamination of soil and groundwater from current and historical waste burial	Standard Suite* plus VOCs. Asbestos in surface soil samples only	• 10 soil bores • 2 monitoring wells

Area of Environmental Concern	AEC ID	Issue	Analytes	Proposed Boreholes & Monitoring Wells
Asbestos Pipeline	VQ	Contamination of soil with ACM from ash slurry pipeline	Asbestos	• 11 soil bores for asbestos only
Sediments in Surrounding Waterways and Lake Macquarie	VR	Contamination of sediments in Wyee Creek from discharges related to the operation of the Ash Dam. Contamination of sediments in SEPP14 wetlands from Ash Dam seepage. Contamination of sediments in Lake Macquarie from discharges (drainage lines and groundwater seepage) related to Power Station operations.	Standard Suite* plus 13 metals and boron, molybdenum, thallium and selenium plus PCBs and PSD and TOC for ecological risk.	• 7 sediment and surface water locations from Wyee Creek • 6 sediment and surface water locations from Mannering Bay • 4 sediment and surface water locations from Wyee Bay • 3 sediment and surface water locations from Chain Valley Bay • 3 sediment and surface water locations from the wider Lake Macquarie
TransGrid Switchyard	VS	Contamination of soil and groundwater from surface water and groundwater migrating from the TransGrid switchyard onto land operated by Delta Electricity. The Vales Point Fire Training Area is also located immediately to the SE of the TransGrid boundary and these proposed samples cover this area.	Standard Suite*plus VOCs, PCBs and PFOS/PFOA	• 1 soil bore • 5 monitoring wells
Fly Ash Plant	VT	Contamination of soil and groundwater from oil leaks and fugitive coal fines	Standard Suite* plus 13 metals and boron, molybdenum, thallium and selenium	• 3 monitoring wells
Site Boundary and Buffer Areas	VU	Assessing migration of potential contamination across the Site boundaries and background conditions where there are no investigations locations as part of other AECs	Standard Suite* plus 13 metals and boron, molybdenum, thallium and selenium, pH, major cations/anions	• 3 soil bores • 20 monitoring wells • Supplemented with additional investigation locations from other surrounding AECs

Notes:

* - Standard Suite includes TRH (C_6 – C_{40}), BTEX, suite of 8 metals, PAHs, phenols. Asbestos will be analysed in one shallow fill sample at each borehole in operational areas. Field personnel to record any indicators of ASS and/or PASS identified across the investigation area

One soil sample from each AEC will be analysed for cation exchange capacity and pH for use in determining the appropriate ecological screening levels to apply.

All sediment samples and selected soil samples will be analysed for particle size distribution and total organic carbon to allow for adoption of appropriate ecological screening levels and health screening levels for vapour inhalation risk.

7.2.1 Waterways

Sediment sampling is proposed to target potential contamination from cooling water discharges, treated water discharges and other potential instances of off-site migration of contaminants from the Site and includes sampling in four areas:

- within Wyee Bay, which receives cooling water discharges;
- within Chain Valley Bay, which receives discharges of treated water from the Chain Valley Bay Retention Basin;
- within Wyee Creek and the Wyee Creek diversion channel, which has been reported to have received unplanned overflow from the Ash Dam; and
- within Mannering Bay, which receives discharges from Wyee Creek.

The proposed sediment sampling design for these areas is targeted at the source and limited downgradient areas. A transect approach to sampling is not considered to be required initially, but may be considered upon receipt of laboratory results from the initial sediment samples. Paired sampling was not considered necessary as the primary objective of this sediment sampling program is to determine baseline conditions in the waterways surrounding the Site, not to assess variability in contaminant concentrations at each sampling location.

A grab sampler is proposed to collect sediment samples at the majority of sampling locations. However, it is also proposed that the core samples are collected at all locations in Mannering Bay, two locations in Wyee Creek and Wyee Bay, one location in Chain Valley Bay, and one background location. The core samples will allow for analysis of trends in metal concentrations in sediment concentrations over time (i.e. the depth profile of metal impacts).

7.2.2 Existing Groundwater Wells

Existing monitoring wells have been identified in the vicinity of the Ash Dam toe drain and within the operational Site area in the area of the UPSS. The locations of these wells are presented on *Figure 5-2 and Figure 5-5* of *Annex A.*

It is proposed that existing groundwater monitoring wells will be sampled during Stage 2 investigation works. Sampling will only occur where the groundwater monitoring wells are deemed to be suitable.

The suitability of the existing groundwater monitoring wells will be assessed based on the following steps:

- ground truthing of the groundwater monitoring wells;
- bore logs will be reviewed to confirm that the wells were appropriately constructed and screened within the groundwater bearing strata;
- where bore logs are not available, wells will be assessed for suitability on a case-by-case basis; and
- the groundwater monitoring wells will be gauged to confirm the total depth of the well against the bore logs and the depth of groundwater.

The sampling process and analytical suite for existing wells deemed suitable will be in accordance with that adopted for newly installed wells.

7.3 PROPOSED SAMPLING METHODOLOGIES

The soil, sediment, surface water and groundwater investigation works will generally involve the following key steps:

- underground service location and mark-out (this may influence currently proposed investigation design);
- proposed borehole location mark-out;
- coring of hard standing surfaces where present;
- drilling and soil sampling of subsurface material using a combination of hand auger, push tube and / or auger drilling;
- sampling of sediment using either a stainless steel push tube or a grab sampler, depending on the conditions at individual locations;
- sampling of surface water using a swing sampler placed below the surface of the water;
- installation of 50 mm diameter groundwater monitoring wells in selected boreholes screened appropriately to intersect the aquifer of interest and facilitate measurement of NAPL (if present);
- backfilling of boreholes;
- test pitting/trenching using excavator or backhoe in selected locations outside of the operational area where access permits;

- reinstatement of hardstanding surfaces;
- surveying the location of boreholes and monitoring wells and marking sediment and surface water sampling points using a GPS; and
- development, measurement of standing water levels and sampling of the groundwater monitoring wells.

7.3.1 Proposed Field Screening Protocols

The following field screening protocols are proposed for the Stage 2 works:

Soil and Sediment

Soils will be logged by an appropriately trained and experienced scientist/engineer to record the following information: soil/sediment type, colour, grain size, sorting, angularity, inclusions, moisture condition, structure, visual signs of contamination (including staining and fragments of fibrous cement sheeting or similar) and odour in general accordance with AS 1726-1993.

A duplicate of each soil sample will be collected for field screening and will be placed in a sealed zip lock bag and screened in accordance with ERM Standard Operating Procedures (SOPs – available upon request) using a Photo Ionisation Detector (PID) fitted with a 10.6 eV lamp, calibrated at the beginning of each working day. Where the presence of Volatile Organic Compounds (VOCs) or other impact is indicated by field screening, additional laboratory analysis may be undertaken.

Groundwater

Prior to sampling or gauging each monitoring well, the well cap will be partially removed to allow the headspace to be screened using a calibrated PID over a period of one minute. The presence of odours will also be noted following removal of the well cap and described by reference to their intensity and character. Following a period of no pumping (24 hours as a minimum) all wells will be dipped to gauge the depth to groundwater and, if necessary, the presence and thickness of LNAPLs/DNAPLs. Wells will be purged using a thoroughly decontaminated peristaltic pump under low flow conditions where conditions allow. During this process, a calibrated water quality parameter meter will be used to record field measurements of pH, conductivity, redox potential, temperature and dissolved oxygen.

7.3.2 Laboratory Analysis

Primary samples will be couriered under chain of custody documentation to ALS Environmental Pty Ltd (ALS), a NATA accredited analytical laboratory. Inter-laboratory duplicate samples will be couriered under chain of custody documentation to Envirolab Services Pty Ltd (Envirolab) also a NATA accredited analytical laboratory.

Soil and groundwater samples will be analysed for the primary contaminants of potential concern listed below along with additional contaminants of potential concern associated with activities undertaken in that area.

- metals and metalloids (arsenic, boron, cadmium, chromium, copper, molybdenum, nickel, lead, mercury, selenium, thallium and zinc);
- Major cations and anions (including sulfate and chloride);
- Total Recoverable Hydrocarbons (TRH);
- BTEX - benzene, toluene, ethylbenzene and xylenes -BTEX);
- Polycyclic Aromatic Hydrocarbons (PAHs) and Phenols;
- Polychlorinated biphenyls (PCBs)
- Perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA)
- asbestos (presence/absence).

Additional contaminants of potential concern may also be analysed if required based on observations made in the field. Leachate analysis will be undertaken on soil samples based on observations made in the field and preliminary laboratory results. The Australian Standard Leachate Procedure (ASLP) is the preferred analytical method and is considered to be more representative of site conditions than the Toxicity Characteristic Leaching Procedure (TCLP).

8 *CONCLUSIONS*

The Preliminary ESA undertaken by ERM has identified that limited previous intrusive ESAs appear to have been completed on the Site and a number of potential areas of environmental concern have been identified based on the understanding of current and historic operations undertaken. These include:

- Power Block (B Station);
- A Station demolition area;
- generator transformer areas;
- main store – dangerous goods storage area;
- contaminated water treatment plant;
- waste oil storage area;
- fuel oil installation;
- vehicle refuelling depot;
- water treatment area;
- chlorine plant;
- coal storage area;
- mobile plant maintenance and refuelling;
- sewage treatment plant;
- Ash Dam;
- asbestos landfills;
- asbestos pipeline;
- Lake Macquarie sediments;
- Rail coal unloader area, rail infrastructure and coal transfer lines; and
- fly ash plant.

In addition, the Preliminary ESA identified potential offsite sources of contamination in association with the Mannering Colliery and Chain Valley Colliery, which are leased from Delta Electricity for the purpose of coal mining operations.

Based on the results of the Preliminary ESA undertaken by ERM and consideration of Delta Electricity's intended approach to establishing a baseline of soil and groundwater contamination, a programme of intrusive (Stage 2) assessment of potential soil and groundwater contamination issues is provided.

The most appropriate sampling design is considered to be a judgemental (targeted) sampling of soil, groundwater and sediments at the established AECs for the Site, which is also considered to provide suitable spatial coverage to act as a baseline assessment.

Based on the results of the Preliminary ESA and consideration of the intended approach to establishing a baseline of soil and groundwater contamination, a programme of intrusive (Stage 2) assessment of potential soil and groundwater contamination issues is provided. The most appropriate sampling design is considered to be a judgemental (targeted) sampling of soil, groundwater, surface water and sediments at the established AECs for the Site, which is also considered to provide suitable spatial coverage to act as a baseline assessment.

Based on the information available at the time of preparation of this report ERM has not identified any contamination issues which are currently undergoing or likely to require material remediation, assuming ongoing industrial land use as a coal fired power plant. A number of potential material issues were identified, which will be assessed during Stage 2 investigation works.

9 *LIMITATIONS*

This report is based solely on the scope of work described in *Section 1.3* and performed pursuant to a contract between ERM and Delta Electricity ("Scope of Work"). The findings of this report are solely based on, and the information provided in this report is strictly limited to the information covered by, the Scope of Work.

In preparing this report for the Client, ERM has not considered any question, nor provides any information, beyond the Scope of Work.

This report was prepared between 9 December 2013 and 10 January 2014 and is based on conditions encountered and information reviewed at the time of preparation. The report does not, and cannot, take into account changes in law, factual circumstances, applicable regulatory instruments or any other future matter. ERM does not, and will not, provide any on-going advice on the impact of any future matters unless it has agreed with the Client to amend the Scope of Work or has entered into a new engagement to provide a further report.

Unless this report expressly states to the contrary, ERM's Scope of Work was limited strictly to identifying typical environmental conditions associated with the subject site(s) and does not evaluate structural conditions of any buildings on the subject property, nor any other issues. Although normal standards of professional practice have been applied, the absence of any identified hazardous or toxic materials or any identified impacted soil or groundwater on the site(s) should not be interpreted as a guarantee that such materials or impacts do not exist.

This report is based on one or more site inspections conducted by ERM personnel and information provided by the Client or third parties (including regulatory agencies). All conclusions and recommendations made in the report are the professional opinions of the ERM personnel involved. Whilst normal checking of data accuracy was undertaken, except to the extent expressly set out in this report ERM:

a) did not, nor was able to, make further enquiries to assess the reliability of the information or independently verify information provided by;

b) assumes no responsibility or liability for errors in data obtained from, the Client, any third parties or external sources (including regulatory agencies).

Although the data that has been used in compiling this report is generally based on actual circumstances, if the report refers to hypothetical examples those examples may, or may not, represent actual existing circumstances.

Only the environmental conditions and or potential contaminants specifically referred to in this report have been considered. To the extent permitted by law and except as is specifically stated in this report, ERM makes no warranty or representation about:

a) the suitability of the site(s) for any purpose or the permissibility of any use;

b) the presence, absence or otherwise of any environmental conditions or contaminants at the site(s) or elsewhere; or

c) the presence, absence or otherwise of asbestos, asbestos containing materials or any hazardous materials on the site(s).

Use of the site for any purpose may require planning and other approvals and, in some cases, environmental regulator and accredited Site Auditor approvals. ERM offers no opinion as to the likelihood of obtaining any such approvals, or the conditions and obligations which such approvals may impose, which may include the requirement for additional environmental works.

The ongoing use of the site or use of the site for a different purpose may require the management of or remediation of site conditions, such as contamination and other conditions, including but not limited to conditions referred to in this report.

This report should be read in full and no excerpts are to be taken as representative of the whole report. To ensure its contextual integrity, the report is not to be copied, distributed or referred to in part only. No responsibility or liability is accepted by ERM for use of any part of this report in any other context.

This report:

a) has been prepared and is intended only for the Client and any party that ERM has agreed with the Client in the Scope of Work may use the report;

b) has not been prepared nor is intended for the purpose of advertising, sales, promoting or endorsing any client interests including raising investment capital, recommending investment decisions, or other publicity purposes;

c) does not purport to recommend or induce a decision to make (or not make) any purchase, disposal, investment, divestment, financial commitment or otherwise in or in relation to the site(s); and

d) does not purport to provide, nor should be construed as, legal advice.

10 REFERENCES

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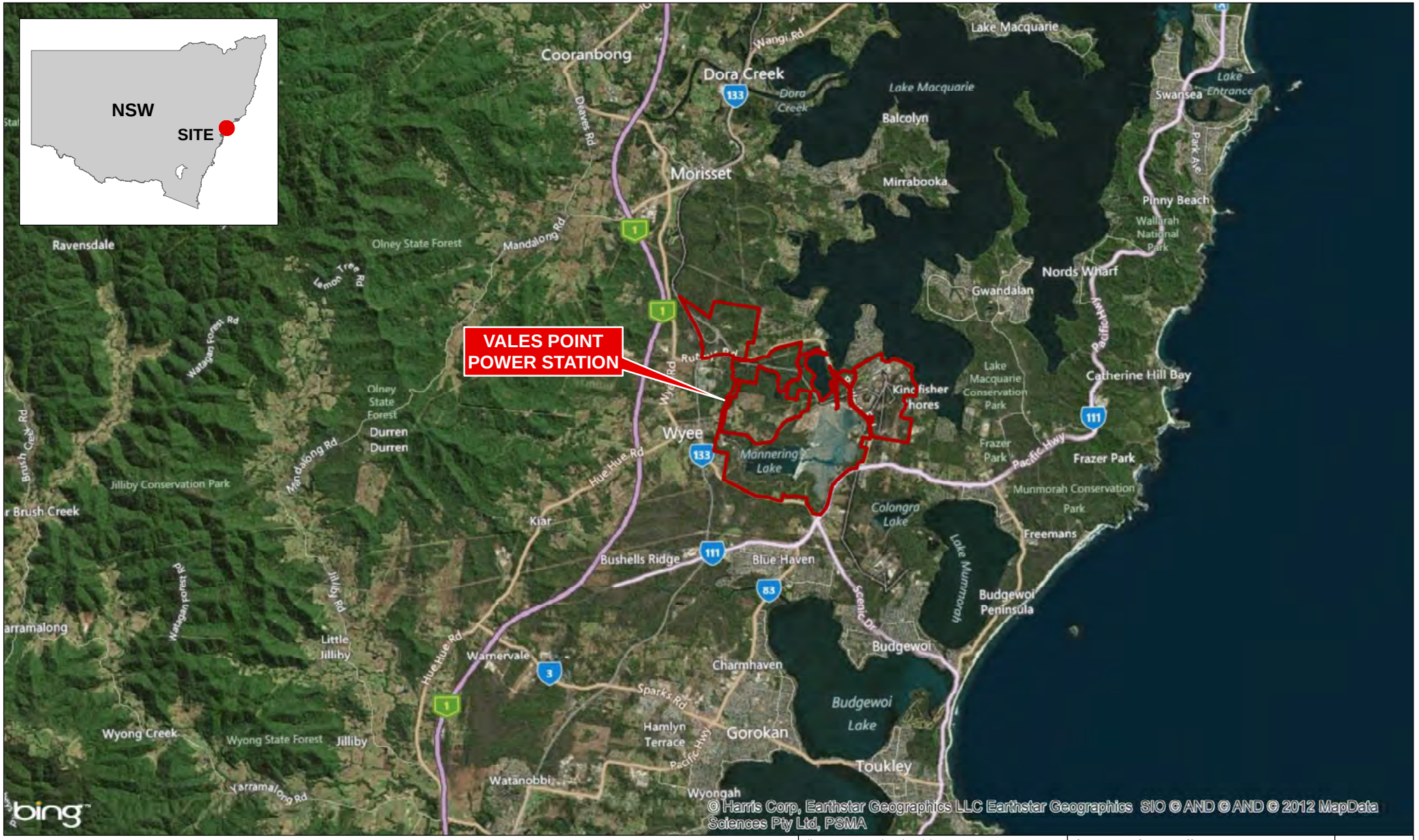
Annex A

Figures



Legend

Site Boundary

0 1 2 3km

N

Client:	Delta Electricity		**Figure 1 - Site Locality**
Drawing No:	0227637s_VP_PESA_G001_R0.mxd		
Date:	05/02/2014	Drawing Size: A4	Project Symphony - Vales Point
Drawn By:	GC	Reviewed By: KD	Stage 1 Preliminary Environmental Site Assessment
This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.			Environmental Resources Management ANZ Auckland, Brisbane, Canberra, Christchurch, Hunter Valley, Melbourne, Perth, Port Macquarie, Sydney

ERM

Legend

- Site Boundary
- Excluded Areas (Mine Leases)

Included Areas (External Operator):

- Fly Ash Plant
- Rail and Mandalong Coal Unloader Area

0 250 500 750m

N

Client:	Delta Electricity		
Drawing No:	0227637s_VP_PESA_G002_R0.mxd		
Date:	05/02/2014	Drawing Size: A3	
Drawn By:	GC	Reviewed By: KD	

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Figure 2 - Site Boundaries

Project Symphony - Vales Point
Stage 1 Preliminary Environmental Site Assessment

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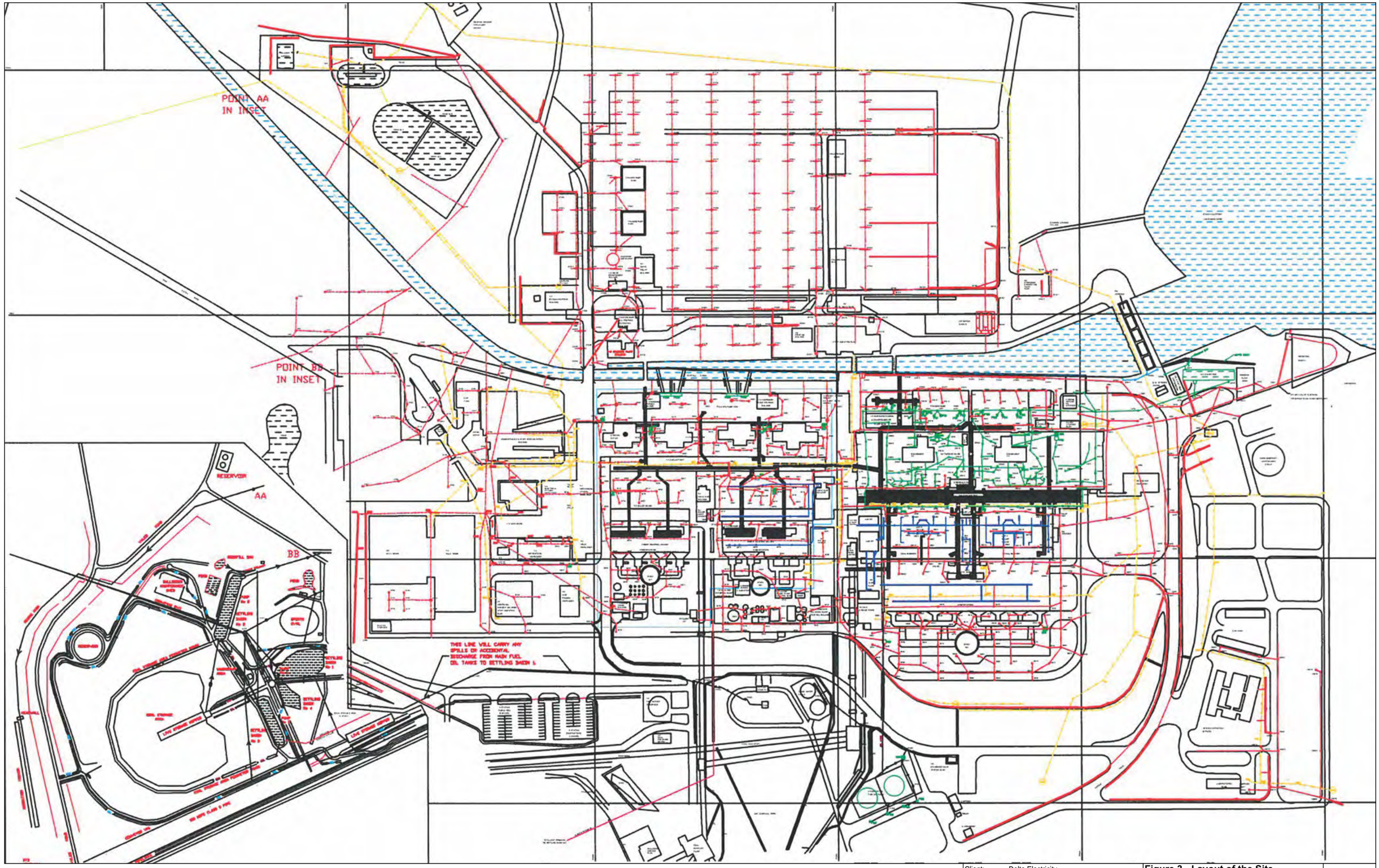

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Delta Electricity,
Drawing No. VP732546-04.

0 20 40 60m

N

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Drawing No:	0227637s_VP_PESA_C001_R0.cdr		
Date:	08/01/2014	Drawing size: A3	
Drawn by:	GC	Reviewed by: KD	

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Figure 3 - Layout of the Site Operational Area

Project Symphony - Vales Point
Stage 1 Preliminary Environmental Site Assessment

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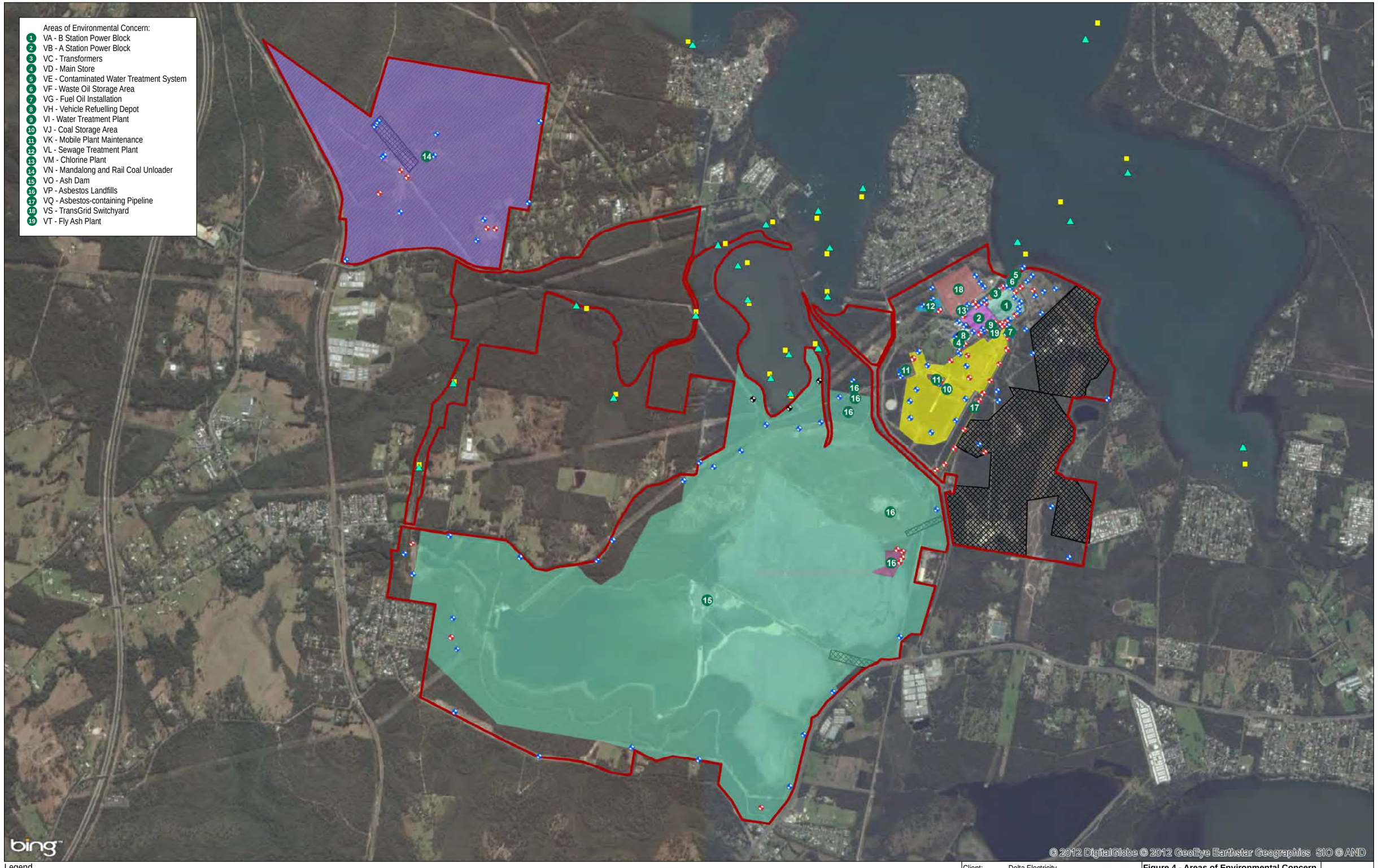

Legend

- Site Boundary
- Excluded Areas (Mine Leases)
- Fly Ash Plant
- Rail and Mandalong Coal Unloader Area
- Existing Monitoring Well
- Monitoring Well
- Sediment Sample
- Soil Bore
- Surface Water Sample

AECs:

- VA - B Station Power Block
- VB - A Station Power Block
- VC - Transformers
- VD - Main Store
- VE - Contaminated Water Treatment System
- VF - Waste Oil Storage Area
- VG - Fuel Oil Installation
- VH - Vehicle Refuelling Depot
- VI - Water Treatment Plant
- VJ - Coal Storage Area
- VK - Mobile Plant Maintenance
- VL - Sewage Treatment Plant
- VM - Chlorine Plant
- VN - Mandalong and Rail Coal Unloader
- VO - Ash Dam
- VP - Asbestos Landfills
- VQ - Asbestos-containing Pipeline
- VS - TransGrid Switchyard
- VT - Fly Ash Plant

0 250 500 750m

N

Client:	Delta Electricity		**Figure 4 - Areas of Environmental Concern**
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Drawn By:	GC	Reviewed By: KD	Stage 1 Preliminary Environmental Site Assessment

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Legend

- Site Boundary
- Excluded Areas (Mine Leases)
- Rail and Mandalong Coal Unloader Area
- Monitoring Well
- Soil Bore
- AECs:
- VN - Mandalong and Rail Coal Unloader

0 50 100 150m

N

Client:	Delta Electricity		**Figure 5.1 - Proposed Sampling Locations**
Drawing No:	0227637s_VP_PESA_G004_R0.mxd		
Date:	05/02/2014	Drawing Size: A3	Project Symphony - Vales Point
Drawn By:	GC	Reviewed By: KD	Stage 1 Preliminary Environmental Site Assessment

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Legend

- Site Boundary
- Existing Monitoring Well
- Monitoring Well
- Sediment Sample
- Soil Bore
- Surface Water Sample
- AECs:
- VO - Ash Dam

0 100 200 300m

N

Client:	Delta Electricity		**Figure 5.2 - Proposed Sampling Locations**
Drawing No:	0227637s_VP_PESA_G005_R0.mxd		
Date:	05/02/2014	Drawing Size: A3	Project Symphony - Vales Point
Drawn By:	GC	Reviewed By: KD	Stage 1 Preliminary Environmental Site Assessment

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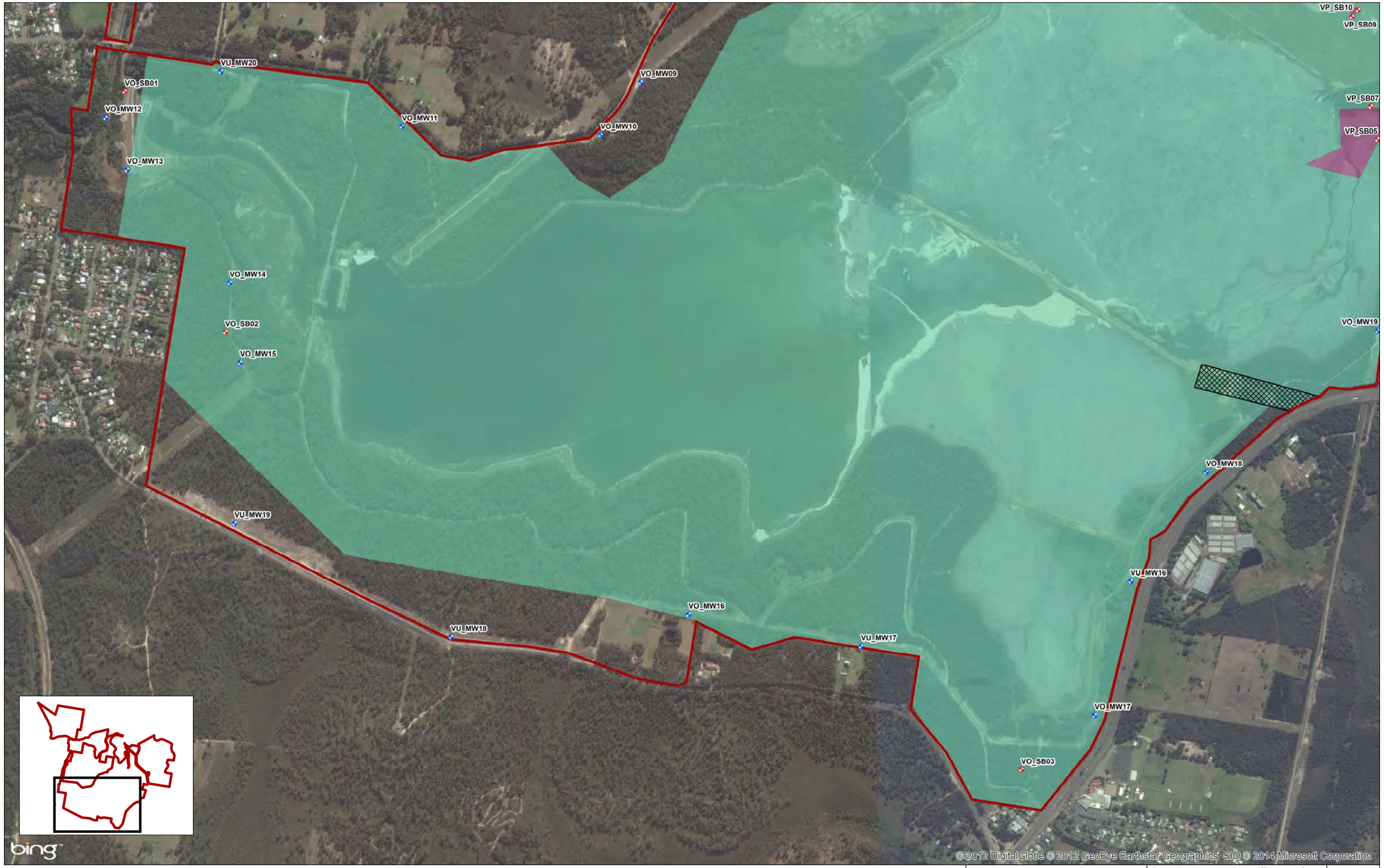

Legend

- Site Boundary
- Excluded Areas (Mine Leases)
- Monitoring Well
- Soil Bore

AECs:

- VO - Ash Dam
- VP - Asbestos Landfills

0 100 200 300m

N

Client:	Delta Electricity		
Drawing No:	0227637s_VP_PESA_G006_R0.mxd		
Date:	05/02/2014	Drawing Size: A3	
Drawn By:	GC	Reviewed By: KD	

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Figure 5.3 - Proposed Sampling Locations

Project Symphony - Vales Point
Stage 1 Preliminary Environmental Site Assessment

Environmental Resources Management ANZ

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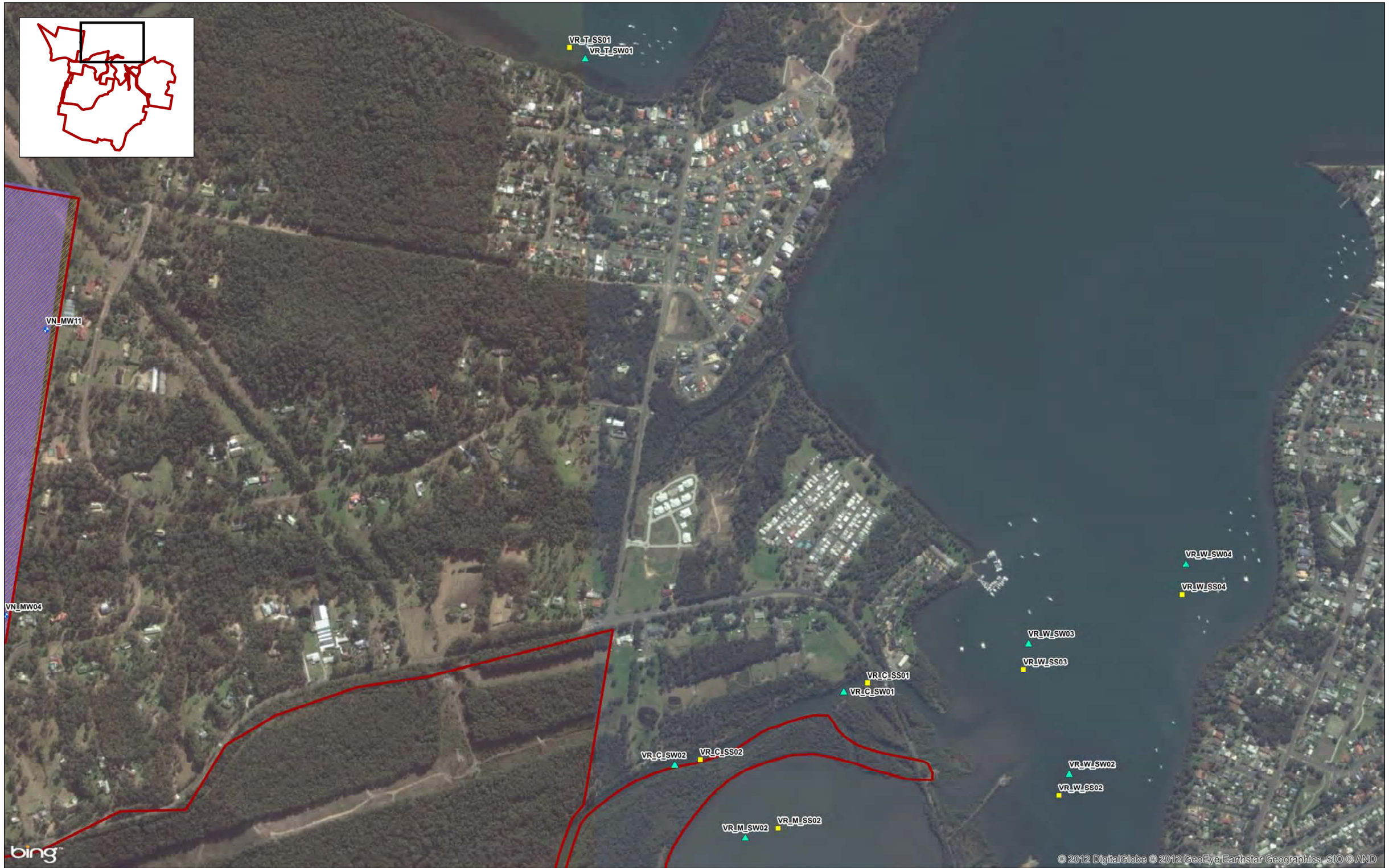
ERM



Legend

- Site Boundary
- Rail and Mandalong Coal Unloader Area
- Monitoring Well
- Sediment Sample
- Surface Water Sample
- AECs:
- VN - Mandalong and Rail Coal Unloader

0 50 100 150m

N

Client:	Delta Electricity		
Drawing No:	0227637s_VP_PESA_G007_R0.mxd		
Date:	05/02/2014	Drawing Size: A3	
Drawn By:	GC	Reviewed By: KD	

This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

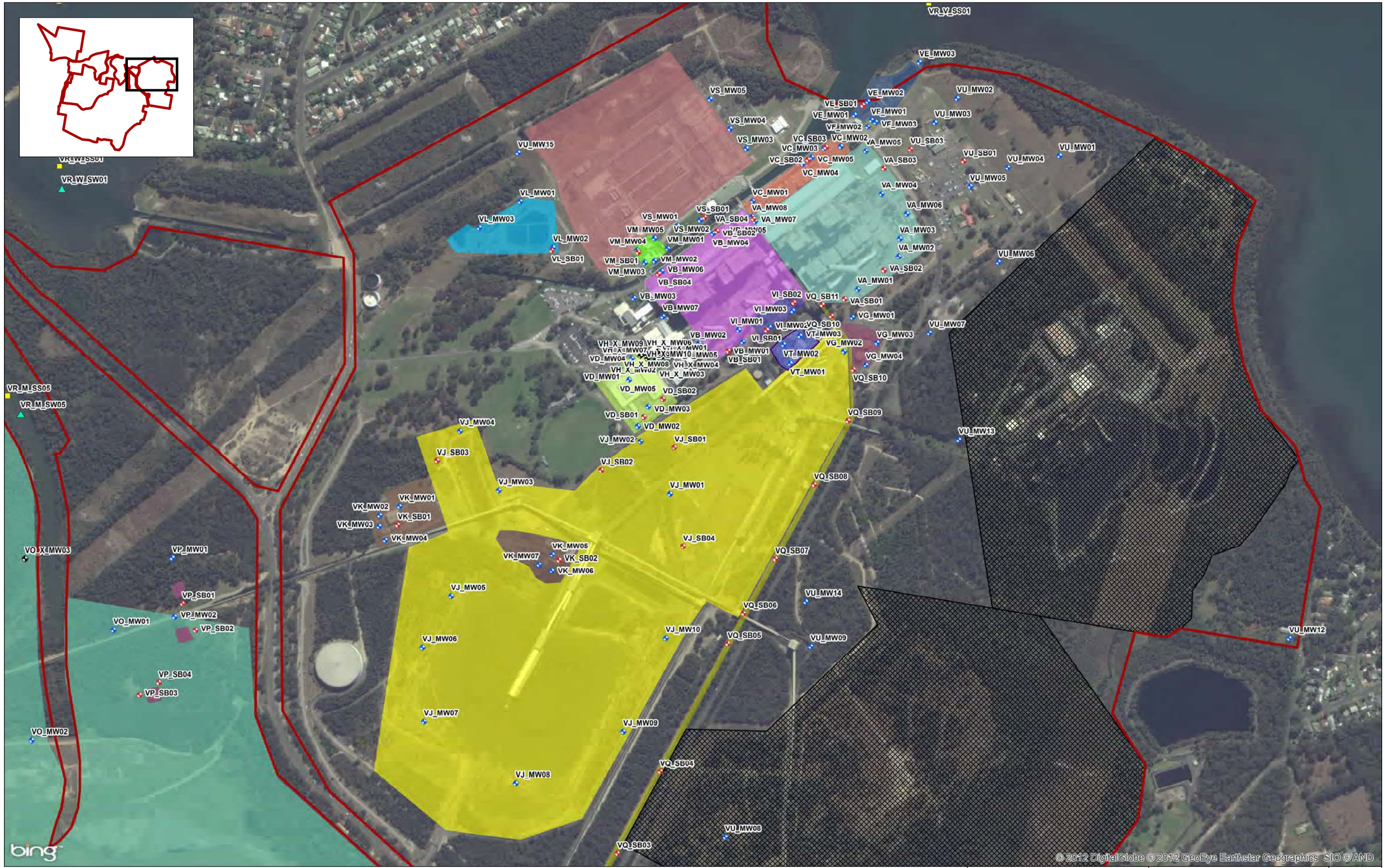
Figure 5.4 - Proposed Sampling Locations

Project Symphony - Vales Point
Stage 1 Preliminary Environmental Site Assessment

Environmental Resources Management ANZ

Auckland, Brisbane, Canberra, Christchurch,
Hunter Valley, Melbourne, Perth, Port Macquarie, Sydney

ERM



Legend

- Site Boundary
- Excluded Areas (Mine Leases)
- Fly Ash Plant
- Existing Monitoring Well
- Monitoring Well
- Sediment Sample
- Soil Bore
- Surface Water Sample

AECs:

- VA - B Station Power Block
- VB - A Station Power Block
- VC - Transformers
- VD - Main Store
- VE - Contaminated Water Treatment System
- VF - Waste Oil Storage Area
- VG - Fuel Oil Installation
- VH - Vehicle Refuelling Depot
- VI - Water Treatment Plant
- VJ - Coal Storage Area
- VK - Mobile Plant Maintenance
- VL - Sewage Treatment Plant
- VM - Chlorine Plant
- VO - Ash Dam
- VP - Asbestos Landfills
- VQ - Asbestos-containing Pipeline
- VS - TransGrid Switchyard
- VT - Fly Ash Plant

0 50 100 150m

N

Client:	Delta Electricity		
Drawing No:	0227637s_VP_PESA_G008_R0.mxd		
Date:	05/02/2014	Drawing Size: A3	
Drawn By:	GC	Reviewed By: KD	

This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

Figure 5.5 - Proposed Sampling Locations

Project Symphony - Vales Point
Stage 1 Preliminary Environmental Site Assessment

Environmental Resources Management ANZ

Auckland, Brisbane, Canberra, Christchurch, Hunter Valley, Melbourne, Perth, Port Macquarie, Sydney

ERM

Legend

- Site Boundary
- Monitoring Well
- Sediment Sample
- Soil Bore
- Surface Water Sample

AECs:

- VE - Contaminated Water Treatment System
- VS - TransGrid Switchyard

0 100 200 300m

N

Client:	Delta Electricity		
Drawing No:	0227637s_VP_PESA_G009_R0.mxd		
Date:	05/02/2014	Drawing Size: A3	
Drawn By:	GC	Reviewed By: KD	

This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

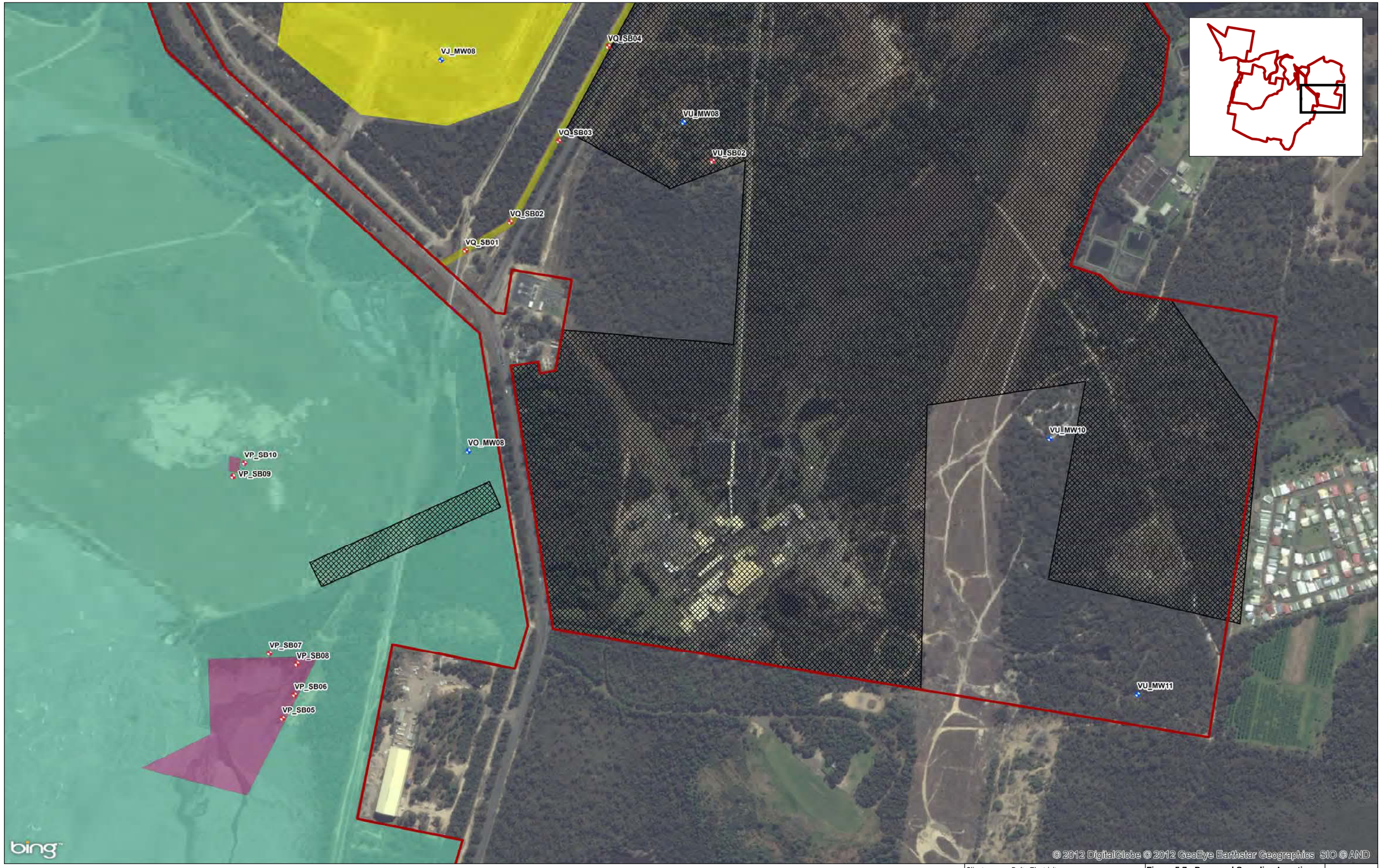
Figure 5.6 - Proposed Sampling Locations

Project Symphony - Vales Point
Stage 1 Preliminary Environmental Site Assessment

Environmental Resources Management ANZ

Auckland, Brisbane, Canberra, Christchurch,
Hunter Valley, Melbourne, Perth, Port Macquarie, Sydney

ERM



Legend

- Site Boundary
- Excluded Areas (Mine Leases)
- Monitoring Well
- Soil Bore

AECs:

- VJ - Coal Storage Area
- VO - Ash Dam
- VP - Asbestos Landfills
- VQ - Asbestos-containing Pipeline

0 50 100 150m

N

Client:	Delta Electricity	
Drawing No:	0227637s_VP_PESA_G010_R0.mxd	
Date:	23/01/2014	Drawing Size: A3
Drawn By:	GC	Reviewed By: KD

This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

Figure 5.7 - Proposed Sampling Locations

Project Symphony - Vales Point
Stage 1 Preliminary Environmental Site Assessment

Environmental Resources Management ANZ

Auckland, Brisbane, Canberra, Christchurch,
Hunter Valley, Melbourne, Perth, Port Macquarie, Sydney

ERM

Annex B

Photographs

Photograph 1

Vehicle refuelling area, view to the south.

Photograph 2

"A Station" demolition zone, facing north.

Photograph 3

Chain Valley Retention Basin, view to the north toward Chain Valley Bay.

Photograph 4

Oil and grit trap, northern part of the Site facing west toward the Site.

Photograph 5

Transformer oil storage area, north of “B Station” view to the south east.

Photograph 6

Sewage treatment area, facing north west.

Photograph 7

Cooling water canal outlet point, facing east toward the Site.

Photograph 8

Asbestos dump north of Ash Dam adjacent to coal conveyor, facing south.

Photograph 9

Ash disposal to ash dam, view to the south west.

Photograph 10

Bulk fuel storage ASTs, south of operational area facing north toward the Site.

Photograph 11

Water treatment plant area, south of “A Station” facing south west.

Photograph 12

Water treatment plant area, south of “A Station” facing south east.

Photograph 13

Example of a workshop area, south western portion of "B Station".

Photograph 14

Hydraulic fluid AST store, north west of "B Station" area, facing west.

Photograph 15

Transformer area, facing south east.

Photograph 16

Waste oil storage and disposal area, north eastern part of the Site facing south.

Photograph 17

Waste oil storage and disposal area, north eastern part of the Site facing north.

Photograph 18

Asbestos pipework, south of operational area facing west.

Annex C

Summary of Lot and DP Information

Lot Number	Depositional Plan Number	Classification	Control
8	28898	Standard Lot	FREEHOLD
24	28898	Standard Lot	FREEHOLD
1	1120391	Standard Lot	FREEHOLD
2	1120391	Standard Lot	FREEHOLD
7497	1165634	Standard Lot	FREEHOLD
462	755266	Standard Part Lot	FREEHOLD
159	755266	Standard Lot	FREEHOLD
479	755266	Standard Lot	FREEHOLD
1	30178	Standard Lot	FREEHOLD
7	30178	Standard Lot	FREEHOLD
2	30178	Standard Lot	FREEHOLD
1	379203	Standard Part Lot	FREEHOLD
1	562635	Standard Lot	FREEHOLD
6	30178	Standard Lot	FREEHOLD
5	30178	Standard Lot	FREEHOLD
3	30178	Standard Lot	FREEHOLD
4	30178	Standard Lot	FREEHOLD
12	1091396	Standard Lot	FREEHOLD
1	1141907	Standard Lot	FREEHOLD
102	1170291	Standard Lot	FREEHOLD
A	379918	Standard Lot	FREEHOLD
B	379918	Standard Lot	FREEHOLD
7077	1056107	Standard Lot	CROWN
3	227442	Standard Lot	FREEHOLD
1B	339441	Standard Lot	FREEHOLD
C	349733	Standard Part Lot	FREEHOLD
D	349733	Standard Lot	FREEHOLD
2	517534	Standard Lot	FREEHOLD
A	187570	Standard Lot	FREEHOLD
102	1065718	Standard Lot	FREEHOLD
20	1113256	Standard Lot	FREEHOLD
524	771299	Standard Lot	FREEHOLD
327	755242	Standard Lot	FREEHOLD
1	28898	Standard Lot	FREEHOLD
7	28898	Standard Lot	FREEHOLD
23	28898	Standard Lot	FREEHOLD
16	28898	Standard Lot	FREEHOLD
9	28898	Standard Lot	FREEHOLD
32	755242	Standard Lot	FREEHOLD
491	755242	Standard Lot	FREEHOLD
13	28898	Standard Lot	FREEHOLD
29A	755242	Standard Lot	FREEHOLD
492	755242	Standard Lot	FREEHOLD
11	701077	Standard Lot	FREEHOLD
3	28898	Standard Lot	FREEHOLD
6	28898	Standard Lot	FREEHOLD
5	28898	Standard Lot	FREEHOLD

Lot Number	Depositional Plan Number	Classification	Control
12	28898	Standard Lot	FREEHOLD
15	28898	Standard Lot	FREEHOLD
28A	755242	Standard Lot	FREEHOLD
2	28898	Standard Lot	FREEHOLD
22	755242	Standard Lot	FREEHOLD
10	28898	Standard Lot	FREEHOLD
2	582122	Standard Lot	FREEHOLD
4	28898	Standard Lot	FREEHOLD
14	28898	Standard Lot	FREEHOLD
11	28898	Standard Lot	FREEHOLD
33	755242	Standard Lot	FREEHOLD
253	755242	Standard Lot	FREEHOLD
3	582269	Standard Lot	FREEHOLD
1	509349	Standard Lot	FREEHOLD
306	755266	Standard Lot	FREEHOLD
2	582270	Standard Lot	FREEHOLD
70	1064421	Standard Lot	FREEHOLD
493	755242	Standard Lot	FREEHOLD
1	582269	Standard Lot	FREEHOLD
1	582270	Standard Lot	FREEHOLD
1	1142019	Standard Lot	FREEHOLD
1	1159355	Standard Lot	FREEHOLD
1	1166358	Standard Lot	FREEHOLD
1	583137	Standard Lot	FREEHOLD
205	755242	Standard Lot	FREEHOLD
204	755242	Standard Lot	UNKNOWN
1	1163828	Standard Lot	FREEHOLD
1	1132515	Standard Lot	FREEHOLD
1	366017	Standard Lot	FREEHOLD
4	366017	Standard Lot	FREEHOLD
3	366017	Standard Lot	FREEHOLD
2	366017	Standard Lot	FREEHOLD
225	755242	Standard Lot	FREEHOLD
17	28898	Standard Lot	FREEHOLD
242	755242	Standard Lot	FREEHOLD
201	755242	Standard Lot	FREEHOLD
226	755242	Standard Lot	FREEHOLD
227	755242	Standard Lot	FREEHOLD
236	755242	Standard Lot	FREEHOLD
22	28898	Standard Lot	FREEHOLD
21	28898	Standard Lot	FREEHOLD
203	755242	Standard Lot	FREEHOLD
224	755242	Standard Lot	FREEHOLD
223	755242	Standard Lot	FREEHOLD
18	28898	Standard Lot	FREEHOLD
4	251398	Standard Lot	FREEHOLD
20	28898	Standard Lot	FREEHOLD

Lot Number	Depositional Plan Number	Classification	Control
19	28898	Standard Lot	FREEHOLD
202	755242	Standard Lot	FREEHOLD
232	755242	Standard Lot	FREEHOLD
509	39857	Standard Lot	FREEHOLD
B	355697	Standard Lot	FREEHOLD
508	39857	Standard Lot	FREEHOLD
1	1132517	Standard Lot	FREEHOLD
1	1132519	Standard Lot	FREEHOLD
4481	1163814	Standard Lot	FREEHOLD
490	755242	Standard Lot	FREEHOLD
C	380467	Standard Part Lot	FREEHOLD
458	755242	Standard Lot	FREEHOLD
1	120796	Standard Lot	FREEHOLD
1	635155	Standard Lot	FREEHOLD
9	30178	Standard Lot	FREEHOLD
109	755266	Standard Lot	FREEHOLD
1	562143	Standard Lot	FREEHOLD
368	755266	Standard Part Lot	FREEHOLD
11	31677	Standard Lot	FREEHOLD
10	31677	Standard Lot	FREEHOLD
12	31677	Standard Lot	FREEHOLD
68	755266	Standard Lot	FREEHOLD
14	31677	Standard Lot	FREEHOLD
13	31677	Standard Lot	FREEHOLD
8	30178	Standard Lot	FREEHOLD
150	755266	Standard Lot	FREEHOLD
4	911564	Standard Lot	CROWN
100	1065718	Standard Lot	FREEHOLD
511	39857	Standard Lot	FREEHOLD
2	582269	Standard Lot	FREEHOLD
1	709513	Standard Lot	FREEHOLD
2	709513	Standard Lot	FREEHOLD
1	410653	Standard Lot	FREEHOLD
101	1065718	Standard Lot	FREEHOLD
3	1120391	Standard Lot	FREEHOLD
2	1132519	Standard Lot	FREEHOLD
1	1120392	Standard Lot	FREEHOLD
3	259306	Standard Lot	FREEHOLD
7	915257	Standard Lot	FREEHOLD

Annex D

Results of Background Searches

Groundwater Works Summary

For information on the meaning of fields please see Glossary
Document Generated on Tuesday, December 17, 2013

Print Report

Works Details Site Details Form A Licensed Construction Water Bearing Zones Drillers Log

Work Requested -- GW011915

Works Details (top)

GROUNDWATER NUMBER	GW011915
LIC-NUM	20BL004727
AUTHORISED-PURPOSES	POULTRY (GROUNDWATER)
INTENDED-PURPOSES	STOCK
WORK-TYPE	Well
WORK-STATUS	Supply Obtained
CONSTRUCTION-METHOD	(Unknown)
OWNER-TYPE	Private
COMMENCE-DATE	
COMPLETION-DATE	
FINAL-DEPTH (metres)	5.40
DRILLED-DEPTH (metres)	0.00
CONTRACTOR-NAME	
DRILLER-NAME	
PROPERTY	N/A
GWMA	603 - SYDNEY BASIN
GW-ZONE	-
STANDING-WATER-LEVEL	
SALINITY	
YIELD	

Site Details (top)

REGION	20 - HUNTER
RIVER-BASIN	211 - MACQUARIE - TUGGERAH LAKES
AREA-DISTRICT	
CMA-MAP	9231-4S
GRID-ZONE	56/1
SCALE	1:25,000
ELEVATION	
ELEVATION-SOURCE	(Unknown)
NORTHING	6329604.00
EASTING	363007.00
LATITUDE	33 9' 49"
LONGITUDE	151 31' 51"
GS-MAP	0055C1

AMG-ZONE	56
COORD-SOURCE	PR.,ACC.MAP
REMARK	

Form-A (top)

COUNTY	NORTHUMBERLAND
PARISH	WALLARAH
PORTION-LOT-DP	99

Licensed (top)

COUNTY	NORTHUMBERLAND
PARISH	WALLARAH
PORTION-LOT-DP	4 755266

Construction (top)

Negative depths indicate Above Ground Level;H-Hole;P-Pipe;OD-Outside Diameter;
ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity

HOLE-NO	PIPE-NO	COMPONENT-CODE	COMPONENT-TYPE	DEPTH-FROM (metres)	DEPTH-TO (metres)	OD (mm)	ID (mm)	INTERVAL	DETAIL
1	1	Casing	Concrete	0.00	0.00	1219			(Unknown)

Water Bearing Zones (top)

no details

Drillers Log (top)

no details

Groundwater Works Summary

For information on the meaning of fields please see Glossary
Document Generated on Tuesday, December 17, 2013

Print Report

Works Details Site Details Form A Licensed Construction Water Bearing Zones Drillers Log

Work Requested -- GW034560

Works Details (top)

GROUNDWATER NUMBER	GW034560
LIC-NUM	20BL026221
AUTHORISED-PURPOSES	DOMESTIC
INTENDED-PURPOSES	DOMESTIC
WORK-TYPE	Bore open thru rock
WORK-STATUS	(Unknown)
CONSTRUCTION-METHOD	(Unknown)
OWNER-TYPE	Private
COMMENCE-DATE	
COMPLETION-DATE	1970-02-01
FINAL-DEPTH (metres)	18.30
DRILLED-DEPTH (metres)	18.30
CONTRACTOR-NAME	
DRILLER-NAME	
PROPERTY	N/A
GWMA	603 - SYDNEY BASIN
GW-ZONE	-
STANDING-WATER-LEVEL	
SALINITY	
YIELD	

Site Details (top)

REGION	20 - HUNTER
RIVER-BASIN	211 - MACQUARIE - TUGGERAH LAKES
AREA-DISTRICT	
CMA-MAP	9231-4S
GRID-ZONE	56/1
SCALE	1:25,000
ELEVATION	
ELEVATION-SOURCE	(Unknown)
NORTHING	6330883.00
EASTING	364130.00
LATITUDE	33 9' 8"
LONGITUDE	151 32' 35"
GS-MAP	0055C1

AMG-ZONE	56
COORD-SOURCE	GD.,ACC.MAP
REMARK	

Form-A (top)

COUNTY	NORTHUMBERLAND
PARISH	WALLARAH
PORTION-LOT-DP	99

Licensed (top)

COUNTY	NORTHUMBERLAND
PARISH	WALLARAH
PORTION-LOT-DP	1462 755266

Construction (top)

Negative depths indicate Above Ground Level;H-Hole;P-Pipe;OD-Outside Diameter;
ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity

HOLE-NO	PIPE-NO	COMPONENT-CODE	COMPONENT-TYPE	DEPTH-FROM (metres)	DEPTH-TO (metres)	OD (mm)	ID (mm)	INTERVAL	DETAIL
1	1	Casing	P.V.C.	-0.50	17.80	51			(Unknown)
1	1	Opening	Slots		18.30	51		1	SL: 0mm; A: 0mm

Water Bearing Zones (top)

FROM-DEPTH (metres)	TO-DEPTH (metres)	THICKNESS (metres)	ROCK-CAT-DESC	S-W-L	D-D-L	YIELD	TEST-HOLE-DEPTH (metres)	DURATION	SALINITY
5.50	5.50	0.00	Unconsolidated	5.50					(Unknown)

Drillers Log (top)

FROM	TO	THICKNESS	DESC	GEO-MATERIAL	COMMENT
0.00	15.24	15.24	Clay Water Supply		
15.24	18.28	3.04	Sand Coarse		

Groundwater Works Summary

For information on the meaning of fields please see Glossary
Document Generated on Tuesday, December 17, 2013

Print Report

Works Details Site Details Form A Licensed Construction Water Bearing Zones Drillers Log

Work Requested -- GW080830

Works Details (top)

GROUNDWATER NUMBER	GW080830
LIC-NUM	20BL169374
AUTHORISED-PURPOSES	TEST BORE
INTENDED-PURPOSES	TEST BORE
WORK-TYPE	Bore
WORK-STATUS	(Unknown)
CONSTRUCTION-METHOD	(Unknown)
OWNER-TYPE	Local Govt
COMMENCE-DATE	
COMPLETION-DATE	2004-08-06
FINAL-DEPTH (metres)	
DRILLED-DEPTH (metres)	
CONTRACTOR-NAME	
DRILLER-NAME	
PROPERTY	MANNERING PARK OVAL
GWMA	-
GW-ZONE	-
STANDING-WATER-LEVEL	
SALINITY	
YIELD	

Site Details (top)

REGION	20 - HUNTER
RIVER-BASIN	211 - MACQUARIE - TUGGERAH LAKES
AREA-DISTRICT	
CMA-MAP	9231-4S
GRID-ZONE	56/1
SCALE	1:25,000
ELEVATION	
ELEVATION-SOURCE	(Unknown)
NORTHING	6330850.00
EASTING	363757.00
LATITUDE	33 9' 9"
LONGITUDE	151 32' 21"
GS-MAP	

AMG-ZONE	56
COORD-SOURCE	Map Interpretation
REMARK	

Form-A (top)

COUNTY	NORTHUMBERLAND
PARISH	WALLARAH
PORTION-LOT-DP	LT126 DP31006

Licensed (top)

COUNTY	NORTHUMBERLAND
PARISH	WALLARAH
PORTION-LOT-DP	126 31006

Water Bearing Zones (top)

no details

Drillers Log (top)

no details

Groundwater Works Summary

For information on the meaning of fields please see Glossary
Document Generated on Tuesday, December 17, 2013

Print Report

Works Details Site Details Form A Licensed Construction Water Bearing Zones Drillers Log

Work Requested -- GW201977

Works Details (top)

GROUNDWATER NUMBER	GW201977
LIC-NUM	20BL171936
AUTHORISED-PURPOSES	MONITORING BORE
INTENDED-PURPOSES	MONITORING BORE
WORK-TYPE	Bore
WORK-STATUS	Equipped - bore used for obs
CONSTRUCTION-METHOD	Auger - Solid Flight
OWNER-TYPE	Private
COMMENCE-DATE	
COMPLETION-DATE	2008-07-24
FINAL-DEPTH (metres)	7.10
DRILLED-DEPTH (metres)	7.10
CONTRACTOR-NAME	
DRILLER-NAME	
PROPERTY	
GWMA	017 - HUNTER
GW-ZONE	-
STANDING-WATER-LEVEL	6.00
SALINITY	
YIELD	

Site Details (top)

REGION	20 - HUNTER
RIVER-BASIN	211 - MACQUARIE - TUGGERAH LAKES
AREA-DISTRICT	
CMA-MAP	9231-4S
GRID-ZONE	56/1
SCALE	1:25,000
ELEVATION	
ELEVATION-SOURCE	
NORTHING	6331388.00
EASTING	363730.00
LATITUDE	33 8' 52"
LONGITUDE	151 32' 20"
GS-MAP	

AMG-ZONE	56
COORD-SOURCE	GIS - Geographic Information System
REMARK	

Form-A (top)

COUNTY	NORTHUMBERLAND
PARISH	WALLARAH
PORTION-LOT-DP	3//30143

Licensed (top)

COUNTY	NORTHUMBERLAND
PARISH	WALLARAH
PORTION-LOT-DP	3 30143

Construction (top)

Negative depths indicate Above Ground Level;H-Hole;P-Pipe;OD-Outside Diameter;
ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity

HOLE-NO	PIPE-NO	COMPONENT-CODE	COMPONENT-TYPE	DEPTH-FROM (metres)	DEPTH-TO (metres)	OD (mm)	ID (mm)	INTERVAL	DETAIL
1		Hole	Hole	0.00	7.10	100			Auger - Sol Flight
1	1	Casing	PVC Class 18	0.00	4.10	60	50		Screwed; Seated on Bottom; En cap
1	1	Opening	Slots - Horizontal	4.10	7.10	60			PVC Class 18; Mechanica Slotted; SL 5mm; A: 1mm; Screwed
1		Annulus	Waterworn/Rounded	0.00	2.40	100	60		Graded; GS 2-5mm
1		Annulus	Bentonite	2.40	2.90	100	60		
1		Annulus	Waterworn/Rounded	2.70	7.10	100	60		Graded; GS 2-5mm

Water Bearing Zones (top)

FROM-DEPTH (metres)	TO-DEPTH (metres)	THICKNESS (metres)	ROCK-CAT-DESC	S-W-L	D-D-L	YIELD	TEST-HOLE-DEPTH (metres)	DURATION	SALINITY
6.00	7.00	1.00		6.00					

Drillers Log (top)

FROM	TO	THICKNESS	DESC	GEO-MATERIAL	COMMENT

0.00	0.10	0.10	Fill
0.10	2.00	1.90	Sandy Clay, residual soil
2.00	7.10	5.10	Sandy Gravelly Clay, residual soil

Groundwater Works Summary

For information on the meaning of fields please see Glossary
Document Generated on Tuesday, December 17, 2013

Print Report

Works Details Site Details Form A Licensed Construction Water Bearing Zones Drillers Log

Work Requested -- GW201978

Works Details (top)

GROUNDWATER NUMBER	GW201978
LIC-NUM	20BL171936
AUTHORISED-PURPOSES	MONITORING BORE
INTENDED-PURPOSES	MONITORING BORE
WORK-TYPE	Bore
WORK-STATUS	Equipped - bore used for obs
CONSTRUCTION-METHOD	Auger - Solid Flight
OWNER-TYPE	Private
COMMENCE-DATE	
COMPLETION-DATE	2008-07-24
FINAL-DEPTH (metres)	7.10
DRILLED-DEPTH (metres)	7.10
CONTRACTOR-NAME	
DRILLER-NAME	
PROPERTY	
GWMA	017 - HUNTER
GW-ZONE	-
STANDING-WATER-LEVEL	6.00
SALINITY	
YIELD	

Site Details (top)

REGION	20 - HUNTER
RIVER-BASIN	211 - MACQUARIE - TUGGERAH LAKES
AREA-DISTRICT	
CMA-MAP	9231-4S
GRID-ZONE	56/1
SCALE	1:25,000
ELEVATION	
ELEVATION-SOURCE	
NORTHING	6331391.00
EASTING	363712.00
LATITUDE	33 8' 52"
LONGITUDE	151 32' 19"
GS-MAP	

AMG-ZONE	56
COORD-SOURCE	GIS - Geographic Information System
REMARK	

Form-A (top)

COUNTY	NORTHUMBERLAND
PARISH	WALLARAH
PORTION-LOT-DP	3//30143

Licensed (top)

COUNTY	NORTHUMBERLAND
PARISH	WALLARAH
PORTION-LOT-DP	3 30143

Construction (top)

Negative depths indicate Above Ground Level;H-Hole;P-Pipe;OD-Outside Diameter;
ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity

HOLE-NO	PIPE-NO	COMPONENT-CODE	COMPONENT-TYPE	DEPTH-FROM (metres)	DEPTH-TO (metres)	OD (mm)	ID (mm)	INTERVAL	DETAIL
1		Hole	Hole	0.00	7.10	100			Auger - Sol Flight
1	1	Casing	PVC Class 18	0.00	4.10	60	50		Screwed; Seated on Bottom; En cap
1	1	Opening	Slots - Horizontal	4.10	7.10	60			PVC Class 18; Mechanica Slotted; SL 5mm; A: 1mm; Screwed
1		Annulus	Waterworn/Rounded	0.00	2.40	100	60		Graded; GS 2-5mm
1		Annulus	Bentonite	2.40	2.90	100	60		
1		Annulus	Waterworn/Rounded	2.90	7.10	100	60		Graded; GS 2-5mm

Water Bearing Zones (top)

FROM-DEPTH (metres)	TO-DEPTH (metres)	THICKNESS (metres)	ROCK-CAT-DESC	S-W-L	D-D-L	YIELD	TEST-HOLE-DEPTH (metres)	DURATION	SALINITY
6.00	7.00	1.00		6.00					

Drillers Log (top)

FROM	TO	THICKNESS	DESC	GEO-MATERIAL	COMMENT

0.00	0.15	0.15	Fill, Concrete
0.15	0.40	0.25	Fill
0.40	1.00	0.60	Clay, residual soil
1.00	2.80	1.80	Sandy Clay, residual soil
2.80	7.10	4.30	Clayey Sand, residual soil

Groundwater Works Summary

For information on the meaning of fields please see Glossary
Document Generated on Tuesday, December 17, 2013

Print Report

Works Details Site Details Form A Licensed Construction Water Bearing Zones Drillers Log

Work Requested -- GW201979

Works Details (top)

GROUNDWATER NUMBER	GW201979
LIC-NUM	20BL171936
AUTHORISED-PURPOSES	MONITORING BORE
INTENDED-PURPOSES	MONITORING BORE
WORK-TYPE	Bore
WORK-STATUS	Equipped - bore used for obs
CONSTRUCTION-METHOD	Auger - Solid Flight
OWNER-TYPE	Private
COMMENCE-DATE	
COMPLETION-DATE	2008-07-25
FINAL-DEPTH (metres)	7.20
DRILLED-DEPTH (metres)	7.20
CONTRACTOR-NAME	
DRILLER-NAME	
PROPERTY	
GWMA	017 - HUNTER
GW-ZONE	-
STANDING-WATER-LEVEL	6.00
SALINITY	
YIELD	

Site Details (top)

REGION	20 - HUNTER
RIVER-BASIN	211 - MACQUARIE - TUGGERAH LAKES
AREA-DISTRICT	
CMA-MAP	9231-4S
GRID-ZONE	56/1
SCALE	1:25,000
ELEVATION	
ELEVATION-SOURCE	
NORTHING	6331405.00
EASTING	363704.00
LATITUDE	33 8' 51"
LONGITUDE	151 32' 19"
GS-MAP	

AMG-ZONE	56
COORD-SOURCE	GIS - Geographic Information System
REMARK	

Form-A (top)

COUNTY	NORTHUMBERLAND
PARISH	WALLARAH
PORTION-LOT-DP	3//30143

Licensed (top)

COUNTY	NORTHUMBERLAND
PARISH	WALLARAH
PORTION-LOT-DP	3 30143

Construction (top)

Negative depths indicate Above Ground Level;H-Hole;P-Pipe;OD-Outside Diameter;
ID-Inside Diameter;C-Cemented;SL-Slot Length;A-Aperture;GS-Grain Size;Q-Quantity

HOLE-NO	PIPE-NO	COMPONENT-CODE	COMPONENT-TYPE	DEPTH-FROM (metres)	DEPTH-TO (metres)	OD (mm)	ID (mm)	INTERVAL	DETAIL
1		Hole	Hole	0.00	7.20	100			Auger - Sol Flight
1	1	Casing	PVC Class 18	0.00	4.20	60	50		Screwed; Seated on Bottom; En cap
1	1	Opening	Slots - Horizontal	4.20	7.20	60			PVC Class 18; Mechanica Slotted; SL 5mm; A: 1mm; Screwed
1		Annulus	Waterworn/Rounded	0.00	2.40	100	60		Graded; GS 2-5mm
1		Annulus	Bentonite	2.40	2.90	100	60		
1		Annulus	Waterworn/Rounded	2.90	7.20	100	60		Graded; GS 2-5mm

Water Bearing Zones (top)

FROM-DEPTH (metres)	TO-DEPTH (metres)	THICKNESS (metres)	ROCK-CAT-DESC	S-W-L	D-D-L	YIELD	TEST-HOLE-DEPTH (metres)	DURATION	SALINITY
6.00	7.00	1.00		6.00					

Drillers Log (top)

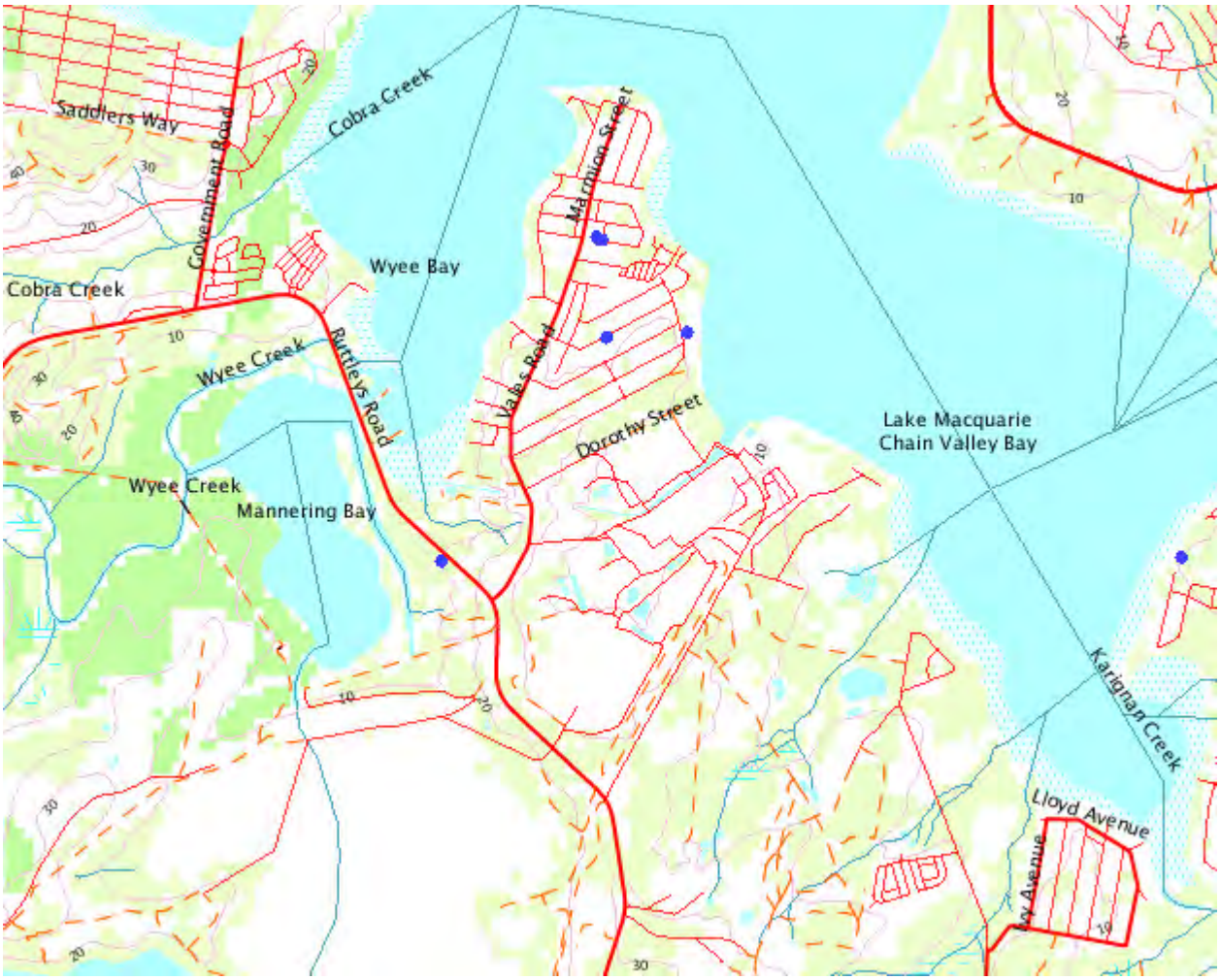
FROM	TO	THICKNESS	DESC	GEO-MATERIAL	COMMENT

0.00	0.15	0.15	Fill, Concrete
0.15	0.40	0.25	Fill
0.40	0.80	0.40	Clay, residual soil
0.80	7.20	6.40	Sandy Clay, residual soil

Symphony IV Groundwater Bore Search

Map created with NSW Natural Resource Atlas - http://www.nratlas.nsw.gov.au

Tuesday, December 17, 2013



0 5 Km

Legend

Symbol	Layer	Custodian
	Cities and large towns renderImage: Cannot build image from features	
Cowra	Populated places renderImage: Cannot build image from features	
	Towns	
	Groundwater Bores	
	Catchment Management Authority boundaries	
	Major rivers	
	Topographic base map	

Annex E

Dataroom Documentation

PARISH OF WALLARAH
COUNTY OF NORTHUMBERLAND

LOT 2 — D.P. 517534

DIAGRAM 'B'
SCALE 1:1000

LOT 2 — D.P. 603830

DUMP 1
DUMP 2
DUMP 3
VALES ROAD
CONE
GONE

LOCALITY PLAN
SCALE 1:4000

LAUSEWAY RD
LOT 2 D.P. 517534
603830
VALES ROAD
SEE DIAGRAM B
SEE DIAGRAM 'A'
ASH POND
CONVEYOR
ROAD
LOT 1
COAL
HIGHWAY
PACIFIC
POR 150
POR 476
POR 477
POR 478
POR 479
POR 462
POR 159
POR 69
POR 414
ROAD 20.115m WIDE

DIAGRAM 'A'
SCALE 1:2000

LOT 2 D.P. 603830
VALES ROAD
POR 150
POR 476
POR 477
POR 478
DUMP 4
DUMP 5
DUMP 6
BM 'A6D' RL 69.88 GIN IN BASE OF TREE
BM 'A5D' RL 47.56 GIN in stob cut in SCRIBBLY GUM (E. HAEMASTOMA)
BM STK. BK. (BURNT OUT) FD. 314°13'-10'26
BM 'A5D' RL 45.97 ON SCRIBBLY GUM
BM CUT PLACED IN BLAZED TREE FD. 44°07'-11'75
BM ANGOPHORA GIN IN TREE
BM GUM in ANGOPHORA
PEG, FD
CON. NOT MARKED

DUMP SITE 5
P.S. GRID CO. ORDS.

POINT	WEST	SOUTH
X	1921·81	1158·68
Y	1900·76	1123·07
BMA5D	1814·16	1142·74

DUMP SITE 6
P.S. GRID CO-ORDS

POINT	WEST	SOUTH
A	1670·89	1088·78
B	1574·74	1157·265
BMA6D	1623·99	1093·70
I.S.G. CO-ORDS. ZONE 56/1		
A	E349700·79	N1327415·72
B	E349818·84	N1327415·95

POWER STATION DATUM — POWER STATION GRID
ORIGIN OF LEVELS - CB.16 MOD 3 (RL 56·942) (SURVEY APRIL 1978)
ORIGIN OF LEVELS BM 4TI ON TREE RL 53·30 (SURVEY 19-3-85)

PRINCIPAL SURVEYOR
DATE 5.2.88

UNLESS OTHERWISE STATED ALL DIMENSIONS ARE IN METRES

SURVEYOR - G.A. BRIGNELL

DATE - APRIL 1978 & 19.3.85

P.M. BOOK 3 Vol. 4 Fo 98 - 110 & S.I. 85/23

AMENDMENTS

1	DRAWING TITLE AMENDED PLAN SIZE INCREASED FROM 'B' SIZE TO 'A' SIZE	DRN. G.M.	CKD. E.I.M.	DATE 6-5-85
2	SURVEY FOR LOCATION OF ASBESTOS DUMPS TO CADASTRAL BOUNDARYS ADDED. SURVEY BY R.A. BRIGNELL 19-3-85 S.I. 85/23	DRN. J.A.S.	CKD. K.S.	DATE 15-7-88
3	ASBESTOS DUMP 6 ADDED SURVEY BY I. HUGHES 19-12-85 S.I. 85/119	DRN. BT	CKD. A.F.M.	DATE 24.2.86
	EXTENSION TO DUMP 6 SURVEY BY S. KING 22-12-87 S.I. 84/31			

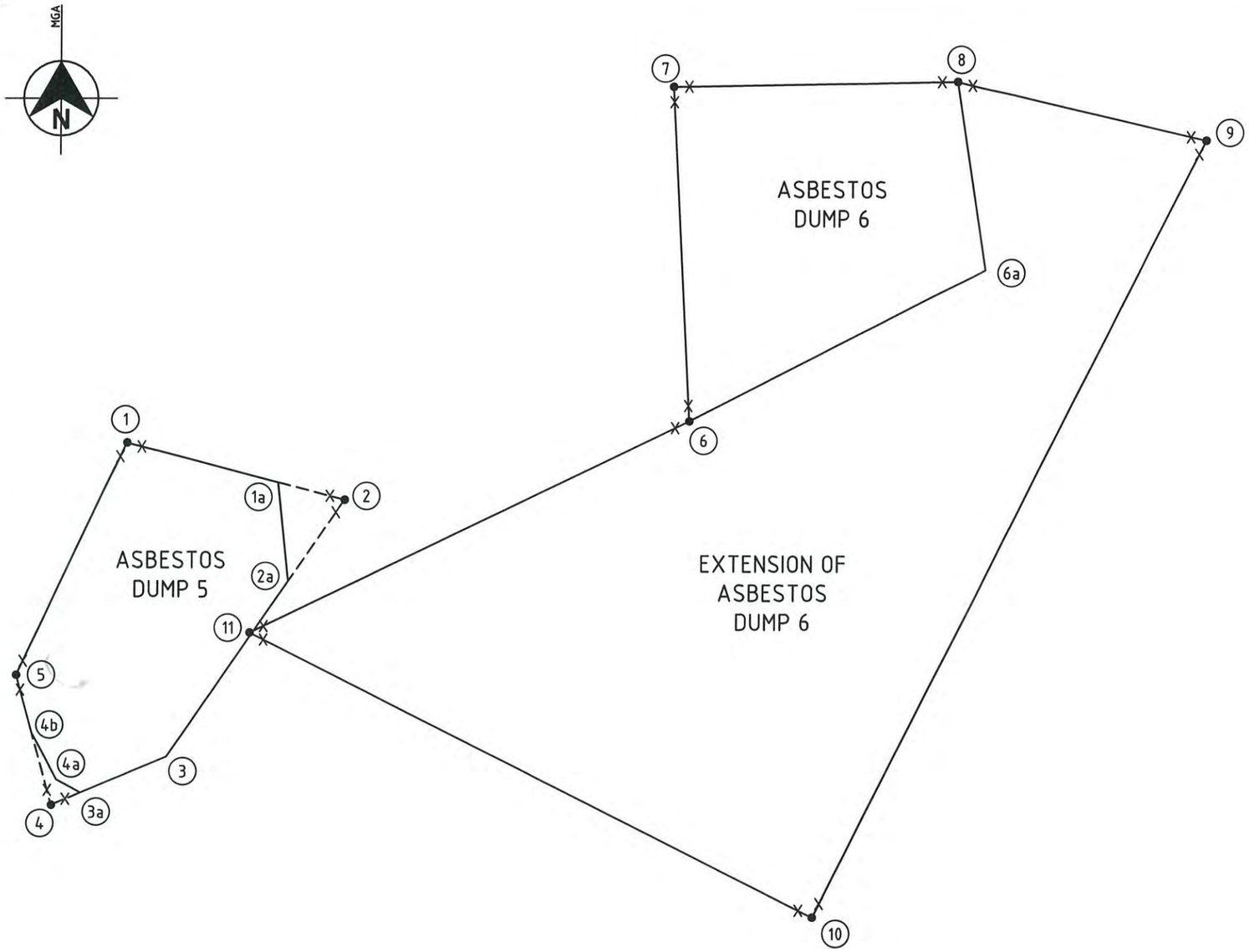
DRAWN	G.M.
CHECKED	E.I.M.

THE ELECTRICITY COMMISSION OF N.S.W.
POWER DIVISION
KKS CODE - UIT

VALES POINT POWER STATION
PLAN OF SURVEY FOR LOCATION OF ASBESTOS DUMP SITES

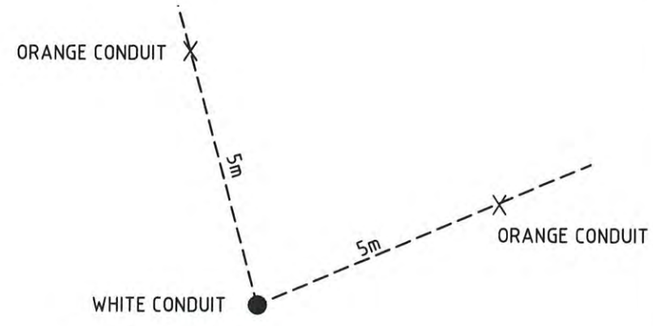
SCALE AS SHOWN
VP 347024 A
AMDT 3

E 1147/2



PLAN

NOT TO SCALE



TYPICAL MARKING LAYOUT DIAGRAM

NOT TO SCALE

IMPORTANT NOTE

CO-ORDINATES USED ON THIS SITE & SHOWN HERE WITHIN ARE APPROXIMATE & ARE BASED ON HISTORICAL CAD FILES HELD BY AURECON FROM PREVIOUS WORK.
THE ACCURACY OR ORIGIN OF THE CO-ORDINATES HAS NOT BEEN INVESTIGATED.
FURTHER INVESTIGATION MAY RESULT IN DIFFERENCES IN CO-ORDINATES BEING FOUND.
ACCURACY +/- 0.05m

LEGEND

(1)	POINT No.
X	ORANGE CONDUIT
●	WHITE CONDUIT

CO-ORDINATE SETOUT TABLE

POINT	EASTING	NORTHING	R.L. (AHD)
1	363102.15	6327873.7	17.8
1a	363165.25	6327857.35	
2	363193.05	6327850.1	18.05
2a	363169.6	6327816.2	
3	363119.2	6327743.15	17.8
3a	363083.75	6327728.15	
4	363071.45	6327722.95	17.8
4a	363073.65	6327733.6	
4b	363063.3	6327752.95	
5	363056.75	6327777	17.75
6	363336.35	6327883.0	18.0
6a	363459.1	6327946.25	
7	363329.15	6328022.05	18.2
8	363447.2	6328024.5	18.35
9	363550.75	6328000.35	19.3
10	363388.65	6327676.95	17.7
11	363153.7	6327794.75	17.95

VX837353_00

Plot Date: 21/11/2013 4:18:12 PM Office: AUNTL Filename: P:\SURVEY-PROJ\230410 - VALES POINT CONTROL SURVEY\004 - ASBESTOS DUMP MARKING\DRAWING\WORKING\230410-004-01.DWG

aurecon
www.aurecongroup.com

CLIENT

REV	DATE	REVISION DETAILS	APPROVED
01	19.11.13	ISSUED TO CLIENT FOR INFORMATION	

SCALE	NTS
SIZE	A3
DRAWN	W. SUTERS
DESIGNED	-
CHECKED	P. STIVANO

PRELIMINARY
NOT FOR CONSTRUCTION

APPROVED
DATE

PROJECT	VALES POINT POWER STATION
TITLE	VALES POINT ASH DAM ASBESTOS DUMP LOCATION IDENTIFICATION

DRAWING No.	PROJECT No.	WBS	TYPE	DISC	NUMBER	REV
	230410	0004	DRG	-	-	01

CONTROL MARKS

MARK	EASTING	NORTHING	RL	DESCRIPTION
PM 66233	362292.274	6325664.837	33.436	SCIMS
TS 12051	384557.597	6355842.776	27.169	SCIMS (NEWCASTLE CORS)
PM 21189	363393.59	6330514.182	13.797	SCIMS
STN 200	360206.19	6327402.6	17.84	STAR PICKET
STN 201	362268.79	6328304.95	18.53	PEG
STN 202	363271.82	6328124.07	19.78	STAR PICKET
STN 203	362884.1	6327187.23	16.42	STAR PICKET
STN 204	362056.64	6327710.95	16.38	DRILL HOLE IN PIT SURROUND

GENERAL NOTES

NO SURVEY HAS BEEN MADE OF INGROUND SERVICES.
(NOR OF ASSOCIATED SURFACE LIDS, MARKERS ETC.)

SURFACE DETAIL ONLY HAS BEEN LOCATED.

NO SPOT LEVELS ARE SHOWN HEREON. CONTOURS ARE INDICATIVE OF SURFACE TOPOGRAPHY ONLY.

CONTOURS SHOWN OUTSIDE THE LIMIT OF SURVEY HAVE BEEN COMPILED FROM AERIAL PHOTOGRAMMETRY FROM DEPT. OF LANDS.
NO GROUND TRUTHING HAS BEEN UNDERTAKEN.

LOCATION OF ASBESTOS SITE BOUNDARIES HAVE BEEN POSITIONED FROM VP 347024 REV.3 PROVIDED BY DELTA ELECTRICITY.

UNLESS OTHERWISE STATED NO BOUNDARY SURVEY HAS BEEN UNDERTAKEN FOR THIS PROJECT.

IF ANY STRUCTURE OR IMPROVEMENT IS TO BE CONSTRUCTED ON OR ADJACENT TO THE BOUNDARIES OF THIS LAND, THE RELEVANT BOUNDARIES MUST BE MARKED PRIOR TO CONSTRUCTION BY A REGISTERED SURVEYOR.
DO NOT SCALE FROM THIS PLAN TO SET OUT ANY BOUNDARIES.

LEVELS TAKEN ON EXPOSED SURFACE ASH WERE CAPTURED USING A HOVERCRAFT - EXPECTED ACCURACY +/-0.05m

SITE CIVIL CONSTRUCTION AND FILLING IS UNDERWAY ONSITE. CONTOURS SHOWN HEREWITH WERE ACCURATE AS AT THE DATE OF SURVEY. NO RE-SURVEY OF SITES HAS BEEN UNDERTAKEN.

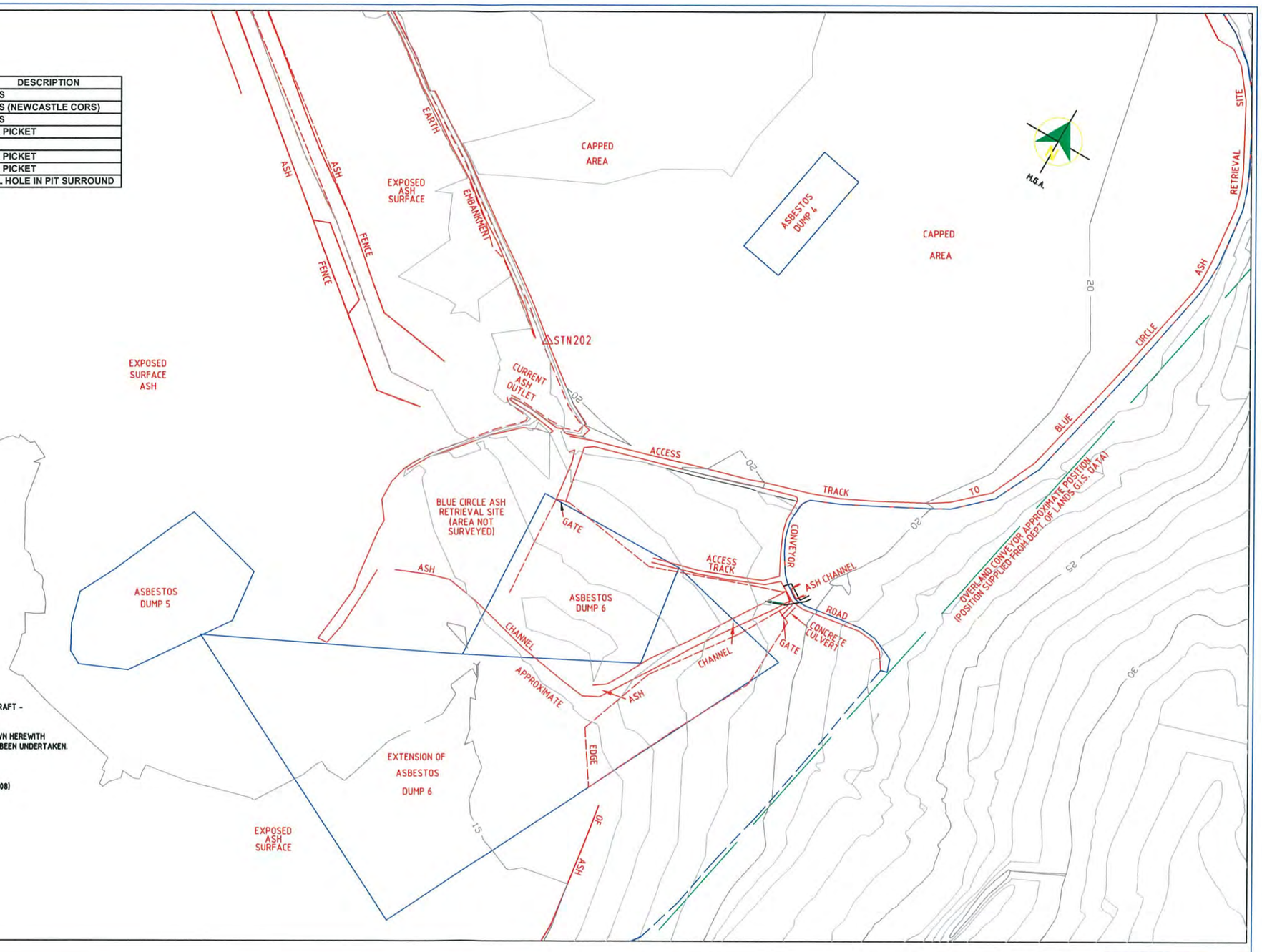
SCALE 1:1500 (AT A0 SIZE SHEET)
DATUM: A.H.D.
ORIGIN OF LEVELS: PM 66233 RL 33.436 (ADOPTED FROM SCIMS AS AT 28/4/2008)

GRID: M.G.A.
ORIGIN OF COORDINATES: PM 66233
AZIMUTH: PM 66233 - TS 12051
CONTOUR INTERVAL: 1.0m

DATE OF SURVEY: MAY/JUNE 2008

LEGEND

- TOP OF EMBANKMENT
- FENCE
- MAJOR CONTOUR
- MINOR CONTOUR
- LIMIT OF SURVEY



SCALE 1:1500

Rev.	Date	Revision Details	Drn	Ver.	App.
1	4/2/09	AMENDED TO INCLUDE DELTA ELECTRICITY DRAWING NUMBERS	LMB	PS/GBT	JWC
0	11/07/08	INITIAL ISSUE	LMB	PS/GBT	JWC

Connell Wagner
Connell Wagner Pty Ltd ABN 54 005 139 873
116 Military Road (PO Box 538) Neutral Bay
New South Wales 2089 Australia
Telephone: +61 2 9465 5599
Facsimile: +61 2 9465 5598
Email: cwsyd@conwag.com

Client: Delta electricity

Project: DELTA ELECTRICITY CENTRAL COAST ASH DAM CAPACITY SURVEYS - 2008

		Signed	Date
Drawn	LMB		
Designed	DP	Signed	Date
Verified	PS/GBT	Signed	Date
Approved	JWC	Signed	Date

Drawing Title: VALES POINT ASH DAM
PLAN SHOWING LOCATION OF
ASBESTOS DUMP SITES 4, 5 & 6

Project No. 38370-001
Scale 1:1500
Sheet Size A1
Drawing No. VX822725
Rev. 1

DO NOT SCALE - IF IN DOUBT ASK

SHEET 2

VISITORS CAR PARK
COMMUNICATIONS BUILDING
1/4 SWYD COMPRESSOR BLD
1/4 SWYD RELAY BLD.
SWITCHYARD
SWITCHYARD
SWITCHYARD ROAD
5/6 SWYD RELAY BLD.
HP-2
HP-1
HYDROGEN PLANT
E
C.W. SCREENS
1/4 TX OIL STORAGE FILTRATION BUILDING
FIRST AID ROAD
FIRST AID
INFO. CENTRE
KIOSK
MAIN ENTRY ROAD
B
CP-2
CP-1
H-9
CHLORINE PLANT
ADMIN ROAD
INLET CANAL
OUTFALL CANAL
TRANSFORMER ROAD
EMERGENCY ACCESS GATE
ADMIN. CAR PARK
ADMIN. BLD.
MAIN GATE
LAB-1
EMPLOYEES CAR PARK
PARK ROAD
TURNSTILES
A - STATION
UNITS 1 TO 4
1/4 AUX BAY ROAD
ELECT. W/SHOP
EW-1
MECH. W/SHOP
MW-2
EMERG. DIESEL STORAGE TANK
EMERG. DIESEL & COMP.AIR PLT.
H-13
TR-1
NO.5 GEN. TRANSFORMER YARD
TRANSFORMERS
TR-4
NO.6 GEN. TRANSFORMER YARD
TROS-1
TROS-2
H-21
H-22A
H-22B
COMM. BLD.
REFUSE OIL STORAGE AREA
CO2 BLD.
H-23
TR-2
TR-3
B - STATION
SO-5
SO-6
H-14 A/B
H-15 A/B
TURBINE MAIN OIL TANKS
H-18
UNIT 5 TURBINE
UNIT 6 TURBINE
H-17
TURBINE MAIN OIL TANKS
OIL DRUM CONTAINMENT AREA
C.W. SCREENS SWITCHROOM
OIL & GRIT TRAP SWITCHROOM
OIL & GRIT TRAP
DECOMMISSIONED AMMONIA TANK DEPOT AP-2
STORMWATER SETTLING BASIN
AP 1-2
OG-1
TANKER UNLOADING AREA
AMMONIA PLANT ROAD
ANHYDROUS AMMONIA TANK DEPOT AP-1 CAPACITY: 60,000 Kg
F
CHEMICAL DOSING PLANT MEZANNINE LEVEL
V3 STORE
BR-1
AUXILIARY
BAY
BR-2
5/6 LIFTS
5/6 AUX. BAY ROAD
TECHNICIANS WORKSHOP
C.W SCREENS ROAD
PS1
PAINTER'S SHEDS
BOILERMAKERS W/SHOP
BW1
BW2
OFFICE BLD.
ELECT FITT'S W/SHOP
STORES LANE
BULK STORE
V1 STORE
V2 STORE
RO1-4
TOOL STORE
MILL
ALLEY
UNIT 5 BOILER
UNIT 6 BOILER
MECH. BOILER W/SHOP
CCR-1
D
PB-1
H-8
PETROL BOWSERS
ADMIN. OFFICE.
MILLS W/SHOP
MW1
GSF ROAD
A
WH-3
WH-4
WH-1
DANGEROUS GOODS STORE
H-7
VEHICLE ACCESS GATE
GARDEN SHED
H-6
CS-2
CS-1
OIL STORE
BULK STORES ROAD
G.S.F. AMENITIES
G.S.F.
MAIN WORKSHOP ROAD
No.1 STACK
COAL PLANT W/SHOP
RO PLANT
COAL WORKSHOP ROAD
FCW-2
No.2 STACK
DEMIN PLANT CONTROL BLD
DEMIN PLANT ROAD
DP 0,1
DP 4-6
DP 7
DP 1-3
AA 1
H 16
RAW WATER SERV. PUMP STATION
JAGGERS W/SHOP
COND. POLISH PLANT
5/6 BOILER ELECT SERVICES W/SHOPS
P.F. MILLS W/SHOPS
TOOL STORE ROAD
CONV. GANTRY
ASH & DUST PLANTS
CS 3
W/SHOP
S-1
PRECIPITATOR
PRECIPITATOR
PRECIPITATOR
PRECIPITATOR
DUST PLANT ROAD
SMG AMENITIES AREA
H-20
H-19
No.3 STACK
GREASERS STORAGE AREA
'A' STATION ACCESS ROAD
COAL CONVEYORS
DEMIN WATER TANKS
FLY ASH LOADING PLANT
HAULAGE ROAD
FIRE SERVICE RESEVOIR
CONTRACTORS AMENITIES AREA
5/6 COAL RECEIVING SWYROOM
COAL CONVEYORS
COAL CONVEYORS
CONV. TRANSFER HOUSE
FUEL OIL TANKS
5/6 COMBINED VALVE STATION BLD.
CONTRACTORS INDUCTION CENTRE
CONTRACTORS OFFICE AREA
HAULAGE ROAD
STORE
FO-2
FO-1
TANK 6
TANK 5
FUEL OIL ROAD
FLY ASH ROAD
COAL PLANT OPP ROAD
VEHICLE ACCESS GATE
SWITCHROOM
COAL PLANT CONTROL ROOM/ MAIN RECEIVING BIN
MOBILE PLANT MAINT.BAY
ASH DISPOSAL PIPE LINES
CONSTRUCTION ROAD

FOR TABLE OF DANGEROUS GOODS DEPOTS
REFER DRAWING No. VX626979_6_10

0 50m 100m

MF PLANT
MF1-2
MF3-4
MF PLANT AT MANNERING PARK STP

G

VX 626979

K	BC GWPHONE	3-6-11	RD
J	EMAIL BC 310411	15-4-11	RD
H	HW1 & PS1 ADDED. SMG WORKSHOPS NOW PAINTERS SHEDS	28-2-11	RD
G	-9 REMOVED FROM 'C'. UNIT 1 & 2 STORAGE BUILDINGS REMOVED. 1-2 HYDROGEN STORAGE REMOVED		
	3-4 HYDROGEN & CO2 STORAGE BUILDING REMOVED		
F	HYP1 REMOVED	31-1-11	RD
E	ALTERED AROUND No.1 STACK	9-3-09	RD

DRAFTING BY: R.T. DAVISON & ASSOC PTY LTD

SCALE: NTS
DRAWN: R DAVISON 23-12-08
CHECKED:
APPROVED:
DATE:

PREMIER Premier Engineering Services Pty Ltd

VALES
DANGEROUS GOODS
LAYOUT-SHEET 2

DRAWING No. VX626979 J

DO NOT SCALE - IF IN DOUBT ASK

SHEET 2

VISITORS CAR PARK
COMMUNICATIONS BUILDING
1/4 SWYD COMPRESSOR BLD.
1/4 SWYD RELAY BLD.
SWITCHYARD
SWITCHYARD ROAD
5/6 SWYD RELAY BLD.
1/4 TX OIL STORAGE FILTRATION BUILDING
FIRST AID ROAD
FIRST AID
INFO. CENTRE
KIOSK
CP-2
CP-1
H-9
CHLORINE PLANT
HP-2
HP-1
HYDROGEN PLANT
C.W. SCREENS
MAIN ENTRY ROAD
EMERGENCY ACCESS GATE
ADMIN ROAD
INLET CANAL
OUTFALL CANAL
TRANSFORMER ROAD
OIL & GRIT TRAP SWITCHROOM
DECOMMISSIONED AMMONIA TANK DEPOT AP-2
STORMWATER SETTLING BASIN
AP 1-2
OIL & GRIT TRAP
C.W. SCREENS SWITCHROOM
OG-1
TANKER UNLOADING AREA
AMMONIA PLANT ROAD
ANHYDROUS AMMONIA TANK DEPOT AP-1 CAPACITY: 60,000 Kg
ADMIN. CAR PARK
ADMIN. BLD.
MAIN GATE
LAB-1
EMPLOYEES CAR PARK
TURNSTILES
PARK ROAD
ELECT. W/SHOP
EW-1
MECH. W/SHOP
MW-2
A - STATION
UNITS 1 TO 4
EMERG. DIESEL STORAGE TANK
EMERG. DIESEL & COMP.AIR PLT.
H-13
TR-1
NO.5 GEN. TRANSFORMER YARD
TRANSFORMERS
TR-4
NO.6 GEN. TRANSFORMER YARD
TR-2
TR-3
B - STATION
TROS-1
TROS-2
COMM. BLD.
H-21
H-22A
H-22B
H-23
REFUSE OIL STORAGE AREA
CO2 BLD.
OIL DRUM CONTAINMENT AREA
SO-5
H-14 A B
TURBINE MAIN OIL TANKS
UNIT 5 TURBINE
H-17
UNIT 6 TURBINE
H-18
SO-6
H-15 A B
TURBINE MAIN OIL TANKS
1/4 AUX BAY ROAD
ADMIN ROAD
OFFICE BLD.
ELECT. FITT'S W/SHOP
BOILERMAKERS W/SHOP
BW1
BW2
CHEMICAL DOSING PLANT MEZZANINE LEVEL
V3 STORE
TECHNICIANS WORKSHOP
BR-1
AUXILIARY BAY
5/6 LIFTS
5/6 AUX. BAY ROAD
BR-2
STORES LANE
BULK STORE
V1 STORE
V2 STORE
RO1-4
TOOL STORE
MILL
ALLEY
UNIT 5 BOILER
UNIT 6 BOILER
CCR-1
MECH. BOILER W/SHOP
D
PS1
PAINTER'S SHEDS
C.W. SCREENS ROAD
MILLS W/SHOP
MW1
PB-1
H-8
PETROL BOWSERS
ADMIN. OFFICE
GSF ROAD
A
WH-3
WH-4
WH-1
DANGEROUS GOODS STORE
H-7
G.S.F. AMENITIES
G.S.F.
BULK STORES ROAD
MAIN WORKSHOP ROAD
No.1 STACK
RO PLANT
COAL PLANT W/SHOP
COAL WORKSHOP ROAD
No.2 STACK
DEMIN PLANT CONTROL BLD.
DAGGERS W/SHOP
FCW-2
DP 7
DP 1-3
COND. POLISH PLANT
5/6 BOILER ELECT. SERVICES W/SHOP
P.F. MILLS W/SHOPS
TOOL STORE ROAD
CONV. GANTRY
ASH & DUST PLANTS
S-1
PRECIPITATOR
PRECIPITATOR
PRECIPITATOR
PRECIPITATOR
DUST PLANT ROAD
SMG AMENITIES AREA
VEHICLE ACCESS GATE
GARDEN SHED
H-6
CS-2
CS-1
OIL STORE
DP 10,11
DP 4-6
AA 1
H 16
STORMWATER PUMP STATION
DEMIN PLANT ROAD
H-20
H-19
No.3 STACK
GREASERS STORAGE AREA
'A' STATION ACCESS ROAD
COAL CONVEYORS
DEMIN WATER TANKS
FLY ASH LOADING PLANT
HAULAGE ROAD
FIRE SERVICE RESEVOIR
CONTRACTORS AMENITIES AREA
5/6 COAL RECEIVING SW/ROOM
COAL CONVEYORS
COAL CONVEYORS
CONV. TRANSFER HOUSE
FUEL OIL TANKS
5/6 COMBINED VALVE STATION BLD.
CONTRACTORS INDUCTION CENTRE
CONTRACTORS OFFICE AREA
HAULAGE ROAD
FO-2
FO-1
TANK 5
TANK 6
FUEL OIL ROAD
FLY ASH ROAD
COAL PLANT OPP ROAD
STORE
VEHICLE ACCESS GATE
SWITCHROOM
COAL PLANT CONTROL ROOM/ MAIN RECEIVING BIN
MOBILE PLANT MAINT.BAY
ASH DISPOSAL PIPE LINES
CONSTRUCTION ROAD

FOR TABLE OF DANGEROUS GOODS DEPOTS
REFER DRAWING No. VX626979_6_10

0 50m 100m
SCALE

VX 626979

MF PLANT
MF1-2
MF3-4
MF PLANT AT MANNERING PARK STP

G

REFERENCE DRAWINGS	DRAWING No	No	REVISIONS	DATE	BY	CKD
		K	BC GWPHONE	3-6-11	RD	
		J	EMAIL BC 310411	15-4-11	RD	
		H	HWI & PSI ADDED. SMG WORKSHOPS NOW PAINTERS SHEDS	28-2-11	RD	
		G	-9 REMOVED FROM 'C', UNIT 1 & 2 STORAGE BUILDINGS REMOVED. 1-2 HYDROGEN STORAGE REMOVED			
			3-4 HYDROGEN & CO2 STORAGE BUILDING REMOVED			
		F	HYP1 REMOVED	31-1-11	RD	
		E	ALTERED AROUND No.1 STACK	9-3-09	RD	

DRAFTING BY :
R.T. DAVISON & ASSOC PTY LTD

SCALE	NTS	DATE
Drawn	R DAVISON	23-12-09
Checked		
Proj. Eng.		

PREMIER Premier Engineering Services Pty Ltd

A1

VALES
DANGEROUS GOODS
LAYOUT-SHEET 2

DRAWING No.	REV.
VX626979_5_10	J
SHEET	OF

NOTIFIED DANGEROUS GOODS DEPOTS

SHEET NO.	DEPOT NO.	DEPOT DESCRIPTION	DG CLASS	STORAGE TYPE
SHEET 2	WH-1	V1 WAREHOUSE-FLAMMABLE LIQUID STORAGE	3	ROOFED
SHEET 2	WH-3	V1 WAREHOUSE-SOLID BIOCIDE-NALCO 7346	5.1	ROOFED
SHEET 2	WH-4	LIQUID CO2 CYLINDER STORE	2.2	CYLINDERS
SHEET 2	CS-1	V1 CLEARSPAN-FLAMMABLE GASSES	2.1	ROOFED
SHEET 2	CS-2	V1 CLEARSPAN-CORROSIVE LIQUIDS	8	ROOFED
SHEET 2	CS-3	CYLINDER STORE	2.1	ROOFED
SHEET 2	PB-1	PETROL BOWSER-UNLEADED PETROL	3	TANK
SHEET 2	CP-1	CHLORINE PLANT-HYDROCHLORIC ACID	8	TANK
SHEET 2	DP-1	DEMIN PLANT-98% SULPHURIC ACID'C'	8	TANK
SHEET 2	DP-2	DEMIN PLANT-98% SULPHURIC ACID'A'	8	TANK
SHEET 2	DP-3	DEMIN PLANT-98% SULPHURIC ACID'B'	8	TANK
SHEET 2	DP-4	DEMIN PLANT-50% CAUSTIC SODA TANK'A'	8	TANK
SHEET 2	DP-5	DEMIN PLANT-50% CAUSTIC SODA TANK'B'	8	TANK
SHEET 2	DP-6	DEMIN PLANT-50% CAUSTIC SODA TANK'C'	8	TANK
SHEET 2	DP-7	DEMIN PLANT-EDP DILUTE SULPHURIC ACID 15%	8	TANK
SHEET 2	DP-10	DEMIN PLANT-FERRIC SULPHATE DOSING	8	IBC
SHEET 2	DP-11	DEMIN PLANT-FERRIC SULPHATE DOSING	8	IBC
SHEET 2	AA-1	AQUEOUS AMMONIA	8	TANK
SHEET 2	FO-1	FUEL OIL TANK 6	C1	TANK
SHEET 2	FO-2	FUEL OIL TANK 5	C1	TANK
SHEET 2	BR-1	#5 BATTERY ROOM-SULPHURIC ACID	8	CELLS
SHEET 2	BR-2	#6 BATTERY ROOM-SULPHURIC ACID	8	CELLS
SHEET 2	S-1	SULPHUR TANK FOR S03 PLANT	4	TANK
SHEET 2	CP-2	CHLORINE PLANT-SODIUM HYDROXIDE	8	TANK
SHEET 2	HP-1	HYDROGEN PLANT-CYLINDERS	2.1	CYLINDER
SHEET 2	HP-2	HYDROGEN PLANT-CYL.BACK UP	2.1	CYLINDER
SHEET 2	AP-1	AMMONIA PLANT -TANK 1. -ANHYDROUS AMMONIA	2.3	TANK
SHEET 2	TR1	GENERATOR TRANSFORMER 5A	C1	VESSEL
SHEET 2	TR2	GENERATOR TRANSFORMER 5B	C1	VESSEL
SHEET 2	TR3	GENERATOR TRANSFORMER 6A	C1	VESSEL
SHEET 2	TR4	GENERATOR TRANSFORMER 6B	C1	VESSEL
SHEET 1	H-4	DOZER FUEL DEPOT	C1	TANK
SHEET 2	H-8	DIESEL FUEL BOWSER-ADJ.PB-1	C1	TANK
SHEET 2	H-9	CHLORINE PLANT-3%HYDROCHLORIC ACID	8	TANK
SHEET 2	H-14A & 14B	#5 TURBINE OIL STORAGE X2 TANKS	C1	TANKS
SHEET 2	H-15A & 15B	#6 TURBINE OIL STORAGE X2 TANKS	C1	TANKS
SHEET 2	H-20	SOX & NOX SHED	2.3	CYLINDERS
SHEET 2	H-21	REFUSE OIL STORAGE NO.2 ADJ.TR-5	C1	TANK
SHEET 2	H-22A & 22B	TEMPORARY TURB.OIL STORAGE	C1	TANK
SHEET 2	H-23	CO2 GAS STORAGE ADJ.TR-5	2.2	CYLINDERS
SHEET 2	RO1	RO HYPOCHLORITE	8	IBC
SHEET 2	RO2	RO HYPOCHLORITE	8	IBC
SHEET 2	RO3	RO AMMONIA	8	IBC
SHEET 2	RO4	RO AMMONIA	8	IBC
SHEET 2	PS1	PAINTERS SHEDS	3	ROOFED
SHEET 2	TROS-1	SPARE TRANSFORMER	C1	VESSEL
SHEET 2	TROS-2	SPARE TRANSFORMER	C1	VESSEL

REV L 3-6-11 BC PHONE

VX 626979

NON-NOTIFIED DANGEROUS GOODS DEPOTS

SHEET NO.	DEPOT NO.	DEPOT DESCRIPTION	DG CLASS	STORAGE TYPE
SHEET 1	H-2	GARAGE-OIL DRUM STORAGE NO.1	C1	DRUMS
SHEET 1	H-3	GARAGE-REFUSE OIL NO.1	C1	TANK
SHEET 2	H-6	V1 CLEARSPAN-OIL DRUM STORAGE NO.2	C1	DRUMS
SHEET 2	H-7	NON-FLAM.GAS-BETWWEN CS-1 & CS-2	2.2	CYLINDERS
SHEET 2	H-13	EMERGENCY DIESEL GENERATOR DIESEL TANK	C1	TANK
SHEET 2	H-17	#5 EXCITER C02 FIRE PROTECTION	2.2	CYLINDERS
SHEET 2	H-18	#6 EXCITER CO2 FIRE PROTECTION	2.2	CYLINDERS
SHEET 2	H-19	GREASER SHED-OIL DRUM STORAGE NO.3	C1	DRUMS
SHEET 2	FCW-2	DEMIN PLANT-SOLID BIOCIDE-NALCO 7346	5.1	ROOFED
SHEET 2	MF1	MF HYPOCHLORITE	8	IBC
SHEET 2	MF2	MF HYPOCHLORITE	8	IBC
SHEET 2	MF3	MF AMMONIA	8	IBC
SHEET 2	MF4	MF AMMONIA	8	IBC
SHEET 2	HYP-1	STANDBY HYPOCHLORITE SOLUTION	8	TANK (NOT COMMISSIONED)
SHEET 2	SO5	UNIT 5 VACUUM SEAL OIL TANK	C2	TANK
SHEET 2	SO6	UNIT 5 VACUUM SEAL OIL TANK	C2	TANK
SHEET 2	OG-1	WASTE OIL STORE		UGT
SHEET 2	H16	AMMONIA DILUTION TANK	NON-DG	TANK
SHEET 2	EW-1	ELECTRICAL WORKSHOP FLC	3	FLC
SHEET 2	BW-1	BOILERMAKERS WORKSHOP FLC	3	FLC
SHEET 2	BW-2	BOILERMAKERS WORKSHOP FLC	3	FLC
SHEET 2	MW-1	MECHANICAL WORKSHOP FLC	3	FLC
SHEET 2	MW-2	MECHANICAL WORKSHOP FLC	3	FLC
SHEET 2	LAB-1	ADMIN LAB FLC	3	FLC
SHEET 2	CCR-1	CHEMICAL CONTROL ROOM FLC	3	FLC

REV L 3-6-11 BC PHONE

VX 626979

WorkCover NSW
92-100 Donnison Street, Gosford, NSW 2250
Locked Bag 2906, Lisarow, NSW 2252
T 02 4321 5000 F 02 4325 4145
WorkCover Assistance Service 13 10 50
DX 731 Sydney workcover.nsw.gov.au

Acknowledgement Number NDG015072

13 November 2013

Alec Liddell
DELTA ELECTRICITY
T/A VALES POINT POWER STATION
PO Box 7285
MANNERING PARK NSW 2259

Dear Sir / Madam

RE: Notification of Dangerous Goods on Premises

PREMISES: VALES RD, MANNERING PARK NSW 2259, AUSTRALIA

Please find enclosed your Acknowledgement of Notification that relates to the storage and handling of dangerous goods at the above premises. Only storage locations on this site that are above placarding quantity are recorded on this Acknowledgement of Notification.

Occupiers of premises on which dangerous goods are stored or handled in notifiable quantities are reminded that, at this point in time, they must notify WorkCover NSW annually of the dangerous goods on those premises.

You are required to advise WorkCover within 14 days of any changes occurring in your details including changes to the type or quantity of dangerous goods stored or handled, or if you no longer occupy the site.

Requirements relating to the storage and handling of dangerous goods on premises are contained in the Occupational Health and Safety Act 2000 and the Occupational Health and Safety Regulation 2001. To support this legislation WorkCover has developed the 'Notification of dangerous goods on premises guide' (publication catalogue number WC01385) which is available on WorkCover NSW's website.

Further information on dangerous goods legislation may be obtained at the Workcover website *www.workcover.nsw.gov.au* or by calling WorkCover on 13 10 50.

Yours sincerely,

Fiona Hayman
Operations Manager
Customer Service Centre

WorkCover NSW
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T 02 4321 5000 F 02 4325 4145
WorkCover Assistance Service 13 10 50
DX 731 Sydney workcover.nsw.gov.au

Dangerous Goods Notification Team
Ph: (02) 4321 5500 Fax (02) 9287 5500

13 November 2013

DELTA ELECTRICITY
T/A VALES POINT POWER STATION
PO Box 7285
MANNERING PARK NSW 2259

ACKNOWLEDGEMENT OF NOTIFICATION OF DANGEROUS GOODS ON PREMISES

ISSUED UNDER AND SUBJECT TO THE PROVISIONS OF
THE OCCUPATIONAL HEALTH & SAFETY ACT 2000 AND REGULATIONS THEREUNDER

Acknowledgement Number NDG015072 **Expiry Date** 17/06/2014

Occupier Contact Alec Liddell **Ph.** 0249 633 852 **Fax**

Issued To DELTA ELECTRICITY

Premises where Notified Dangerous Goods are stored/handled

VALES RD, MANNERING PARK NSW 2259, AUSTRALIA

Nature of Site Electricity Generation

Emergency Contact for this Site Shift Manager . **Ph.** 02 4352 6220

Site Staffing Site Hours: 24 HRS 7 DAYS / 300 STAFF

This acknowledgement must be retained as PROOF OF NOTIFICATON
You must notify WorkCover annually of the Dangerous Goods stored on these premises.

WORK SAFE HOME SAFE

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Issued To DELTA ELECTRICITY
Acknowledgement Number NDG015072

Storage ID	**Storage Type**	**Max Storage Capacity (Kg/L)**		
AA1	Above Ground Tank	25000		
UN Number	Product Name	Class/Division	Typical Quantity	Packing Group
2672	AMMONIA SOLUTION	8	15000L	III

Storage ID	**Storage Type**	**Max Storage Capacity (Kg/L)**		
BR1	Roofed Store	20000		
UN Number	Product Name	Class/Division	Typical Quantity	Packing Group
2794	BATTERIES, WET, FILLED WITH ACID	8	20000L	III

Storage ID	**Storage Type**	**Max Storage Capacity (Kg/L)**		
BR2	Roofed Store	20000		
UN Number	Product Name	Class/Division	Typical Quantity	Packing Group
2794	BATTERIES, WET, FILLED WITH ACID	8	20000L	III

Storage ID	**Storage Type**	**Max Storage Capacity (Kg/L)**		
CP1	Above Ground Tank	2400		
UN Number	Product Name	Class/Division	Typical Quantity	Packing Group
1789	HYDROCHLORIC ACID	8	1200L	II

Storage ID	**Storage Type**	**Max Storage Capacity (Kg/L)**		
CP2	Above Ground Tank	1000		
UN Number	Product Name	Class/Division	Typical Quantity	Packing Group
1824	SODIUM HYDROXIDE SOLUTION	8	750L	II

Storage ID	**Storage Type**	**Max Storage Capacity (Kg/L)**		
CS1	Cylinder Store	600		
UN Number	Product Name	Class/Division	Typical Quantity	Packing Group
1001	ACETYLENE, DISSOLVED	2.1	50L	
1049	HYDROGEN, COMPRESSED	2.1	50L	
1075	PETROLEUM GASES, LIQUEFIED	2.1	50L	

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Storage ID	**Storage Type**	**Max Storage Capacity (Kg/L)**		
CS2	Roofed Store	1000		
UN Number	Product Name	Class/Division	Typical Quantity	Packing Group
2672	AMMONIA SOLUTION	8	5L	III
3266	CORROSIVE LIQUID, BASIC, INORGANIC, N.O.S.	8	10L	II
1830	SULFURIC ACID	8	50L	II
1789	HYDROCHLORIC ACID	8	70L	II

Storage ID	**Storage Type**	**Max Storage Capacity (Kg/L)**		
DP1	Above Ground Tank	25000		
UN Number	Product Name	Class/Division	Typical Quantity	Packing Group
1830	SULFURIC ACID	8	16000L	II

Storage ID	**Storage Type**	**Max Storage Capacity (Kg/L)**		
DP10	Above Ground Tank	1000		
UN Number	Product Name	Class/Division	Typical Quantity	Packing Group
1760	CORROSIVE LIQUID, N.O.S.	8	500L	II

Storage ID	**Storage Type**	**Max Storage Capacity (Kg/L)**		
DP11	Above Ground Tank	1000		
UN Number	Product Name	Class/Division	Typical Quantity	Packing Group
1760	CORROSIVE LIQUID, N.O.S.	8	500L	II

Storage ID	**Storage Type**	**Max Storage Capacity (Kg/L)**		
DP2	Above Ground Tank	25000		
UN Number	Product Name	Class/Division	Typical Quantity	Packing Group
1830	SULFURIC ACID	8	16000L	II

Storage ID	**Storage Type**	**Max Storage Capacity (Kg/L)**		
DP3	Above Ground Tank	25000		
UN Number	Product Name	Class/Division	Typical Quantity	Packing Group
1830	SULFURIC ACID	8	16000L	II

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Storage ID	**Storage Type**	**Max Storage Capacity (Kg/L)**		
DP4	Above Ground Tank	31000		
UN Number	Product Name	Class/Division	Typical Quantity	Packing Group
1824	SODIUM HYDROXIDE SOLUTION	8	20000L	II

Storage ID	**Storage Type**	**Max Storage Capacity (Kg/L)**		
DP5	Above Ground Tank	31000		
UN Number	Product Name	Class/Division	Typical Quantity	Packing Group
1824	SODIUM HYDROXIDE SOLUTION	8	20000L	II

Storage ID	**Storage Type**	**Max Storage Capacity (Kg/L)**		
DP6	Above Ground Tank	31000		
UN Number	Product Name	Class/Division	Typical Quantity	Packing Group
1824	SODIUM HYDROXIDE SOLUTION	8	20000L	II

Storage ID	**Storage Type**	**Max Storage Capacity (Kg/L)**		
DP7	Above Ground Tank	5000		
UN Number	Product Name	Class/Division	Typical Quantity	Packing Group
2796	SULFURIC ACID	8	4500L	II

Storage ID	**Storage Type**	**Max Storage Capacity (Kg/L)**		
FO1	Above Ground Tank	1200000		
UN Number	Product Name	Class/Division	Typical Quantity	Packing Group
00C1	DIESEL	C1	600000L	

Storage ID	**Storage Type**	**Max Storage Capacity (Kg/L)**		
FO2	Above Ground Tank	1200000		
UN Number	Product Name	Class/Division	Typical Quantity	Packing Group
00C1	DIESEL	C1	600000L	

Storage ID	**Storage Type**	**Max Storage Capacity (Kg/L)**		
H21	Above Ground Tank	35000		
UN Number	Product Name	Class/Division	Typical Quantity	Packing Group
00C1	COMBUSTIBLE LIQUIDS C1	C1	25000L	

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Storage ID	**Storage Type**	**Max Storage Capacity (Kg/L)**		
H22A	Above Ground Tank	45000		
UN Number	Product Name	Class/Division	Typical Quantity	Packing Group
00C1	COMBUSTIBLE LIQUIDS C1	C1	20000L	

Storage ID	**Storage Type**	**Max Storage Capacity (Kg/L)**		
H22B	Above Ground Tank	70000		
UN Number	Product Name	Class/Division	Typical Quantity	Packing Group
00C1	COMBUSTIBLE LIQUIDS C1	C1	35000L	

Storage ID	**Storage Type**	**Max Storage Capacity (Kg/L)**		
H23	Cylinder Store	8000		
UN Number	Product Name	Class/Division	Typical Quantity	Packing Group
2187	CARBON DIOXIDE, REFRIGERATED LIQUID	2.2	8000Kg	

Storage ID	**Storage Type**	**Max Storage Capacity (Kg/L)**		
H4	Above Ground Tank	35000		
UN Number	Product Name	Class/Division	Typical Quantity	Packing Group
00C1	DIESEL	C1	25000L	

Storage ID	**Storage Type**	**Max Storage Capacity (Kg/L)**		
H8	Underground Tank	26900		
UN Number	Product Name	Class/Division	Typical Quantity	Packing Group
00C1	DIESEL	C1	20000L	

Storage ID	**Storage Type**	**Max Storage Capacity (Kg/L)**		
H9	Above Ground Tank	1000		
UN Number	Product Name	Class/Division	Typical Quantity	Packing Group
1789	HYDROCHLORIC ACID	8	400L	II

Storage ID	**Storage Type**	**Max Storage Capacity (Kg/L)**		
HP1	Cylinder Store	38000		
UN Number	Product Name	Class/Division	Typical Quantity	Packing Group
1049	HYDROGEN, COMPRESSED	2.1	38000L	

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Storage ID	**Storage Type**	**Max Storage Capacity (Kg/L)**		
HP2	Cylinder Store	20000		
UN Number	Product Name	Class/Division	Typical Quantity	Packing Group
1049	HYDROGEN, COMPRESSED	2.1	20000L	

Storage ID	**Storage Type**	**Max Storage Capacity (Kg/L)**		
HYP1	Above Ground Tank	35000		
UN Number	Product Name	Class/Division	Typical Quantity	Packing Group
1791	HYPOCHLORITE SOLUTION	8	20000L	III

Storage ID	**Storage Type**	**Max Storage Capacity (Kg/L)**		
HYP2	Above Ground Tank	1500		
UN Number	Product Name	Class/Division	Typical Quantity	Packing Group
1791	HYPOCHLORITE SOLUTION	8	1000L	III

Storage ID	**Storage Type**	**Max Storage Capacity (Kg/L)**		
PB1	Underground Tank	20000		
UN Number	Product Name	Class/Division	Typical Quantity	Packing Group
1203	PETROL	3	20000L	II

Storage ID	**Storage Type**	**Max Storage Capacity (Kg/L)**		
PS1	Roofed Store	2500		
UN Number	Product Name	Class/Division	Typical Quantity	Packing Group
1950	AEROSOLS	2	5L	
1263	PAINT	3	500L	II
1263	PAINT	3	750Kg	III

Storage ID	**Storage Type**	**Max Storage Capacity (Kg/L)**		
PW1	Roofed Store	2500		
UN Number	Product Name	Class/Division	Typical Quantity	Packing Group
1263	PAINT (including paint, lacquer, enamel, stain, shellac, varnish, polish, liquid filler and liquid lacquer base)	3	200L	III

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Storage ID	Storage Type	Max Storage Capacity (Kg/L)		
S1	Above Ground Tank	100000		
UN Number	Product Name	Class/Division	Typical Quantity	Packing Group
1350	SULFUR	4.1	60000Kg	III

Storage ID	Storage Type	Max Storage Capacity (Kg/L)		
TR1	Process Vessel	100000		
UN Number	Product Name	Class/Division	Typical Quantity	Packing Group
00C1	COMBUSTIBLE LIQUIDS C1	C1	100000L	

Storage ID	Storage Type	Max Storage Capacity (Kg/L)		
TR2	Process Vessel	100000		
UN Number	Product Name	Class/Division	Typical Quantity	Packing Group
00C1	COMBUSTIBLE LIQUIDS C1	C1	100000L	

Storage ID	Storage Type	Max Storage Capacity (Kg/L)		
TR3	Process Vessel	100000		
UN Number	Product Name	Class/Division	Typical Quantity	Packing Group
00C1	COMBUSTIBLE LIQUIDS C1	C1	100000L	

Storage ID	Storage Type	Max Storage Capacity (Kg/L)		
TR4	Process Vessel	100000		
UN Number	Product Name	Class/Division	Typical Quantity	Packing Group
00C1	COMBUSTIBLE LIQUIDS C1	C1	100000L	

Storage ID	Storage Type	Max Storage Capacity (Kg/L)		
TROS2	Process Vessel	78000		
UN Number	Product Name	Class/Division	Typical Quantity	Packing Group
00C1	COMBUSTIBLE LIQUIDS C1	C1	78000L	

Storage ID	Storage Type	Max Storage Capacity (Kg/L)		
WH1	Roofed Store	500		
UN Number	Product Name	Class/Division	Typical Quantity	Packing Group
1193	ETHYL METHYL KETONE (METHYL ETHYL KETONE)	3	10L	II

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Storage ID	Storage Type	Max Storage Capacity (Kg/L)		
WH1	Roofed Store	500		
1170	ETHANOL (ETHYL ALCOHOL)	3	40L	II
1223	KEROSENE	3	40L	III
1263	PAINT	3	80L	III

Storage ID	Storage Type	Max Storage Capacity (Kg/L)		
WH3	Roofed Store	400		
UN Number	Product Name	Class/Division	Typical Quantity	Packing Group
1479	OXIDIZING SOLID, N.O.S.	5.1	400Kg	II

Storage ID	Storage Type	Max Storage Capacity (Kg/L)		
WH4	Roofed Store	5000		
UN Number	Product Name	Class/Division	Typical Quantity	Packing Group
1013	CARBON DIOXIDE	2.2	5000L	

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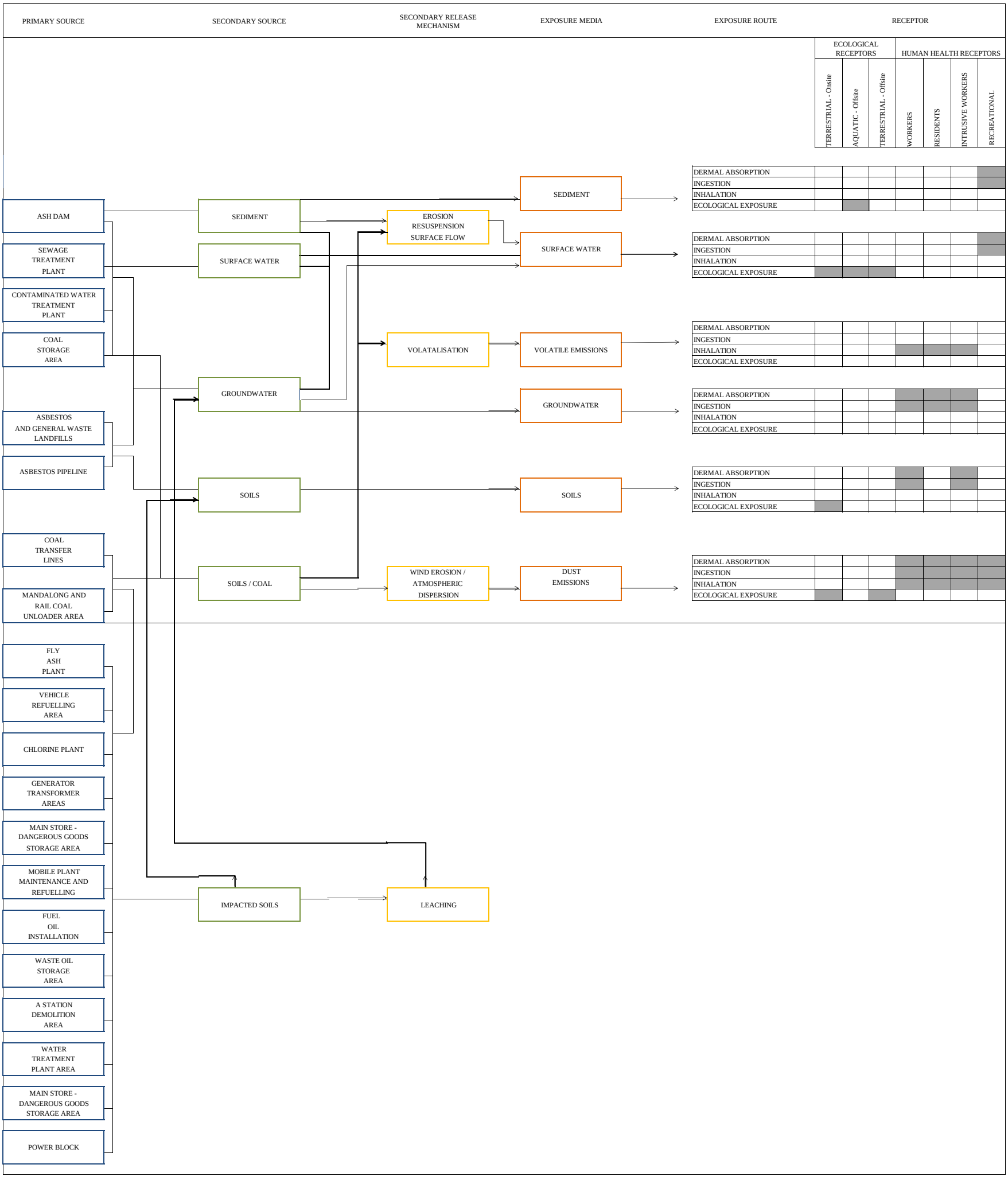
WORK SAFE HOME SAFE

Annex F

Preliminary Conceptual Site Model

Generalized Conceptual Site Model - Vales Point Power Station



LEGEND

- Primary Source
- Secondary Source
- Release Mechanism
- Exposure Media
- Potentially Complete Pathway
- Incomplete Pathway

Annex G

Data Quality Objectives and Detailed Investigation Methodology

G.1 DATA QUALITY OBJECTIVES

G.1.1 Step 1: State the Problem

Objectives

The objectives of the Preliminary ESA are as stated in *Section 1.2*.

G.1.2 Step 2: Identify the Decisions

Decision Statements

Overall, the principal decision to be made is whether there are actual or potential material contamination issues related to the proposed sale of the power generation assets. Additional decisions to be made include:

- Is there sufficient data to provide an environmental baseline at the time of the transaction?
- What is the nature and extent of soil, sediment and/or groundwater impact on / beneath the Site?
- Does the impact at the Site represent a risk to human health, based on the current and continued use of the site?
- Is the impact at the Site likely to warrant regulation under the *Contaminated Land Management Act 1997* and remediation?
- Is material remediation likely to be required?

Assessment Criteria

The proposed sources of site assessment criteria are presented in *Section H*.

Waste Classification for Off-Site Disposal

Any excess soil or groundwater generated during the Stage II program will be classified in accordance with the NSW Department of Environment, Climate Change and Water (2009) *Waste Classification Guidelines, Part 1: Classifying Waste* and relevant associated Chemical Control Orders.

G.1.3 Step 3: Identify Inputs to Decision

The inputs required to make the above decisions are as follows:

- existing relevant environmental data, taking into consideration the number and location of existing soil and groundwater sampling locations, the construction of existing groundwater monitoring wells and the date of the most recent groundwater monitoring event;
- direct measurement of environmental variables including soil type, soil gas concentrations, odours, staining, water strike and groundwater level and water quality parameters;
- laboratory measurement of soil and groundwater samples for one or more of the identified potential contaminants of concern;
- field and laboratory quality assurance/quality control data;
- the relevant soil and water quality criteria outlined previously; and
- assessment of whether the concentrations of the contaminants of concern are greater than or equal to or less than the adopted criteria.

G.1.4 Step 4: Define the Study Boundaries

Spatial Boundaries

The site location and description is provided in *Section 2*.

Constraints within the Study Boundaries

Constraints on the delivery of the Stage II program within the study boundaries may include:

- location of underground services or infrastructure;
- the condition of existing monitoring wells; and
- obtaining permission/access to enter and sample in offsite areas and onsite areas that are operated by external parties (where deemed necessary.

G.1.5 Step 5: Develop a Decision Rule

The DQOs have been designed to facilitate the collection of adequate soil and groundwater data to address the decisions in Step 2 of the DQO process. Some project constraints may impact on the implementation of the Stage 2 program, for example access to certain locations may be restricted by the presence of sub-surface services.

Deviations from the Stage 2 program will be communicated to the relevant project stakeholders during the course of the assessment and discussed in the Stage 2 report, acknowledging the source of any available information and any limitations on the assessment.

Field and Laboratory QA/QC

The suitability of soil and groundwater data will be assessed based on acceptable limits for field and laboratory Quality Assurance/Quality Control (QA/QC) (results outlined in relevant guidelines made or endorsed under the *Contaminated Land Management Act 1997*.

In the event that acceptable limits are not met by laboratory analyses, the field observations relating to the nature of the samples will be reviewed and if no obvious source for the non-conformance is identified, such as an error in sampling, preservation of sample/s or heterogeneity of sample/s, liaison with the laboratories will be undertaken in an effort to identify the issue that had given rise to the non-conformance.

If the soil and groundwater data is deemed to be unsuitable, additional analyses may be undertaken on the original sample/s, on duplicate samples or on other samples, if required to meet the objectives of the assessment. If no explanation for the non-conformance is identified, the concentrations for the affected samples will be considered as an estimate.

Assessment Criteria

Individual soil, sediment, surface water and groundwater data, along with the maximum, minimum, mean, standard deviation and 95% Upper Confidence Limit (UCL) of the mean concentration (if required) will be compared to the relevant assessment criteria. Exceedence of the assessment criteria will not necessarily indicate the requirement for remediation or a risk to human health and / or the environment. If individual or 95% UCL concentrations exceed the assessment criteria, consideration of the extent of the impact, the potential for receptors to be exposed and regulatory compliance will be considered.

The adopted assessment criteria have generally been sourced from guidelines made or approved under the *Contaminated Land Management Act 1997*, which includes the National Environment Protection Council (NEPC) (April 2013) *National Environment Protection (Assessment of Site Contamination) Measure 1999*, NEPC, Canberra and where alternative sources have been utilised appropriate justification has been provided.

Soil

Soil data will be assessed against investigation criteria as follows:

The primary criteria adopted in the assessment of soil data collected at the Site is National Environment Protection Council (NEPC) (April 2013) *National Environment Protection (Assessment of Site Contamination) Measure 1999*, NEPC, Canberra (hereafter referred to as the ASC NEPM), *Schedule B1 - Guideline on Investigation Levels for Soil and Groundwater*. These assessment criteria include;

- Health Investigation Level (HIL) 'D' – Commercial/Industrial
- HIL 'C' – Public Open Space; and
- Health Screening Levels (HSLs) Commercial/Industrial for direct contact and vapour intrusion; and
- Ecological Investigation /Screening Levels (EILs/ESLs).

It is noted that laboratory analysis for pH and CEC is required to establish site specific EILs/ESLs, and an assessment of background conditions may be necessary. The establishment of EILs/ESLs will be undertaken in preparation of the Stage 2 report, and sample locations in up-gradient non-operational areas may be utilised in establishing background conditions.

Further, it is noted that whilst the HIL 'C' screening criteria are generally not applicable to undeveloped, urban bushlands and reserves, they will be adopted at sampling locations in non-operational areas considered to present a more sensitive land use category.

The CRC CARE (2011) HSLs for direct soil contact and vapour intrusion exposure by Intrusive Maintenance Workers (Shallow Trench) will also be adopted as appropriate.

Application of the HILs/HSL/EILs/ESLs will be considered on a case by case basis in accordance with the ASC NEPM to reflect local conditions encountered at the time of the intrusive works.

Where no Australian-endorsed assessment criteria are available, reference will be made to the National Institute of Public Health and the Environment (RIVM) (2001) *Technical Evaluation of the Intervention Values for Soil/sediment and Groundwater: Human and Ecotoxicological Risk Assessment and Derivation of Risk Limits for Soil, Aquatic Sediments and Groundwater* - Human Toxicological Serious Risk Concentrations in soil (SRC_{human} soil). It is noted that these guideline values have no regulatory standing in NSW and hence further assessment of any exceedences of these criteria may be required.

Groundwater

Groundwater data will be assessed against investigation criteria published in the ASC NEPM (2013), *Schedule B1 - Guideline on Investigation Levels for Soil and Groundwater*, which references the following guidance:

- ANZECC and Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ) (2000) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*.

- Trigger values for marine water, level of protection 95% species and Trigger values for marine water, level of protection 99% species (for bioaccumulation of mercury and for locations intercepting groundwater potentially flowing toward SEPP14 protected wetlands);

- National Health and Medical Research Council (NHMRC) and National Resource Management Ministerial Council (NRMMC) (2011) *Australian Drinking Water Guidelines Paper 6 National Water Quality Management Strategy*;

- NHMRC (2008) *Guidelines for Managing Risks in Recreational Waters*

- (note that these will be applied with reference to NHMRC and NRMMC (2011) – referenced above); and

- Cooperative Research Centre for Contamination Assessment and Remediation of the Environment (CRC CARE) (2011) *Technical Report No. 10, Health Screening Levels for Petroleum Hydrocarbons in Soil and Groundwater*.

- HSLs for vapour intrusion (HSL 'D') – Commercial/Industrial and HSLs for vapour intrusion by Intrusive Maintenance Worker (Shallow Trench).

Where no Australian-endorsed assessment criteria are available, reference to the National Institute of Public Health and the Environment (RIVM) (2001) *Technical Evaluation of the Intervention Values for Soil/sediment and Groundwater: Human and Ecotoxicological Risk Assessment and Derivation of Risk Limits for Soil, Aquatic Sediments and Groundwater*, Human Toxicological and Ecotoxicological Serious Risk Concentrations in Groundwater (SRC_{human} groundwater and SRC_{eco} groundwater). It is noted that these guideline values have no regulatory standing in NSW and hence further assessment of any exceedences of these criteria may be required.

Surface Water

Surface water data will be assessed against investigation criteria published in the ASC NEPM (2013), *Schedule B1 - Guideline on Investigation Levels for Soil and Groundwater*, which references the following guidance:

- ANZECC and Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ) (2000) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*.
  Trigger values for marine water, level of protection 95% species and Trigger values for marine water, level of protection 99% species (for bioaccumulation of mercury);

- NHMRC (2008) *Guidelines for Managing Risks in Recreational Waters*
  (note that these will be applied with reference to NHMRC and NRMMC (2011) – referenced above); and

Where no Australian-endorsed assessment criteria are available, reference to the National Institute of Public Health and the Environment (RIVM) (2001) *Technical Evaluation of the Intervention Values for Soil/sediment and Groundwater: Human and Ecotoxicological Risk Assessment and Derivation of Risk Limits for Soil, Aquatic Sediments and Groundwater*. Ecotoxicological Serious Risk Concentrations in Surface water (SRC_{eco} surface water). It is noted that these guideline values have no regulatory standing in NSW and hence further assessment of any exceedences of these criteria may be required.

Sediment

Sediment quality data will be assessed against investigation criteria published in the following guidelines:

- ANZECC / ARMCANZ (2000) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* - Interim Sediment Quality Guidelines (ISQGs); or

- the equivalent Commonwealth of Australia (2009) *National Assessment Guidelines for Dredging.*

Appropriateness of LOR

Comparison of the laboratory Limit of Reporting (LOR) to the assessment criteria will be undertaken to confirm that the assessment criteria are less than the laboratory LOR. Any exceptions to this will be appropriately noted and justified.

G.1.6 Step 6: Specify Limits on Decision Errors

The acceptable limits on decision errors applied during the review of the results will be based on the Data Quality Indicators (DQIs) of precision, accuracy, representativeness, comparability and completeness (PARCC) in accordance with ASC NEPM (2013), *Schedule B3 - Guideline on Laboratory Analysis of Potentially Contaminated Soils*.

The potential for significant decision errors will be minimised by:

- completing a robust Quality Assurance/Quality Control (QA/QC) assessment of the validation data and application of the probability that 95% of data will satisfy the DQIs, therefore a limit on the decision error would be 5% that a conclusive statement may be incorrect;
- assessing whether appropriate sampling and analytical density has been achieved for the purposes of providing a baseline of soil, sediment and groundwater conditions at the point of transaction; and
- ensuring that the criteria set was appropriate for the ongoing use of the site as a power generation facility.

G.1.7 Step 7: Develop (Optimise) the Plan for Completing The Works

The DQOs have been developed based on a review of existing data. If data gathered during the assessment indicates that the objectives of the assessment programme are not being met, the sampling design (including sampling pattern, type of samples and analytes) will be adjusted accordingly using feedback (where necessary) from project stakeholders.

G.2 DETAILED SOIL AND GROUNDWATER INVESTIGATION METHODOLOGY

G.2.1 Sub-Surface Clearance

All proposed drilling locations will be cleared of underground and above ground utilities in accordance with ERM's Sub-Surface Clearance (SSC) Procedure. The key steps involved in ERM's SSC procedure include:

- assigning a SSC Experienced Person (EP) who is responsible for all SSC activities;
- obtaining Dial Before You Dig Plans and marking out public utilities if required;
- obtaining site utility plans (where available) and obtaining approval from the site contact for the proposed drilling locations;
- conducting a site walkover to identify any visual clues of site services;
- checking all locations for the presence of underground services using a cable location tool;
- where possible soil bores will be located to avoid working in critical areas, defined as areas with 3 m of a subsurface obstruction; and

- each soil bore will be cleared using a hand auger or Non-Destructive Drilling (NDD) to a depth of 1.2 m bgl in non-critical zones or 2.3 m bgl in areas classed as critical zones.

G.2.2 Soil Bore Drilling

Soil bores will be drilled in accordance with ERM SOPs using the general methodology outlined below

- Where necessary, hardstand drilling locations will be penetrated using a concrete corer prior to physical borehole clearance and drilling;

- each soil bore will be cleared using a hand auger or Non-Destructive Drilling (NDD) techniques to the depth required by ERM's SSC Procedure;

- a drilling rig, incorporating direct push-tube methodology will be used to advance the boreholes to the target depth or until deemed refusal is encountered;

- prior to the commencement of drilling and between drilling locations, all down-hole drilling equipment will be decontaminated to minimise potential for cross contamination between the sampling locations.

G.2.3 Soil Sampling Protocol

Soil samples will be collected and logged in accordance with ERM SOPs. In summary the following work procedures will be followed:

- the soil will be logged by an appropriately trained and experienced scientist/engineer to record the following information: soil/rock type, colour, grain size, sorting, angularity, inclusions, moisture condition, structure, visual signs of contamination (including staining and fragments of fibre cement sheeting) and odour in general accordance with AS 1726-1993;

- soil samples will be collected from the surface and at 0.5 m intervals thereafter, or from each lithological unit (whichever is greater);

- suitable PPE including fresh disposable nitrile gloves will be used during sampling and equipment decontamination; and

- a duplicate of each soil sample collected for field screening will be placed in sealed zip lock bags and screened in accordance with ERM SOPs using a PID fitted with a 10.6 eV lamp, calibrated at the beginning of each working day. Where the presence of VOCs or other impact is suspected, additional laboratory analysis may be undertaken.

- A representative soil samples will be collected (to the extent practicable) in accordance with techniques described in Australian Standard AS4482 (Part 2) to maintain the representativeness and integrity of the samples.

The samples will be placed in pre-treated laboratory supplied sample containers. The containers will be filled, where practical, to minimise headspace, before being sealed and appropriately labelled. Labels will include the following information:

- sample identification number;
- job number; and
- Date of collection.

- field QA/QC samples will be collected including field duplicates, inter-laboratory duplicates, rinsate blanks, trip blanks and trip spikes (as required).
- Sample jars will be sealed and immediately placed in a cooler on ice to minimise potential degradation of organic compounds.

G.2.4 Soil Bore and Test Pit Reinstatement

Upon completion soil bores will be backfilled and the surface covering reinstated to match existing.

G.2.5 Waste Materials Generated During Drilling

All non-liquid waste materials generated during drilling works will be stored on-site in drums or other appropriate sealed containers at a designated staging area. If evidence of significant contamination is observed during drilling (e.g. staining or odour) an attempt will be made to store any potentially impacted wastes separately. All wastes will be disposed off-site to an appropriately licenced landfill by an approved and appropriately licensed waste removal contractor

G.3 GROUNDWATER INVESTIGATION

G.3.1 Groundwater Well Installation

Selected boreholes will be converted to groundwater monitoring wells in accordance with ERM SOPs.

The following methodology will be implemented to install the new monitoring wells.

- the wells will be constructed of 50 mm diameter factory slotted screen (0.4 mm slots) and blank uPVC well materials. The wells will be screened within groundwater bearing strata and constructed to allow the ingress of non-aqueous phase liquids (NAPLs) which may be present;

- the well casing and screen will be inserted into the borehole. Washed and graded filter sand will be poured into the annulus between the well screen and borehole wall, ensuring that the sand covers the entire screened level and extends at least 0.5 metres above the top of the screen;

- bentonite pellets will then poured on top of the sand at a minimum thickness of one metre and hydrated to effectively seal off the well from surface water or perched / shallow groundwater inflows; and

- each well will be grouted using cement /bentonite grout to within 0.5 m of the surface and the final 0.5 m reinstated with concrete and a heavy duty cover, well casing will be sealed with air-tight, lockable 'envirocaps';

- the well cap will be labelled with the groundwater monitoring well I.D.;

- following monitoring well installation, each well will be developed to remove any fine materials or contaminants potentially introduced during drilling. Wells will be considered developed when either a minimum of 10 well volumes had been removed, or when water quality parameters stabilise or if the well is pumped dry prior to this. Where sufficient well volumes cannot be obtained, attempts will be made to remove fines and construction material by purging the well over several days to allow for recharge.

G.3.2 Groundwater Purging and Sampling Protocol

Where new monitoring wells are installed, groundwater purging and sampling will occur at least one week after well installation and development to allow subsurface conditions to stabilise.

The well cap will be partially removed to allow the headspace to be screened using a calibrated PID over a period of one minute. The presence of odours will also be noted following removal of the well cap and described by reference to their intensity and character. Following a period of no pumping (as a minimum 24 hours) all wells will be dipped to gauge the depth of groundwater and if necessary the presence and depths of NAPLs.

Wells will be purged using a thoroughly decontaminated peristaltic pump under low flow conditions until sufficient water has been removed to obtain stabilised readings of pH, conductivity, redox potential, temperature and dissolved oxygen which was calibrated prior to use. The stabilisation criteria are as described in *Table H.1* below.

Table G.1 Water quality parameter stabilisation criteria

Parameter	Stabilisation criteria
pH	± 0.1 pH units
Electric Conductivity (EC)	± 3% (µS/cm or mS/cm)
Temperature	± 0.5ºC
Oxidation Reduction Potential (ORP)	± 10 mV
Dissolved Oxygen (DO)	± 0.3 mg/L

It is noted that both ORP and DO are typically slower to stabilise than the other parameters, and may be particularly unstable when not using a closed flow through cell. In this case, greater weight will be given to pH and EC as the 'stabilising' parameters.

Low-flow sampling techniques will be used to obtain samples that are representative of the local groundwater environment at the Site. The inlet of the low-flow pump will be placed approximately 50 cm from the base of the well in order to obtain a representative sample of the aquifer. Water samples will be collected using equipment dedicated to each monitoring well to eliminate the potential for cross-contamination between sample locations.

The following order of sampling will be adopted:

- samples to be analysed for volatile compounds placed into 40 mL amber vials;
- samples to be analysed for semi-volatile compounds placed in 250 mL solvent washed amber bottles; and
- samples to be analysed for metals filtered through disposable cartridges containing 0.45 µm filters and placed in 125 mL plastic bottles preserved with nitric acid.

If NAPL is observed in any groundwater wells, attempts will be made to collect a representative sample of the NAPL for characterisation using a dedicated disposable bailer.

The containers will be filled, where practical, to minimise headspace, before being sealed and appropriately labelled. Labels will include the following information:

- sample identification number;
- job number; and
- date of collection.

Sample jars will be sealed and placed in a cooler on ice immediately to minimise potential for degradation of the sample.

G.3.3 Waste Materials Generated During Groundwater Development/Purging

Water from development of the wells will be collected and stored in appropriately labelled dedicated drums or an intermediary bulk container (IBC) within the designated staging area. The water will be classified and disposed off-site in accordance with relevant NSW Waste Classification Guidelines.

G.4 ACID SULFATE SOILS IDENTIFICATION

Data relating to the identification of PASS and ASS conditions in the subsurface will be recorded during the soils and groundwater investigation. Field indicators of ASS and PASS conditions may include;

Acid sulfate soil indicators

- Iron stains on any drain or pond surfaces, or iron-stained groundwater.
- Iron oxide mottling in bore holes.
- Water of pH <4 in surface water, drains or groundwater.
- Soil pH <3.5−4
- Jarosite containing horizons (a pale yellow mineral deposit)
- Corrosion of concrete and/or steel structures.
- Sulfurous (H_2S) smell

Potential Acid Sulfate Soil Indicators

- Typically waterlogged muds (soft texture, blue grey or dark greenish grey) or estuarine silty sands or sands (mid to dark grey) or bottom sediments of estuaries and tidal lakes (dark grey to black).
- Soil pH of 6−8.
- Positive peroxide test
- Sulfurous (H_2S) smell

Acid Sulfate Soils Manual (1998)

G.5 SEDIMENT INVESTIGATION

Sediment samples will be collected in general accordance with the methodologies outlined in CSIRO (2005) *Handbook for Sediment Quality Assessment* via the use of either a stainless steel Van Veen grab sampler or via direct push coring Sample handling, labelling and decontamination procedures will be aligned with those adopted for soil sampling and those outlined in CSIRO (2005).

All sediment samples will be collected from the boat. Core sample collection will therefore be restricted to shallow areas. Sampling locations may be adjusted slightly to facilitate core sample collection. A 50 mm diameter corer will be advanced to a maximum depth of 0.75 m. Depending on sample recovery, a maximum of three sediment samples representing distinct depth ranges will be collected from each core.

G.6 SURFACE WATER INVESTIGATION

Surface water samples will be collected from Lake Macquarie and Wyee Creek. Surface water samples will be collected approximately 1.0 m from the bottom using a Van Dorn sampler . If there are any locations where water depth is not sufficient for Van Dorn deployment, samples will be collected by hand, holding the sampling container beneath the surface of the water with the container facing upstream, while avoiding disturbing substrate.

Sample containers will be sealed and immediately placed in a cooler on ice to minimise potential degradation of organic compounds. The samples will be transported under chain of custody documentation to a NATA accredited laboratory at the end of each day, and analysed for the analytical suite presented in *Table H.1, Annex H*.

A calibrated water quality meter will be used to analyse this subsample for field parameters including pH, conductivity, redox potential, temperature and dissolved oxygen. Observations of the general condition of the surface water and its surrounds will also be recorded during sampling.

G.7 SURVEY

All groundwater wells (excluding existing groundwater monitoring wells) will be surveyed to Australian Height Datum (AHD) for elevation and Map Grid of Australia (MGA) coordinates for location. For groundwater monitoring wells, the elevation of the highest point of the top of the PVC casing will be measured. A notch will be embedded in the casing to indicate the location surveyed. This mark will be the measuring point for future groundwater elevation measurements. This will allow for the appropriate groundwater elevations calculations and groundwater flow direction interpretations.

G.8 LABORATORY ANALYSIS

G.8.1 Sample Handling

Primary samples will be couriered under chain of custody documentation to ALS Environmental Pty Ltd (ALS), a NATA accredited analytical laboratory. Inter-laboratory duplicate samples will be couriered under chain of custody documentation to Envirolab Services Pty Ltd (Envirolab) also a NATA accredited analytical laboratory. Soil and groundwater samples will be analysed for a suite of potential contaminants of concern listed below with some samples in specific areas being scheduled for additional analysis as outlined in *Tables H.2 and H.3, Annex H*.

- metals and metalloids (arsenic, cadmium, chromium, copper, nickel, lead, mercury, selenium and zinc);
- Total Recoverable Hydrocarbons (TRH);
- Polycyclic Aromatic Hydrocarbons (PAHs);
- Volatile Organic Compounds (including benzene, toluene, ethylbenzene and xylenes -BTEX); and
- asbestos (presence / absence – soil only).

Additional contaminants of concern may be analysed to target specific contaminants of concern or if required based on observations made in the field.

These contaminants can include (though are not limited to):

- Polychlorinated Biphenyls (PCBs) – related to use of PCB-containing transformer oil on site;
- Total Organic Carbon (TOC); and
- Perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA) – to target areas where fire retardants may have been used or stored.

G.8.2 Analytical Methodology

A summary of the laboratory analytical methodologies are provided herein. Based on discussions with the laboratories, it was understood that these methodologies are currently being updated to comply with the recent changes to the NEPM (as amended in 2013). Hence the methodologies herein are subject to change, though these changes will be outlined in the quality control reports submitted by the laboratory at the time of receipt of the results.

Volatile TRH C6-C10/BTEX

ALS (soil): USEPA SW 846 - 8260B; Extracts are analysed by Purge and Trap, Capillary GC/MS. Quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Method 501).

ALS (water): USEPA SW 846 - 8260B**;** Water samples are directly purged prior to analysis by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. Alternatively, a sample is equilibrated in a headspace vial and a portion of the headspace determined by GCMS analysis. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2)

ALS (sediments): Extracts are analysed by Purge and Trap, Capillary GC/MS. Quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Method 501).

Envirolab (soil): Analysed via purge and trap, gas chromatography-mass spectrometer (method reference USEPA 8260 method; USEPA5030 (P/T)).

Envirolab (water): VOC vial analysed directly. Determination is completed by PT-GC/FID. PT internal system standard injected into sample to monitor system performance (reference modified "in house" USEPA 8015, 8020 or 8260 method).

Semi-volatile TRH

ALS (soil): USEPA SW 846 - 8015A; Sample extracts are analysed by Capillary GC/FID and quantified against alkane standards over the range C10 - C36. This method is compliant with NEPM (1999) Schedule B(3) (Method 506.1).

ALS (water): USEPA SW 846 - 8015A; The sample extract is analysed by Capillary GC/FID and quantification is by comparison against an established 5 point calibration curve of n-Alkane standards. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2).

ALS (sediments): Ultra trace including sum of C10-C40: (USEPA SW 846 - 8270B) Extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Method 504).

Envirolab (soil): Solid samples are extracted with dichloromethane/acetone (1:1) and extracts are injected into capillary Gas Chromatograph equipped with Flame Ionisation Detector (reference method USEPA 3500 and USEPA 3510.

Envirolab (water): Water samples are double/triple extracted with dichloromethane and extracts are injected into capillary Gas Chromatograph equipped with Flame Ionisation Detector (reference method USEPA 8000.

Selected Inorganics (As, Hg, Cd, Cr, Cu, Pb, Ni, Se, Zn)

ALS (soil): Total Metals by ICP-AES: (APHA 21st ed., 3120; USEPA SW 846 - 6010) (ICPAES). Metals are determined following an appropriate acid digestion of the soil. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM (1999) Schedule B(3).

Total Mercury by FIMS: AS 3550, APHA 21st ed., 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids are determined following an appropriate acid digestion. Ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (1999) Schedule B(3).

ALS (water): APHA 20th ed., 3125; USEPA SW846 – 6020. The ICPMS technique utilizes highly efficient argon plasma to ionise selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.

Quantification is achieved by measuring the intensity of the element in the sample against an established calibration curve for that element. Mercury: AS 3550. Flow Injection Mercury – Atomic Absorption Spectrometry (FIM-AAS) is a flameless atomic absorption technique. Water samples are analysed in their 'as received' nitric acid preserved state. For the determination of total mercury a further oxidation using a bromate/bromide reagent is employed to oxidise organic mercury compounds. The ionic mercury is reduced to atomic mercury vapour by a reducing agent (SnCl2). Atomic mercury vapour is then purged into a heated quartz cell. Quantification is achieved using an established absorbance versus concentration calibration curve.

Metals in Saline Water: APHA 21st ed., 3125; USEPA SW846 - 6020 Samples are 0.45 um filtered prior to analysis. The ORC-ICPMS technique removes interfering species through a series of chemical reactions prior to ion detection. Ions are passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to measurement by a discrete dynode ion detector. This method is compliant with NEPM (1999) Schedule B(3).

ALS (sediments): (APHA 21st ed., 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020): The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector. Analyte list and LORs per NADG.

Total Mercury by FIMS (Low Level): AS 3550, APHA 21st ed., 3112 Hg - B (Flow-injection ($SnCl_2$)(Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids is determined following an appropriate acid digestion. Ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (1999) Schedule B(3)

Envirolab (soil): Solid samples are digested with mineral acids (Hydrochloric and Nitric Acid) before analysis with Inductively Coupled Plasma – Optical Emission Spectrometry (ICP-OES) (reference method USEPA 6010C). Determination of mercury is by cold vapour AAS. Solid samples are digested with mineral acids (Hydrochloric and Nitric Acid) before analysis (reference method USEPA 7471A).

Envirolab (water): Determination via ORC-ICP-MS (reference method USEPA 200.8, USEPA 3005A (prep), USEPA 6020A or USEPA 7010/APHA 3113). Water samples are further acidified on receipt (Nitric Acid) before analysis with Inductively Coupled Plasma – Mass Spectrometry (ICP-MS) and Inductively Coupled Plasma – Optical Emission Spectrometry (ICP-OES). Water samples are digested with strong oxidants (Hydrochloric Acid, Bromine Monochloride, Nitric Acid and Potassium Permanganate) before analysis. Mercury determination is via cold vapour AAS.

Filtered water samples are digested with strong oxidants (Hydrochloric Acid, Bromine Monochloride, Nitric Acid and Potassium Permanganate) before analysis

PAH

ALS (soil): (USEPA SW 846 - 8270B) Extracts are analysed by Capillary GC/MS in Selective Ion Mode (SIM) and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Method 502 and 507).

ALS (water): USEPA SW 846 - 8270D Sample extracts are analysed by Capillary GC/MS in SIM Mode and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2).

ALS (sediments): Super ultratrace PAH by USEPA 3640. Extracts are analysed by 8270 GCMS Capillary column, SIM mode using large volume programmed temperature vaporisation injection.

Envirolab (soil): Solid samples are extracted with dichloromethane/acetone (1:1) and the extracts are injected into capillary Gas Chromatograph equipped with a Mass Selective Detector (MSD) in SIM mode (reference method USEPA 8270).

Envirolab (water): Water samples undergo double/triple extraction with dichloromethane and analysis by capillary Gas Chromatograph equipped with Mass Selective Detector (MSD) in SIM mode (reference method 8310 and USEPA 8270).

Volatile Organic Compounds

ALS (soil): (USEPA SW 846 - 8260B) Extracts are analysed by Purge and Trap, Capillary GC/MS. Quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Method 501).

ALS (water): Volatile Organic Compounds: USEPA SW 846 - 8260B Water samples are directly purged prior to analysis by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2).

Envirolab (soil): Determination by Purge and Trap GC-MS (reference method 8260).

Envirolab (water): Determination by Purge and Trap GC-MS (reference method USEPA 8260B).

Asbestos Fibres in Soil

ALS (soil): AS 4964 - 2004 Method for the qualitative identification of asbestos in bulk samples.

Envirolab (soil): Asbestos fibres are qualitatively identified in soil using polarized light microscopy (PLM) in accordance with Australian Standard AS 4964-2004. It is noted in AS 4964-2004 that this method is not necessarily suitable to quantify asbestos in soil however an estimate of the %w/w of asbestos fibres and fragments in soil will be made for assessment against the soil asbestos investigation criteria reported in the Western Australian Department of Health (2009) *Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia*. This will involve manually separating any visible asbestos fragments and fibres from the soil matrix and weighing the resulting material. It is considered that the %w/w results will be an estimate only and will be dependent on the soil matrix.

Cation Exchange Capacity

ALS (soil): Rayment & Higginson (1992) Method 15A1. Cations are exchanged from the sample by contact with Ammonium Chloride. They are then quantitated in the final solution by ICPAES and reported as meq/100g of original soil. This method is compliant with NEPM (1999) Schedule B(3) (Method 301).

Envirolab (soil): Solids are washed with Ethanol and Glycerine to remove soluble salts such as NaCl. The solid is then exchanged (by default) with a solution of 1M Ammonium Chloride. The solution is then analysed for Cations using Inductively Coupled Plasma – Optical Emission Spectrometry (ICP-OES). Alternative exchange solutions can be used on request.

pH

ALS (soil): (APHA 21st ed., 4500H+) pH is determined on soil samples after a 1:5 soil/water leach. This method is compliant with NEPM (1999) Schedule B(3) (Method 103).

Envirolab (soil): Solids are extracted with Ultra High Purity (UHP) water at a ratio of 1:5 soil:water. Analysis is by a pH selective electrode. Waters are analysed directly using a pH selective electrode Determination by electrode (reference method USEPA 9045).

PCBs

ALS (soil): (USEPA SW 846 - 8270B) Extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Method 504).

ALS (water): USEPA SW 846 - 8270D Sample extracts are analysed by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2).

ALS (sediments): USEPA Method 3640 (GPC cleanup),3620 (Florisil), 8081/8082 (GC/uECD/uECD) This technique is compliant with NEPM (1999) Schedule B(3) (Method 504).

Envirolab (soil and water): Sample extracts are analysed by injecting a measured aliquot into a gas chromatograph equipped with either a narrow- or wide-bore fused-silica capillary column and either an electron capture detector (GC/ECD) or an electrolytic conductivity detector (GC/ELCD).

Total Organic Carbon

ALS (soil): Dried and pulverised sample is reacted with acid to remove inorganic Carbonates, then combusted in a LECO furnace in the presence of strong oxidants / catalysts. The evolved (Organic) Carbon (as CO2) is automatically measured by infra-red detector.

ALS (water): APHA 21st ed., 5310 B, The automated TOC analyzer determines Total and Inorganic Carbon by IR cell. TOC is calculated as the difference. This method is compliant with NEPM (1999) Schedule B(3) (Appdx. 2).

PFOS/PFOA

ALS (soil): A portion of soil is soaked in sodium hydroxide followed by extraction with methanol. The extract is neutralised with HCl and an aliquot taken to dryness, made up in mobile phase. Analysis is by LC/MSMS, ESI Negative Mode using MRM. This is an in-house method in general accordance with EP231.

ALS (groundwater): Direct injection analysis of linear and branched pefluorooctyl sulfonates and acids by LC-Electrospray-MS-MS, Negative Mode using MRM. This is an in-house method.

Particle Size Distribution

ALS (soil and sediment): Analysis of the particle size of soils in accordance with Australian Standards AS 1289.3.6.1 and/or AS 1289.3.6.2 by sieving, with analysis of clays and fine particles by sedimentation and hydrometer analysis (based on the AS 1289.3.6.3).

G.9 QUALITY ASSURANCE/QUALITY CONTROL

QA/QC procedures for this project will be aligned with the requirements of both NEPM (1999 – as amended 2013) and NSW DEC (2006) *Guidelines for the NSW Site Auditor Scheme (2nd edition)* and can be summarised as follows:

G.9.1 Calibration Procedures

All equipment used in the field will be used under the appropriate technical procedures and calibrated prior to use in accordance with the manufacturer's specifications. The PID will be calibrated at the beginning of each working day in accordance with ERM's SOPs. Water quality meters will be calibrated by the hire company prior to use and relevant calibration certificates retained by ERM. Water quality meters will also be calibrated at the beginning of each day in accordance with the manufacturer specifications. All of the relevant calibration records will be provided as an annex in the investigation reports.

G.9.2 Decontamination Procedures

All sampling equipment will be decontaminated between sampling locations where designated disposable materials are not used.

All non-dedicated equipment will be decontaminated as follows:

- all loose soil removed with a wire brush;
- washed in potable (tap) water and brush scrubbing using tap water and a non-phosphate detergent (Decon 90);
- rinsed with water; and
- air dried.

During push tube drilling the soil samples will be collected in single use plastic tubes minimising the potential to cross-contaminate soil samples. Between sampling locations the cutting shoe and rod containing the single use shoes will be decontaminated as listed above. Any visible soil material will be removed from the drill rig equipment using a wire brush and water (if required).

G.9.3 Sample Containers, Preparation and Preservation

All samples for laboratory analysis will be placed in appropriate containers as required by the laboratory. Groundwater samples will also be pre-treated (e.g. filtering, preservative) where required by the laboratory. A list of the appropriate sample containers from ALS and Envirolab to use during soil, sediment, surface water and groundwater investigation works is presented in later sections within this annex.

It is noted that suitable glass and/or plastic containers (with Teflon liners removed) will be used for collection of soil, sediment, groundwater and surface water samples scheduled for analysis of PFOS and PFOA. These containers are provided by the laboratory specifically for analysis for PFOS and PFOA. Soil and sediment samples will be collected from push-tube cores and placed in laboratory prepared containers as listed in *Table H.2* below. Groundwater samples will be collected using low-density polyethylene (LDPE) tubing. Surface water samples will be collected in appropriate containers and decanted into laboratory prepared containers as listed in *Table H.3* below. Where samples are collected from equipment which is not single use (i.e. hand auger), equipment will be appropriately decontaminated and a rinsate sample collected.

A summary of the sample containers required for the standard suite of analytes is presented below in *Table G.1* and *Table G.2*.

Table G.2 Laboratory Sample Container Schedule – Soil and Sediments

Analytes	ALS Container	Envirolab Container
Metals, TRH, BTEX, PAH and VOCs, CEC, pH	150 mL glass jar	250 mL glass jar
PFOS/PFOA	150 mL glass jar with Teflon liner removed	250 mL glass jar with Teflon liner removed
Asbestos	100 g - 200g soil in zip lock bag (double bagged)	500 mL zip lock bag
Particle sizing	100 g - 200g soil in zip lock bag or jar	-

TableG.3 Laboratory Sample Container Schedule – Groundwater and Surface water

Analytes	ALS Container	Envirolab Container
Metals (via ORC-ICP-MS)	125 mL plastic bottle with red on white label.	50 mL plastic or glass
Volatile TRH, BTEX and VOC	2 40 mL amber glass vials with purple labels.	3 40 mL amber glass vials
PAH and semi-volatile TRH	2 x 500 mL and 1 x 100 mL amber glass bottle with orange label[1]	500 mL glass bottle
PFOS/PFOA	125 mL plastic bottle with grey label with Teflon lid liner removed	125 mL plastic bottle with grey label with Teflon lid liner removed

G.9.4 Sample Labelling, Transport & Chain of Custody

All sample containers will be labelled and placed on ice immediately after collection and shipped in insulated boxes under chain of custody documentation to the laboratory for analysis. Regular pick-ups from the Site have been pre-arranged with ALS. ALS will be responsible for sending samples to the secondary laboratory.

Separate chain of custody forms must be filled out for each laboratory (ALS and Envirolab). If there are samples from multiple sites a separate chain of custody form will be prepared for each site. The chain of custody forms must also include the analytical suite code and the quote number.

G.9.5 Field Quality Assurance Samples

Rinsate Blanks

A rinsate blank checks the effectiveness of the process of equipment decontamination. One rinsate blank sample will be obtained each day by each sampling team where sampling equipment that is not "single use" is employed (i.e. hand auger). The rinsate solution is collected by washing laboratory supplied distilled water over the equipment after decontamination and submitting the sample for laboratory analysis.

It is not anticipated that groundwater rinsate samples will be required given that disposable tubing will be used during groundwater sampling and the pump mechanism is not in direct contact with the groundwater during sampling. If decontamination of equipment is conducted, a rinsate sample will be collected at a rate of one per piece of equipment per day.

Field Duplicate Samples

A blind duplicate sample is obtained by splitting a primary sample in the field into two portions and sending the duplicate sample to the laboratory with a disguised identification. Intra-laboratory duplicate samples are used to check the repeatability of the laboratory results and to assess the heterogeneity of the analyte and will be collected at a rate of one in 20. Inter-laboratory samples are similar to blind duplicate samples however they are submitted to a secondary laboratory, to check upon the proficiency of the primary laboratory. Inter-laboratory samples will be collected at a minimum rate of one per 20 samples.

Trip Blank and Trip Spike

Trip blanks and trip spikes are prepared by the laboratory, and are designed to assess the potential for loss of volatiles and cross contamination resulting from the sampling storage and handling procedures. One of each will be taken to the field to accompany soil or water samples analysed for volatile contaminants to the primary laboratory. One trip blank and trip spike samples will be included with each group of samples transported to the laboratory.

G.9.6 Laboratory QA/QC Procedures

Laboratory Quality Assurance and Quality Control (QA/QC) procedures will be undertaken in accordance with NEPC (2013) *National Environment Protection (Assessment of Site Contamination) Amendment Measure 2013 (No. 1,* Schedule B3 - Guideline on Laboratory Analysis of Potentially Contaminated Soils and will comprise matrix spikes, method blanks and surrogate recoveries. The results of the quality control testing will be presented in the laboratory reports. Duplicate testing will also be undertaken by the laboratories to compare the results obtained in analysing samples.

ALS and Envirolab will provide the following quality assurance data:

- NATA approval for analyses undertaken;
- sample receipt confirmation;
- laboratory duplicates;
- instrument blank;
- detection limits;
- 10% matrix spike and matrix spike duplicates;
- 10% laboratory duplicates; and
- acceptable limits for spike recoveries.

Accuracy

Accuracy is defined as the proximity of an averaged result to the true value, where all random errors have been statistically removed. Unless the true value is known, accuracy may take on a meaning equivalent to the term bias due to the existence of systematic errors. Accuracy is measured by percent recovery, '%R'. Unless otherwise stated, accuracy data for matrix spike and matrix spike duplicates will be expected to vary within the following ranges shown in *Table G.3*:

Table G.4 Expected Matrix Spike Percentage Recovery

Analyte	Acceptable Percentage Recovery

Analyte	Acceptable Percentage Recovery
General analytes	70-130 %R
Organophosphate pesticide analytes (if required)	60-130 %R
Chromium	62-120 %R

Accuracy of data is treated as an estimate where the data is below the lower recovery limit and above 10%R (i.e. 10-69%R for general analytes, 10-59%R for OPP and 10-61%R for chromium). In the event that the data value is below the 10%R the data value should be rejected. In the event that the data value is above the upper recovery limit, the data value will be treated as an estimate.

Precision

Precision is considered to be the degree to which data generated from replicate or repetitive measurements differ from one another due to random errors. Precision is measured using the standard deviation, 'SD', or Relative Percent Difference, '%RPD'. Replicate data existing in the %RPD range presented below shall be accepted as quality data, whereas data outside of the acceptance criteria will require further discussion.

%RPD Range: if result > 10 x EQL, the maximum of 30% RPD;

if result < 10 x EQL, the maximum of 50% RPD.

Blanks

Laboratory method blanks are designed to check for artefacts and interferences during the analysis stages, which may lead to the reporting of false positive results. In the event that a positive blank is reported for this project, the following remedies will proceed:

- laboratory to review data;
- positive blank results may not be subtracted from sample results;
- no further action necessary if sample results reported were less than laboratory reporting limit;
- analyse additional field blanks if taken and within holding times;
- positive sample results may be acceptable if analyte concentrations were significantly greater than the amount reported in the blank (ten times for laboratory reagents such as methylene chloride, chloroform, and acetone etc., and five times for all other analytes). Alternatively, the laboratory reporting limit may be raised to accommodate blank anomalies provided that regulatory guidelines were not compromised by any adjustment made to the laboratory reporting limit; and
- professional expertise would be used in all cases, which may include conducting additional testing.

Matrix Spikes

Environmental samples are spiked with laboratory grade standards to assess the interactive effects between the sample matrix and the analytes being measured. Matrix Spikes 'MS' are reported as a percent recovery %R, at a minimum rate of 1 in every 20 samples for this project.

Percent Recovery is expressed as: $\%R = \frac{(SSR-SR)}{SA} \times 100$

where: SSR = spiked sample result

SR = sample result (blank)

SA = spike added

Laboratory Duplicates

Laboratory duplicate samples measure precision, which is calculated as standard deviation SD or Relative Percent Difference %RPD. Duplicates are collected in a single sample container in the field and are analysed as two separate extractions.

Relative Percent Difference is expressed as: $\%\ RPD = \frac{(D1-D2)}{D1+D2)/2} \times 100$

where: D1=sample concentration

D2=duplicate sample concentration

Laboratory Surrogates

Surrogates are QC monitoring spikes, which are added at the beginning of the sample extraction process in the laboratory where applicable. Surrogates were measured as Percent Recovery %R.

Percent Recovery is expressed as: $\%R = \frac{(SSR)}{SA} \times 100$

where: SSR=spiked sample result

SA =spike added

Surrogate spike recoveries indicate the presence of sample specific interferences. In the event that the USEPA have not published a surrogate recovery limit, the range 70 – 130% recovery soil will be used. In the event that a surrogate recovery fails to comply with the documented or established limits, the sample will be re-extracted and reanalysed. Should the recovery breaches occur again, this will be regarded as an indication of matrix interference and a decision will be made to accept or reject the dataset.

G.9.7 Quality Assurance/Quality Control

Table G.5 Sampling & Analysis Methodology Assessment

Field Considerations	Laboratory Considerations
Precision Requirements	
The investigation will be conducted following ERM SOPs and any variations from these procedures will be documented and justified.	Analysis of the following will be reported: • Laboratory and inter-laboratory duplicates; • Field duplicates; • Laboratory prepared volatile trip spikes.
Accuracy Requirements	
The investigation will be conducted following ERM SOPs and any variations from these procedures will be documented.	Analysis of the following will be reported: • Field blanks; • Rinsate blanks; • Reagent blanks; • Method blanks; • Matrix spikes; • Matrix spike duplicates; • Surrogate spikes; • Reference materials; • Laboratory control samples; • Laboratory prepared spikes
Representativeness Requirements	
Appropriate media will be identified and sampled according to the SAQP.	All samples will be analysed according to the SAQP.
Comparability Requirements	
The same SOPs will be used during each sampling event.	Analytical methods suitable for the target media will be used.
All sampling will be conducted by an appropriately qualified and experienced sampler.	The PQLs used to report analyte concentrations will be less than the adopted investigation levels.
Impacts of climatic conditions on sample integrity will be minimised by immediately placing samples into insulated ice-filled containers. Trip spike samples will be collected to monitor potential loss of volatile analytes.	The same laboratories will be used to analyse all sample.
The types of samples collected will be consistent.	The same units will be used to report analyte concentrations.
Completeness Requirements	
All accessible proposed locations will be sampled.	All accessible proposed locations will be sampled. All analytes will be analysed according to the SAQP.
The investigation will be conducted following ERM SOPs and any variations from these procedures will be documented.	Appropriate analysis methods and PQLs will be used.
All sampling will be conducted by an	Sample documentation will be provided.

Field Considerations	Laboratory Considerations
appropriately qualified and experienced sampler.	Sample holding times will be complied with.
Documentation of field works will be provided.	

G.10 CONTINGENCY PLANNING

Due to the uncertain nature of subsurface investigations, variations to the proposed scope of work may be necessary based on conditions encountered in the field. The most relevant potential uncertainties are described below, along with proposed contingency actions to address these issues:

Unexpected contaminants/unexpected high concentrations encountered: The analytical suite for soil and groundwater is based on the results of the historical investigations and knowledge of contaminants that are commonly associated with the former land use, such that identification of unexpected contaminants is unlikely. Should significant or unexpected contamination be encountered, additional sampling may be undertaken to attempt to further investigate and/or delineate the impact (to the extent practicable and subject to approval from Delta Electricity).

LNAPL and/or DNAPL encountered: If LNAPL and/or DNAPL is observed at any groundwater wells, attempts will be made to collect a representative sample of the separate phase liquid for characterisation. The benefits and costs of this additional analysis would be discussed with Delta Electricity prior to proceeding with additional works.

Difficult ground conditions encountered: If difficult ground conditions are encountered at an investigation location, an alternative adjacent location will be attempted to bypass potential subsurface obstacles encountered. In the unlikely event that laterally extensive difficult ground conditions prevent completion of the scope of work (i.e. achieving required depth), alternative investigation methods may be considered.

Insufficient sediment present for sampling: In the event that no sediment is encountered at the natural level at identified locations alternative locations will be identified based on conditions observed in the field. In the event that the volume of sediment is recovered from a single core is insufficient for laboratory analysis for particle size, an additional core will be taken immediately adjacent to the initial core.

Access to an area of potential concern is not feasible: If access to an area is not granted by Delta Electricity within the required time frame ERM will target locations around the perimeter of that area where access can be made available safely.

Existing monitoring wells are damaged or unsuitable for sampling: It may be necessary to install replacement wells where existing wells are damaged or unsuitable.

Annex H

Preliminary SAQP Tables

Table H.1: Preliminary SAQP - Sampling Location Distribution and RationaleVales Point Power Station
Project Symphony - 0227637

Site	Area	Sampling Element	Rationale	Landuse Screening Criteria	SB	MW	SS	SW	Total Locations	Existing MWs	Total MWs
Vales Point	VA	B Station Power Block	Contamination of soil and groundwater from spills and leaks of various chemicals	Commercial/Industrial	4	8	0	0	12	0	8
Vales Point	VB	A Station	Contamination of soil and grondwater from spills and leaks of various chemicals	Commercial/Industrial	3	7	0	0	10	0	7
Vales Point	VC	Transformer Area	Contamination of soil and grondwater from spills and leaks of various chemicals	Commercial/Industrial	2	5	0	0	7	0	5
Vales Point	VD	Main Dangerous Goods Store	Contamination of soil and grondwater from spills and leaks of various chemicals	Commercial/Industrial	2	5	0	0	7	0	5
Vales Point	VE	Contaminated Water Treatment Plant	Contamination of soil and groundwater from contaminated water from operational areas	Commercial/Industrial	1	3	0	0	4	0	3
Vales Point	VF	Waste Oil Storage	Contamination of soil and groundwater from transfer line gearbox oil leaks, fugitive coal fines, current and historic fuel storage, locomotive maintenance, and rail infrastructure activity.	Commercial/Industrial	0	3	0	0	3	0	3
Vales Point	VG	Fuel Oil Installation	Contamination of soil and groundwater from loss of fuel and oil	Commercial/Industrial	0	4	0	0	4	0	4
Vales Point	VH	Vehicle Refuelling Depot	Contamination of soil and groundwater from loss of fuel (UPSS)	Commercial/Industrial	0	7	0	0	7	3	10
Vales Point	VI	Water Treatment Plant Area	Contamination of soil and groundwater from spills and leaks of chemicals used in water treatment processes	Commercial/Industrial	2	3	0	0	5	0	3
Vales Point	VJ	Coal Storage Area	Potential leaching of contaminants from stockpiled coal, retention ponds and truck wash facilities	Commercial/Industrial and Open space	4	10	0	0	14	0	10
Vales Point	VK	Mobile Plant Maintenance and Refuelling Areas	Contamination of soil and groundwater from fuel storage/dispensing, waste oil tank and cleaning/lubricating facilities	Commercial/Industrial	2	7	0	0	9	0	7
Vales Point	VL	Sewage Treatment Plant	Potential leaching of contaminants from sewage treatment facilities or retention ponds	Commercial/Industrial and Open space	1	3	0	0	4	0	3

Site	Area	Sampling Element	Rationale	Landuse Screening Criteria	SB	MW	SS	SW	Total Locations	Existing MWs	Total MWs
Vales Point	VM	Chlorine Plant	Contamination of soil and groundwater from spills and leaks of chemicals used in water treatment processes and the adjacent transformer oil storage and filling station	Commercial/Industrial	1	5	0	0	6	0	5
Vales Point	VN	Rail Coal Unloader Area and Coal Oonveyors	Contamination of soil and groundwater from transfer line gearbox oil leaks, fugitive coal fines, current and historic fuel and coal storage, locomotive maintenance, and rail infrastructure activity	Commercial/Industrial and Open space	5	12	0	0	17	0	12
Vales Point	VO	Ash Dam	Contamination of soil and groundwater from ash dam leachate, waste disposal and ash slurry/return water lines with ACM.	Commercial/Industrial and Open space	3	21	0	0	24	3	24
Vales Point	VP	Asbestos Landfills	Contamination of soil and groundwater from current and historical waste burial	Commercial/Industrial	10	2	0	0	12	0	2
Vales Point	VQ	Asbestos Pipeline	Contamination of soil with ACM from ash slurry pipeline	Commercial/Industrial	11	0	0	0	11	0	0
Vales Point	VR	Sediments in Surrounding Waterways	Contamination of sediments in Wyee Creek from discharges related to the operation of the Ash Dam. Contamination of sediments in SEPP14 wetlands from Ash Dam seepage. Contamination of sediments in Lake Macquarie from discharges (drainage lines and groundwater seepage) related to Power Station operations	Marine environment	0	0	23	23	23	0	0
Vales Point	VS	TransGrid Switchyard	Contamination of soil and groundwater from surface water and groundwater migrating from the TransGrid switchyard onto land operated by Delta Electricity	Commercial/Industrial	1	5	0	0	6	0	5
Vales Point	VT	Fly Ash Plant	Contamination of soil and groundwater from oil leaks and fugitive coal fines	Commercial/Industrial	0	3	0	0	3	0	3
Vales Point	VU	Buffer Lands and Boundaries	Assessing migration of potential contamination across the Site boundaries and background conditions where there are no investigations locations as part of other AECs	Commercial/Industrial and Open space	3	20	0	0	23	0	20
	Totals				**55**	**133**	**23**	**23**	**211**	**6**	**139**

Notes:

SB = Soil Bore (not including bores converted to MW) / MW = Soil Bore converted to Groundwater Monitoring Well / Existing MWs = based on available reports and assumes wells are operational for sampling. Some SB locations may be completed as test pits using an excavator, where access allows.

SS = Sediment Sample / SW= Surface Water

Total Locations = SB + MW (or SS/SW)

Total MWs = proposed wells + existing wells

Depth of soil investigations will be assessed based on field conditions and will be tailored to target specific potential sources (eg pipelines / UST's etc.) where relevant, however for planning purposes it has been assumed that the average depth will be 3 m (with exception of noted shallow locations). Monitoring wells will be screened within groundwater bearing strata and constructed to allow the ingress of non-aqueous phase liquids (NAPLs) which may be present, and will be tailored to target specific potential sources (eg pipelines / UST's etc.) where relevant, estimated average depth of 8 - 10 m. It Unless otherwise specific, sediment samples will be advanced to a maximum depth of 1m.

Buffer lands will be visually inspected for evidence of potentially contaminated activity. The assessment of the requirement for investigation of the buffer lands will be based on the results of inspection and discussion with Macquarie Generation.

N/A not applicable

Area	Sampling Element	Total Locations	Total number of samples	Sample Details	Metals (8)	Metals (13)+	TRH, BTEX, PAH, Phenol	Asbestos P/A	VOC	PCB	Cations/Anions	PFOS/PFOA	ph / CEC	PSD, TOC	Comments
VA	B Station Power Block	12	24	Field screening - including PID measurements and visual/olfactory observations will be noted throughout the drilled profile; Sample Collection - samples will be collected at the surface and 0.5 m intervals for the first 2 m and every 1 m thereafter, or where changes in lithological units or significant contamination are noted; and Sample Analysis - one shallow sample targeting fill and the zone of surface impacts (0-1.5 m bgl) and one deeper sample targeting natural soil/geology between vadose zone and water bearing unit.	24	0	24	12	24	24	0	12	1	1	Analytical suite includes general suite (metals, TRH, BTEX, PAH, phenols) to target incidental operations and fill materials. Additional analytes include PCBs to target transformer operation, VOCs to target solvent use in maintenance of plant. and asbestos (presence/absence) in shallow fill materials. Selected soil samples will also be analysed for pH, CEC, PSD and TOC to allow for adoption of appropriate HSLs and ecological criteria (where applicable). Sediment analysis includes TOC and PSD.
VB	A Station	10	20	Field screening - including PID measurements and visual/olfactory observations will be noted throughout the drilled profile; Sample Collection - samples will be collected at the surface and 0.5 m intervals for the first 2 m and every 1 m thereafter, or where changes in lithological units or significant contamination are noted; and Sample Analysis - one shallow sample targeting fill and the zone of surface impacts (0-1.5 m bgl) and one deeper sample targeting natural soil/geology between vadose zone and water bearing unit.	20	0	20	10	20	20	0	10	1	1	
VC	Transformer Area	7	14	Field screening - including PID measurements and visual/olfactory observations will be noted throughout the drilled profile; Sample Collection - samples will be collected at the surface and 0.5 m intervals for the first 2 m and every 1 m thereafter, or where changes in lithological units or significant contamination are noted; and Sample Analysis - one shallow sample targeting fill and the zone of surface impacts (0-1.5 m bgl) and one deeper sample targeting natural soil/geology between vadose zone and water bearing unit.	14	0	14	7	14	14	0	7	1	1	
VD	Main Dangerous Goods Store	7	14	Field screening - including PID measurements and visual/olfactory observations will be noted throughout the drilled profile; Sample Collection - samples will be collected at the surface and 0.5 m intervals for the first 2 m and every 1 m thereafter, or where changes in lithological units or significant contamination are noted; and Sample Analysis - one shallow sample targeting fill and the zone of surface impacts (0-1.5 m bgl) and one deeper sample targeting natural soil/geology between vadose zone and water bearing unit.	14	0	14	7	14	0	0	0	1	1	
VE	Contaminated Water Treatment Plant	4	8	Field screening - including PID measurements and visual/olfactory observations will be noted throughout the drilled profile; Sample Collection - samples will be collected at the surface and 0.5 m intervals for the first 2 m and every 1 m thereafter, or where changes in lithological units or significant contamination are noted; and Sample Analysis - one shallow sample targeting fill and the zone of surface impacts (0-1.5 m bgl) and one deeper sample targeting natural soil/geology between vadose zone and water bearing unit.	8	0	8	0	8	8	0	0	1	1	
VF	Waste Oil Storage	3	6	Visual inspection - the coal transfer lines will be visually inspected to assess any evidence for leaks and spills which may have impacted the underlying soils/groundwater. The need for investigation locations will be assess based on the results of this inspection. Field screening - including PID measurements and visual/olfactory observations will be noted throughout the drilled profile; Sample Collection - samples will be collected at the surface and 0.5 m intervals for the first 2 m and every 1 m thereafter, or where changes in lithological units or significant contamination are noted; and Sample Analysis - one shallow sample targeting fill and the zone of surface impacts (0-1.5 m bgl) and one deeper sample targeting natural soil/geology between vadose zone and water bearing unit.	6	0	6	0	6	0	0	0	0	0	
VG	Fuel Oil Installation	4	8	Visual inspection - the fuel tranfer lines fromthe Fuel Oil Installation to the power block will be visually inspected to assess any evidence for leaks and spills which may have impacted the underlying soils/groundwater. The need for investigation locations will be assess based on the results of this inspection. Field screening - including PID measurements and visual/olfactory observations will be noted throughout the drilled profile; Sample Collection - samples will be collected at the surface and 0.5 m intervals for the first 2 m and every 1 m thereafter, or where changes in lithological units or significant contamination are noted; and Sample Analysis - one shallow sample targeting fill and the zone of surface impacts (0-1.5 m bgl) and one deeper sample targeting natural soil/geology between vadose zone and water bearing unit.	8	0	8	0	0	0	0	0	1	1	
VH	Vehicle Refuelling Depot	7	14	Field screening - including PID measurements and visual/olfactory observations will be noted throughout the drilled profile; Sample Collection - samples will be collected at the surface and 0.5 m intervals for the first 2 m and every 1 m thereafter, or where changes in lithological units or significant contamination are noted; and Sample Analysis - one shallow sample targeting fill and the zone of surface impacts (0-1.5 m bgl) and one deeper sample targeting natural soil/geology between vadose zone and water bearing unit.	14	0	14	0	0	0	0	0	1	1	
VI	Water Treatment Plant Area	5	10	Field screening - including PID measurements and visual/olfactory observations will be noted throughout the drilled profile; Sample Collection - samples will be collected at the surface and 0.5 m intervals for the first 2 m and every 1 m thereafter, or where changes in lithological units or significant contamination are noted; and Sample Analysis - one shallow sample targeting fill and the zone of surface impacts (0-1.5 m bgl) and one deeper sample targeting natural soil/geology between vadose zone and water bearing unit.	10	0	10	5	0	0	10	0	1	1	
VJ	Coal Storage Area	14	28	Field screening - including PID measurements and visual/olfactory observations will be noted throughout the drilled profile; Sample Collection - samples will be collected at the surface and 0.5 m intervals for the first 2 m and every 1 m thereafter, or where changes in lithological units or significant contamination are noted; and Sample Analysis - one shallow sample targeting fill and the zone of surface impacts (0-1.5 m bgl) and one deeper sample targeting natural soil/geology between vadose zone and water bearing unit.	0	28	28	0	0	0	0	0	1	1	
VK	Mobile Plant Maintenance and Refuelling Areas	9	18	Field screening - including PID measurements and visual/olfactory observations will be noted throughout the drilled profile; Sample Collection - samples will be collected at the surface and 0.5 m intervals for the first 2 m and every 1 m thereafter, or where changes in lithological units or significant contamination are noted; and Sample Analysis - one shallow sample targeting fill and the zone of surface impacts (0-1.5 m bgl) and one deeper sample targeting natural soil/geology between vadose zone and water bearing unit.	18	0	18	9	18	0	0	0	1	1	
VL	Sewage Treatment Plant	4	8	Field screening - including PID measurements and visual/olfactory observations will be noted throughout the drilled profile; Sample Collection - samples will be collected at the surface and 0.5 m intervals for the first 2 m and every 1 m thereafter, or where changes in lithological units or significant contamination are noted; and Sample Analysis - one shallow sample targeting fill and the zone of surface impacts (0-1.5 m bgl) and one deeper sample targeting natural soil/geology between vadose zone and water bearing unit.	8	0	8	4	0	0	0	0	1	1	

Area	Sampling Element	Total Locations	Total number of samples	Sample Details	Metals (8)	Metals (13)+	TRH, BTEX, PAH, Phenol	Asbestos P/A	VOC	PCB	Cations/Anions	PFOS/PFOA	ph / CEC	PSD, TOC	Comments
VM	Chlorine Plant	6	12	Field screening - including PID measurements and visual/olfactory observations will be noted throughout the drilled profile; Sample Collection - samples will be collected at the surface and 0.5 m intervals for the first 2 m and every 1 m thereafter, or where changes in lithological units or significant contamination are noted; and Sample Analysis - one shallow sample targeting fill and the zone of surface impacts (0-1.5 m bgl) and one deeper sample targeting natural soil/geology between vadose zone and water bearing unit.	12	0	12	6	0	12	12	0	1	1	Analytical suite includes general suite (metals, TRH, BTEX, PAH, phenols) to target incidental operations and fill materials. Additional analytes include PCBs to target transformer operation, VOCs to target solvent use in maintenance of plant. and asbestos (presence/absence) in shallow fill materials. Selected soil samples will also be analysed for pH, CEC, PSD and TOC to allow for adoption of appropriate HSLs and ecological criteria (where applicable). Sediment analysis includes TOC and PSD.
VN	Rail Coal Unloader Area and Coal Oonveyors	17	34	Visual inspection - the AEC will be visually inspected to assess any evidence of potential contamination of soils/groundwater. The need for investigation locations will be assess based on the results of this inspection. Field screening - including PID measurements and visual/olfactory observations will be noted throughout the drilled profile; Sample Collection - samples will be collected at the surface and 0.5 m intervals for the first 2 m and every 1 m thereafter, or where changes in lithological units or significant contamination are noted; and Sample Analysis - one shallow sample targeting fill and the zone of surface impacts (0-1.5 m bgl) and one deeper sample targeting natural soil/geology between vadose zone and water bearing unit.	0	34	34	17	0	0	0	0	1	1	
VO	Ash Dam	24	48	Field screening - including PID measurements and visual/olfactory observations will be noted throughout the drilled profile; Sample Collection - samples will be collected at the surface and 0.5 m intervals for the first 2 m and every 1 m thereafter, or where changes in lithological units or significant contamination are noted; and Sample Analysis - one shallow sample targeting fill and the zone of surface impacts (0-1.5 m bgl) and one deeper sample targeting natural soil/geology between vadose zone and water bearing unit.	0	48	48	24	0	0	0	0	1	1	
VP	Asbestos Landfills	12	24	Field screening - including PID measurements and visual/olfactory observations will be noted throughout the drilled profile; Sample Collection - samples will be collected at the surface and 0.5 m intervals for the first 2 m and every 1 m thereafter, or where changes in lithological units or significant contamination are noted; and Sample Analysis - one shallow sample targeting fill and the zone of surface impacts (0-1.5 m bgl) and one deeper sample targeting natural soil/geology between vadose zone and water bearing unit.	24	0	24	24	24	0	0	0	1	1	
VQ	Asbestos Pipeline	11	11	Field screening - including visual observations of potential ACM will be noted; Sample Collection - samples will be collected at the surface; and Sample Analysis - one shallow sample targeting surface impacts (0-0.2 m bgl).	0	0	0	11	0	0	0	0	1	1	
VR	Sediments in Surrounding Waterways	23	49	Where possible, up to three sediment samples will be collected at each location at intervals of 0.25 m to a maximum depth of 0.75 m. It is estimated that a depth profile of sediment samples will be able to be acheived at 12 of the sampling locations. At the other sampling locations, a single sediment sample will be collected from the surface 0.25 m. Sediment samples will be collected in general accordance with the methodologies outlined in CSIRO (2005) Handbook for Sediment Quality Assessment. Samples will be collected using a stainless steel push tube advanced from the creekline (Wyee Creek) or using a boat-based stainless steel push tube sampler or grab sampler (Lake Macquarie). Sample handling, labelling and decontamination procedures will be aligned with those adopted for soil sampling and those outlined in CSIRO (2005).	0	49	49	0	0	0	0	0	49	49	
VS	TransGrid Switchyard	6	12	Field screening - including PID measurements and visual/olfactory observations will be noted throughout the drilled profile; Sample Collection - samples will be collected at the surface and 0.5 m intervals for the first 2 m and every 1 m thereafter, or where changes in lithological units or significant contamination are noted; and Sample Analysis - one shallow sample targeting fill and the zone of surface impacts (0-1.5 m bgl) and one deeper sample targeting natural soil/geology between vadose zone and water bearing unit.	12	0	12	6	12	12	0	6	1	1	
VT	Fly Ash Plant	3	6	Field screening - including PID measurements and visual/olfactory observations will be noted throughout the drilled profile; Sample Collection - samples will be collected at the surface and 0.5 m intervals for the first 2 m and every 1 m thereafter, or where changes in lithological units or significant contamination are noted; and Sample Analysis - one shallow sample targeting fill and the zone of surface impacts (0-1.5 m bgl) and one deeper sample targeting natural soil/geology between vadose zone and water bearing unit.	6	6	6	3	0	0	0	0	1	1	
VU	Buffer Lands and Boundaries	23	46	Field screening - including PID measurements and visual/olfactory observations will be noted throughout the drilled profile; Sample Collection - samples will be collected at the surface and 0.5 m intervals for the first 2 m and every 1 m thereafter, or where changes in lithological units or significant contamination are noted; and Sample Analysis - one shallow sample targeting fill and the zone of surface impacts (0-1.5 m bgl) and one deeper sample targeting natural soil/geology between vadose zone and water bearing unit.	46	0	46	0	0	0	0	0	1	1	
Totals		**211**	**414**		**244**	**165**	**403**	**145**	**140**	**90**	**22**	**35**	**68**	**68**	

Analytical suite notes:

Metals (8)	Metals (arsenic, cadmium, chromium, copper, nickel, lead, mercury and zinc);	General Suite
Metals (13+B+Mb+Th+Se)	Metals (arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, manganese, nickel, lead, mercury, vanadium and zinc) plus boron, molybdenum, thallium and selenium	Additional metals target additional contaminants potentially present in ash.
TRH,BTEX,PAH,Phenol	Total Recoverable Hydrocarbons (TRH); Benzene, Toluene, Ethylbenzene, Xylene (BTEX), Polycyclic Aromatic Hydrocarbons (PAHs) and Phenols	General Suite
Asbestos P/A	Asbestos (presence / absence – soil only). Where is asbestos is detected, this will be quantified by calculating %W/W.	Targets asbestos in shallow fill materials or beneath pipework known or suspected to contain asbestos. Operational areas only.
VOC Suite	Volatile Organic Compounds (including chlorinated hydrocarbons)	Targeted to areas with known or suspected use of solvents including worksop areas or other maintenance
PCB	Polychlorinated biphenyls	Targeted to transformers and power block drainage areas.
PSD, TOC	TOC – Total Organic Carbon; PSD – Particle Size Distribution.	All sediments and selected soil samples to allow for adoption of appropriate HSLs.
pH / CEC	pH and cation exchange capacity.	Soils in non-operational area to determine appropriate ESLs / EILs.
PFOS/PFOA	Perfluorooctanesulfonic acid and Perfluorooctanoic acid	Targeted to areas known or suspected to have had transformer fires.

Asbestos analysis will generally be undertaken only on the upper (fill) sample, unless results from the upper sample or field screening / observations require that the deeper sample be analysed.
It is proposed that sediment samples from a range of depths be analysed for PCBs as PCB impacts are most likely to have been associated with historic activities and hence deeper sediments, however this may be undertaken in a staged manner with a proportion (>50%) of samples from each depth interval analysed initially and remaining samples analysed should detctions be noted.

Table H.3: Preliminary SAQP - Groundwater and Surfacewater
Vales Point Power Station
Project Symphony - 0227637

Area	Sampling Element	Total MWs	SW Samples	Metals (8)	Metals (13)+	TRH/BTEX/PAH/ Phenols	VOC Suite	PCB	Cations/ Anions	PFOS/PFOA	Field Parameters
VA	B Station Power Block	8	0	8	0	8	8	8	0	8	8
VB	A Station	7	0	7	0	7	7	7	0	7	7
VC	Transformer Area	5	0	5	0	5	5	5	0	5	5
VD	Main Dangerous Goods Store	5	0	5	0	5	5	0	0	0	5
VE	Contaminated Water Treatment Plant	3	0	3	0	3	3	3	0	0	3
VF	Waste Oil Storage	3	0	3	0	3	3	3	0	0	3
VG	Fuel Oil Installation	4	0	4	0	4	0	4	0	0	4
VH	Vehicle Refuelling Depot	10	0	10	0	10	0	0	0	0	10
VI	Water Treatment Plant Area	3	0	3	0	3	0	0	3	0	3
VJ	Coal Storage Area	10	0	0	10	10	0	0	0	0	10
VK	Mobile Plant Maintenance and Refuelling Areas	7	0	7	0	7	7	0	0	0	7
VL	Sewage Treatment Plant	3	0	3	0	3	0	0	0	3	3
VM	Chlorine Plant	5	0	5	0	5	0	5	5	0	5
VN	Rail Coal Unloader Area and Coal Oonveyors	12	0	0	12	12	0	0	0	0	12
VO	Ash Dam	24	0	0	24	24	0	0	0	0	24
VP	Asbestos Landfills	2	0	2	0	2	2	0	0	0	2
VQ	Asbestos Pipeline	0	0	0	0	0	0	0	0	0	0
VR	Sediments in Surrounding Waterways	0	23	0	23	23	0	0	0	0	23
VS	TransGrid Switchyard	5	0	5	0	5	5	5	0	5	5
VT	Fly Ash Plant	3	0	3	0	3	0	0	0	0	3
VU	Buffer Lands and Boundaries	20	0	20	0	20	0	0	0	0	20
Totals		**139**	**23**	**93**	**69**	**162**	**45**	**40**	**8**	**28**	**162**

Analytical suite notes:

Metals (8)	Metals (arsenic, cadmium, chromium, copper, nickel, lead, mercury and zinc);
Metals (13)+B+Mb+Th+Se)	Metals (arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, manganese, nickel, lead, mercury, vanadium and zinc) plus boron, molybdenum, thallium and selenium
TRH/BTEX/PAH/Phenol	Total Recoverable Hydrocarbons (TRH); Benzene, Toluene, Ethylbenzene, Xylene (BTEX), Polycyclic Aromatic Hydrocarbons (PAHs) and Phenols
VOC Suite	Volatile Organic Compounds (including chlorinated hydrocarbons)
PCB	Polychlorinated biphenyls
PFOS/PFOA	Perfluorooctanesulfonic acid and Perfluorooctanoic acid
Field parameters	pH, electrical conductivity, redox, temperature.

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