Stage 1 and 2 - Desktop Environmental, Hydrogeological and Geotechnical Assessment

REPORT ON PSP AREA 11 – MINTA FARM

- Final V4
- 17 February 2011

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REPORT ON PSP AREA 11 – MINTA FARM

- Final V4
- 11 February 2011

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Contents

List of Tables

List of Figures

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SINCLAIR KNIGHT MERZ

Executive Summary

Background and Objectives

Sinclair Knight Merz Pty Ltd (SKM) was commissioned by the Growth Areas Authority (GAA) to undertake a Stage 1 and 2 Environmental, Hydrogeological and Geotechnical Site Assessment of the Precinct Structure Plan (PSP) Area referred to as the Minta Farm Area (PSP Area 11) located in Berwick, Victoria (hereafter referred to as "the site" or "PSP Area 11").

The site has been identified as future land supply for various commercial, residential and community land uses. The aim of this assessment is to identify opportunities and constraints to the proposed land development which may potentially be caused by existing or past land uses, and site and sub-surface conditions, in accordance with the DSE General Practice Note, *Potentially Contaminated Land* (June 2005). Stage 1 of the project comprised the site history and preliminary desktop review of information. The Stage 2 works involved inspections of the properties identified as high risk during the Stage 1 with respect to contamination, hydrogeology and geotechnical considerations. This report includes the findings of both the Stage 1 and 2 assessments.

Scope of Works

The following scope of work was undertaken at the site:

- The Stage 1 assessment comprised the gathering of relevant information (including the use of literature sources) for the purposes of identifying potential sources of contamination, hydrogeological and geotechnical issues;
- The Stage 2 assessment included inspecting selected properties within the site for potential sources of contamination and areas of geotechnical and hydrogeological significance (i.e. areas of water logging, existing groundwater bores etc) identified during the Stage 1 assessment; and
- The approach and findings of these assessments, together with supporting information, are documented within this report.

Conclusions

Site Contamination Assessment

Based on the information gathered during the Stage 1 and 2 assessment, the following conclusions can be made:

- The site history assessment found that the site has had a long history of agricultural land uses dating back to at least the 1850s;
- A review of current aerial photography indicates that the site is currently used for agricultural purposes;

- Based on the available information, site history assessment and the site inspection the following potential sources of contamination have been identified on site:
  - Application of agricultural chemicals to crops or stock across the site (including broad application);
  - Possible use of imported fill material to level site;
  - Farm property with residence and farmyard infrastructure including sheds and storage yards potentially used for chemical storage (fuels, oils, fertilisers, herbicides, insecticides and pesticides) and machinery maintenance;
  - Two aboveground storage tanks (ASTs) and numerous fuel drums distributed in the vicinity of the farm yard storage areas;
  - One petrol bower and (inferred) underground fuel storage tank (UST) was identified near the vehicle maintenance shed;
  - One diesel UST and associated bowser was identified near the vehicle maintenance shed;
  - A number of sheds containing farm machinery and evidence of ground staining were observed on-site;
  - Five farm dams which have been filled with fill material of an unknown origin;
  - Former stockyard in the north of the site, now dismantled; and
  - Piles of waste materials within the farm property storage yards including concrete, metal piping and disused farm machinery and equipment.
- A number of potential off-site sources of contamination have also been identified in the vicinity of the site (see **Section 7.1.2**). The majority of the identified sources are located significant distances (>1km) from the site and are therefore not considered to represent a significant risk of contamination to the subject site or are considered to represent a low risk of contamination to the site;
- Based on the information obtained from the sources described in this report, there do not appear to be any significant constraints from a site contamination perspective which would render the land unsuitable for a particular land use. Localised contamination is likely to be able to be effectively remediated or managed.

Geotechnical Assessment

Key geotechnical issues associated with development of the site include the potential presence of highly reactive soils in the west, soft soils with near surface groundwater levels in the east and surface water ponding after periods of rain. Fill material, including likely deep filling of the known former farm dams, is expected to be uncontrolled and may not be suitable for development in its present state.

Hydrogeological Assessment

There is limited hydrogeological information specific to the site area. Based on the available regional data, the hydrogeological model for the site is considered to be:

- The presence of two minor aquifers on site: the Quaternary sediments in the north and east of the site; and the Older Volcanics in the west of the site;
- These aquifers behave as a single unit, and have a total depth of less than 50m;
- The watertable occurs within all out cropping units at the site (including the Quaternary sediments, Tertiary Volcanics, and Silurian basement). Groundwater levels are shallow and are potentially less than 5m deep in the south of the site, and less than 3m deep in the north of the site; and
- Groundwater salinity is variable and can be expected to range between fresh and brackish (501 to 13,000 mg/L).

The primary constraint for development is expected to be the shallow watertable, which may cause groundwater inflow to excavations. Opportunities include the potential for small-scale groundwater use such as Managed Aquifer Recharge (MAR) and Aquifer Thermal Energy Storage (ATES), however the feasibility of these options can be better assessed when groundwater levels and aquifer properties have been confirmed.

Recommendations

Further assessments of the identified site contamination, hydrogeological and geotechnical issues are recommended to determine the suitability of the site for the proposed land uses and to confirm that future buildings and infrastructure (roads and underground service networks) are appropriately designed. Further assessment works may include, but are not limited to, the following activities:

- Drilling and collection of soil samples from grid based and targeted locations (e.g. former in-filled farm dams, storage yards and shed) to test the soil for potential contaminants of concern and also assess the geotechnical soil and rock properties for design of foundations, engineered fill platforms and pavements;
- Drilling and installation of six groundwater monitoring wells to determine the depth to groundwater, sampling of the groundwater to assess for potential contaminants of concern and aquifer hydraulics testing to determine aquifer properties;
- Excavation and removal of underground storage tanks, soil remediation and tank pit validation; and
- Removal of other potentially contaminating infrastructure (i.e. septic tanks and above ground storage tanks) followed by validation of remaining soil quality.

We understand that the proposed use of the site is as future land supply for various land uses, including sensitive uses such as residential and community facilities, in addition to open space,

retail and a range of business uses such as office, light industrial and manufacturing. As no specific land uses have been allocated to individual parcels of land, further assessment for site contamination, geotechnical or hydrogeological purposes is not considered appropriate at this point in time. An informed investigation strategy can be prepared once further information on the proposed land uses for specific areas of the site is available. Future intrusive assessment works should also be timed to coincide with the scaling down or cessation of current site operations and prior to the commencement of the proposed development and construction works.

It is also recommended that the GAA approach the Casey City Council to determine the requirement for a formal environmental audit at the site, as per ministerial direction No. 1 - Requirement for environmental audit (DSE General Practice Note, *Potentially Contaminated Land* (June 2005). If an environmental audit of the site is required in accordance with Part IXD of the *Environment Protection Act 1970*, a period of at least 6 months prior to development should be allowed to progress through the audit process. It is likely that a longer period of time will be required should significant contamination be identified at the site, to allow for remediation works.

Further testing of the site is likely to be required based on the findings of this investigation. In accordance with the DSE General Practice Note (DSE, 2005), areas of the site would be classified as high or medium potential for contamination depending on the end site use. The level of further assessment needed will be intrusive, requiring collection of soil and/or groundwater samples from grid and/or targeted sample locations in accordance with Australian Standards AS4482.1-2005. Samples may be collected using a drill rig to drill soil bores or install groundwater monitoring wells at selected locations, or with a backhoe or excavator to excavate test pits. Soil and groundwater samples should be submitted to a NATA accredited laboratory for analyses of selected analytes.

List of Abbreviations

- AHD – Australian Height Datum
- AMG – Australian Map Grid
- ANZECC - Australian New Zealand Environment and Conservation Council
- ARMCANZ – Agriculture and Resource Management Council of Australia and New Zealand
- AS – Australian Standard
- ASRIS – Australian Soil Resources Information System
- ATES – Aquifer Thermal Energy Storage
- BTEX – Benzene, Toluene, Ethylbenzene and Xylene
- BH – Borehole
- CoC – Chain of Custody
- DDT – Dichlorodiphenyltrichloroethane
- DDE – Dichlorodiphenyldichloroethylene
- DS – Stock and Domestic
- DO – Dissolved Oxygen
- DQO – Data Quality Objective
- DY – Dairy
- EOA – Environmental Audit Overlay
- EC – Electrical Conductivity
- EHS – Environment, Health and Safety
- EIL – Ecological Investigation Levels
- EMP – Environmental Management Plan
- EPA – Environment Protection Authority
- ESA – Environmental Site Assessment
- FZ1 – Farming Zone Schedule 1
- GAA – Growth Areas Authority
- GME – Groundwater Monitoring Event
- GMS – Groundwater Management System
- GQO – Groundwater Quality Objective
- GWZ1 – Green Wedge Zone 1
- HIL – Health Investigation Levels
- IR - Irrigation
- LPP - Local Planning Policies
- LPPF - Local Planning Policy Framework
- mbgl – Metres below ground level
- MAH – Monocyclic Aromatic Hydrocarbons
- MAR – Managed Aquifer Recharge

- MSS - Municipal Strategic Statement
- MW – Monitoring Well
- NATA – National Association of Testing Authorities, Australia
- NEPC – National Environment Protection Council
- NEPM – National Environment Protection Measure
- OCP – Organochlorine Pesticides
- OPP – Organophosphate Pesticides
- PAH – Polycyclic Aromatic Hydrocarbons
- PASS – Potential Acid Sulphate Soils
- PSP – Precinct Structure Plan
- RWL – Reduced Water Level
- SAP – Sampling & Analysis Plan
- SB – Soil Bore
- SEPP – State Environment Protection Policy
- SKM – Sinclair Knight Merz
- SPPF - State Planning Policy Framework
- SWL – Standing Water Level
- TDS – Total Dissolved Solids
- TPH – Total Petroleum Hydrocarbons
- UST – Underground Storage Tank
- UGZ – Urban Growth Zone
- WSPA - Water Supply Protection Area

1. Introduction

1.1. Background and Objectives

Sinclair Knight Merz Pty Ltd (SKM) was commissioned by the Growth Areas Authority (GAA) to undertake a Stage 1 and 2 Environmental, Hydrogeological and Geotechnical Site Assessment of the Precinct Structure Plan (PSP) Area referred to as the Minta Farm Area (PSP Area 11) located in Berwick, Victoria (hereafter referred to as "the site" or "PSP Area 11").

The site has been identified as future land supply for various commercial, residential and community land uses. The aim of this assessment is to identify opportunities and constraints to the proposed land development which may potentially be caused by existing or past land uses, and site and sub-surface conditions, in accordance with DSE General Practice Note, *Potentially Contaminated Land* (June 2005). Stage 1 of the project comprised the site history and preliminary desktop review of information. The Stage 2 works involved inspections of the properties within the site identified as high risk during the Stage 1 assessment with respect to contamination, hydrogeology and geotechnical considerations. This report includes the findings of both the Stage 1 and 2 assessments completed.

1.2. Scope of Work

The following scope of work was undertaken at the site:

- The Stage 1 assessment comprised the gathering of relevant information (including the use of literature sources) for the purposes of identifying potential sources of contamination, hydrogeological and geotechnical issues;
- The Stage 2 assessment included inspecting selected properties within the site for potential sources of contamination and areas of geotechnical and hydrogeological significance (i.e. areas of water logging, existing groundwater bores etc) identified during the Stage 1 assessment; and
- The approach and findings of these assessments, together with supporting information, are documented within this report.

1.3. Statement of Limitations

This Report has been prepared by SKM for the sole use of the Growth Areas Authority ("the Client").

Undertaking an assessment or study of the on-site conditions may reduce the potential for exposure to the presence of contaminated or inadequate bearing ground and/or groundwater. All reports and conclusions that deal with sub-surface conditions are based on interpretation and judgement and as a result have uncertainty attached to them. It should be noted that this report contains

interpretations and conclusions which are uncertain, due to the nature of the investigations. No study can completely eliminate risk, and even a rigorous assessment and/or sampling program may not detect all problem areas within a site. The following information sets out the limitations of the Report.

This Report should only be presented in full and should not be used to support any objective other than those detailed within the Agreement. In particular, the Report does not contain sufficient information to enable it to be used for any use other than the project specific requirements for which the Report was carried out, which are detailed in our Agreement. SKM accepts no liability to the Client for any loss and/or damage incurred as a result of changes to the usage, size, design, layout, location or any other material change to the intended purpose contemplated under this Agreement.

It is imperative to note that the Report only considers the site conditions current at the time of investigation, and to be aware that conditions may have changed due to natural forces and/or operations on or near the site. Any decisions based on the findings of the Report must take into account any subsequent changes in site conditions and/or developments in legislative and regulatory requirements. SKM accepts no liability to the Client for any loss and/or damage incurred as a result of a change in the site conditions and/or regulatory/legislative framework since the date of the Report.

The Report is based on an interpretation of factual information available and the professional opinion and judgement of SKM. Unless stated to the contrary, SKM has not verified the accuracy or completeness of any information received from the Client or a third party during the performance of the services under the Agreement, and SKM accepts no liability to the Client for any loss and/or damage incurred as a result of any inaccurate or incomplete information.

The Report is based on assumptions that the site conditions as revealed through selective sampling are indicative of conditions throughout the site. The findings are the result of standard assessment techniques used in accordance with normal practices and standards, and (to the best of our knowledge) they represent a reasonable interpretation of the current conditions on the site. However, these interpretations and assumptions cannot be substantiated until specifically tested and the Report should be regarded as preliminary advice only.

Any reliance on this Report by a third party shall be entirely at such party's own risk. SKM provides no warranty or guarantee to any third party, express or implied, as to the information and/or professional advice indicated in the Report, and accepts no liability for or in respect of any use or reliance upon the Report by a third party.

This Report makes no comment on the presence of hazardous materials, unless specifically requested.

2. Investigation Methodology

2.1. General Assessment Approach

2.1.1. Stage 1 Assessment

A Stage 1 assessment (also referred to as a Phase 1 Environmental Site Assessment (ESA)) is typically undertaken to establish site conditions, historical site uses and practices. As part of this Stage 1 assessment the following sources of information have been reviewed:

- Relevant Reports:
  - Limited Environmental Assessment Cranbourne North (Stage 2), Minta Farm Precincts and Clyde North Precinct (Chadwick T & T, 2009);
  - Limited Geotechnical Assessment Cranbourne North (Stage 2) PSP and Clyde North PSP (Chadwick T & T, 2009);
  - Desktop Cultural Heritage Assessment (Tardis Enterprises, 2009);
  - Casey - Cardinia Growth Area: Review of Groundwater Issues Identified in Growth Area (Coomes Consulting, 2006);
  - Officer Precinct Additional Groundwater Observation Bores for Analysis of Water Table Constraints to Urban Development (SKM, 2006);
  - Cardinia Employment Corridor Groundwater and Salinity Investigation (SKM, 2008);
  - Australand Holdings. 298-346 Clyde Road, Berwick. Environmental Audit Report Under the Environment Protection Act (GHD, 2002);
  - Environmental Audit Report 358 Clyde Road, Berwick, Victoria (Coffey Environments, 2007); and
  - Environmental Audit Report 950 Round Road, Cranbourne North, Victoria (Lane Consulting, 2006)
- EPA Priority Sites Register;
- EPA List of Certificates and Statements of Environmental Audit (current and completed audits);
- Topographical Maps;
- Groundwater Management System (GMS) bore searches;
- Geological Maps;
- Hydrogeological Maps; and
- Potential Acid Sulfate Soils (PASS) Probability Maps.

Typically a site inspection and interviews with site personnel are also undertaken as part of a Stage 1 assessment, however for this particular assessment these works occurred during the Stage 2 assessment, as described in **Section 2.1.2** below).

The Stage 1 assessment seeks to identify where possible:

- The potential source(s) of on and off site contamination,
- Pathways and receptors of contamination; and
- Areas of environmental (contamination, hydrogeological and geotechnical) concern which will form the basis of subsequent assessments at the site.

2.1.2. Stage 2 Assessment

For this particular investigation, the site inspection works are referred to as a Stage 2 assessment. The site inspection undertaken included a close inspection of areas which have been identified during the Stage 1 as high risk from a contamination, hydrogeological and geotechnical perspective. Based on the findings of these site inspections, the need for further soil and groundwater investigation (typically by sampling and analysis) have been made.

2.1.3. Stage 3 Assessment

A Stage 3 intrusive site investigation may be undertaken if a change to a more sensitive land use is planned in order to characterise the site with respect to contamination, as per ministerial direction No. 1 - Requirement for environmental audit (DSE General Practice Note, *Potentially Contaminated Land* (June 2005). Hydrogeological and geotechnical conditions should also be investigated during the stage 3 assessments. Note that this stage of site investigation is usually referred to as a Stage 2 (or Phase 2) ESA. With respect to each of the abovementioned disciplines, the following works are may be undertaken as part of a Stage 3 assessment:

- ***A contamination assessment*** will typically seek to determine the level (if any) of contamination present on site, establish the lateral and vertical distribution of contamination and identify the source(s) of on-site and off-site contamination. Prior to undertaking any intrusive soil and/or groundwater investigation, a Sampling and Analysis Plan (SAP) is generally prepared. The SAP defines the intended sampling locations and the contaminants that will be tested for, based on the site characteristics as determined in a Phase 1 ESA;
- ***A geotechnical assessment*** will typically seek to obtain information on the sub-surface conditions at the site through a geotechnical site investigation comprising a series of boreholes and/or test pits and laboratory testing. Field and laboratory test data is used to develop a site model describing the soil and/or rock profile and the variability across the site. A geotechnical assessment would generally include advice on site classification and allowable bearing capacity for shallow foundation design and comments regarding excavations, foundation systems, pavement design and other items relevant to the proposed development; and

- ***A hydrogeological assessment*** will typically include determination of the depth to the water table and the potentiometric surface of deeper confined aquifers through the installation of groundwater observation bores, assessment of groundwater and surface water interaction and assessment of aquifers suitability for managed aquifer recharge (MAR).

2.1.4. Remediation

If significant contamination is identified at a site, to a level where the beneficial uses of land, surface water or groundwater are at risk or precluded (described in further detail in **Section 3**), remediation of the identified contamination may be required in order to allow for a particular land use to continue or commence in future.

2.1.5. Environmental Auditing

The environmental audit system under the *Environment Protection Act 1970* is administered by the Victorian Environment Protection Authority. A statutory Environmental Audit of a site involves the appointment of an EPA accredited environmental auditor to undertake an independent assessment of the environmental condition of a site and provide an opinion regarding the site's suitability for feasible or proposed end uses. The DSE practice note requires an environmental audit to occur when a sensitive use is proposed in areas with a high potential for contamination (i.e.: childcare centre, pre-school, primary school, or some form of dwelling; refer to Table 2 of the DSE General Practice Note *Potentially Contaminated Land*; June 2005). In some cases this audit may be deferred by applying for an Environmental Audit Overlay (EAO). An EAO may be applied for when it is anticipated to be too difficult to undertake an Environmental Audit (such as where there are multiple land owners).

During an Environmental Audit, a range of information including a site history assessment and results of relevant soil and groundwater testing undertaken are evaluated by the environmental auditor in order to form an opinion regarding the site's suitability for the proposed end uses. At the conclusion of the audit a certificate or statement of environmental audit may be issued. A certificate indicates that the use of the land is unrestricted, whereas a statement indicates that particular beneficial uses of the land or groundwater are either precluded or suitable only under specified conditions.

3. Regulatory Framework for Assessment

3.1. Legislation and Policy

3.1.1. Planning and Environment Act 1987

The *Planning and Environment Act 1987* sets out the requirements of planning authorities when preparing planning schemes or amendments to planning schemes. The Act requires planning authorities to "take into account any significant effects which it considers the scheme or amendment might have on the environment or which it considers the environment might have on any use or development envisaged in the scheme or amendment".

Under Section 12 (2) (a) of the *Planning and Environment Act 1987*, the *Ministerial Direction No. 1 – Potentially Contaminated Land* requires planning authorities to satisfy themselves that the environmental conditions of land proposed to be used for a sensitive use, agriculture or public open space are, or will be, suitable for that use. This is generally done through the completion of an environmental site assessment and audit process.

3.1.2. Environment Protection Act 1970

The *Environment Protection Act 1970* established the Victorian Environment Protection Authority (EPA) and made provisions with respect to the powers, duties, and functions of the EPA and the protection of the environment. The Act provides for environmental audits, which are used to provide an authoritative opinion on the suitability of potentially contaminated land for future use, and form an integral part of the land use planning and approval process. The Act also provides the basis for the various State Environment Protection Policies (outlined below) which provide the framework for the assessment and management of the environmental quality of land, surface waters and groundwater in Victoria.

3.1.3. Land State Environment Protection Policy 2002

The State Environment Protection Policy (Prevention and Management of Contamination of Land) (Land SEPP) sets out the regulatory framework for the prevention and management of contaminated land within the State of Victoria. The intent of this framework is to maintain and maximise, to the extent practicable, the quality of the land environment in Victoria, in order to protect its existing and potential beneficial uses. The Land SEPP was declared in June 2002 in accordance with Section 16 of the *Environment Protection Act 1970*, and the Victorian EPA is responsible for its implementation.

The Land SEPP identifies a range of land use categories and a range of protected beneficial uses for each of these categories. The EPA considers that land (soil) is *polluted* where current and/or future protected beneficial uses for the relevant land use categories are precluded. Beneficial uses of land are considered to be precluded when relevant soil quality objectives set out in the Land

SEPP for those beneficial uses have been exceeded. Further information on the beneficial uses of land with respect to specific land use categories can be found in **Appendix A**.

3.1.4. Groundwater State Environment Protection Policy 1997

The quality of groundwater in Victoria is protected under the 1997 State Environment Protection Policy (SEPP) 'Groundwaters of Victoria' (Groundwater SEPP), declared under the *Environment Protection Act 1970* and administered by the EPA. The groundwater SEPP defines a range of protected beneficial uses for defined segments of the groundwater environment, which are based on the total dissolved solids (TDS) content of the groundwater. The EPA considers that groundwater is *polluted* where protected beneficial uses for the relevant segment are precluded. Beneficial uses of groundwater are considered to be precluded when relevant groundwater quality objectives set out in the groundwater SEPP for those beneficial uses have been exceeded, or where non-aqueous phase liquid is present.

Where groundwater has been polluted, groundwater must be cleaned up such that the protection of beneficial uses is restored, or to be cleaned up the extent practicable. Further information on the beneficial uses of groundwater with respect to the various segments of groundwater can be found in **Appendix A**.

3.1.5. Surface Water State Environment Protection Policy 2003

The quality of Victoria's surface water environments are protected under the 2003 State Environment Protection Policy 'Waters of Victoria' (Surface Water SEPP), declared under the *Environment Protection Act 1970* and administered by the EPA. The Surface Water SEPP sets out the environmental values and beneficial uses of water which are to be protected for each segment of the surface water environment and includes schedules which cover some specific surface water catchments in Victoria. Beneficial uses of surface waters are considered to be precluded when relevant water quality objectives set out in the surface water SEPP for those beneficial uses have been exceeded.

In addition to assessment of surface water quality, the relevant water quality objectives stated in this SEPP are applied to groundwater at the point of groundwater discharge to a surface water system, to assess whether the maintenance of ecosystems beneficial use of groundwater is protected.

3.2. Guidelines and Standards

3.2.1. National Environment Protection (Assessment of Site Contamination) Measure (NEPM) 1999

The NEPM is the national guideline for assessing contaminated sites and was prepared by the National Environment Protection Council (NEPC). The NEPM is implemented in each Australian

jurisdiction under the *National Environment Protection Measures (Implementation) Act 1998 (Commonwealth)*. The NEPM document ensures there is a nationally consistent approach to the assessment of contamination. The NEPM includes two main schedules which provide guidance on the methods of site contamination assessment, environmental and health based investigation levels for soil and groundwater contaminants, human and environmental health risk assessment and reporting requirements.

3.2.2. Various EPA Publications and Guidelines

The following publications and guidelines from the Victorian and New South Wales Environment Protection Authorities are commonly applied and referenced for intrusive soil and groundwater site assessments:

- EPA Victoria, 2000. Groundwater Sampling Guidelines. Publication 669;
- EPA Victoria, 2006. Hydrogeological assessment (groundwater quality) guidelines. Publication 668; and
- NSW EPA, 1994. Guidelines for Assessing Service Station Sites.

3.2.3. Potentially Contaminated Land General Practice Note 2005

This general practice note was produced by the Department of Sustainability and Environment in conjunction with the Victorian EPA and provides guidance to the general public and planners on the identification of potentially contaminated land and the stages of assessment and audit required should a site be considered contaminated.

3.2.4. Australian Standard AS4482.1-2005: Guide to the investigation and sampling of sites with potentially contaminated soil – Part 1: Non-volatile and semi-volatile compounds

The Australian Standard 4482.1 provides guidance on the collection of sufficient and reliable information when assessing potentially contaminated sites. In particular this standard focuses on the assessment of sites potentially contaminated with non volatile and semi volatile compounds. The standard covers key elements of preliminary site investigations (i.e. Stage 1 or Phase 1 ESAs), detailed site investigation methods (i.e. Phase 2 ESAs), data quality objectives (DQO), developing sampling strategies, the collection of samples and quality assurance procedures.

3.2.5. Australian Standard AS4482.2-1999: Guide to the sampling and investigation of potentially contaminated soil – Part 2: Volatile substances

This standard refers to AS448.1 regarding the establishment of preliminary site information, and provides more specific guidance on field screening and sample collection techniques when assessing sites that are potentially contaminated with volatile compounds.

3.2.6. Australian Standard AS1726-1993: Geotechnical Site Investigations

Australian Standard AS1726 sets out minimum requirements for a geotechnical site investigation, as a component in the engineering design, construction, commissioning and operation of civil engineering and building works.

The standard specifies considerations affecting the design and construction of works which must be made in a geotechnical site investigation. Assessment of these factors enables the identification of field and laboratory work to obtain the geotechnical data required to facilitate the engineering design and construction of the works. The standard provides guidance on suitable field and laboratory examination and testing of geotechnical materials and outlines a system of material classification.

The applications of this Standard include assessment of natural or filled ground, new construction, maintenance of existing facilities, the evaluation of post construction performance and the assessment of failure.

3.3. Regulatory Framework in the Context of this Assessment

The acts, policies, guidelines and standards relevant for each stage of assessment are set out in **Table 1**.

- **Table 1. Acts, Policies, Guidelines and Standards Relevant for Site Assessments**

Stage of Assessment	Relevant Acts and Policies	Relevant Guidelines and Standards	How the Regulatory Framework Applies
Proposed Change to Land Use	*Planning and Environment Act 1987*	*Ministerial Direction No. 1 – Potentially Contaminated Land* *DSE Potentially Contaminated Land Practice Note 2005*	The Planning and Environment Act requires planning authorities to satisfy themselves that the environmental conditions of land proposed to be used for a sensitive use, agriculture or public open space are, or will be, suitable for that use. This is generally done through the completion of an environmental site assessment and audit process (see below).

Stage of Assessment	Relevant Acts and Policies	Relevant Guidelines and Standards	How the Regulatory Framework Applies
Desktop Investigation (Phase 1 ESA)	*Environment Protection Act 1970* *Planning and Environment Act 1987* *National Environment Protection Measures (Implementation) Act 1998 (Commonwealth)*	NEPM 1999 AS4482.1-2005 AS4482.2-1999	The Environment Protection Act and SEPPs provide the legislative basis and policy framework for the assessment and management of contaminated land and groundwater in Victoria. The guidelines and standards provide guidance on the collection of reliable information in order to assess the environmental condition of a site appropriately.
Intrusive Soil, Groundwater and Geotechnical Assessments (Phase 2 ESA)	*Environment Protection Act 1970* *Land SEPP 2002* *Groundwater SEPP 1997* *Waters of Victoria SEPP 2003*	NEPM 1999 AS4482.1-2005 AS4482.2-1999 AS1726-1993	
Statutory Environmental Auditing	*Environment Protection Act 1970* *Planning and Environment Act 1987* *Land SEPP 2002* *Groundwater SEPP 1997* *Waters of Victoria SEPP 2003*	NEPM 1999 Various Victorian EPA Guidelines and Publications	The environmental audit system is provided for in the Environment Protection Act 1970 and the audit process is administered by the Victorian EPA.

4. Site Description

General information on the PSP Area 11 site is presented in **Table 2**. Refer to **Figure 1** for a site location map and **Figure 2** for a site plan, attached at the end of this report.

- **Table 2. PSP Area 11 Site Details**

Item	Description
Location / Address	The site is roughly rectangular in shape and is bounded by a row of houses to the north west, Princes Freeway to the north east, Soldiers Road to the west and south west, Grices Road to the south, Cardinia Creek to the east. The site is located within the suburb of Berwick, in the south east of Melbourne.
Australian Map Grid Coordinates	North West Corner: 5786130 metres north 355848 metres east. North East Corner: 5785486 metres north 357760 metres east West South West Corner: 5785187 metres north 355711 metres east South West Corner: 5784264 metres north 356436 metres east South East Corner: 5784112 metres north 357554 metres east
Current Title Information	The site is divided into 4 parcels of land. The current and historical title information for each parcel of land is summarised in the Chadwick T & T (2009a) report provided as **Appendix B**.
Site Area (ha)	290 ha
Local Council	Casey City Council
Current Land Zoning	Under the Casey Planning Scheme (DSE, 2010), the majority of PSP Area 11 is zoned as the Urban Growth Zone (UGZ), with a small parcel of land in the south eastern corner of the site zoned as Public, Parks and Recreation Zone (PPRZ). The purpose of the Urban Growth Zone is to support the transition of non-urban land into urban land. The southern site boundary is located on the Urban Growth Boundary.
Zoning of Surrounding Land	Under the Casey Planning Scheme (DSE, 2010), the land surrounding PSP Area 11 comprises the following zones: - Urban Growth Zone (UGZ) – immediately east south east and south of the site; - Farming Zone Schedule 1 (FZ2): immediately north east of the site; - Residential 1 (RZ1): immediately north west and west of the site; and - Low Density Residential (LDRZ): immediately south west of the site.

Item	Description
Environmental Audit Overlay	There are no sites with an environmental audit overlay within the site or within 200 m of the site boundary.
Site Layout	The site forms an irregular rectangular shape. Access to the site is via a driveway extending into the site from Soldiers Road. The site itself contains a private network of gravelled access tracks surrounding the various paddocks and main house and workshop areas. Refer to **Figure 2** for a site layout plan.
Current Land Uses	The site is currently used for agricultural purposes.
Proposed Land Uses	The proposed future use of the site is as future land supply for various land uses including sensitive uses such as residential and community facilities in addition to open space, retail and a range of business uses such as office, light industrial and manufacturing. At present, no specific land uses have been allocated to individual parcels of land.
Surrounding Land Uses	The land surrounding the site to the north east, and south of the site is currently used for agricultural purposes. Immediately east of the site is Cardinia Creek, with agricultural land uses extending beyond the creek (PSP 5). The land immediately north west and west of the site is occupied by residential land uses.

5. Environmental Setting

Information on the general environmental setting of PSP Area 11 is outlined in the following sections.

5.1. Topography

The site is at an elevation of approximately 40 to 60 m above sea level or Australian Height Datum (mAHD) and slopes regionally towards the south east. The surrounding land also falls to the south east. The surface topography is presented on **Figure 3** provided at the end of this report.

5.2. Regional Geology

The Department of Primary Industries (DPI) Online Geological Map and the Geological Survey of Victoria's Berwick Map Sheet (Scale 1:25,000) were reviewed to assess the geological conditions at the site. The western half of the site is generally overlain by tertiary aged sandy and silty clay sediments, including pyroclastics and mud flow deposits. The eastern half of the site is characterised by Quaternary floodplain and stream deposits comprising silty clays and silty sands. Silurian-aged siltstone and sandstone bedrock outcrops in the south of the site. Tertiary aged Older Volcanics basalt is mapped as the surface unit outside and adjacent to the boundary of the north western corner of the site.

Surface geology for the site and immediately surrounding areas is presented on **Figure 3** provided at the end of this report.

5.3. Soils and Acid Sulphate Soils Map Review

A review of the Australian Soil Resources Information System (ASRIS) online map describes the soil in the western half of the site as medium clay, medium heavy clay, heavy clay with a clay content of >45%. The eastern half of the site comprises a clay loam, sandy or silty clay loam with a clay content of 30 - 35 % (ASRIS, 2010).

The ASRIS online map was accessed for information regarding acid sulphate soils. The map indicates that soils within the site boundary can be classed as having a low to extremely low probability of acid sulphate soil occurrence (ASRIS, 2010).

5.4. Regional Hydrology

The nearest surface water bodies to the site are shown on **Figure 3** and include:

- Cardinia Creek which forms the eastern site boundary and drains into Western Port Bay;
- An unnamed minor drainage channel is noted on various plans as running from two farm dams in the central area of the site to the south east where the drainage channel feeds into Cardinia Creek;
- A total of 5 other farm dams are also evident within the study area.

5.5. Regional Hydrogeology

From the regional mapping, the main hydrogeological units at the site in order from youngest to oldest are:

- Quaternary sand with silt and clay associated with drainage lines in the north and east of the site (shown as Unnamed Alluvium in Figure 3);
- Tertiary-aged pyroclastics and mud flow deposits associated with the Older Volcanics in the north-west corner of the site (shown as Older Volcanic Group in Figure 3); and
- Silurian fractured rock basement of the Melbourne Formation (siltstone) outcrops to the west of PSP 11 (shown as the Murrindindi Supergroup in Figure 3).

The Quaternary and Tertiary units are not regionally extensive and are generally considered to constitute minor aquifers. The Silurian fractured rock basement can behave as a low-yielding aquifer in areas where significant fracturing occurs, and can be used for minor groundwater supply in these areas.

The Victorian Groundwater Management System (GMS) database was accessed to identify the presence of any nearby registered groundwater bores. Sixteen groundwater bores were registered within a 1.5 km radius of the site. The locations of the groundwater bores are shown on **Figure 3** and information on each of the registered groundwater bores are presented in **Appendix C**. Geological logs for one of the bores (S9031227) indicated that the Silurian basement was encountered at 26m depth. As such, the sediments (Tertiary and Quaternary) overlying the basement at this location are thin, however sediments are expected to become thicker towards Westernport Bay to the southeast. In general the thickness of sediments across the site is likely to be less than 50m.

The aquifers present at the site are considered to be regionally unconfined or semi-confined, and would therefore be connected to surface water features to some degree. The sedimentary aquifers in this area have similar properties and are generally considered to behave as a single aquifer.

Depending on the presence and thickness of clay in the upper parts of the sedimentary profile, however, deeper parts of the sediments beneath the site can behave as locally confined aquifers.

Recharge to the aquifer would largely occur through direct infiltration from rainfall. Irrigation of market gardens in the area may also recharge the water table aquifer. Local discharge from the aquifers is likely to be to the creeks on the site. Regional discharge is expected to be towards Westernport Bay to the southeast. The local water bodies, Cardinia Creek and the minor unnamed drainage channel on site are considered to be the potential receptors of any contaminated groundwater originating from the site.

A review of the Department of Natural Resources and Environment's South Western Victoria Water Table Aquifers Map indicates that the water table aquifer is located within the pre-cainozoic Silurian bedrock unit (DCNR, 1995), but would also occur in the Tertiary and Quaternary units where they are present close to the surface.Limited information on the standing water levels was available, therefore a water table contour map could not be constructed for this area. The Melbourne Mapsheet (SKM, 2009) provides watertable depths across a broad area, and shows the watertable in the vicinity of the site to be between 5 and 10m deep. More detailed watertable mapping has been undertaken for the Cardinia Shire Council, which includes the PSP 11 area (SKM, 2005). This mapping used groundwater level information from 21 bores with time series water level information and standing water level information recorded during bore construction from selected bores. The method for preparing the depth to watertable was the statistical Krigin External Drift (KED) approach. A reliability map for the data was also prepared and this indicated areas of low confidence, and provided guidance on where additional information capture would be most useful. Based on the reliability map and information provided by DSE on likely primary development areas, a drilling program was developed to improve the overall accuracy of the depth to watertable exercise. In total 23 additional bores were constructed.

Upon comparison of the watertable map produced by SKM (2005) and Figure 3 of this report, it becomes evident that the depth to groundwater closely follows the surface geology in the area. In summary:

- In the north west corner of the study area the geological unit found at the surface is the Older Volcanics basalt and the depth to watertable maps shows water levels of between 5 m and 10 m below the surface;
- To the north and east of the area, where the Unnamed Alluvium is found at the surface, the depth to watertable map indicates the shallowest waterlevels are present and these range from between 1.5 m and 3 m of the surface.
- To the west of the site, the Silurian fractured rock outcrops and this part of the area corresponds to watertable depths of between 3 m and 5 m.

It should be noted that this aquifer is primarily recharged via rainfall and the watertable elevation map was constructed for early 2004. This means that the below average rainfall experienced in recent years could potentially have resulted in reduced watertable elevations, relative to those summarised above.

There has been no hydrogeological testing at the site and therefore hydraulic parameters are unknown. Typical parameters are given in **Table 3**.

- **Table 3. Typical hydrogeological parameters (after Leonard, 1992).**

Geological Unit	Hydraulic Conductivity	Transmissivity	Storativity (unconfined aquifer)
Quaternary sediments	Unknown	Unknown	0.05 – 0.25
Older Volcanics	1 – 2 m/day	20 – 50 m^2/day	0.05
Melbourne Formation	>1 m/day[1]	Unknown	Unknown

1 - (Lane Consulting, 2002).

5.6. Regional Groundwater Quality

Limited hydrogeochemical data was available from existing registered bores within the area, therefore groundwater salinity (as Total Dissolved Solids (TDS) concentration) was obtained from available published mapping, specifically the Department of Sustainability and Environment's *South Western Victoria Water Table Aquifers Map* (DCNR, 1995) and The Melbourne Mapsheet (DSE, 2009). The *South Western Victoria Water Table Aquifers Map* map indicates that groundwater TDS in the vicinity of the site is likely to be between 501 and 13,000 mg/L, while the Melbourne Mapsheet suggests groundwater with a range of salinity between 1,001 and 7,000 mg/L. To be conservative, based on the TDS, the groundwater is classified as Segment A2 quality groundwater according to the Groundwaters of Victoria SEPP (Victorian Government, 1997). The following beneficial uses of groundwater are therefore protected at the site:

- Maintenance of ecosystems;
- Potable water supply (acceptable);
- Potable mineral water supply;
- Agriculture, parks and gardens;
- Stock watering;
- Industrial water use;
- Primary contact recreation; and
- Buildings and structures.

The site is not located within a known mineral springs area (Victorian Mineral Water Committee, 2010), therefore this beneficial use is not considered to be relevant for this site.

5.7. Groundwater Use

The site falls within the Koo Wee Rup Water Supply Protection Area (WSPA), which has been declared in response to significant groundwater use and declining water levels in the area. The purpose of the WSPA is to protect groundwater supply and quality for future users, by maintaining groundwater levels. Allocations of groundwater in the Koo Wee Rup WSPA are in excess of the Permissible Consumptive Volume (PCV), which means that applications for additional groundwater extraction may not be approved in some zones.

A summary of the groundwater bore uses as registered in the GMS is provided in **Table 4**.

Table 4. Summary of Registered Groundwater Bore Uses

Groundwater Bore Use(s)	No. of Registered Groundwater Bores
Stock and Domestic (DS)	1
Irrigation (IR)	1
Investigation (IV)	1
Not Known/Not Given	13
Total	**16**

6. Information Review

This section summarises the various sources of information, records and reports reviewed as part of the Stage 1 desktop assessment.

6.1. Existing Reports

A review of existing reports which have been completed in relation to the site or for areas in close proximity to the site is presented below.

6.1.1. Limited Environmental Assessment Report. Cranbourne North Stage 2, Minta Farm Precincts and Clyde North Precinct (Chadwick T & T, 2009a)

This assessment covered PSP Area 11 (Minta Farm) in addition to land in the surrounding areas including Clyde North. The assessment undertaken by Chadwick T & T included a review of current and historical title information, aerial photography and a site inspection. A review of the historical certificates of title information presented in the report indicated that the Baillieu family have been owners of Lot 1 since 1965 and Lot 14 since 1985. Lot 14 was previously owned by the Sharp family between 1903 and 1985 and the Taylor family between 1888 and 1903.

The data assessment and site inspection conducted by Chadwick T&T (2009a) revealed the following potential sources of contamination at the Minta Farm site:

- Lot 1C & 1D - Contamination due to earthworks (e.g. fill material, fuel spills)
- Lot 14A - Swimming pool, sheds, waste/scrap, railway sleepers, farm chemicals
- Lot 14B - Crops of wheat, canola, sorghum. Aerial view: soil scaring/staining
- Lot 14 C - Septic tank, stockyard, divoflow (detergent), fuel, machinery shed, soil stockpiles, dams, above ground storage tanks, underground storage tanks and bowsers.
- Lot 14D & 14E - Contamination due to earthworks (e.g. fill material, fuel spills)

Based on the information provided in the Chadwick T & T Report the exact locations of these lots within the PSP Area 11 were unclear. However, given that only one main farming property occupies PSP Area 11 it is inferred that Lots 14A, 14B and 14C are where the main residence, workshops, storage sheds and storage yards are located.

No intrusive soil sampling or geotechnical investigation works were undertaken at the Minta Farm PSP Area.

6.1.2. Limited Geotechnical Assessment Cranbourne North (Stage 2) PSP and Clyde North PSP (Chadwick T & T, 2009b)

This geotechnical assessment was provided as an Appendix to the above environmental assessment report. A total of eight boreholes were drilled to depths of between 2.8m and 6.0m across the

Cranbourne North (Stage 2) PSP and Clyde North PSP areas. A further eight shallow boreholes drilled for environmental sampling were advanced to depths of between 0.1m and 0.4m and were considered to be of insufficient depth to provide geotechnical information.

There were no boreholes drilled in the Minta Farm PSP Area as part of this investigation; however, one geotechnical borehole (BH-07) was located on the south side of Grices Road near the southern boundary of the Minta Farm PSP Area. The borehole indicates a profile comprising soft to firm clay to a depth of 1.1m (overlain by a friable crust), overlying 'friable' clayey sandy silt with rock fragments and shells. Refusal at 2.8m is noted. The exact location of this borehole is unclear; however, it appears to be in the vicinity of a mapped Silurian rock outcrop. The described soil profile appears to be consistent with recent alluvial deposits overlying tertiary aged sediments.

No laboratory testing was performed as part of this investigation. Based on the mapped geology, a general site classification in accordance with AS2870-1996 (Residential Slabs and Footings) of Class H was provided where the geology comprises older volcanics and Class M for the remainder of the site.

Estimated allowable bearing capacities of 50kPa to 100kPa have been provided for the geological units mapped in this area. However, we note that given the soft material recorded in the relevant borehole log it is considered important to perform further geotechnical testing in this area in order to assess the depth and lateral extent of this soft material and its suitability as a founding material.

6.1.3. Officer Precinct Additional Groundwater Observation Bores for Analysis of Water Table Constraints to Urban Development (SKM, 2006)

This assessment was completed by SKM in 2006 in relation to the groundwater conditions in the Officer Precinct, which forms an area located just to the north of the PSP Area 5 (Officer Employment Area) and PSP Area 11. This study follows on from an earlier assessment titled *Shallow Groundwater Constraints to Urban Development* completed for the Cardinia Shire Council by SKM in 2005. A review of the report was undertaken as the site is located in close proximity to the subject site and therefore potentially contains information of relevance to this area.

The 2005 study completed by SKM involved the use of an interpolation technique to estimate the depth to groundwater in the Officer Precinct area where actual groundwater data was not available. The study concluded that the Officer Precinct area should be classified as 'Not Recommended for Urban Development' based on the likelihood of encountering shallow water tables at less than 1.5mbgl. Subsequently in the SKM (2006) assessment, groundwater wells were installed in the areas where actual data did not exist, in particular where the water table was considered to be <1.5 mbgl, and additional field data was collected.

The addition field data revealed that the depth to the water table was between 1.5 and 3.0 mbgl. The report concluded that the groundwater conditions are not as strong a constraint to urban development as originally thought, however the area is still considered to be "severely constrained". SKM (2006) recommended that further consideration of the potential for shallow water tables and management strategies should be provided for in the planning process. It is important to reiterate that this study was completed for an area of land to the north east of the PSP Area 11 site. Therefore the conclusions on site conditions in the Officer Precinct are not necessarily relevant to PSP Area 11.

6.1.4. Casey - Cardinia Growth Area: Review of Groundwater Issues Identified in Growth Area (Coomes Consulting, 2006)

Coomes Consulting was engaged by the Cardinia Shire Council to review the SKM 2005 and 2006 reports (summarised above). Coomes Consulting found that whilst there was the potential for shallow groundwater to be encountered in the Officer area, it is likely that if the land use changes from agricultural to a more urbanised land use, the recharge to watertable aquifer is likely to be reduced due to increase hardstand surfaces and surface compaction during development. It is also anticipated that there will be long term impacts to the groundwater, including the lowering of the water table from reduced infiltration and an increase in transpiration as trees and gardens mature.

The report also identified that there are techniques to managing the potentially shallow water tables during development, including the selection of appropriate materials (i.e. impervious barriers) to address groundwater aggressivity, drainage infrastructure and interception.

6.1.5. Cardinia Employment Corridor Groundwater and Salinity Investigation (SKM, 2008)

A study of the hydrogeological conditions of two small precincts within the wider Cardinia Employment Corridor was conducted by SKM for the Cardinia Shire Council in 2008. Whilst the study did not specifically address the subject site, it did briefly cover the hydrogeological conditions of the area, which falls just to the east of this employment corridor. The employment corridor lies on the coastal plains of Western Port Bay and is covered by a 20m to 30m thick low permeability clay unit which is underlain by basement Silurian aged siltstones forming a low permeability fractured rock aquifer. The rate of groundwater flow through the corridor is expected to be slow and the groundwater salinity of the water table aquifer is expected to be between 1,500 and 3000 mg/L as indicated by the DNRE's Beneficial Use Maps. This was confirmed from actual groundwater data from the area obtained from the GMS (SKM, 2008).

The study concluded that the water table is anticipated to be shallow in some areas of the precinct and therefore future infrastructure construction and planning should consider this during design. Major groundwater issues are not expected provided that surface drainage is good and increased

recharge to the water table aquifer does not occur as a result of the proposed urban developments in the area.

6.1.6. Desktop Cultural Heritage Assessment (Tardis Enterprises, 2009)

A review of the desktop cultural heritage assessment revealed that the pastoral activities (land clearing, ploughing and dam construction) in the Berwick – Pakenham region commenced in the 1840s to 1850s when Europeans settled in the area.

6.1.7. Cranbourne North Development Plan and Cranbourne East Development Plan. Land Use Buffers, Key Issues Paper. Preliminary Draft (FOCUS, 2004)

A key issues paper on key planning issues relating to land use buffers was prepared by FOCUS for the City of Casey in relation the Cranbourne North Development Plan and Cranbourne East Development Plan. The FOCUS (2004) report identified the following industrial land uses in the Cranbourne area which require a buffer:

- Broiler farm located at 1580 Thompsons Road, Cranbourne;
- Extractive industries at 1520 Thompsons Road, Cranbourne (this site has a permit for the extraction of clay);
- Concrete batching plants at 1520, 1545 and 1575 Thompsons Road, Cranbourne (1545 Thompsons Road has a permit for the extraction of sand); and
- Abattoir and waste water treatment lagoons at 1500 Thompsons Road, Cranbourne (this site has a permit to discharge waste water to land).

These identified industries in the vicinity of PSP Area 11 represent potential off-site sources of contamination to the subject site.

6.2. EPA Priority Sites Register

A search of the EPA's Priority Sites Register, which lists those sites for which EPA has requirements for active management of land and groundwater contamination, was conducted. The site was not listed on the Register and there are no registered priority sites within a 1km radius of the site.

6.3. EPA List of Sites Issued with Statements and Certificates of Environmental Audit

Under Victoria's *Environment Protection Act 1970*, statutory environmental audits of potentially contaminated land result in the issue of a Certificate of Environmental Audit if the site is considered suitable for any beneficial use (and land use). Sites are issued a Statement of Environmental Audit if they are not found to be suitable for all beneficial uses (or land uses), as defined under Section 4 of the Act. Issue of a Statement indicates that some contamination remains

at the site that precludes one or more beneficial uses and/or requires management for the site to be suitable for one or more land uses.

The Victorian EPA maintains a list of all sites for which a Certificate or Statement of Environmental Audit has been issued. At the time of reporting, the following three sites within a 5km radius of the site have been issued with a Statement or Certificate of Environmental Audit:

- 298-346 Clyde Road, Berwick (approximately 1.6 km to the west of the site) – issued with a Certificate of Environmental Audit;
- 358 Clyde Road, Berwick (approximately 1.6 km to the west of the site) – issued with a Statement of Environmental Audit; and
- 950 Pound Rd, Cranbourne North (approximately 2.7 km to the south west of the site) – issued with a Statement of Environmental Audit.

Although is it very unlikely that a statement of environmental audit would be issued if a site represented a significant risk of off-site contamination, a review of these environmental audit reports was undertaken to gain an appreciation of the site use history of surrounding properties and to determine if any residual soil and/or groundwater impact at the audit site has the potential to impact upon the subject site. In addition, information concerning the geology and hydrogeology of the area was also obtained.

6.3.1. Australand Holdings. 298-346 Clyde Road, Berwick. Environmental Audit Report Under the Environment Protection Act (GHD, 2002)

This audit site is located approximately 1.6 km to the west of the subject site. A statement of environmental audit was initially issued for this property in 2001. At the time of the statement being issued low level soil contamination comprising vanadium, zinc and dieldrin, organochlorine pesticides (OCPs) and total petroleum hydrocarbons (TPH >C9) were identified in the north east of the site (GHD, 2002). The following remedial actions were required before another environmental audit could be conducted and a certificate issued:

- Demolition of the shed in the north eastern corner of the site and validation of the soils beneath the shed; and
- Removal of a septic tank and validation of soils from beneath this structure.

As the site owner required a Certificate of Environmental Audit, further remediation and assessment works as stated above were undertaken at the site. The following key results and discussion was presented in the report with respect to the soil results obtained from the validation:

- Only one reported concentration of zinc exceeded the adopted ecological investigation levels (EILs) and was considered to be restricted to the surface soils as a result of runoff from the adjacent shed's galvanised roof;

- Vanadium was also detected in natural soil samples collected from the site in excess of the NEPM EIL criteria, however this contamination was determined to be representative of natural soil and geological conditions in the area, based on research detailed in the audit report; and
- Some microbiological contamination was identified in the validation samples collected from beneath the septic tank, however this was not considered to be of concern given the short lifespan of the bacteria identified (estimated 100 days).

Following the completion of the remediation works the north eastern section of the site and based on the points raised above, the contamination was considered to have been successfully remediated to a standard where the site is considered suitable for all beneficial uses including residential land uses.

Groundwater contamination at the site was not considered likely, therefore a groundwater investigation was not undertaken at the site. A sample of spring water which was discovered to be discharging on the audit site was collected and submitted for analysis. Arsenic was reported at a concentration above the adopted drinking water guideline, however the arsenic was considered to be naturally occurring and not of concern. Accordingly a Certificate of Environmental Audit was issued for the audit site.

Based on the information presented above, it is very unlikely that this audit site would have any impact on the subject site.

6.3.2. Environmental Audit Report 358 Clyde Road, Berwick, Victoria (Coffey Environments, 2007)

This audit site is located approximately 1.6 km to the west of the subject site. The primary sources of contamination were considered to be the imported fill material identified on site and the historical site uses including a long history of agricultural activities. Elevated concentrations of certain metals (chromium, cobalt, molybdenum, nickel and selenium) were reported in the site soils in excess of the adopted NEPM EIL guidelines but below the NEPM HIL 'A' guidelines. Coffey Environments (2007) concluded that the metals concentrations reported in the soil at the site were likely to be representative of naturally occurring conditions. TCLP elutriation testing was conducted on selected samples which exhibited elevated concentrations of chromium and nickel, and indicated that the mobility of these constituents was low. With respect to soil contamination, the report indicated that it was considered "highly unlikely" that the soil contamination identified on site to have the potential to cause off site contamination.

The groundwater assessment at the site concluded that the direction of groundwater flow was towards the west with a minor component of south westerly groundwater flow. The investigation identified elevated concentrations of metals including antimony, copper, hexavalent chromium (CrVI), mercury, nickel, tin and zinc in the groundwater at the site. The site was not considered to

be the source of the elevated concentrations of metals in the groundwater nor was the site considered to be a source for potential off-site migration of contaminants.

Based on the review of this report, it is considered very unlikely that the soil and/or groundwater contamination identified at this audit site has the potential to impact on the subject site.

6.3.3. Environmental Audit Report 950 Round Road, Cranbourne North, Victoria (Lane Consulting, 2006)

This audit site is located approximately 2.7 km to the south west of the subject site. Based on the information presented in the audit report, the site has had a long history of agricultural uses including market gardening and grazing, which is consistent with surrounding land uses.

The site investigation for this audit identified organochlorine pesticides (OCPs) including concentrations of dieldrin, DDT+DDE and Endosulphan, in soil in the south west of the site, an area which was being used for cultivation purposes. Given that the investigation identified a potential risk to human health from these contaminants, a site specific human health risk assessment for these pesticides was conducted by Lane Consulting. The risk assessment concluded that there was a negligible risk to human health based on the reported concentrations of these contaminants. However, the residual levels of pesticides identified at the site were considered to render the land unsuitable for the grazing of beef for human consumption, therefore precluding the 'Production of Food, Flora and Fibre' beneficial use.

The groundwater assessment conducted at the site indicated that the direction of groundwater flow was towards the north east of the site where it was considered likely that the groundwater would discharge to drains located in the area and Eumemmering Creek. The groundwater at the site was found to contain elevated concentrations of nitrate, chromium, copper, nickel and selenium, however the investigation concluded that these contaminants were representative of regional conditions. The investigation noted that uncharacteristically elevated groundwater salinity was noted in the south west of the site, which was considered to be influenced by the intensive market gardening on the adjacent property.

Based on the review of this report, it is considered very unlikely that the soil and/or groundwater contamination identified at this audit site has the potential to impact on the subject site.

6.4. EPA List of Current Environmental Audit Sites

The Victorian EPA also maintains a list of sites which are also currently subject to the environmental audit process. At the time of reporting there were no sites within a 5km radius of the site which were undergoing audit.

6.5. Historical Zoning Records Review

The Department of Planning and Community Development (DPCD) website was accessed for historical zoning information in relation to the site. Historical planning scheme information was only available for 1985 and indicated that the site was zoned as general farming (F1). This is consistent with the aerial photography from around this period presented in Chadwick T & T (2009a).

6.6. Aerial Photography Review

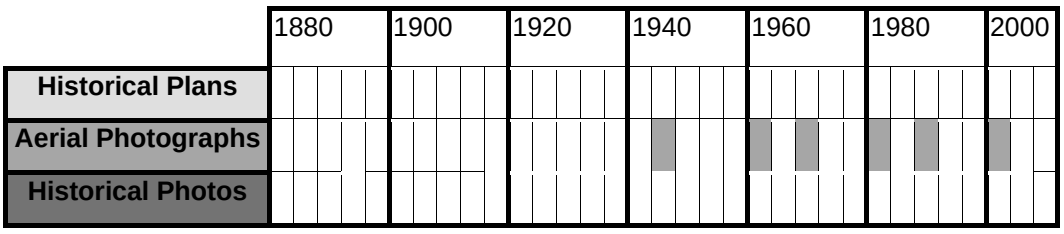
As a historical aerial photograph review was undertaken as part of the Chadwick T& T (2009a) assessment, only a brief review of recent photography was undertaken as part of this present assessment. The 1989 aerial photography (Chadwick T&T, 2009a) was compared to a 2009 aerial photograph of the site, presented in **Figure 4a.** Five farm dams which were evident in the 1989 aerial photograph appear to have been filled in with fill material of an unknown origin and re-surfaced by 2009. The 2009 aerial photo also shows a farm property including a homestead in centre of the site, with a number of associated shed and storage yards which contained piles of waste materials. A stockyard was also visible in the north of the site on the 2009 aerial photo.

6.7. Data Integrity Assessment

It is recognised that not all prior land use information has been identified, and given the resources provided for this investigation only a relatively general history of the site has been established. However, the completeness and quality of the historical data is considered to be sufficient for the purposes of the investigation.

The table below represents the years for which site use history data collected during this investigation was available.

Table 5. Information Availability



Note: Blank boxes indicate no information was available.
Shaded Boxes indicate information was viewed.

7. Site Characterisation

7.1. Site Contamination Assessment

Based on the information presented in the previous sections, a number of potential on and off site sources of contamination were identified during the Stage 1 Assessment of PSP Area 11. In accordance with the DSE General Practice Note *Potentially Contaminated Land* (June 2005), this report provides an assessment of the potential for the site to be contaminated. The potential sources of on-site contamination were assigned a qualitative level of risk based on professional experience. The level of risk considers the likelihood of contamination being present and the potential consequences of that contamination. the likelihood of the contamination representing a potential constraint to future development at the site. Where potential on-site sources of contamination were identified as having a high risk of contamination during the Stage 1 Assessment, a site inspection was recommended which was then carried out during the Stage 2 assessment. No off-site potential sources of contamination were inspected during the Stage 2 Assessment.

7.1.1. Potential Sources of Contamination On-Site and Findings of Site Inspection

The potential sources of on-site contamination were targeted during the site inspection of the PSP Area 11 on 17 June 2010. Each of the potential sources of on-site contamination identified during that Stage 1 and 2 assessments are listed in **Table 6** along with the findings of the Stage 2 site inspection. The original risk rankings have been revaluated following the site inspection with the revised risk rankings also provided in **Table** 6. **Appendix D** provides a copy of the field notes and photographs from the site inspection.

The property numbers referred to in **Table 6** have been allocated to a particular property parcel by SKM for the purposes of this investigation. **Figure 4a** shows the allocated property number and the location of each of these identified potential sources of on-site contamination where possible. **Figure 4b** shows a close up of the potential sources of contamination identified in the vicinity of the main farm property.

The two non-point sources of potential contamination listed in Table 6 were assessed as presenting a medium risk of contamination. On the basis of this risk ranking and the broad-scale and historical nature of these potential sources, a site inspection was not conducted. Nevertheless, it is considered likely that further assessment of the land (through intrusive soil and groundwater assessments) may be required at a later date, once more information regarding the proposed land uses is available and an informed sampling strategy can be prepared. These potential sources would be addressed at that time.

- **Table 6. Stage 1 and 2 Assessments - Summary of Potential On-Site Sources of Contamination**

Findings of Site Inspection (Stage 2)	Site Use/Activity	Potentially Contaminated Medium	Potential Contaminants of Concern	Potential Contamination Risk	Property No.
Not Inspected	***General/Non Point Source or Point Source:*** Long history of agricultural land uses across the site dating back to at least 1850s. May have included activities such as the application of agricultural chemicals to crops or stock.	Soil, Groundwater and Surface Water	OCPs, OPPs, herbicides, fungicides, insecticides, nutrients, metals, TPH and MAHs	Medium	All Properties
Not Inspected	***General/Non Point Source:*** Possible use of imported fill material to level site.	Soil	Various	Low to Medium	All Properties

Findings of Site Inspection (Stage 2)	Site Use/Activity	Potentially Contaminated Medium	Potential Contaminants of Concern	Potential Contamination Risk	Property No.
▪ Two (2) trailer mounted above ground fuel storage tanks (ASTs) and 200L drums were found on the outskirts of the main farm property. See Photos 1 and 2 in Appendix D; ▪ A number of sheds were present on site in the vicinity of the main farm building complex and included: – Main vehicle shed: Housed tractors and a stock of herbicides and pesticides including Bipyridilium Pesticide, Trifluralin 480 (including solvents and hydrocarbons), Amine 625 (2,4-Dichlorophenoxyacetic Acid, Dimethylamine Salt) and Alliance Herbicide (including paraquat and paraquat dichloride). Minor staining of the concrete floor of the shed was noted. See Photo 3 in Appendix D; – Secondary vehicle shed: housed obsolete tractors; – Vehicle maintenance garage: used for the storage of vehicles, parts and maintenance equipment. See Photo 4 in Appendix D; and – Other minor sheds on the property were inspected and found to contain sheets of tin, old equipment and old containers of unknown contents.	***Point Sources:*** Farm property with residence and farmyard infrastructure including sheds and storage yards used potentially used for chemical storage (fuels, oils, fertilisers, herbicides, insecticides and pesticides) and machinery maintenance.	Soil and Groundwater	OCPs, OPPs, herbicides, fungicides, insecticides, nutrients, and, TPH, MAHs, metals and asbestos	High	1 and 2

Findings of Site Inspection (Stage 2)	Site Use/Activity	Potentially Contaminated Medium	Potential Contaminants of Concern	Potential Contamination Risk	Property No.
A diesel bowser and associated underground storage tank (UST) was identified outside the vehicle maintenance garage. The dip point of the UST was opened and found to contain a makeshift wooden dip stick. The stick indicated that the UST contained a small amount of diesel fuel, however a reliable estimate of volume was unable to be determined. Anecdotal evidence from site personnel indicated that the diesel UST was still in use. See Photo 5 in Appendix D. An AST was not observed at this location, however the trailer mounted ASTs located elsewhere implies that the AST previously identified (Chadwick T&T, 2009a) may have been trailer mounted. A petrol bowser was also evident in the vicinity of the vehicle maintenance garage. No tank dip point was evident as the surface of the UST was concreted over. Anecdotal evidence from site personnel indicated that this tank was no longer in use. See Photo 6 in Appendix D.	***Point Sources:*** Divoflow (caustic detergent), fuel drums, machinery shed, aboveground and underground storage tanks (AST/UST) as identified in Chadwick T&T (2009a).	Soil and Groundwater	TPH, MAHs, Lead, surfactants, sodium hydroxide, potassium hydroxide and calcium oxide, OCPs, OPPs, herbicides, fungicides and insecticides.	High	1 and 2 (Lot 14C)

Findings of Site Inspection (Stage 2)	Site Use/Activity	Potentially Contaminated Medium	Potential Contaminants of Concern	Potential Contamination Risk	Property No.
The former farm dam located in the centre of the site (Property 1) and the four former dams along the southern perimeter of the site (along Soldiers Road and Grices Road – Property 2) were visually confirmed to be in-filled with material of an unknown origin . The backfilled material may have been sourced locally from the original dam excavation, however this could not be confirmed.	***Point Sources:*** Five farm dams which have been filled in with fill material of an unknown origin.	Soil and Groundwater	Various	High	1 and 2
The burnt-off areas identified from aerial imagery were also inspected. No evidence of a recent fire or burnt grass was evident during the site inspection. It is presumed that the area was burnt off some time ago for the purpose of promoting re-growth and that the vegetation has since recovered.	***Point Sources:*** Burnt off-areas	Soil	TPH, MAHs, PAHs and metals	Low	2
The area identified as a stockyard on aerial photography was also inspected during the site visit. The stockyard did not appear to contain a sheep or cattle dip. The area was found to contain piles of fencing and old containers. It appears as though the stock yards have been dismantled as the site is no longer used for stock grazing purposes.	***Point Source:*** Former Stockyard in the north of the site identified from a review of aerial photography.	Soil and Groundwater	OCPs, OPPs, herbicides, fungicides, insecticides, nutrients, metals and microbiological	Medium	3 (Lot 14C)
Piles of waste materials including concrete, metal piping and disused farm machinery and equipment were also observed to the south of the main farm property. See Photo 7 in Appendix D	***Point Source:*** Piles of waste materials within the farm property storage yards	Soil	Nutrients, TPH, MAHs, PAHs and metals	Medium to High	2 (Lot 14C)

Findings of Site Inspection (Stage 2)	Site Use/Activity	Potentially Contaminated Medium	Potential Contaminants of Concern	Potential Contamination Risk	Property No.
A septic tank was identified in the vicinity of the property adjacent to the lake. See Photo 8 in Appendix D	***Point Sources:*** Septic Tank	Soil and Groundwater	Nutrients,	Medium	1
During the site inspection it was discovered that construction works were being carried out in the northwest and the southeast corners of the site.	***Point Sources:*** Construction Compounds – Use of heavy machinery, leaks of fuels and oils	Soil	TPH, MAHs, PAHs and metals	Medium	1 and 3

Notes:
OCPs – Organochlorine Pesticides
OPP s– Organophosphorus Pesticides
TPH – Total Petroleum Hydrocarbons
MAHs – Monocyclic Aromatic Hydrocarbons (including benzene, toluene, ethylbenzene and xylenes)
PAHs – Polycyclic Aromatic Hydrocarbons
Nutrients – Ammonia, nitrate, nitrite, phosphate
Bracketed lot number refers to the property reference in the Chadwick T & T Limited Environmental Site Assessment Report (2009a).

7.1.2. Potential Sources of Contamination Off-Site

The areas surrounding the site were also considered during the Stage 1 assessment in order to identify the presence of off-site facilities or land uses that could potentially cause environmental impact to the site. The off-site sources identified in the vicinity of the site are summarised in **Table 7** and illustrated on **Figure 5**.

- **Table 7. Summary of Potential Off-Site Sources of Contamination**

Type of Land Use / Facility	Potential Contaminants of Concern	Distance and Direction from Site (km)
Commercial/Industrial: Adjacent agricultural land uses bounding the site	OCPs, OPPs, nutrients, herbicides, metals, TPH and MAHs	Adjacent to the northern and southern site boundary in all directions
Audit Site: 298-346 Clyde Road, Berwick.	OCPs and Metals	1.6 km to the west of the site
Audit Site: 358 Clyde Road, Berwick, Victoria	OCPs and Metals	1.6 km to the west of the site
Commercial: BP Service Station	TPH, MAHs, Phenols and Lead	1.7 km to the north west of the site
Audit Site: 950 Round Road, Cranbourne North, Victoria	Metals	2.7 km to the south west of the site
Commercial/Industrial: Land used for intensive Market Gardening	OCPs, OPPs, nutrients, herbicides, metals, TPH and MAHs	2.9 km to the west of the site
Industrial Facility: Cranbourne Abattoirs - Wagstaff Cranbourne) - 1500 Thompsons Road, Cranbourne, Victoria	Nutrients, microbiological and surfactants (from equipment wash down)	4.5 km to the west of the site
Industrial Facility: Dandy Pre-Mix Concrete – 1545 Thompsons Road, Cranbourne, Victoria	Lime/cement, Fly Ash, TPH/BTEX, PAHs, Phenols and Metals	4.1 km to the west of the site
Industrial Facility: TGS Sand and Soil – 1550 Thompsons Road, Cranbourne, Victoria	Nitrate, phosphate, ammonia, TPH and MAHs	4.5 km to the west of the site
Industrial Facility: Broadway and Frame Pre – Mixed Concrete – 1575 Thompsons Road, Cranbourne, Victoria	Lime/cement, Fly Ash, TPH/BTEX, PAHs, Phenols and Metals	4 km to the west of the site

Type of Land Use / Facility	Potential Contaminants of Concern	Distance and Direction from Site (km)
Industrial Facility: La Ionica facility – 1580 Thompsons Road, Cranbourne East, Victoria	Nutrients, microbiological and surfactants (from equipment wash down), TPH and MAHs	4 km to the west of the site

A number of off-site sources of contamination have been identified in the vicinity of the site. The majority of the identified sources are located significant distances (>1km) from the site and are therefore not considered to represent a significant risk of contamination to the subject site. The potential source of contamination in close proximity to the site, that is the surrounding agricultural land uses are considered to represent a low risk of causing contamination at the site. None of the off-site properties listed in Table 7 were inspected during the Stage 2 assessment.

7.1.3. Potential Receptors of Contamination

Potential receptors of contamination (should any exist) at or near the site include:

- Site workers at the site;
- Residents at the site (current and future);
- Future construction workers at the site;
- Visitors to the site;
- Underground utilities located on and around the site (including easements);
- Surrounding residents, occupants and visitors (via windblown contamination during excavation works);
- Sensitive land based ecosystems on and near the site; and
- The nearest surface water body (including aquatic ecosystems), namely Cardinia Creek located along the eastern site boundary.

7.1.4. Exposure Pathways & Routes

These potential receptors may be impacted through ingestion, inhalation or dermal contact of contaminants with potentially contaminated soil (on site) and groundwater (on and off site). Off site receptors (including humans and aquatic and land based ecosystems) may be impacted through the transport of contamination via a number of pathways such as trenches containing underground services (from the site to off site locations), storm water drainage networks, surface drainage via overland flow (runoff), groundwater flow and surface water transport (e.g. to and in the surface water bodies including minor drainage channels and farm dams within the site and Cardinia Creek).

7.2. Geotechnical Assessment

7.2.1. General

Based on the available geological information, it is anticipated that the western half of the site is underlain by tertiary sediments, including pyroclastics and possible mud flow deposits. The sub-surface profile in this area is generally expected to comprise sandy and silty clays. An indicative site classification of Class "M to H" is applicable to these conditions in accordance with Table D2 of AS2870-1996 – Residential slabs and footings - construction. Characteristic surface movements in the range of 20mm to 70mm may be anticipated for Class "M to H" sites. This classification would depend on the depth, thickness and reactivity of the clay material in this area.

The eastern half of the site is expected to be underlain by recent flood plain and stream deposits. The sub-surface profile in this area is generally expected to comprise silty clays and silty sands. The site classification in accordance with AS2870 would depend on the composition and thickness of these deposits and may range from Class "A to S" to Class "M to H". An indicative site classification of Class "M" may be adopted for this area of the site. Characteristic surface movements in the range of 20mm to 40mm may be anticipated for Class "M" sites.

It is noted that five former farm dams are known to have been backfilled across this site, and it is possible that additional areas of fill material may be present. A site classification of Class "P" would apply for areas where uncontrolled fill is encountered. A site classification of Class "P" requires that footings be designed on the basis of engineering principles as opposed to the adoption of the standard footing designs presented in AS2870.

The above site classifications are based on regional geological information and are intended for preliminary consideration only. Geotechnical site investigations including soil sampling and laboratory testing should be undertaken prior to the design and construction of any footing systems, pavements and associated civil infrastructure.

7.2.2. Site Inspection

No areas were specifically targeted for the geotechnical assessment, however at the time of the site inspection, surface water ponding was observed in the central area of the site. Based on our experience with similar ground conditions in the area, the soil profile is very moisture sensitive, which may present trafficability problems for construction equipment.

7.3. Hydrogeological Assessment

7.3.1. General

There is very limited lithology information for the bores drilled on the site, and therefore the hydrogeological characterisation is based on regional information described in **Section 5**. From the regional mapping, the main hydrogeological units at the site, from youngest to oldest are:

- Quaternary sand with silt and clay associated with drainage lines in the north and east of the site;
- Tertiary-aged pyroclastics and mud flow deposits associated with the Older Volcanics in the west of the site;
- Silurian fractured rock basement of the Melbourne Formation (siltstone).

Based on the available data, the hydrogeological model for the site is considered to be:

- The presence of two minor aquifers on site: the Quaternary sediments in the north and east of the site; and the fractured rock in the west of the site.
- These aquifers have a total thickness of less than 50m;
- Aquifers are unconfined at the surface, becoming semi-confined with depth;
- Recharge is from direct infiltration of rainfall, and potentially from irrigation of market gardens;
- Groundwater discharges locally to minor drainage channel in the centre of the site. Regional groundwater discharge is towards the southeast to Westernport Bay;
- The watertable occurs within all out cropping units at the site. Groundwater levels are likely to be between 3 m and 5 m below the surface to the west of the area, associated with the Silurian fractured rock. Groundwater levels are likely to be between 1.5 m and 3 m to the north and east of the site, associated with the alluvium. Greater depths to groundwater are expected where the Older Volcanics occurs, in the north west corner of the study area;
- Groundwater salinity is variable and can be expected to range between fresh and brackish (501 to 13,000 mg/L); and
- Hydraulic conductivity in the aquifers is in the order of 1 m/day, and transmissivity is less than 50 m^2/day.

7.3.2. Site Inspection

No areas were specifically targeted during the site inspection for the hydrogeological assessment. The GMS search conducted as part of the Stage 1 assessment identified the presence of one groundwater well on site. This groundwater monitoring well could not be located during the site inspection.

As noted in the section above, at the time of the site inspection some water logged areas were also observed on site in the centre area of the site. Before commencing development activities on site, it is important to confirm that the watertable is well below the surface, to ensure that groundwater is not the cause of water logging observed on site. Shallow water tables have the potential to cause implications for future development by causing groundwater inflows to drains, basements and any excavations. If shallow water tables are evident on site, this would require below ground structures to be either completely sealed, or have groundwater pumped out constantly and disposed of.

The depth to watertable mapping that was undertaken by SKM (2005) for the Cardinia Shire Council is considered a good source of watertable depth information. However, given that this mapping was undertaken for the period of 2004 and the change in rainfall patterns in recent years, it is recommended that new groundwater bores are constructed, in order to obtain a more accurate indication of watertable elevations in PSP 11. The installation of new groundwater bores will provide more recent and more site specific information relating to depth to groundwater in this area.

Six groundwater bores are proposed for construction within PSP 11. A summary of the bore locations, target aquifers and purpose is provided in Table 8. The locations of the proposed bores are shown in Figure 3.

- **Table 8 Summary of Proposed Sites for Groundwater Bore Construction**

Proposed Groundwater Bore Number	Proposed Groundwater Bore Location	Proposed Groundwater Bore Target Aquifer and Depth	Purpose of Groundwater Bore
1	North west corner of site	Older Volcanics aquifer; approximate depth of < 50 m	▪ This bore will provide site specific information relating to water table elevation in the basalt.
2	North of site	Unnamed Alluvium aquifer, approximate depth of < 25 m	▪ This bore will provide site specific information relating to water table elevation in the alluvial aquifer. ▪ This bore will also provide information regarding regional groundwater flow , when combined with information from other bores
3	Near the eastern boundary of the area	Unnamed Alluvium aquifer, approximate depth of < 25 m	▪ This bore will provide site specific information relating to water table elevation in the alluvial aquifer. ▪ This bore will also provide information regarding regional groundwater flow , when combined with information from other bores
4	South-east corner of the area	Unnamed Alluvium aquifer, approximate depth of < 25 m	▪ This bore will provide site specific information relating to water table elevation in the alluvial aquifer. ▪ This bore will also provide information regarding regional groundwater flow , when combined with information from other bores ▪ This bore can provide an indication of the relationship between groundwater and surface water in the area, as it is in close proximity to Cardinia Creek
5	Near the western boundary of the area	Silurian fractured rock aquifer, approximate depth of < 50 m	▪ This bore will provide site specific information relating to water table elevation in the fractured rock aquifer. ▪ This bore will also provide information regarding regional groundwater flow , when combined with information from other bores
6	To the south of the area	Silurian fractured rock aquifer, approximate depth of < 50 m	▪ This bore will provide site specific information relating to water table elevation in the fractured rock aquifer. ▪ This bore will also provide information regarding regional groundwater flow , when combined with information from other bores

8. Development Opportunities and Constraints

8.1. Site Contamination

Based on the information described in this report, there do not appear to be any significant constraints from a site contamination perspective which would render the land unsuitable for a particular land use. However, there are particular areas which have been identified as having a potentially high risk of contamination (see **Table 6**). It is likely that the identified areas of concern will comprise discrete or localised areas of contamination that can be cost-effectively remediated or managed. These areas will need to be assessed in greater detail, through an intrusive investigation including soil and groundwater sampling, before a more robust conclusion regarding the site's suitability for a particular land use can be made.

A long history of agricultural land uses has been identified within PSP Area 11. The DSE (2005) *Potentially Contaminated Land General Practice Note* recommends that such land undergo detailed Phase 1 and 2 environmental site assessments prior to change of land use to a more sensitive receptor, given the potential contamination that may result from agricultural use. This will require intrusive sampling, canvassing the entire site according to Australian Standards 4482 '*Guide to investigation and sampling of sites with potentially contaminated soil'*, and submitting these samples to an appropriate NATA accredited laboratory for analysis. The results, and all other information gathered regarding the site use history will be used by an accredited EPA Auditor to form an opinion regarding the proposed future uses of the site.

The EPA list of sites with Statements and Certificates of Environmental Audit (**Section 6.3**) also demonstrates that agricultural land practices are a potential source of contamination to soil and groundwater. Therefore further, more detailed site specific investigations would be required prior to change of land use for more sensitive uses.

Phase 1 and 2 assessments may be completed as part of a statutory Environmental Audit prior to the re-zoning of land to a more sensitive use in accordance with the *Environment Protection Act 1970*. This may be considered a potential constraint due to the time and costs required to complete an Environmental Audit. If an audit results in a Statement of Audit (not a Certificate of Audit), the Statement may also specify site management measures that may constrain future development.

8.2. Geotechnical

Based on the available information, there does not appear to be any key geotechnical or geological constraints that indicate the area is unsuitable for development. However, the following issues require consideration in the planning and design of any development, and should be assessed through a geotechnical site investigation:

- The composition, thickness and reactivity of the tertiary and recent deposits which characterise the surface geology across the site would determine the site classification for foundation design. The recent flood plain and stream deposits and the tertiary sediments, including pyroclastic and mud flow material, may comprise highly reactive soils;
- The location and extent of any fill material, including likely deep filling of the known former farm dams, is expected to be uncontrolled and may not be suitable as a founding material in its current state;
- Potential soft sediments in the vicinity of the Cardinia Creek floodplain may provide low bearing capacities for potential developments;
- Potential near-surface groundwater in the vicinity of Cardinia Creek, which could rise in the event of flooding. Consideration of developing part of this area (which slopes down towards the creek) on an engineered fill platform, or construction of a water retarding structure, may be required.

8.3. Hydrogeological

The hydrogeological constraints to future development relate mainly to the shallow depth of the water table at the site. Excavations may intersect the watertable and cause groundwater to flow into underground structures, requiring either that water is collected and disposed, or that underground structures are fully lined to prevent inflows. The depth of the watertable at the site must be confirmed to determine whether a shallow watertable is an actual constraint.

Paving the site will reduce recharge to the underlying aquifers, which could also reduce discharge to nearby surface water features. Since the surrounding area is already developed, reduction in recharge is unlikely to have significant impacts.

Several opportunities exist in relation to the use of groundwater. Depending on groundwater quality (salinity and contamination) and aquifer transmissivity at the site, there may be the opportunity to install bores for stock and domestic uses, such as watering gardens. Depending on aquifer transmissivity, higher volume uses could also be considered, such as irrigation for public reserves or ovals. This would reduce reliance on mains water. The site is located within the Koo Wee Rup WSPA, however, which may limit the ability to extract water for larger-scale uses.

Other potential options which could be explored include:

- Managed Aquifer Recharge (MAR) – this technique uses the aquifer as a storage facility. Excess water (for example rainfall runoff during winter) can be captured, injected into the aquifer, and stored until the water was required for use in a drier period. Generally, MAR schemes capture and store water during winter, and extract water for use in summer. To store large volumes of water in this way, a deeper watertable or a confined aquifer is preferable.

- Aquifer Thermal Energy Storage (ATES) – this technology uses groundwater to efficiently heat and cool buildings. Groundwater maintains a relatively stable temperature throughout the year, which can be augmented so that one area contains warm groundwater, while another contains cool groundwater. Groundwater is then pumped between the warm and cool areas on an annual basis, and passed through a heat exchanger which uses the thermal energy stored in the groundwater to heat or cool a building. For example in winter, groundwater would be extracted from the warm area, and passed through the heat exchanger, before being injected into the cold groundwater area. The direction of flow is reversed in summer, to cool the building. The flow of water between areas of warm and cool groundwater maintains the temperature gradient required to heat or cool the building. Sites with deeper watertables and confined aquifers are more conducive to such systems.

Both of the above options are more likely to be feasible if watertables are deep, aquifer transmissivity is high, and confined or semi-confined aquifer are present. Existing information suggests these requirements may not be fulfilled at the site, however drilling and aquifer testing would be required to confirm this.

9. Planning Considerations

A desktop planning assessment was conducted to identify potential land use and approvals risks and opportunities associated with the development of PSP Area 11. The findings of the desktop assessments are presented in the following sections.

9.1. Planning Context

The *Planning and Environment Act* 1987 allows certain documents to be incorporated in a planning scheme by reference within the Table to Clause 81.01 or the Schedule to Clause 81.01 of the relevant planning scheme. PSPs are incorporated documents and as such should be incorporated and read as part of the planning scheme.

The Urban Growth Zone (UGZ) applies to land that has been identified for future urban development within the Urban Growth Boundary. In the UGZ, the PSP is the long term strategic plan that allows the conversion of non-urban land to urban land. One of the main purposes of the PSPs is to identify and address any opportunities and constraints that will affect future urban development.

The planning system is the primary means for regulating land use and approving development and is an important mechanism for triggering the consideration of potentially contaminated land. As part of this assessment, a review of the Casey Planning Scheme has been undertaken. This included state and local policy, zones, overlays and relevant particular provisions which currently apply to the land occupied by existing potentially contaminating uses, and provides the relevant consideration of this issue if these land uses change in the future.

9.2. State, Municipal and Local Planning Policy Framework

The State Planning Policy Framework (SPPF) contains general principles for land use and development in Victoria and specific policies relating to strategic issues of State significance which must be considered by responsible authorities when planning decisions are made. It applies on a state wide basis.

The Local Planning Policy Framework (LPPF) is a statement of the key strategic planning, land use and development objectives for each municipality and the strategies and actions for achieving these objectives. The Municipal Strategic Statement (MSS) establishes the strategic planning framework while the Local Planning Policies (LPP) provides the policy statements to achieve the vision for a municipality.

The following tables provide an outline of the state, municipal and local planning policy objectives relevant to the assessment of buffers within the PSP area.

Table 9. State Planning Policy

Planning Policy	Policy Objective
State Planning Policy Framework	
Clause 12 – Metropolitan Development	The purpose of this Clause 12.01 (A more compact city) is to facilitate sustainable development that takes full advantage of existing settlement patterns, and investment in transport and communication, water and sewerage and social facilities. One of the strategies contained in this policy for the better management of metropolitan growth through the development of PSP consistent with the applicable Precinct Structure Plan Guidelines approved by the Minister for Planning to: ■ Ensure greater housing choice, diversity and affordability. ■ Develop vibrant, well serviced activity centres. ■ Provide sustainable transport networks. ■ Deliver accessible community facilities and infrastructure. ■ Create multi-use, linked open space networks. ■ Boost employment and commercial activity. ■ Increase environmental sustainability.
Clause 15 – Environment	Clause 15.04 refers to air quality and seeks to prevent the reduction in community amenity by air emissions by ensuring, wherever possible, that there is suitable separation between potentially amenity reducing and sensitive land uses and developments. Consideration should be given to *Recommended Buffer Distances for Industrial Residual Air Emissions* (EPA 1990) to determine the extent of separation.
	Clause 15.06 refers to soil contamination and seeks to ensure that potentially contaminated land is suitable for its intended future use and development, and that contaminated land is used safely. Clause 15.06-2 refers to *Ministerial Direction No.1* and outlines requirements for applications for use of land or known to have been used for industry, mining or the storage of chemicals, gas, wastes or liquid fuel.
	Clause 15.05 seeks to assist the control of noise effects on sensitive land uses by ensuring that development is not prejudiced and community amenity is not reduced by noise emissions, by planning tools such as land use separation.

Table 10. Local Planning Policy

Casey Planning Scheme	
Municipal Strategic Statement	
Clause 21.02– Key Influences	This policy outlines five regions of the municipality of Casey, including ■ The Foothills ■ The Built-up Area ■ The Urban Fringe ■ The Farm ■ The Bay. The main planning issues affecting the Urban Fringe are: ■ Rapid urban growth

Casey Planning Scheme	
	■ Provision of physical and social infrastructure, particularly roads ■ Poor access to activity centres and employment opportunities ■ Social and physical isolation ■ Lack of identify or sense of belonging to an established community ■ Conflict between urban and other uses, such as rural and extractive industries. ■ Threat from inappropriate development which may optimise future residential development of an area.
Clause 21.06 – The Urban Fringe	The objectives of this policy are: ■ To ensure development occurs in an orderly manner. ■ To ensure the timely provision of physical and social infrastructure. ■ To improve access to activity centres and employment opportunities. ■ To foster the development and growth of new residential communities. ■ To minimise conflict between urban and non-urban uses. ■ To ensure that any interim development does not compromise the future urban use of the land. A strategy of this policy is to ensure land adjacent to quarries or refuse tips is not developed for residential purposes unless there is no threat to the safety and amenity of future residents and appropriate buffers are provided.
Clause 21.09 – Building New Communities	The objectives of this policy are: ■ To ensure residential land is used efficiently so that existing land zoned for this purpose is consumed less quickly and future residential growth is not directed to areas that are remote and less suitable for urban development. ■ To ensure that residential subdivision of new areas occurs in an orderly manner. ■ To develop a more rounded and balanced community structure by making new communities more appealing to a wider range of people. ■ To foster a sense of belonging amongst residents by providing visible clusters of local facilities to encourage resident interaction on a regular basis. ■ To build community pride through providing an attractive and functional physical environment that local communicates can call their own.
Clause 21.11 - Employment	The objectives of this policy include: ■ To expand the number of employment opportunities within Casey. ■ To provide employment opportunities in and around activity centres. ■ To make employment centres more accessible to all modes of transport. ■ To protect the limited supply of industrial land in the municipality from inappropriate land uses. Some strategies to achieve these objectives are: ■ Encourage the retention of industrial zones primarily for industrial purposes. Exceptions can be made for non-industrial uses that complement industrial zones, such as takeaway premises, or for uses that do not prejudice the use of nearby land for industrial purposes. ■ Discourage the rezoning of industrial zones to other zones except in exceptional circumstance where it can be demonstrated that there is a significant net benefit to the community.
Local Planning Policy Framework	
Clause 22.01 –	This policy applies to all land contained within the Urban Growth Boundary and

Casey Planning Scheme	
Future Urban Areas Policy	identified for future urban purposes in the Casey-Cardinia Growth Area Framework Plan. The objectives of this policy are to: ■ To identify land which may be suitable for urban purposes in future. ■ To prevent such land from being used or developed in a manner which could prejudice its possible future use for planned urban purposes.
Clause 22.05 – Residential Development Policy	This policy applies to all land zoned residential with the objectives: ■ To provide a planning framework to guide the orderly development of residential land that is responsive to community aspirations for housing needs. ■ To identify existing environmental features, land uses and constraints which need to be considered in the development of land for urban purposes. ■ To identify requirements in relation to the provision of transport infrastructure, utility services, community facilities, open space and other land use matters which are necessary to serve the needs of the local and wider community. ■ To create a high quality living environment recognising environmental sustainability.

9.3. Zones and Overlays

Although there were a number of potentially contaminating land uses identified in the vicinity of PSP Area 11 (see **Table 6** and **Table 7**), this PSP area is located well outside the threshold distances/buffer zones for the identified potentially contaminating land uses, therefore no zones and overlay information with respect to the buffer distances have been provided.

Potentially contaminating activities in the area that do not require buffers include farming, market gardens and occasional light commercial use.

9.4. Future Land Use

If a 'sensitive use' (e.g. a proposal to rezone land to a residential use) is proposed on potentially contaminated land, consideration needs to be given to *Ministerial Direction No. 1- Potentially Contaminated Land (Direction No. 1).* The purpose of this direction is:

> *"to ensure that potentially contaminated land us suitable for a use which is proposed to be allowed under an amendment to a planning scheme and which could be significantly adversely affected by any contamination."*

The Direction requires a planning authority to satisfy itself that the environmental conditions of potentially contaminated land or area will be suitable for a use proposed, through an environmental audit.

The Direction defines uses including residential use, a child care centre, pre-school or primary school as 'sensitive uses'.

An environmental audit is provided for under the *Environment Protection Act* 1970 and involves an independent assessment of the condition of a site and requires an environmental auditor to form an opinion about its suitability for the proposed use.

The Environmental Audit Overlay (EAO) is a mechanism provided in the *Victorian Planning Provisions* and planning schemes to ensure the requirement for an environmental audit under *Direction No. 1* is met before the commencement of the sensitive use or any buildings and works associated with that use. The application of the overlay ensures the requirement will be met in the future but does not prevent the assessment and approval of a planning scheme amendment (e.g. rezoning).

By applying the overlay, the planning authority has made an assessment that the land is potentially contaminated, and is unlikely to be suitable for a sensitive use without more detailed assessment and remediation works or management. By applying the EAO the planning authority is also determining that the requirements of *Direction No. 1* may be deferred.

The EAO should not be used simply as a means of identifying land that is or might be contaminated, and previous zoning is not a sufficient reason to justify the application of an EAO. As stated in the Explanatory Statement to *Direction No. 1* it may only be appropriate to defer audit requirements (through the application of an EAO) if testing of the land before a notice of amendment is given is difficult or inappropriate.

Additionally, before deciding on a planning permit application, Section 60 of the *Planning and Environment Act* 1987 requires a responsibility to consider:

> *"any significant effects which the responsible authority considers the use or development may have on the environment or which the responsible authority considers the environment may have on the use or development."*

9.5. Key Contacts

City of Casey : 03 9205 5200

Michael Pollard (Acting, Planning Manager)

Duncan Tuner (Planning Manager) – currently on secondment

EPA Southern Metro: 03 8710 5555

9.6. Conclusion

Although there were a number of potentially contaminating land uses identified in the vicinity of PSP Area 11, this PSP area is located well outside the threshold distances/buffer zones for the

identified potentially contaminating land uses and is therefore those land uses are not expected to impede future development of the area.

Potentially contaminating activities in the area that do not require buffers include farming, market gardens and occasional commercial or light industrial use.

10. Conclusions and Recommendations

10.1. Conclusions

Site Contamination Assessment

Based on the information gathered during this assessment, the following conclusions can be made:

- The site history assessment found that the site has had a long history of agricultural land uses dating back to at least the 1850s;
- A review of current aerial photography indicates that the site is currently used for agricultural purposes;
- Based on the available information, site history assessment and the site inspection the following potential sources of contamination have been identified on site:
  - Application of agricultural chemicals to crops or stock across the site (including broad application) (all properties);
  - Possible use of imported fill material to level site (all properties);
  - Farm property with residence and farmyard infrastructure including sheds and storage yards potentially used for chemical storage (fuels, oils, fertilisers, herbicides, insecticides and pesticides) and machinery maintenance (Property 1 and 2 on Figure 4a);
  - Two aboveground storage tanks (ASTs) and numerous fuel drums distributed in the vicinity of the farm yard storage areas (Property 1 and 2 on Figure 4a);
  - One petrol bower and (inferred) underground storage tank (UST) was identified near vehicle maintenance shed (Property 1 and 2 on Figure 4a);
  - One diesel UST and associated bowser was identified near the vehicle maintenance shed (Property 1 and 2 on Figure 4a);
  - A number of sheds were observed on-site including (Property 1 and 2 on Figure 4a):
    - Main vehicle shed that housed tractors and a stock of herbicides and pesticides. Minor staining of the concrete floor of the shed was noted;
    - Secondary vehicle shed housed obsolete tractors;
    - Vehicle maintenance garage used for the storage of vehicles, parts and maintenance equipment; and
    - Other minor sheds on the property used for the storage of sheets of tin, old equipment and old containers of unknown contents.
  - Five farm dams which have been filled with fill material of an unknown origin (Property 1 and 2 on Figure 4a);
  - Former stockyard in the north of the site, now dismantled(Property 2 on Figure 4a); and

- Piles of waste materials within the farm property storage yards including concrete, metal piping and disused farm machinery and equipment (Property 2 on Figure 4a).

- A number of potential off-site sources of contamination have also been identified in the vicinity of the site (see **Section 7.1.2**). The majority of the identified sources are located significant distances (>1km) from the site and are therefore not considered to represent a significant risk of contamination to the subject site or are considered to represent a low risk of contamination to the site;
- Based on the information obtained from the sources described in this report, there does not appear to be any significant constraints from a site contamination perspective which would render the land unsuitable for a particular land use. Localised contamination is likely to be able to be effectively remediated or managed.

Geotechnical Assessment

Based on the available geological information, it is anticipated that the western half of the site is underlain by tertiary aged continental sediments including pyroclastics and possible mud flow deposits. The eastern half of the site is expected to be underlain by recent flood plain and stream deposits comprising silty clays and silty sands. Indicative site classifications of Class "M to H" (for the western half) and Class "M" (for the eastern half) have been assessed in accordance with AS2870.

Estimated allowable bearing capacities of 50kPa to 100kPa have been provided for the geological units mapped in this area. However, it is noted that soft materials recorded in the relevant borehole log. As such, it is considered important to perform further geotechnical testing in this area in order to assess the depth and lateral extent of this soft material and its suitability as a founding material.

Key geotechnical issues associated with development of the site include the potential presence of highly reactive soils in the west and soft soils with near surface groundwater levels in the east. Fill material, including likely deep filling of the known former farm dams, is expected to be uncontrolled and may not be suitable for development in its present state. In addition, surface water ponding may occur after periods of rain, which may present trafficability constraints.

Hydrogeological Assessment

There is limited hydrogeological information specific to the site area. Based on the available regional data, the hydrogeological model for the site is considered to be:

- The presence of two minor aquifers on site: the Quaternary sediments in the north and east of the site; and the Older Volcanics in the west of the site.
- These aquifers behave as a single unit, and have a total depth of less than 50m;
- Aquifers are unconfined at the surface, becoming semi-confined with depth;

- Recharge is from direct infiltration of rainfall, and potentially from irrigation of market gardens;
- Groundwater discharges locally to Cardinia Creek in the centre of the site. Regional groundwater discharge is towards the southeast to Westernport Bay;
- The watertable occurs within all out cropping units at the site (including the Quaternary sediments, Tertiary Volcanics, and Silurian basement). Groundwater levels are shallow and are potentially less than 5m deep in the south of the site, and less than 3m deep in the north of the site;
- Groundwater salinity is variable and can be expected to range between fresh and brackish (501 to 13,000 mg/L);
- Hydraulic conductivity in the aquifers is in the order of 1 m/day, and transmissivity is less than 50 m^2/day.

The primary constraint for development is expected to be the shallow watertable, which may cause groundwater inflow to excavations. Opportunities include the potential for small-scale groundwater use, MAR and ATES, however the feasibility of these options can be better assessed when groundwater levels and aquifer properties have been confirmed.

10.2. Recommendations

Further assessment of the identified site contamination, hydrogeological and geotechnical issues are recommended to determine the suitability of the site for the proposed land uses and to confirm that future buildings and infrastructure (roads and underground service networks) are appropriately designed. Further assessment works may include, but are not limited to, the following activities:

- Drilling and collection of soil samples from grid based and targeted locations (e.g. former in-filled farm dams, storage yards and shed) to test the soil for potential contaminants of concern and also assess the geotechnical soil and rock properties for foundations, engineered fill platforms and pavements;
- Drilling and installation of groundwater monitoring wells to determine the depth to groundwater, sampling of the groundwater to assess for potential contaminants of concern and aquifer hydraulics testing to determine aquifer properties;
- Excavation and removal of underground storage tanks, soil remediation and tank pit validation; and
- Removal of other potentially contaminating infrastructure (i.e. septic tanks and above ground storage tanks) followed by validation of remaining soil quality.

We understand that the proposed future use of the site is as future land supply for various land uses including sensitive uses such as residential and community facilities in addition to open space, retail and a range of business uses such as office, light industrial and manufacturing. As no specific land uses have been allocated to individual parcels of land, further assessment for site

contamination, geotechnical or hydrogeological purposes is not considered appropriate at this point in time. An informed investigation strategy can be prepared once further information on the proposed land uses for specific areas of the site is available. Future intrusive assessment works should be timed to coincide with the cessation or scaling down of current site operations and prior to the commencement of the proposed development and construction works.

Further testing of the site is likely to be required based on the findings of this investigation. In accordance with the DSE General Practice Note (DSE, 2005), areas of the site would be classified as high or medium potential for contamination depending on the end site use. The level of further assessment needed will be intrusive, requiring collection of soil and/or groundwater samples from grid and/or targeted sample locations in accordance with Australian Standards AS4482.1-2005. Samples may be collected using a drill rig to drill soil bores or install groundwater monitoring wells at selected locations, or with a backhoe or excavator to excavate test pits. Soil and groundwater samples should be submitted to a NATA accredited laboratory for analyses of selected analytes.

It is also recommended that the GAA approach the Casey City Council to determine the requirement for a formal environmental audit at the site, as per ministerial direction No. 1 - Requirement for environmental audit (DSE General Practice Note, *Potentially Contaminated Land* (June 2005). If an environmental audit of the site is required in accordance with Part IXD of the *Environment Protection Act 1970*, a period of at least 6 months prior to development should be allowed to progress through the audit process. It is likely that a longer period of time will be required should significant contamination be identified at the site, to allow for remediation works.

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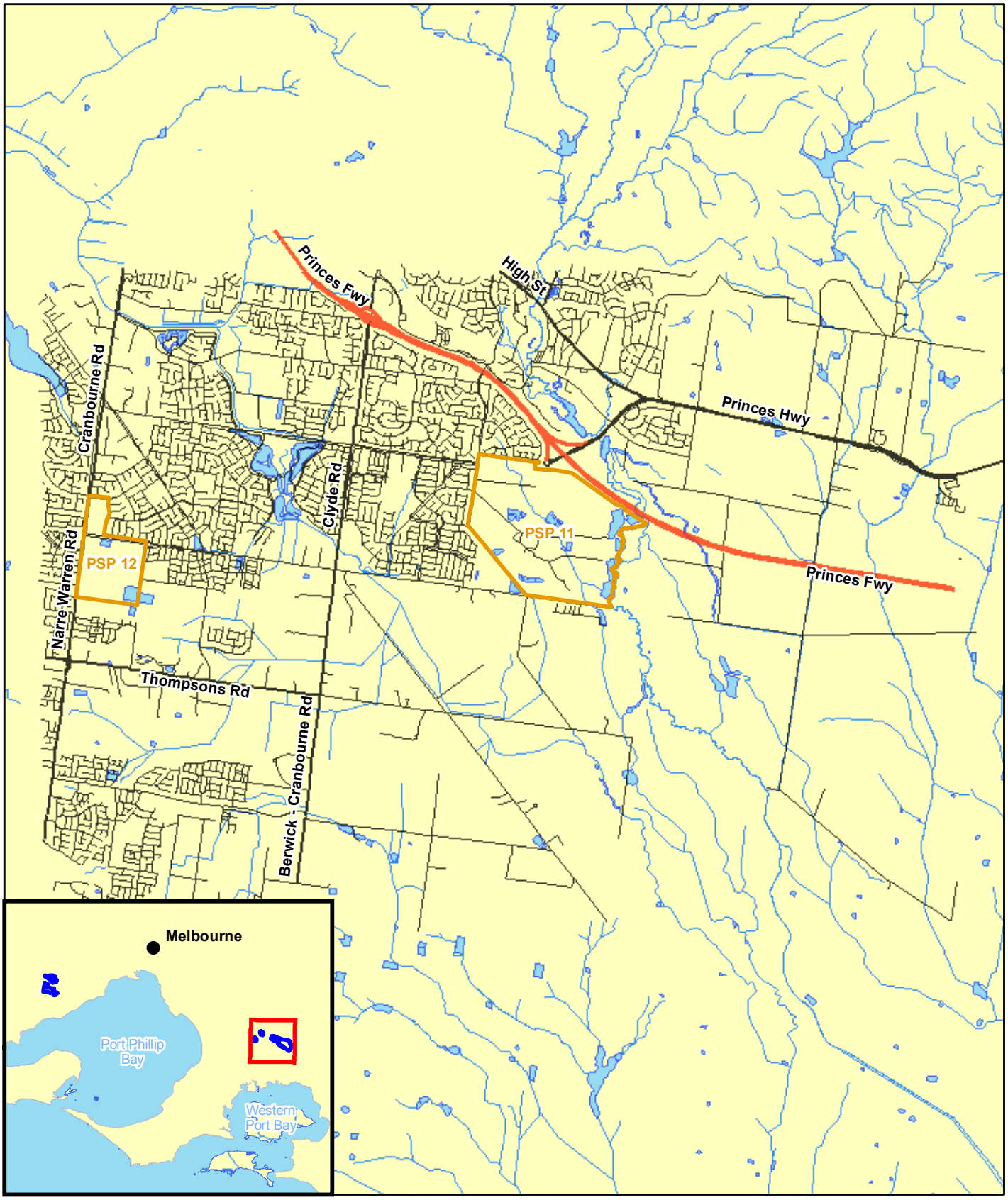
Figures

Figure 1 - Site Location Plan



Stage 1 - Desktop Site Contamination, Hydrogeological and Geotechnical Assessment
Growth Areas Authority

LEGEND

- PSP Boundary
- Highway
- Major Road
- Minor Road
- Watercourse
- Waterbodies

N

0 2

Kilometres

SKM

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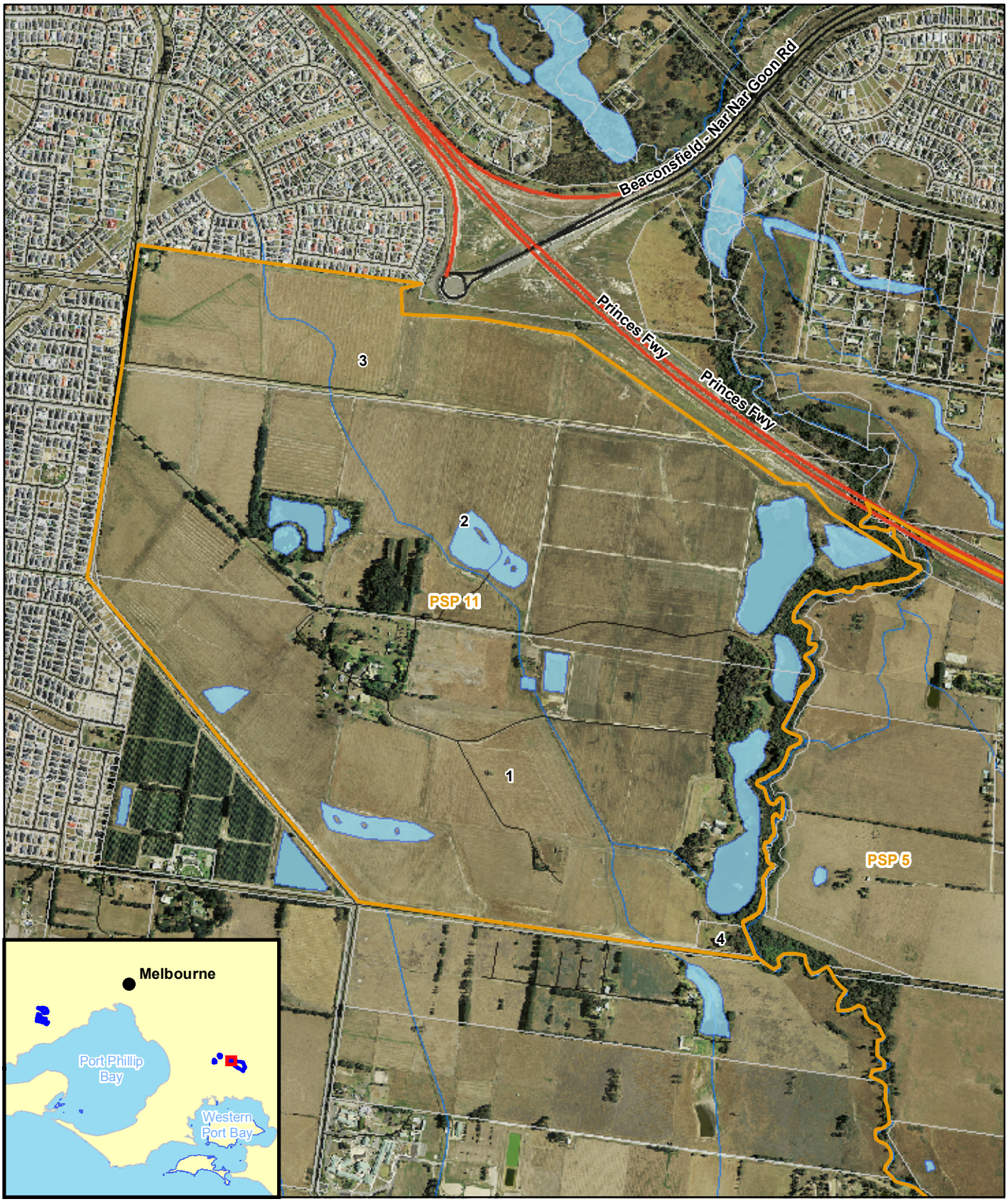
Figure 2 - PSP 11 Site Layout Plan



Stage 1 - Desktop Site Contamination, Hydrogeological and Geotechnical Assessment
Growth Areas Authority

LEGEND

- PSP Boundary
- Highway
- Major Road
- Minor Road
- Watercourse
- Waterbodies
- Cadastre

N

0 0.5

Kilometres

SKM

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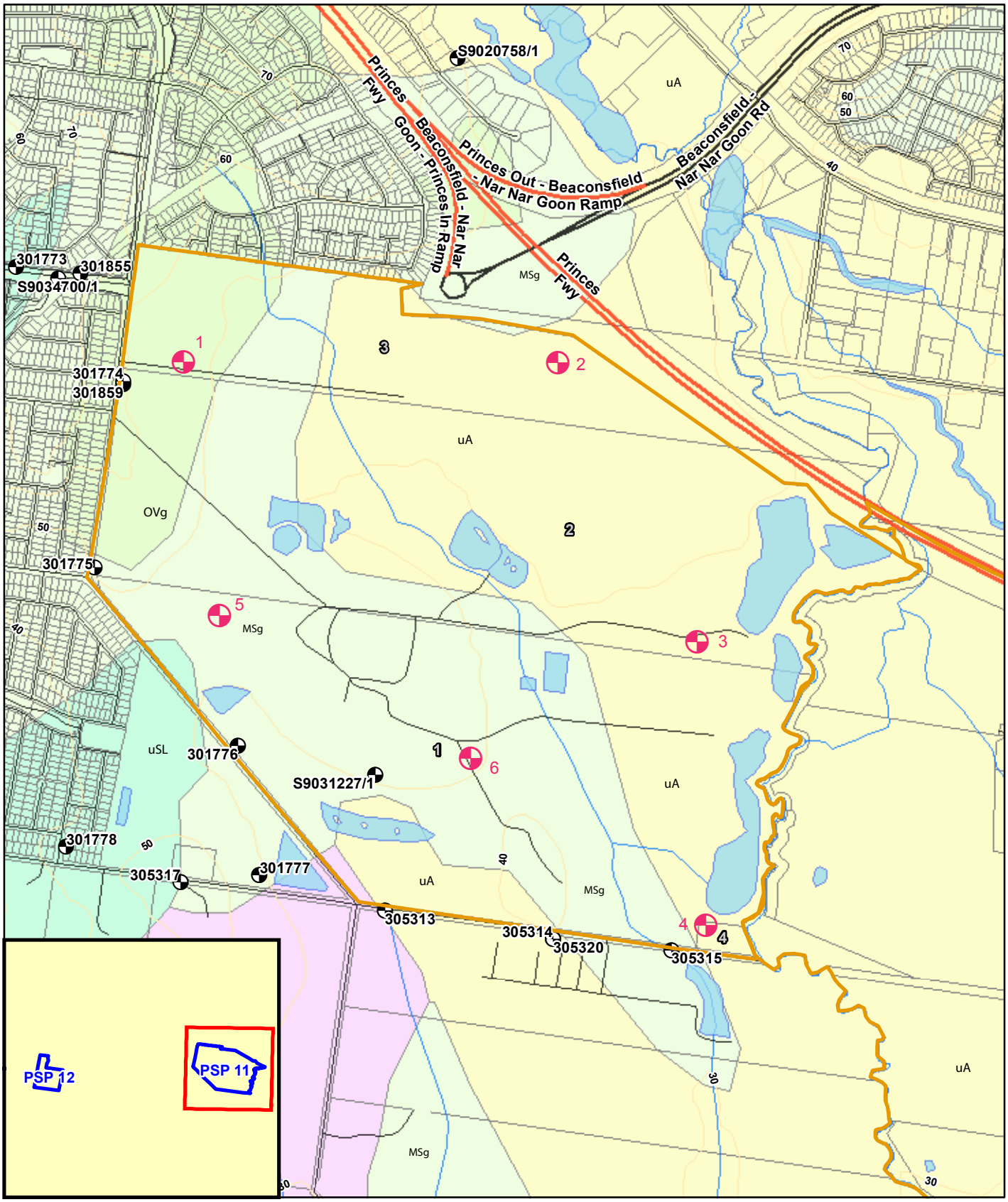
Figure 3 - PSP 11 Site Setting Plan



Stage 1 - Desktop Site Contamination, Hydrogeological and Geotechnical Assessment
Growth Areas Authroity

- Groundwater Bore
- PSP Boundary
- Highway
- Major Road
- Minor Road
- Contour (10m)
- Cadastre
- Watercourse
- 4 Proposed Groundwater Bore
- Waterbody

Surface Geology

- uA Unnamed alluvium
- Unnamed colluvium
- Unnamed dune deposits
- uSL Unnamed swamp and lake deposits
- unnamed hornfels
- Andersons Creek Formation
- Baxter Sandstone
- Brighton Group
- Dargile Formation
- Humevale Siltstone
- Lysterfield Granodiorite
- Moorabool Viaduct Sand
- MSg Murrindindi Supergroup
- OVg Older Volcanic Group
- Tynong Granite

0 0.4
Kilometres

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SKM

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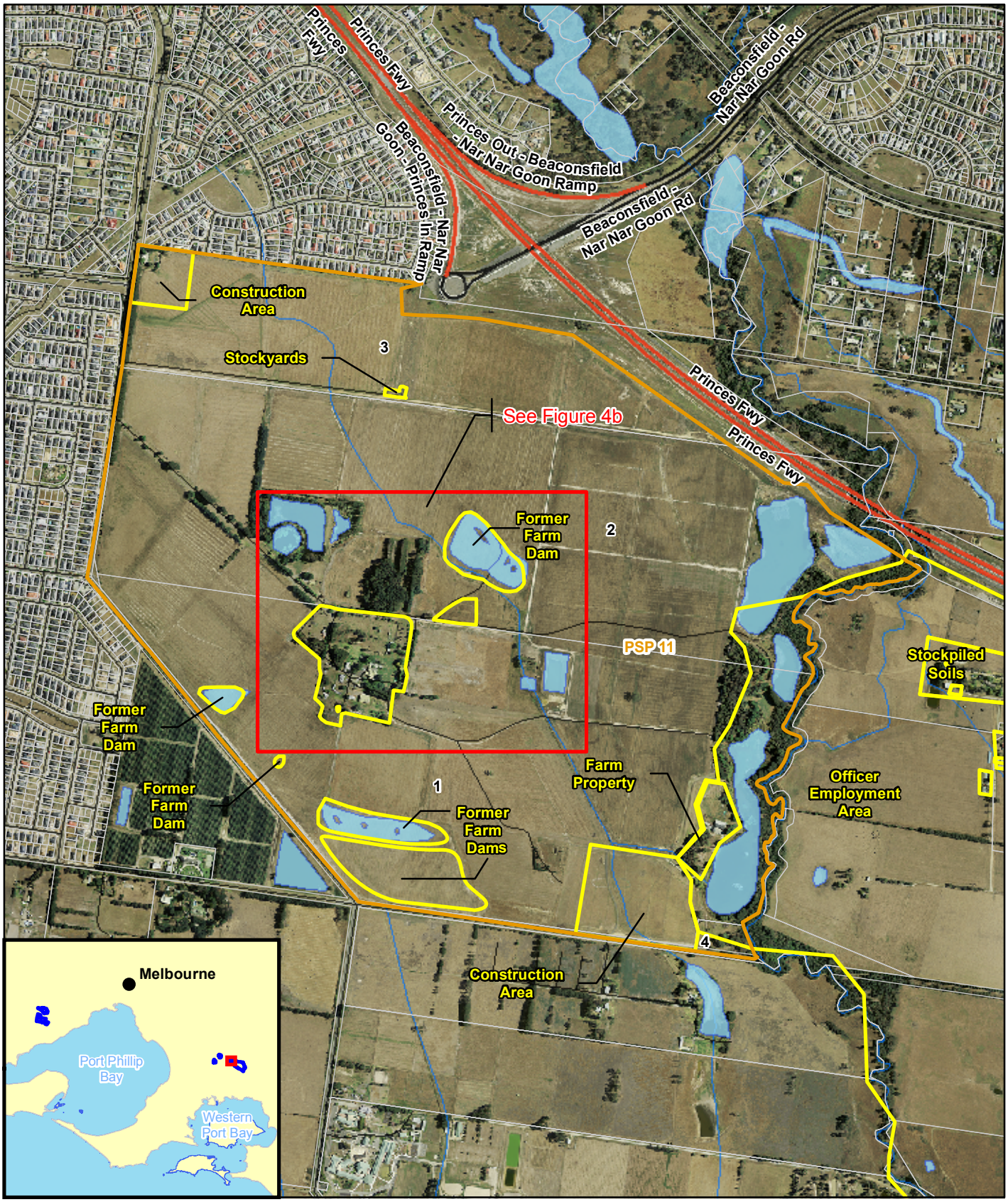
Figure 4a - PSP 11 Potential Sources of Contamination



Stage 1 and 2 - Desktop Site Contamination, Hydrogeological and Geotechnical Assessment
Growth Areas Authority

LEGEND

- PSP Boundary
- Off-Site Potential Contamination
- On-Site Potential Contamination
- Cadastre
- Highway
- Major Road
- Minor Road
- Watercourse
- Waterbodies

N

0 500
Meters

SKM

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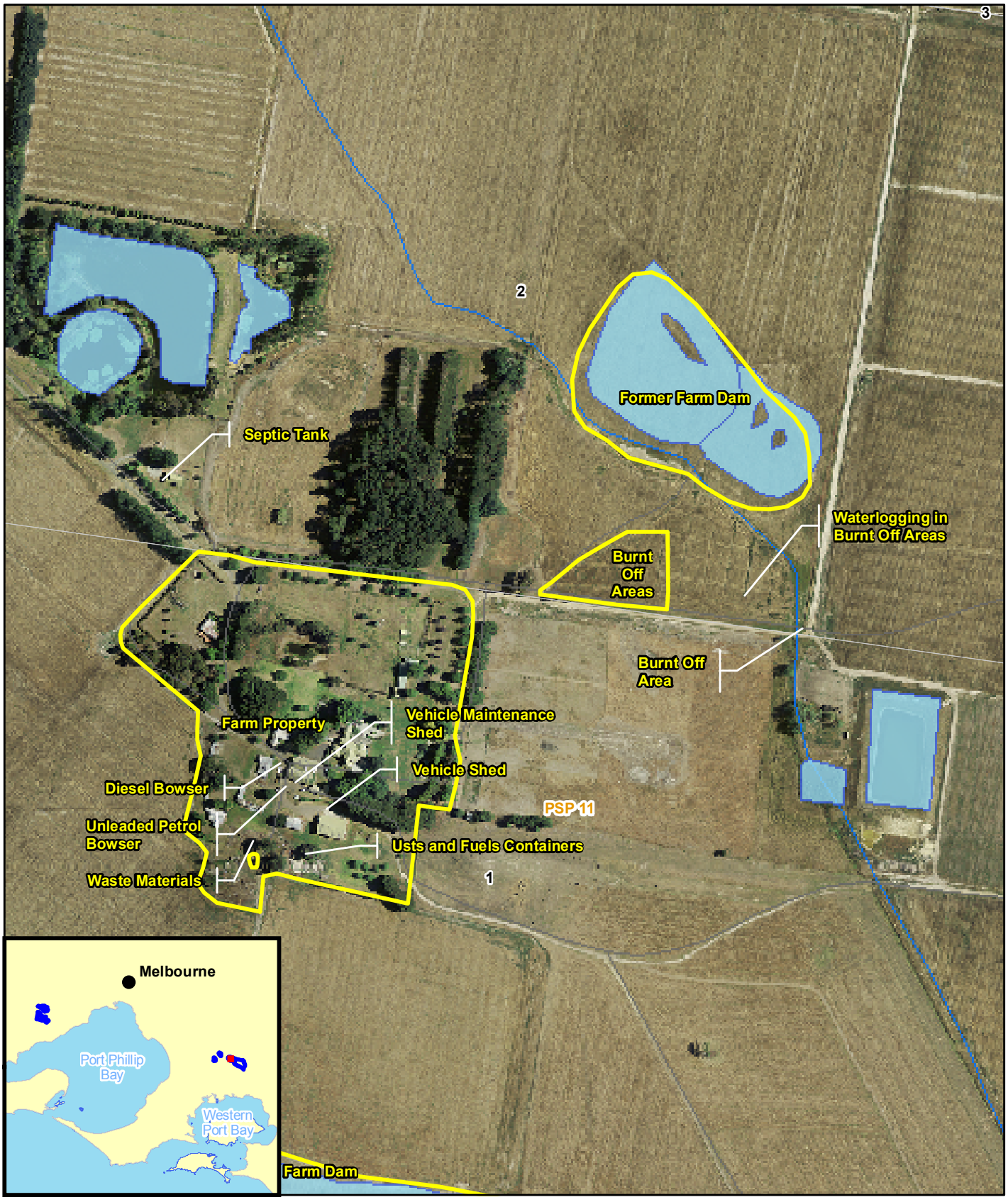
Figure 4b - PSP 11 Potential Sources of Contamination



Stage 1 and 2 - Desktop Site Contamination, Hydrogeological and Geotechnical Assessment
Growth Areas Authority

LEGEND

- PSP Boundary
- On-Site Potential Contamination
- Cadastre
- Highway
- Major Road
- Minor Road
- Watercourse
- Waterbodies

N

0 100

Metres

SKM

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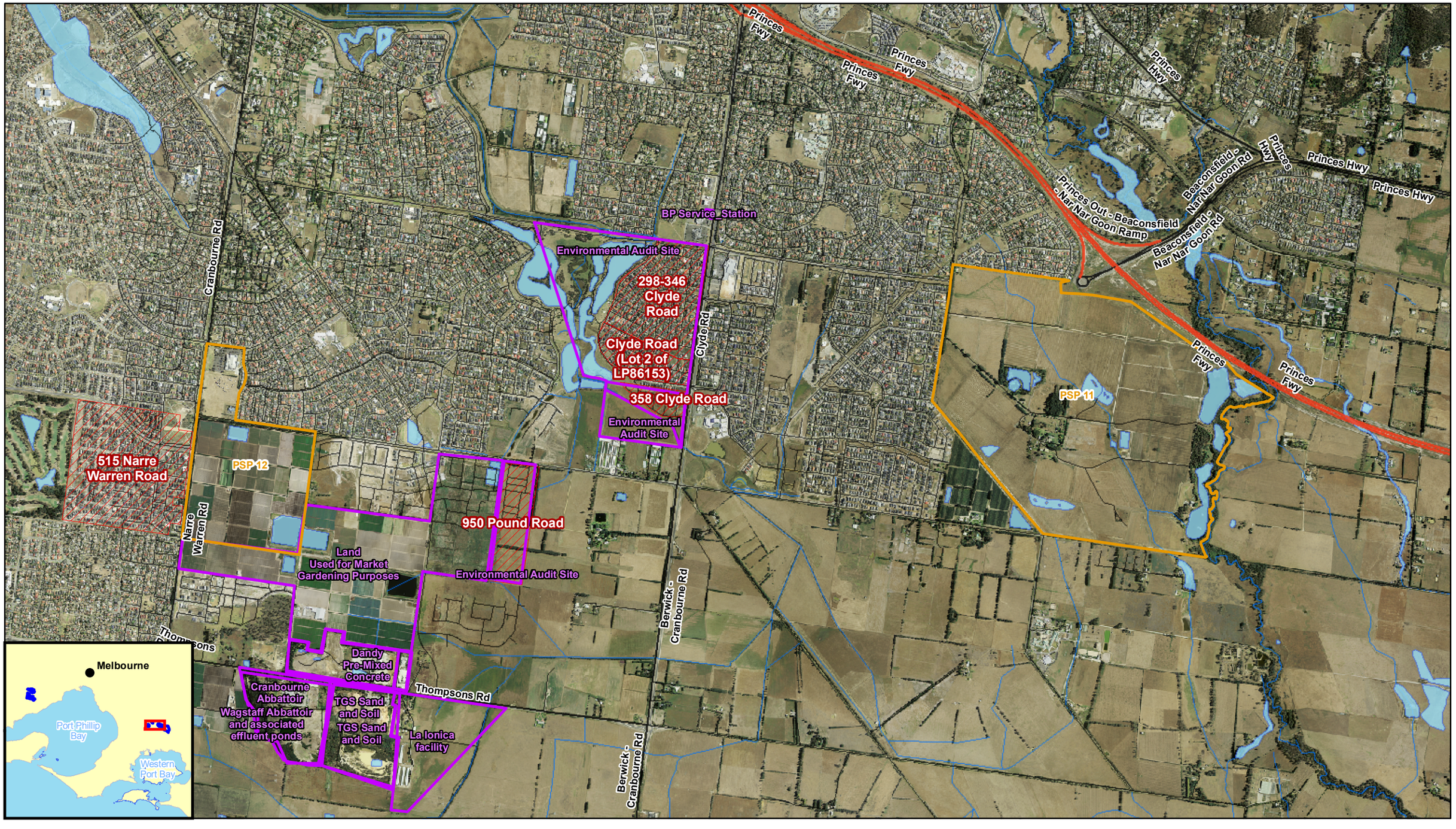
Figure 5 - PSP 11 and PSP 12 Potential Sources of Offsite Contamination



Stage 1 - Desktop Site Contamination, Hydrogeological and Geotechnical Assessment
Growth Areas Authority

LEGEND

- PSP Boundary
- Off-Site Potential Contamination
- EPA Audit Site
- Highway
- Major Road
- Minor Road
- Watercourse
- Waterbodies

N

0 1

Kilometres

SKM

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Appendix A SEPP Information

Land SEPP

Land Use Categories

The following land use categories are defined in Clause 9(1) of the Land SEPP:

- *"Sensitive uses: consisting of land used for residential use, a child care centre, pre-school, or primary school. A sensitive use may occur in an area of high density)where development makes maximum use of available land space and there is minimal access to soil) or in Other low density areas (where there is generally substantial access to soil)";*
- *"Agricultural: consisting of rural areas involved in agricultural or horticultural practices"*
- *"Parks and Gardens: consisting of parks and forested area as defined in any Victorian or Commonwealth legislation or subordinate legislation, or any regions designated by the Authority or Department of Natural Resources and Environment"*
- *"Recreation / Open Space: consisting of general open space and public recreation areas";*
- *"Commercial: consisting of a range of commercial and business activities"; and*
- *"Industrial: consisting of utilities and a range of industrial activities".*

We understand that the end use of the site is yet to be determined and may comprise one or more of the above land uses.

Beneficial Uses of Land to be Protected

The Land SEPP (2002) states that the following beneficial uses must be protected for the following land uses:

- **Table A-1. Beneficial Uses of Land**

Land Use/ Beneficial Use	Parks & Reserves	Agricultural	Sensitive Use		Recreation / Open Space	Commercial	Industrial
			High Density	*Other*			
Maintenance of Ecosystems							
a) Natural Ecosystems	✓						
b) Modified Ecosystems	✓	✓		✓	✓		
c) Highly Modified Ecosystems		✓	✓	✓	✓	✓	✓
Human Health	✓	✓	✓	✓	✓	✓	✓
Buildings and	✓	✓	✓	✓	✓	✓	✓

Land Use/ Beneficial Use	Parks & Reserves	Agricultural	Sensitive Use		Recreation / Open Space	Commercial	Industrial
			High Density	*Other*			
Structures							
Aesthetics	✓		✓	✓	✓	✓	
Production of food, flora & fibre	✓	✓		✓			

Groundwater SEPP

Beneficial Uses of Groundwater to be Protected

- **Table A-2. Beneficial Uses of Groundwater**

	Segment (TDS)				
Beneficial Use / Segment	**Segment A1 (0-500 mg//L)**	**Segment A2 (501-1000 mg//L)**	**Segment B (1001-3500 mg//L)**	**Segment C (3501-13000 mg/L)**	**Segment D (> 13,000 mg/L)**
Maintenance of Ecosystems	✓	✓	✓	✓	✓
Potable Water Supply					
a) Desirable	✓				
b) Acceptable		✓			
Potable Mineral Water Supply	✓	✓	✓		
Agricultural, parks & gardens	✓	✓	✓		
Stock Watering	✓	✓	✓	✓	
Industrial Water Use	✓	✓	✓	✓	✓
Primary Contact Recreation	✓	✓	✓	✓	
Buildings and Structures	✓	✓	✓	✓	✓

Appendix B Chadwick T & T, 2009a. Limited Environmental Assessment Report

REPORT

THE GROWTH AREAS AUTHORITY AND TRACT CONSULTANTS ON BEHALF OF AUSTRALAND HOLDINGS LTD

Limited Environmental Assessment
Cranbourne North (Stage 2), C21 Business Park Precincts and Clyde North Precinct

Report prepared for:
THE GROWTH AREAS AUTHORITY AND TRACT CONSULTANTS ON BEHALF OF AUSTRALAND HOLDINGS LTD

Report prepared by:

CHADWICK T&T PTY LTD

Distribution:

THE GROWTH AREAS AUTHORITY AND TRACT CONSULTANTS ON BEHALF OF AUSTRALAND HOLDINGS LTD	**2 copies**
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March 2009

Job no: 500994

Table of contents

Appendix H: **Bore Logs**

Appendix I: **Soil Analytical Laboratory Reports**

1 Introduction

Chadwick T&T Pty Ltd (CT&T) has been engaged by The Growth Areas Authority and Tract Consultants on behalf of Australand Holdings Ltd to undertake a Limited Geotechnical and Environmental Assessment (LGEA) of land located in the Precinct Structure Plan (PSP). The site is located within an urban growth area and consists of the following Precinct Structure Plan (PSP). areas:

- Cranbourne North (Stage 2);
- Clyde North; and
- C21 Business Park.

The above three PSP areas represent 'the site' and this is shown in Figure 1. Figure 2 provides an aerial photograph provided by the client showing the location of the different areas that belong to the site. Note that the area designated by a yellow outlined boundary, located below the Cranbourne Nth (Stage 2) PSP Area is not included in this assessment.

Currently the site is generally utilised for agricultural land use, including cattle grazing and horse grazing with a number of residential and agricultural buildings present. In addition, other current land uses within the area of the site include a school, a nursery and an abandoned chicken farm.

1.1 Objectives

The objectives for the Limited Environmental Assessment were to:

- Identify areas that may require an environmental investigation, based on a review of current and past land uses;
- Attempt to identify areas on the site with potential contamination risk, based on the information obtained;
- Using limited analytical data from sixteen (16) soil assessment locations across the site to establish whether contaminants (including aesthetically unacceptable materials), may or may not be present in soils at the ground surface or subsurface levels at concentrations that may produce unacceptable risks to human health and/or the environment; and
- Provide information on the potential for remediation, if required.

The objectives for the Limited Geotechnical Assessment were to:

- Provide geological and geomorphological descriptions of the site based on a desktop study and the onsite geology encountered during the advancement of boreholes;
- Provide a preliminary geotechnical assessment based on site walkover and testing at sixteen (16) soil assessment locations across the site (except C21 Business Park); and
- Provide an assessment relating to construction issues, bearing capacity and founding mediums.

Note that the Limited Geotechnical Assessment is attached as Appendix A.

1.2 Scope of Works

The scope of works for this LGEA included the following stages:

1.2.1 Site History and Desktop review

- *Aerial Photographs*: Review of nineteen (19) historical aerial photographs from 1960 to 1991, which provide information regarding historical land uses at the site and site surrounding areas;
- *Title search:* Review of historical title information which may provide information regarding previous land uses;
- *EPA Victoria:* Review of EPA records including the 'Priority Sites Registry' and the list of issued 'Certificates and Statements of Environmental Audit' to assess whether the site or adjacent areas are mentioned on any of these lists; and
- *Geology and Hydrogeology*: Desktop review of existing geology and hydrogeological conditions at the site.

1.2.2 Site Inspection

The scope of works for the initial site inspection, undertaken between 10th and 13th December 2008, was to gain information about the following aspects:

- Visual inspection of the site, including existing site structures and site surrounding areas;
- Occurrence of surface staining or discoloured soil, an indication of fill material evidenced by visual inspection, an indication of contamination from a visual assessment of vegetation and/or significant odours;
- Presence of stockpiled material, imported soil or fill material;
- Presence of burn-off areas or waste storage areas;
- Condition of all visible features, including foundations, positions of known former buildings and current buildings, underground or above ground tanks, pits, wells, drains and bores;
- Chemical storage and transfer areas, including the presence of waste or chemical containers;
- Information about current and former land uses, where obtainable from landowners or tenants;
- Land use in site surrounding areas; and
- Photographic documentation of site conditions and particular observations.

1.2.3 Soil Sampling

The second site visit undertaken on 22nd and 23rd December 2008 had the following scope of works:

- Advancement of eight (8) boreholes with a drill rig to a depth of 3 metres below ground surface and to a depth of 6 metres in one case (BH 05);
- Undertaking Dynamic Cone Penetrometer (DCP) tests at each location where a borehole is advanced with the drill rig;
- Confirm whether groundwater is present in the borehole that has been advanced to 6 metres depth (BH 05);
- Advancement of seven (7) boreholes with a hand auger to a maximum depth of 0.4 metre in areas that were not accessible with the drill rig;

- Logging of the lithology encountered at each borehole; and
- Collection of soil samples for the geotechnical assessment and also from different soil horizons and subsequent submission of soil samples to the designated primary and secondary laboratory for analysis for the environmental investigation.

CT&T reviewed all analytical results for soil in conjunction with the findings of the site visits in order to produce a report in accordance with the objectives of this Limited Geotechnical and Environmental Assessment (LGEA).

1.2.4 Discussion and recommendations

A discussion is provided on the findings of the above in Section 5.

2 Site Information

The site is located within the suburbs of Clyde North, Narre Warren South and Berwick (refer to Figure 1). Refer to Table 1 below for general information about the site.

Table 1: Site Identification

Site Name	Clyde North Precinct
Site Components and Location	Cranbourne North (Stage 2) PSP Area: Confined by Clyde Road, Glasscocks Road and northern and western boundaries that do not appear to be defined by any man-made structures; Clyde North PSP Area: Confined by Pound Rd, Grices Rd, Thompsons Road and Cardinia Creek; C21 Business Park PSP Area: Confined by Soldiers Rd, Grices Rd, and Cardinia Creek.
Total Site Area	Cranbourne North (Stage 2) PSP Area - approximately 40 Ha, Clyde North PSP Area – approximately 540 Ha C21 Business Park PSP Area – approximately 310 Ha
Title Identification Details	See Appendix C
Current Zoning – Planning Zone	UGZ Urban Growth Zone, UFZ Urban Floodway Zone, SUZ3 Special Use Zone Schedule 3, PPRZ Public Park and Recreation Zone, PUZ1 Public Use Zone – Service and Utility.
Current Site Use	Predominantly agricultural
Proposed Site Use	Urban

2.1 Distribution of lots across the site

As discussed the site comprises of three areas. These are set out below with the associated lots. These are shown in Figures 1, 2, 3 and 4.

- **Cranbourne North (Stage 2) PSP Area:** 1085 Glasscocks Road; 358S Clyde Road, 1095 Glasscocks Road, 1105 Glasscocks Road, 1115 Glasscocks Road, 1135 Glasscocks Road and 1145 Glasscocks Road.
- **Clyde North PSP Area:** Lots 1A, 1B, 2, 3A to 3D, 4 to 8, 9A, 9B, 10, 11, 12A, 12B and 13;
- **C21 Business Park PSP Area:** Lots 1C, 1D, 14A to 14E.

2.2 Geology and Hydrogeology

2.2.1 Regional Geology

The Berwick 1:25,000 Geological Series Map in conjunction with the 1:25,000 Engineering Geology Map of the Berwick Area, both produced by the Geological Survey of Victoria indicates that the site is underlain by four geological units, these being:

- Quaternary (Qrm) swamp deposits consisting of clay, silt and sandy clay;

- Quaternary (Qra) slope wash and stream deposits consisting of sandy silty clay and sand;
- Tertiary (Tvp) older volcanics consisting of clay, silty clay, sandy silty clay; and
- Tertiary (Tpb) Baxter Formation consisting of sandy clay.

Figure 1 of the attached *Preliminary Geotechnical Assessment – Cranbourne North (Stage 2) PSP and Clyde North PSP* located in Appendix A shows the approximate boundaries of these geological units across the Cranbourne North (Stage 2) PSP area, C21 PSP, and the Clyde North PSP area. Table 1 of the above-mentioned report compares the geological and engineering descriptions as shown in the Geological Survey Victoria Maps.

2.2.2 Regional Hydrogeology and Groundwater Chemistry

The Victorian Groundwater Beneficial Use Map, *South Western Water Table Aquifer Map* (DCNR 1995) indicates that the site is underlain by a Upper Tertiary aquifer and that this aquifer was likely to have a salinity of between 501 – 3,500 mg/L total dissolved solids (TDS), which would classify the groundwater as either Segment A2 or B under the State Environmental Protection Policy (SEPP) *Groundwaters of Victoria* (1997).

The geology consists of various geological units, so it must be noted that conditions could vary significantly across the site. With consideration of the Older Volcanic geological unit the following is relevant.

The *Geological Survey Report No. 66* (Leonard undated) states that

> "near Frankston the groundwater in the Older Volcanics generally ranges from 2,000mg/L to 4,000mg/L TDS,"…….." although the quality of groundwater tends to be better in the Cranbourne area where the Older Basalt outcrops or is only covered by a thin veneer of younger sediments."

The closest natural water way to the site is the Cardinia Creek which is located on the eastern boundary of the C21 Business Park PSP Area and the Clyde North PSP Areas. The Cardinia Creek eventually flows into the Western Port Bay, which is an area of environmental significance as it registered under the National Estate and is a Ramsar Site.

2.3 Adjoining Land Uses

Former adjacent land uses include livestock farming, agriculture, rural residential and possibly sand mining. Current land uses include medium density residential to the north and west and rural properties to the east and south. The Pakenham Bypass is adjacent to the north eastern corner of the C21 Business Park PSP Area. Floodway zones are located on and within close proximity of the site.

2.4 Topography

Based on field observations made during the site inspections conducted between 10th and 13th December 2008, the following can be stated:

- The land along Glasscocks Road is essentially level;
- Along Grices Road the area rises from west to east, with an elevation in the area of Lot 9A;
- Lot 3C contains an elevated area in the centre of the property;
- The properties east of Soldiers Road and south of Grices Road are essentially level; and

- Lot 14A to E and 1C and 1D are essentially level with elevated land within Lot 14A.

A desktop assessment shows land elevations ranging from 60 metres elevated in the north west of the C21 Business Park PSP area to between 20 to 30 metres in the south east of the Clyde North PSP area.

2.5 Surface Runoff and Drainage

The following general descriptions are outlined for each of the PSP Areas:

- C21 Business Park PSP Area: A drainage line runs from the north of the site in a south easterly direction toward dams prior to entering the Cardinia Creek to the south east of this area.
- Cranbourne North (Stage 2) PSP Area: generally flat, with a large dam at the north western portion of the site and additional dams/man made wetlands are located outside the site boundary also to the north west of the site. Man made drainage channels are located within close proximity of the western boundary, running generally north-south through the western portion of this area and generally along the northern boundary.
- Clyde North PSP Area: A few drainage channels generally run in a southerly direction in this area, with the exception of the eastern portion of the site where the surface runoff would be expected to drain into the Cardinia Creek.

2.6 Issued Certificates and Statements of Environmental Audit

The table below lists Environmental Audit Certificates and Statements within close proximity of the site.

Table 2. List of Issued Certificates and Statements of Environmental Audit

Type	Number	Municipality	Locality	Address	Completion	Comments
Statement	54977-2	CASEY	Berwick	358 Clyde Road	24/05/2007	358 Clyde Road audit lies directly to the north of the Cranbourne Nth (Stage 2) PSP Area.
Statement	49142-2	CASEY	Cranbourne North	Favero Gardens Narre Warren-Cranbourne Road	20/09/2006	Approximately 1.5 to 2.0km from site.
Statement	49142-4	CASEY	Cranbourne North	Favero Gardens Narre Warren-Cranbourne Road	03/03/2006	Approximately 1.5 to 2.0km from site.

Table 2. List of Issued Certificates and Statements of Environmental Audit

Type	Number	Municipality	Locality	Address	Completion	Comments
Statement	57874-1	CASEY	Cranbourne North	950 Pound Road	23/02/2006	Location unknown as Pound Road has altered due to development in the area.
Statement	49142-3	CASEY	Cranbourne North	Favero Gardens Narre Warren-Cranbourne Road	17/10/2005	Approximately 1.5 to 2.0km from site.
Statement	49142-1	CASEY	Cranbourne North	Favero Gardens Narre Warren-Cranbourne Road	23/09/2002	Approximately 1.5 to 2.0km from site.
Statement	43146-1	CASEY	Berwick	298-346 Clyde Road	05/02/2001	Approximately 700m from site
Statement	34276-1	CASEY	Berwick	Former Berwick Depot Site, 30-32 Peel Street	17/03/1998	More than 3 km from site
Certificate	50242-1	CASEY	Berwick	34 Gardiner Street	18/12/2002	More than 4km from site
Certificate	46168-1	CASEY	Berwick	298-346 Clyde Road	31/05/2002	Approximately 700m from site
Certificate	48035-1	CASEY	Berwick	Langmore Lane	22/04/2002	Former low level water tank site. 3km from site

2.7 EPA Priority Sites Registry

Six separate searches of the EPA Priority Sites Register have indicated that the site is not listed on, and is not in the vicinity of a site listed of the Priority Sites Register at the date of the searches, namely 12th February 2009.

The Extracts of EPA Priority Sites Register are located in Appendix F.

2.8 Previous Assessment Works

Assessment work has been conducted during Environmental Audits, preliminary site investigations and infrastructure work. Known investigation or assessment work conducted at or near the site are listed below:

- Soil testing for Melbourne Water drain has been previously undertaken on the Melbourne Water Corporation thin strip of land that runs from Grices Road to Pound Road, see

figure 3, north west corner (this information was supplied by Mr Alberti and is annocdotal);

- A Preliminary Site Investigation has been undertaken at or adjacent to 2125 Thompsons Road; and
- Audits undertaken in the area include 358 Clyde Road; 298-346 Clyde Road and 950 Pound Road, Cranbourne North.

3 Site History

3.1 Site History Investigation

3.1.1 Aerial Photograph Review

Historical aerial photographs for the site and the surrounding properties were obtained from the Aerial Photography Archive (Department of Sustainability and Environment) as part of the site history compilation from 1960 - 1991. A total of nineteen (19) aerial photographs were reviewed that show the site. A summary of the CT&T pertinent findings from the review of the aerial photographs is provided in Appendix D.

Copies of the aerial photographs are included in Appendix B.

Table 3. Lists of aerial photographs

Year	Project Number	Run/Film/Photo
1991	2085	2/4445/107
1989	2004	32/4290/ 180, 32/4290/181
1980	7921-1	6/3531/12, 6/3531/13, 6/3531/15, 5/3530/181, 5/3530/182
1979	7921	3/3433/49
1978	79211	5/3221/161
1970	891, 848	53E/2359/15, 54/2359/179, 5/2429/14, 5/2429/15
1960	360	36/1084/134, 36/1084/135, 36/1084/137, 36/1084/138, 37/1084/126

3.1.2 Site History

The Berwick Historical Society provided the information below with respect to the Gin Gin Bin (aka Gin Gin Bean run) to the east of the site is outlined below:

> "John Fowler Turnbull, of the firm of Collins Street merchants, Turnbull Bros and Company, was another to take up land east of Cardinia Creek in 1837. This was later known as the Gin Gin Bin run of 7,000 acres, two miles south-east of Berwick. The lease was in his own name from 1837-40, then in Alex Kinghorne's (a member of the firm) to 1842, and then with Hugh Reoch as partner….. The land became the home of the Lecky family."

According to the information from the historical titles, the Lecky family took over the lease in 1916.

The area of the site was formerly known as Cardinia Plains and Greenmount prior to being renamed as Cardinia Creek 1 of which part was transferred from Charles Dodds to Robert Henry in the early 1840's. This was stated by the historical society to be later occupied by Terence O'Connor, who purchased the freehold by pre-emptive right in 1854.

Sand mining is thought to have taken place adjacent to the Cardinia Creek, although generally the main land use has been grazing of sheep and cattle and dairy farming. An

area of the Cranbourne North (Stage 2) PSP Area, now known as 1085 Glasscocks Road, was utilised for market gardening commencing in 1962.

3.1.3 Site Walkover Historical Assessment

The building on Lot 9A (Clyde North PSP) appears to be one of the original buildings in the area. The area previously mined for sand has been highly modified, but well rehabilitated, but has the potential for contamination due to mining activities. There is a possibility of landfills within gullies as historically no council landfills were available.

Stockyards were located across the site, although it is unknown as to the number of sheep or cattle dips. One stock dip was noted at the 2125 Thompsons Road site(Clyde North PSP).

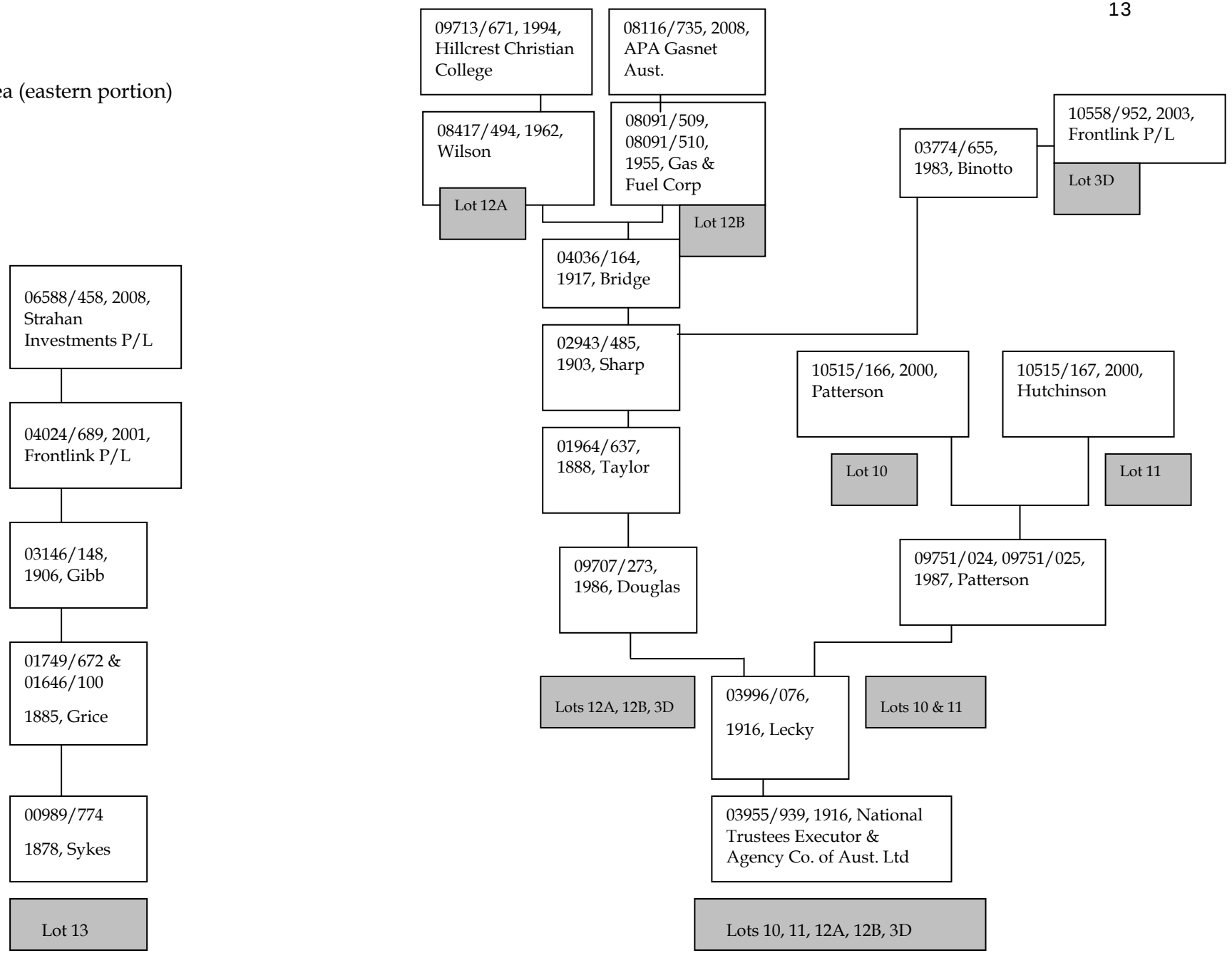
3.1.4 Historical Land Title Review

Historical land title information (historical certificates of title) for the site were obtained from the Department of Sustainability and Environment (refer to Appendix C).

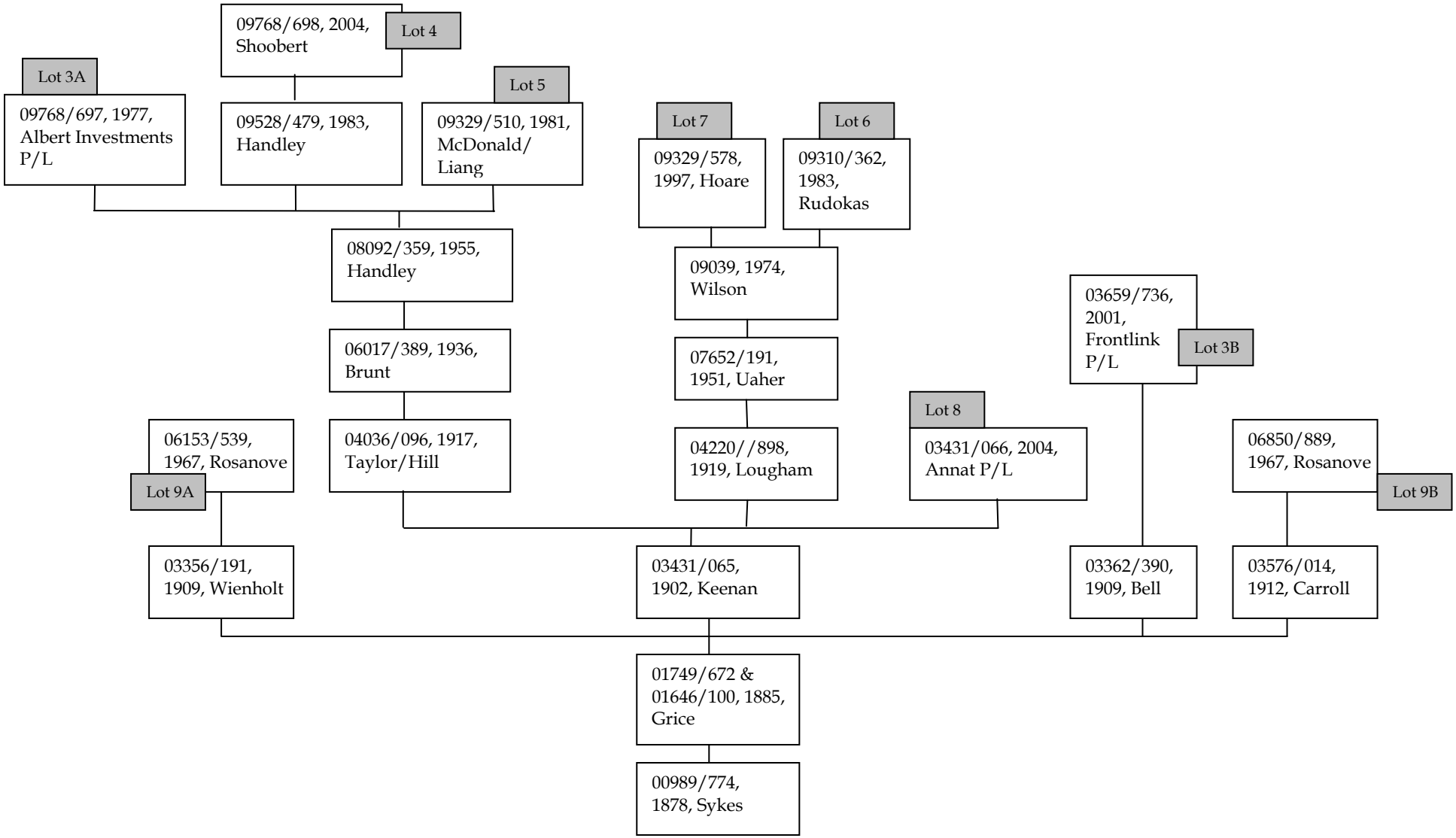
It should be noted that the historical titles for 1085 Glasscocks Road (Cranbourne North PSP) show this site was owned by a market gardener in 1962, until 1987 when it was purchased in 1987 by Allen's Vegetable Farms. Also, the lots now known as Lot 3A, 4 and 5 (Clyde North PSP) were owned by hotel proprietors in 1917, although it is unknown whether or not the hotel was located at this site.

A summary of the information extracted from the historical and current certificates of title are presented in Appendix C and summarised below.

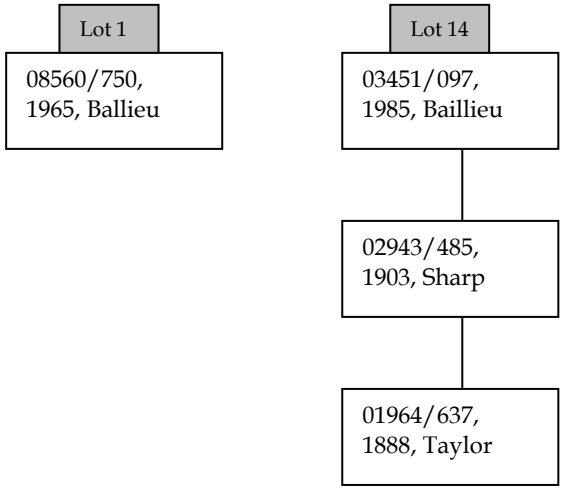
Clyde North PSP Area (eastern portion)



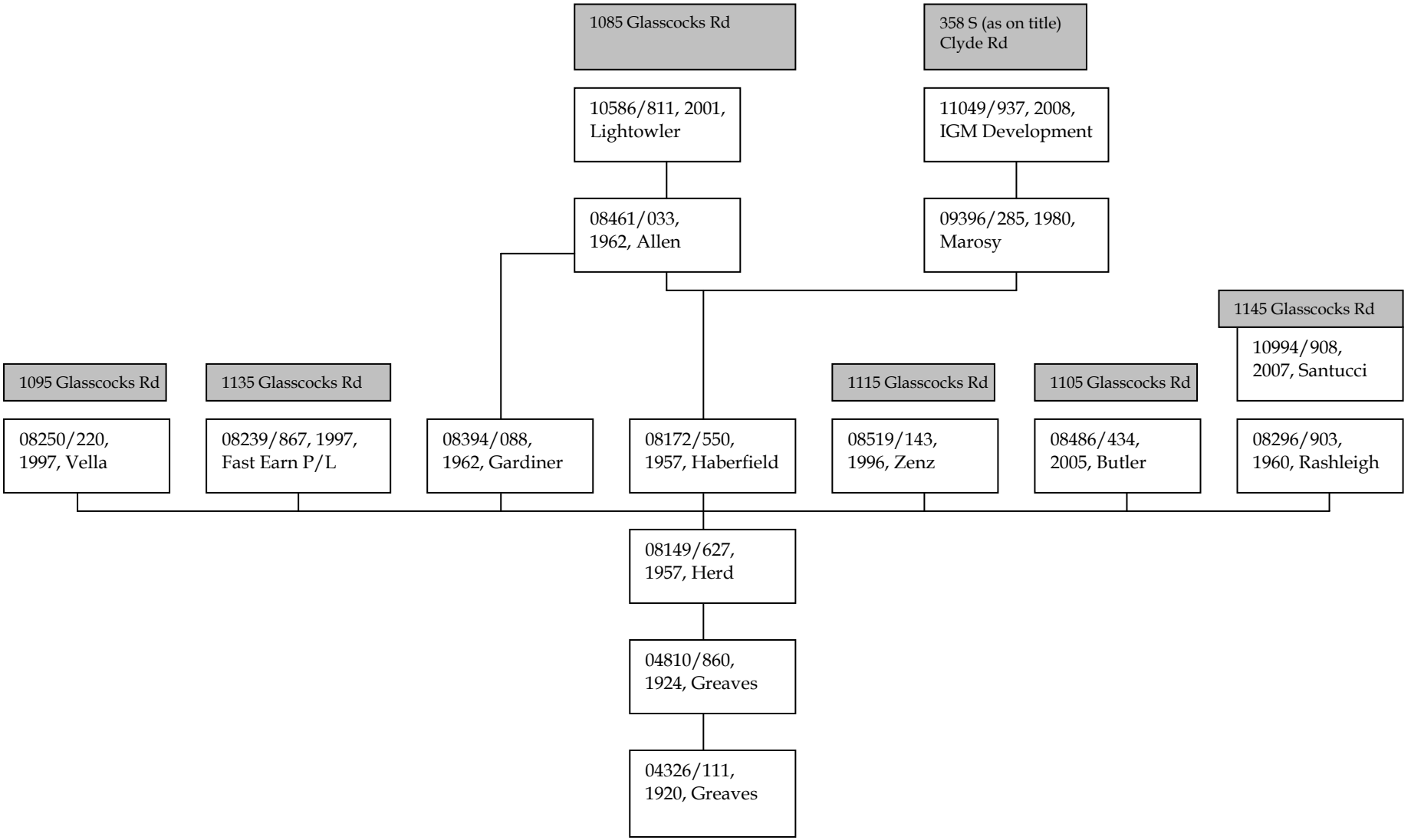
Clyde North PSP Area (western portion)



C21 Business Park PSP Area



Cranbourne North (Stage 2) PSP Area



3.2 Potential for Contamination

3.2.1 Potential Areas of Contamination

This limited assessment indicates that the site has the potential to have Contaminants of Potential Concern (COPC) to be present within select areas, see table 4 below for a summary. Please note, this list is not conclusive due to the preliminary nature of this assessment.

The former site uses and listed COPC are potential triggers for an environmental audit under the Environment Protection Act 1970, to be requested as part of planning authority (or EPA, should contamination be significant). This is particularly relevant for those areas of the total site where there is evidence of historical site uses that may contribute to significant pollution, i.e. vehicle storage, fuel tanks, sheep and cattle dips, herbicide and pesticide storage, sheds, building rubble. Note that in the context of whether or not an Environmental Audit is triggered for a site or a portion of a site, the decision process is based on the interpretation of the relevant guidelines, including the Minister's Direction No. 1, *Planning and Environment Act* 1987) by a planning authority (most likely the City of Casey in this case).

Further investigation is recommended for COPC as listed below. It must be noted that this investigation is preliminary in nature only and may not have determined all COPCs or their location.

A groundwater investigation may be considered necessary due to the potential impact by COPC sourced from various underground structures (such as septic tanks or from leaking fuel tanks) and site activities (such as pesticide use etc). This will depend upon further results of further assessment, and potentially remediation / validation works conducted in accordance with AS4482.1 (2005).

Table 4. Summary of potential contamination sources

Potential source of contamination		Indicative COPC
Swimming pools	Chemicals	Water treatment and conditioning chemicals, including alum, cyanuric acid, sodium bisulfate, caustic soda, lime, calcium hypochlorite, sodium chloride. Bacteriacides; including copper sulphate and organic compounds. Various indicator chemicals eg. orthotolidine.
Soil staining	Imported fill material, salinity.	Hydrocarbons, BTEX, PAHs.
Machinery / vehicle maintenance	Fuel leaks or spills	Hydrocarbons, BTEX, PAHs, phenols, lead.
Fuel tanks, oil drums	Hydrocarbons from fuel leaks/spills. Potential contamination of groundwater.	Heavy Metals, Hydrocarbons, BTEX, PAHs, phenols, lead.
Stockyards	Weed/pest control, including sheep/cattle dips, faecal accumulation	Pesticides, arsenic, herbicides, nutrients.
Debris (such as white goods, car bodies, metal scrap, batteries)	Hydrocarbons from fuels, metal corrosion, refrigerant emissions, lead and corrosion from batteries	Heavy Metals, CFCs, Oils, Hydrocarbons, BTEX, Phthalates, PCBs, PAHs, phenols, lead.
Fertiliser	Nutrients for plants	Nitrates, phosphate, mercury, cadmium.
Weed and pest control / orchard, greenhouse	Pesticides/herbicides	Fungicides, pesticides and herbicides, lead, arsenic.
Imported soils	Potential for contamination and asbestos in stockpiles	Asbestos, PAH, lead, heavy metals, etc.
Septic tanks	Inadequate septic system	Groundwater and/or soils may be impacted by nitrate, ammonia and/or microbiological contamination from septic.

3.2.2 Contaminants of Potential Concern

The COPC at the site are listed in the table 5 below. This list is not conclusive due to the preliminary nature of this assessment.

The table below lists chemicals used in various industries /activities. The exact nature of the contaminant associated with the particular potential source of contamination is site specific, depending on the standard of management and the practice and safety procedures employed at each site. We have referenced relevant information (such as AS4482.1 2005) to compile this table. Not all PCOCs identified by us may be realised at each site, and where chemical testing was undertaken by us, we have tested for those potential contaminants of concern that are most likely to be present based upon the noted potential source of contamination and our experience.

Table 5: Contaminants of Potential Concern

Property Address / Description of sampling location	Potential contaminating land uses	Actual contamination
Clyde North PSP Area		
Lot 1A, Lot 1B, Lot 2	Possible contaminated fill on site due to earthworks.	No sample collection undertaken.
Lot 3A	Fertiliser application.	Sample #BH10, Reported results under relevant criteria for sulphur, sulphate, lead, arsenic and nickel. Chromium was reported at 33mg/kg.
Lot 3B	Chemicals, machinery shed and horse manure. Small area of soil scaring in south western paddock.	No sample collection undertaken.
Lot 3C	Machinery shed, chemicals including herbicide and swimming pool, burning off evidence, above ground storage tank (heating oil), septic tank and airstrip.	Sample #BH04: Reported results under relevant criteria: lead & arsenic at 0.3m bgs. Chromium: 11mg/kg at 0.3m bgs. Sample #BH05: Reported results under relevant criteria: lead at 0.5m bgs. Chromium: 16mg/kg at 0.5m bgs.
Lot 3D	Large machinery shed (not accessed), aviation gasoline (UN1203). Old stockyard. Soil scaring or earthwork evident from aerial view.	Sample #BH06: Reported results under relevant criteria: lead at 0.3m bgs. Chromium: 12mg/kg at 0.3m bgs.
Lot 4	Machinery shed, chemical drums, waste metal and wood, car and batteries. Truck yard, truck bodies. Swimming pool chemicals.	No sample collection undertaken.
Lot 5	Possibly fertiliser, pesticide/herbicide.	No sample collection undertaken.
Lot 6	Fertiliser, pesticide/herbicide. Large sheds, waste metal, car bodies, machinery parts, etc. Scaring on soils. Unused bowser.	No sample collection undertaken.
Lot 7	Herbicide/pesticide, fertiliser (vineyard, vegetable garden), machinery shed, septic tank.	Sample #BH14: Reported results under relevant criteria: lead, copper, nickel and zinc at 0.2m bgs. Chromium: 64mg/kg at 0.2m bgs.

Table 5: cont.		
Property Address / Description of sampling location	**Potential contaminating land uses**	**Actual contamination**
Lot 8	Lubricants, horse manure, herbicide, septic tank. Swimming pool chemicals. Large shed.	Sample #BH09: Reported results under relevant criteria: cobalt, copper and nickel at 0.3m bgs. Sulphate is under criteria at 460mg/kg. Chromium: 82mg/kg at 0.3m bgs.
Lots 9A & 9B	Refused access to this property, although owner stated that garbage was buried on site. Aerial inspections (Google) shows what appears to be a stock yard, dams, swimming pools, sheds, greenhouse and an old home.	No sample collection undertaken.
Lot 10	Hay shed, stock yards, stock dip, various chemicals (including paint, diesel, petrol, herbicides and fertilisers), sheds (including machinery shed), dams, an unused tank and a septic tank.	Sample #BH02: Reported results under relevant criteria: arsenic and zinc at surface. Inorganics reported at surface; nitrate, sulphate. Phosphate: 210mg/kg.
Lot 11	Historically sand mined. Machinery shed, chemicals, septic tank. Altered water course. Swimming pool.	No sample collection undertaken.
Lot 12A & 12 B	Drums (content unknown), building material/rubble, pesticides, rat poison, sewerage treatment ponds, Above Ground fuel storage tanks. Workshop/shed and some waste material. LPG Gas.	Sample #BH01 (Lot 12A): Reported results over criteria for TPH at surface: fraction range C15-C28 @ 2,800mg/kg; C29-C36 @ 4,100mg/kg; C10-36 @ 6,925mg/kg. Results under relevant criteria: lead at surface and 0.4m bgs. Chromium: 17mg/kg at surface
Lot 13	Machinery shed, soil, paint, pesticides, ash/evidence of burning, storage of fence posts, diesel above ground storage tank, septic tank, dams.	Sample #BH08: TPH results over relevant criteria; fraction C10-C14, C15-C28, C29-C36. Reported results over relevant criteria for zinc at surface at 600mg/kg. Reported results under relevant criteria for cobalt, copper, lead, nickel and Toluene. Chromium: 17mg/kg at 0.15m bgs. Sample #BH16: Reported results under relevant criteria: lead at 0.4m bgs. Chromium: 18mg/kg at 0.4m bgs.

Table 5. Summary of potential contamination sources *cont.*

Property Address	Potential contaminating land uses	Actual contamination
Cranbourne North (Stage 2) PSP Area		
1085 Glasscocks Rd	Machinery shed, oil & grease, large area of machinery parts & tyres, Roundup, empty above ground storage tanks, Excavated Underground Storage Tank. Septic. Soil staining or stockpiles.	Sample #BH11: Reported results under relevant criteria: cobalt, copper, zinc at surface. Nickel over relevant criteria: 67mg/kg at surface. Chromium: 32mg/kg at surface
1095 Glasscocks Rd	Intensive nursery industry on site and associated herbicides, pesticides, fertiliser. Stockpiled crates, water runoff from sheds. Dark soil in back yard. Three above ground storage tanks. One below ground storage tank.	Sample #BH12: Reported results under relevant criteria: copper, nickel, zinc at surface. SO4 200mg/kg at 0.4m bgs Chromium: 26mg/kg at surface
1105 Glasscocks Rd	Refused access to property. Aerial inspection (Google) shows a plantation to the rear of the property, many buildings; some of which appear to be hot-houses.	No sample collection undertaken.
1115 Glasscocks Rd	Aerial inspection (Google) shows some surface staining or disturbance in small areas to the north of the house. Three buildings, in addition to the house, are located on the site.	No sample collection undertaken.
1135 Glasscocks Rd	Chicken sheds and grain silos. Grass adjacent to sheds is lush compared to surroundings.	Sample #BH13: Reported results under relevant criteria: cobalt, copper, nickel, zinc at surface. Nitrate at 460mg/kg at surface & 130mg/kg at 0.3m bgs. Chromium: 26mg/kg at surface
2-26 Pound Rd/1145 Glasscocks Rd	Aerial inspection (Google) shows a house and swimming pool and grazing land.	No sample collection undertaken.
358 S Clyde Rd	Cattle grazing.	No sample collection undertaken.

Table 5. Summary of potential contamination sources *cont.*

Property Address	Potential contaminating land uses	Actual contamination
C21 Business Park PSP Area		
Lot 1C & 1D	Contamination due to earthworks, eg. fill material, fuel spills.	No sample collection requested.
Lot 14A, Lot 14B, Lot 14C	Swimming pool, sheds, waste/ scrap, railway sleepers, farm chemicals (Lot 14A) Crops of wheat, canola, sorghum. Aerial view: soil scaring/staining (Lot 14B). Septic and stockyard (lot 14C). Divoflow fuel, machinery shed, soil stockpiles, dams, above ground storage tanks, underground storage tanks and bowsers.	No sample collection requested. No sample collection requested. No sample collection requested.
Lot 14 D, Lot 14E	Contamination due to earthworks, eg. fill material, fuel spills.	No sample collection requested.

4 Analytical Results

4.1 Laboratory Analysis

MGT Environmental Consulting Pty Ltd was used as the primary analytical laboratory, with Labmark used for the analysis of quality control samples. Both MGT and Labmark are accredited by the National Association of Testing Authorities (NATA) for the analysis undertaken.

Selected samples were submitted to the laboratory for all, or a combination of the following analytes:

- Cyanide, nitrate, phosphate, total sulphur, sulphate,;
- Metals: As, Be, Cd, Cr (CrIII and CrVI), Co, Cu, Hg, Mo, Ni, Pb, Sb, Se, Sn, Zn;
- Explosives;
- Halogenated Hydrocarbons;
- BTEX;
- Organochlorine Pesticides (OCP);
- Organophosphorus Pesticides (OPP);
- Chlorinated Hydrocarbons;
- Polycyclic Aromatic Hydrocarbons (PAH);
- Phenols;
- Polychlorinated Biphenyls (PCB);
- Total Recoverable Hydrocarbons (TRH);
- Semi volatile Organic Compounds (SVOC) including Phthalates and semi volatile Chlorinated Hydrocarbons (CHC); and
- Volatile Organic Compounds (VOC) including monocyclic aromatic hydrocarbons (MAH), volatile CHCs and Halogenated Volatiles.

Quality assurance samples including blind replicate, split samples and blanks were submitted to the laboratories for heavy metal analysis. A discussion of the Quality Assurance/Quality Control program adopted by Chadwick T&T is provided in Section 4.3.

Chain of Custody (COC) documentation is presented in Appendix I and Certified Laboratory Reports are included in Appendix G.

4.2 Soil Analytical Results

Samples were obtained from two of the three areas of the assessment site. No sampling was considered necessary at the C21 Business Park PSP Area due to the proposed end land use (ie. Business). Also, soil samples were not obtained from Lots 9A and 9B (Clyde North PSP) as permission was not granted by the land owner. Soil analytical laboratory results are displayed in Appendix I.

The following summary of results for each relevant area is outlined in the tables below.

Table 6. Soil Sampling Summary, Cranbourne North (Stage 2) PSP Area

Sample No.	Location	Comments
BH11	1085 Glasscocks Road	Reported results under relevant criteria: cobalt, copper, zinc at surface. Nickel over criteria: 67mg/kg at surface. Chromium: 32mg/kg at surface
BH12	1095 Glasscocks Road	Reported results under relevant criteria: copper, nickel, zinc at surface. SO4 200mg/kg at 0.4m bgs Chromium: 21mg/kg at surface
BH13	1135 Glasscocks Road	Reported results under relevant criteria: cobalt, copper, nickel, zinc at surface. Nitrate at 460mg/kg at surface & 130mg/kg at 0.3m bgs. Chromium: 26mg/kg at surface

Table 7. Soil Sampling Summary, Clyde North PSP Area

Sample No.	Location	Comments
BH01	See Figure 6. Lot 12A	Reported results over criteria for TPH at surface: fraction range C15-C28 @ 2,800mg/kg; C29-C36 @ 4,100mg/kg; C10-36 @ 6,925mg/kg. Results under relevant criteria: lead at surface and 0.4m bgs. Chromium: 17mg/kg at surface and 0.4m bgs.
BH02	See Figure 7. Lot 10.	Reported results under relevant criteria: arsenic and zinc at surface. Inorganics reported at surface; nitrate, sulphate. Phosphate: 210mg/kg.
BH03	See Figure 7. Lot 10.	Sampled at 0.3m bgs.
BH04	See Figure 8. Lot 3C	Reported results under relevant criteria: lead & arsenic at 0.3m bgs. Chromium: 11mg/kg at 0.3m bgs.
BH05	See Figure 6. Lot 3C	Reported results under relevant criteria: lead at 0.5m bgs. Chromium: 16mg/kg at 0.5m bgs.
BH06	See Figure 6. Lot 3D	Reported results under relevant criteria: lead at 0.3m bgs. Chromium: 12mg/kg at 0.3m bgs.
BH07	See Figure 9. Lot 13	Reported results under relevant criteria: arsenic, , copper, lead and nickel at 1.0m bgs. Chromium: 44mg/kg at 1.0m bgs. Sulphate is over criteria at 460mg/kg.

Table 7. Soil Sampling Summary, Clyde North PSP Area *cont.*

Sample No.	Location	Comments
BH08	See Figure 9. Lot 13	TPH results over criteria; fraction C10-C14, C15-C28, C29-C36. Reported results over criteria for zinc at surface at 600mg/kg. Reported results under criteria for cobalt, copper, lead, nickel and Toluene. Chromium: 17mg/kg at 0.15m bgs.
BH09	See Figure 10. Lot 8	Reported results under relevant criteria: cobalt, copper and nickel at 0.3m bgs. Sulphate is over criteria at 460mg/kg. Chromium: 82mg/kg at 0.3m bgs.
BH10	See Figure 11. Lot 3A	1.0m bgs: Reported results under relevant criteria: sulphate, lead, arsenic and nickel. Chromium: 33mg/kg at 1.0m bgs.
BH14	See Figure 10. Lot 7	Reported results under relevant criteria: lead, copper, nickel and zinc at 0.2m bgs. Chromium: 64mg/kg at 0.2m bgs.
BH15	See Figure 9. Lot 13	No sampling undertaken.
BH16	See Figure 13. Lot 13	Reported results under relevant criteria: lead at 0.4m bgs. Chromium: 18mg/kg at 0.4m bgs.

Reported analytical results between 21mg/kg to 32mg/kg were obtained for Chromium III & IV across the Cranbourne North (Stage 2) PSP Area. This range is in line with the average Chromium results across the site (ie. 24mg/kg) and may reflect background concentrations. Further investigation would be required to be conducted to determine if this is or is not the case.

Chromium results of 82mg/kg, 64mg/kg and 44mg/kg were also reported at Lot 8, Lot 7 and Lot 13 respectively (Clyde North PSP).

Samples were collected for Total Petroleum Hydrocarbons within close proximity of above ground storage tanks at Lots 12A and 13. Reported results were over criteria at both locations. Results were within the higher chain fractions at Lot 12A with a sum of TPH C10-C35 of 6,925mg/kg (Clyde North PSP). The sample obtained from Lot 13 had reported results of TPH C10-C35 at 2,580mg/kg (Clyde North PSP).

A summary of contamination in excess of relevant criteria is shown on figure 14.

4.3 Quality Assurance / Quality Control

Chadwick T&T implemented a quality assurance and quality control (QA/QC) program as part of field procedures and interpretation of laboratory results, which is based on relevant Australian Standards.

The QA/QC program undertaken as part of the assessment by Chadwick T&T included the following:

- Sampling equipment decontamination between sampling points;
- Preservation of samples with ice during transport from the field to the laboratory;
- Transportation of samples with accompanying COC documentation;
- Collection of blind and split duplicate samples and review of calculated relative percent difference (RPDs);
- Collection and review of rinsate and trip blanks for a selection of the contaminants of potential concern (heavy metals);
- Comparison of field and analytical data;
- Compliance with sample holding times; and
- Review of laboratory internal analysis of blanks, spikes and duplicates.

Decontamination Procedures

Sampling equipment (i.e. hand auger) was disassembled, scrubbed and washed in Decon 90 solution and rinsed with de-ionised water. Disposable equipment did not require decontamination as it was disposed of following use (i.e. nitrile gloves, tubing, disposable bailers).

Field QC Sampling Program

The QC sampling program conducted during this investigation involved collection of samples for data reliability purposes assessing possible errors due to potential sources of cross contamination, inconsistencies in sampling and analytical techniques used.

A quantitative measure of the accuracy of the results obtained was undertaken by calculating the relative percentage difference (RPD) values for each duplicate pair. The RPD values were calculated using the following equation.

$$\text{RPD}(\%) = \frac{\langle Co - Cs \rangle}{\left\langle \frac{Co + Cs}{2} \right\rangle} \times 100$$

where Co = concentration obtained from the original sample

Cs = concentration obtained from the split or duplicate sample

The RPD was used to normalise each pair of results, allowing data interpretation and reliability. For RPD values that exceed a generally accepted 30 to 50% limit (AS 4482.1 – 2005), correlation of data between the sample pair is considered poor. Where any duplicate or split pair result had one sample that was reported to be below the limit of reporting and the other was positive, then the limit of reporting divided by two was used for calculation of the RPD.

Soil Quality Control Samples

Soil quality control samples were collected and submitted to the laboratory for analysis as listed in Table 1 below.

Table 8: Soil QC Samples Overview

QA samples	Material	Duplicate/ Sample ID	Primary Sample ID	Date Sampled	Laboratory	Analysis
Trip Blank	Water	QC08	-	23/12/2008	MGT	Heavy Metals, OCPs
Rinsate Blank	Water	QC07	-	23/12/2008	MGT	Heavy Metals, OCPs
Blind Replicate	Soil	QC03	BH08/0.15	22/12/2008	MGT	Heavy Metals, TRH
Split Sample	Soil	QC04	BH08/0.15	22/12/2008	Labmark	Heavy Metals, TRH
Blind Replicate	Soil	QC05	BH16/0.4	23/12/2008	MGT	Heavy Metals, BTEX, PAH, TPH
Split Sample	Soil	QC06	BH16/0.4	23/12/2008	Labmark	Heavy Metals, OCPs, DDE.

RPD Calculations for Soil Blind Replicate and Split Samples

Of the 83 analyte pairs tested, 64 results for soil blind replicate and split samples were below the laboratory limit of reporting, and therefore RPDs were not able to be calculated. Of the 19 calculated RPD values five (5) were outside the acceptable range when compared to guidance limits as set out in AS4482.1-2005 (30 - 50%). The result is detailed in Table 2 below.

Table 9: Exceeding RPD Exceeding for Soil Split Sample

Primary and Duplicate Sample ID	Date Sampled	Analyte	Primary Sample (mg/kg)	Duplicate Sample (mg/kg)	RPD (%)
BH16/0.4	23/12/2008	Lead	8.1	22.0	92.4
BH16/0.4	23/12/2008	Zinc	5.0	8.5	51.9
BH16/0.4	23/12/2008	Zinc	5.0	2.7	59.7
BH08/0.5	22/12/2008	Lead	63.0	110.	54.3
BH08/0.5	22/12/2008	Zinc	600	350	52.6

The RPD exceeding 50% for three sample pairs were reported for Zinc concentrations and two sample pairs were reported to exceed 50% RPD for lead concentrations. Metals are often associated with particulate materials which are not uniformly distributed within soil matrices. Accordingly it is quite common for concentration differences (i.e. RPD greater than 50%) to be recorded for individual samples. Two of the reported Zinc concentrations are low and close to the LOR, hence minor variations in concentrations will lead to large RPD's.

Based upon the above information, the single RPD exceedance is therefore, in our opinion, not to detrimentally affect the quality of the data set or our interpretation of the results.

Soil Sampling Blank Results

Four (4) blank samples (rinsate blank and trip blank) were analysed during the sampling event at the site, to check that there was no cross contamination of substances from the sampling equipment utilised or during transport. All blank results were reported below the limit of reporting.

Rinsate blanks

As detailed within AS4482.1 *These samples provide information ensuring that there is no cross-contamination of substances from the sampling equipment used. Rinsate blanks should be collected where cross-contamination of samples is likely to impact on the validity of the sampling and assessment process.*

Trip blanks

Trip Blank samples provide information ensuring that there is no cross-contamination of substances during the transport of samples. Trip blanks are placed in the sample container (i.e. esky) and transported at the end of each soil sampling event/day to the primary laboratory. This process is conducted to assess for cross contamination of substances whilst on-route to the nominated primary laboratory. A methodology nor purpose for the collection of trip blanks is not provided within AS4482.1 (2005).

Integration of Field Observation and Analytical Data

The field observations and the analytical results were assessed together as part of the data interpretation. Photoionisation detector (PID) readings at BH08 ranged between 7.9 to 118.9ppm, which is consistent with reported results in the soil analysis.

Sample Holding Times

Compliance with recommended holding-times as provided within AS 4482.1 was adhered to for all samples analysed by the laboratories commissioned to undertake the soil analyses.

Laboratory Quality Control

NATA accredited analytical laboratories were used for all laboratory testing including MGT Environmental for primary testing and Labmark for secondary (quality control) testing. Laboratory QC conducted by the primary and secondary laboratory includes laboratory blanks, matrix spikes and duplicates. Laboratory QC is summarised in Table 3 below.

Table 3: Laboratory QC Data Summary - MGT/Labmark

Sample Matrix	Report number	Laboratory	Laboratory Duplicate RPD Range	Spike Recovery % Range	Laboratory Blank Concentrations
Soil	235150	MGT	<1 - 17	71-128	Non detect
Soil	361488 (Project No. 09ENME0000258)	Labmark	Not available	102-125	Non detect

Review of the internal laboratory QC for both the primary and secondary laboratories was considered satisfactory for the following reasons:

- All internal duplicate samples were in the acceptable range of 0-50% (AS4482.1 - 2005).
- No target analytes were detected in any of the laboratory method blanks.
- All matrix spike % recoveries were within the set acceptable criteria for the NATA accredited analysing laboratories (70 – 130%).

Conclusions of QA/QC Program

Based on the results of the QA/QC program as detailed above, the following is concluded:

- The internal laboratory quality control program reported acceptable results;
- The field sampling procedure was carried out in accordance with the CT&T QA/QC program, which is based on sampling guidelines provided in the Australian Standard 4482.1 and 4482.2;
- The RPDs for blind and split samples were acceptable, although five elevated RPD (>50%) were noted and have been attributed to inherent soil heterogeneity and/or low concentrations. However, this was not considered to impact on the integrity of the data set;
- Blank results were all reported below the laboratory's limit of reporting;

- Laboratories used were NATA accredited for the analyses performed; and
- Samples were analysed within the applicable holding times.

It is concluded that the sampling and analytical programs were acceptable and the results obtained are of reliable quality to reach the conclusions made in this preliminary soil assessment regarding the contamination status of soil at the site.

5 Discussion

Reported results over criteria were obtained from a few targeted locations across the site during this limited investigation. Of particular relevance are the reported results obtained below:

Cranbourne North (Stage 2)

- Nickel at 67mg/kg in BH11 at 1085 Glasscocks Road;
- At BH13 elevated nitrate was reported at the poultry farm site at 1135 Glasscocks Road.

Clyde North

- Lot 3A (BH10), Lot3C (BH04), Lot 3D (BH06), Lot 7 (BH14), Lot 8 (BH09), Lot12A (BH01), Lot 13 (BH08), BH11, BH12, BH13 Chromium results from 11-82mg/kg. Chromium speciation would determine the potential contamination status;
- Zinc at up to three times above adopted Ecological Investigation Level of 200mg/kg at Lot 13 (BH8);
- TPH fractions above relevant criteria at both Lot 12A (BH01) and Lot 13 (BH08) within close proximity of fuel storage tanks.

C21 Business Park

Soil sampling not requested in this area.

A summary of contamination in excess of relevant criteria is shown on figure 14.

On the basis that contamination has been confirmed to be present, and additional potentially contaminated areas have been identified, it is recommended that additional assessment works are undertaken. Future investigations should target areas of concern identified (particularly stock dips and areas used to store hydrocarbons, herbicides, pesticides and other chemicals as set out in tables 4 and 5) and contaminants of concern as outlined in this limited environmental assessment. The client may form a strategy to undertake these, inclusive of but limited to:

- Segmenting areas that require further investigation;
- Where area require further investigation, these works should be undertaken consistent with a *Detailed Site Assessment* as described in AS4482.1 (2005); and
- These areas that would require further Environmental Assessment should be subject to appropriate planning controls through the PSP process.

Based upon the above information, there is the potential for the following to be realised:

- Some areas may not be suitable for their intended use without further assessment, remediation and validation works; and
- Some areas may be subjected to planning authority requirements in accordance with the Department of Sustainability and Environment *Potentially Contaminated Land* General Practice Note June 2005.

6 Applicability

This report has been prepared for the benefit of The Growth Areas Authority and Tract Consultants on behalf of Australand Holdings Ltd. with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose without our prior review and agreement.

This report represents a review of data and information relating to the subject property of this report. The data and information was obtained not by Chadwick T&T Pty Ltd but from other sources and contacts, some of whom may be noted in the report. Chadwick T&T note that inherent in any assessment approach is the fact that information is based on a number of "spot" tests of soil conditions and that conditions may vary between those locations.

The analyses, evaluations, opinions and conclusions presented in this report are based on the information provided, and they could change if the information is in fact found to be unrepresentative of site conditions, particularly between sampling and analysis locations.

Chadwick T&T Pty Ltd will not update the report and has not taken into account events occurring after the time its review was conducted.

CHADWICK T&T PTY LTD

Environmental and Engineering Consultants

Report prepared by:	Authorised for Chadwick T&T Pty Ltd by:
.....	.....
Ian Stapleton	Mr Darren Edwards
Project Manager	Senior Project Manager

Appendix A: ***Preliminary Geotechnical Assessment – Cranbourne North (Stage 2) PSP and Clyde North PSP***

REPORT

The GAA and Tract Consultants Pty Ltd

Limted Geotechnical Assessment Cranbourne North (Stage 2) PSP and Clyde North PSP

Report prepared for:

THE GAA AND TRACT CONSULTANTS PTY LTD

Report prepared by:

CHADWICK T&T PTY LTD

Distribution:

THE GAA AND TRACT CONSULTANTS PTY LTD	2 copies
CHADWICK T&T PTY LTD (FILE)	1 copy

February 2009

Job no: 500994-R2

Table of contents

1 Introduction

Chadwick T&T Pty Ltd (CT&T) have been engaged by The GAA and Tract Consultants Pty Ltd (TC) on behalf of Australand, to undertake a limited geotechnical and environmental assessment of land holdings in Cranbourne North and Clyde North. This report presents the findings of the preliminary geotechnical assessment.

2 The Site

2.1 Regional Geology

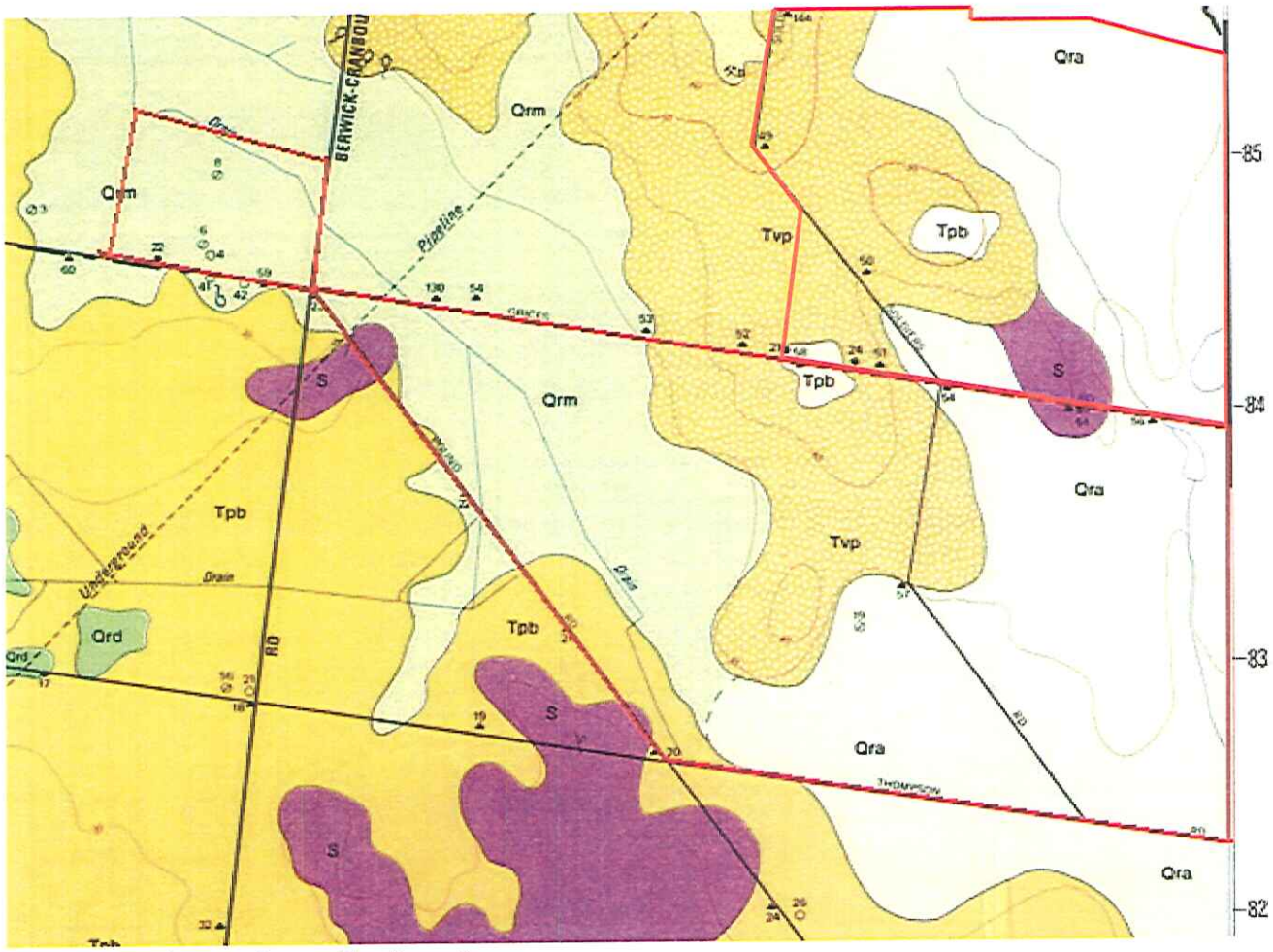
The Berwick 1:25,000 Geological Series Map in conjunction with the 1:25,000 Engineering Geology Map of the Berwick Area, both produced by the Geological Survey of Victoria indicates that the site is underlain by four geological units, these being:

- Quaternary (Qrm) swamp deposits consisting of clay, silt and sandy clay;
- Quaternary (Qra) slope wash and stream deposits consisting of sandy silty clay and sand;
- Tertiary (Tvp) older volcanics consisting of clay, silty clay, sandy silty clay; and
- Tertiary (Tpb) Baxter Formation consisting of sandy clay.

Figure 1 shows the approximate boundaries of these geological units across the Cranbourne North (Stage 2) PSP area, the Clyde North PSP area and the C21 area. Table 1 compares the geological and engineering descriptions as shown in the Geological Survey Victoria Maps.

The boreholes, which ranged in depth from 0.1m to 6m, drilled as part of the field investigation generally confirmed these geological units.

Figure 1: Approximate Boundaries and Geological Units



Approximate Site Boundary

Qra Sandy silty clay, sand

Qrm Clay, silt, sandy clay

Qrd Sand, silty sand, clayey sand

Tpb Sand, clayey sand, silt, minor gravel and clay-generally consolidated sediments

Tpb Sandy clay, minor sand-generally poorly consolidated sediments

Tvo Limburgite, olivine basalt, titanaugite basalt

Tvp Clay, silty clay, sandy silty clay, pyroclastics

Tew Fissile clay, poorly consolidated sand and clayey sand, brown coal (in places intercalated with basal part of Older Volcanics)

Dgl Granodiorite, biotite granodiorite

S Massive micaceous quartz siltstone, interbedded micaceous quartz sandstone

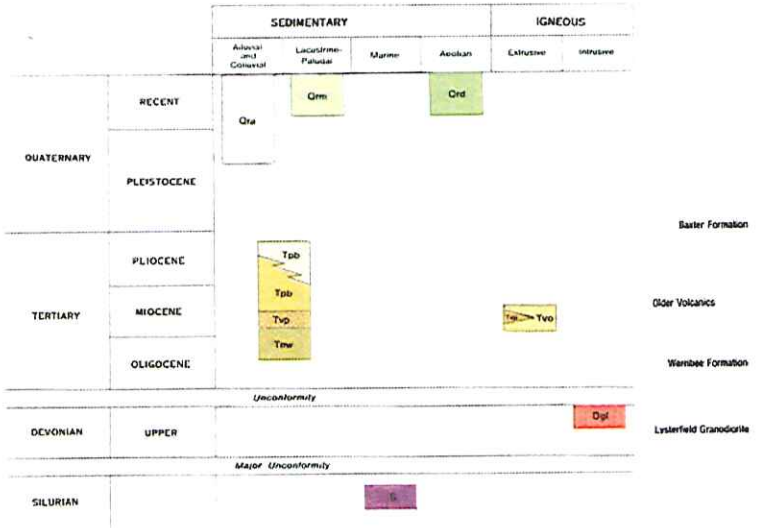


Table 1 Geological and Engineering Descriptions of soils across the site

Geological Unit (Symbol)	Description	Engineering Soil Type (Symbol)	Description
Quaternary (Qrm)	Clay, silt, sandy clay	Sedimentary Soil (Acm)	Mottled yellow and grey, firm to stiff clay and silty clay, occasionally sandy – a CH soil (swamp deposits)
Quaternary (Qra)	Sandy silty clay, sand	Sedimentary Soil (Acm & sm)	Yellow, brown and grey in part mottled, firm to stiff clay and loose to compact silty sand – generally a CL soil but CH and SC soils present (flood plain and stream deposits)
Tertiary Older Volcanics (Tvp)	Clay, silty clay, sandy sitly clay, pyroclastics	Sedimentary Soil (CScm & c)	Yellow and brown, stiff to hard, slightly sandy silty clay (CScm) - a CH to MH soil intercalated with Grey and pink, very stiff to hard clay (CSc) – a CH soil (continental sediments including pyroclastics and possible mud flow deposits)
Tertiary Baxter Formation (Tpb)	Sandy clay, minor sand-gravelly poorly consolidated sediments	Sedimentary Soil (CScm)	Yellow and brown, stiff, slightly sandy silty clay – CH to MH soil (continental sediment – possibly flood plain deposit)
Silurian (S)	Massive micaceous quartz siltstone, interbedded micaceous quartz	Rock - includes soil up to about 2m thick (ST(ss))	Siltstone, minor sandstone, moderately to highly weathered

References: Geological Survey of Victoria 1:25,000 Berwick Geological Series Map
Geological Survey of Victoria 1:25,000 Engineering Geology, Berwick Area

3 Subsurface Conditions

Sixteen (16) boreholes were put down as part of the geotechnical and environmental assessment. Eight (8) of these (boreholes BH3 to BH7 and BH9 to BH11) were used to assess the subsurface profile across the entire site. The approximate locations of the boreholes are shown on the plan in Appendix A. The boreholes BH1, BH2, BH8 and BH12 to BH16 drilled for the purpose of shallow environmental sampling were of insufficient depth to provide any additional information on the subsurface profile of the site. The field investigation revealed subsurface conditions generally consistent with the four geological units found across the site.

Groundwater seepage was encountered in the advancement of borehole BH4 at a depth of approximately 2.5m indicating that a more porous stratum may exist at around this depth. Dewatering may be necessary where excavations deeper than 2m are proposed, such as for sewer and drainage construction, although it is anticipated that simple pump and sump dewatering would suffice. Detailed borelogs are provided in Appendix B.

4 Geotechnical Engineering

4.1 General

Opinions contained in this report are based on data obtained from eight deep boreholes drilled across the site. The eight shallow boreholes were of insufficient depth to provide additional information relating to the subsurface profile and geotechnical aspects of the site. The nature and continuity of subsoil conditions away from and at depth below the investigation locations has been inferred, but it must be appreciated that actual conditions could vary from those assumed.

4.2 Site Classification for Building Footings

Based on the field investigation and on information obtained from the relevant geological maps, it is likely that building sites in the Cranbourne North (Stage 2) PSP area and approximately the western half of the Clyde North PSP area (where the geology consists of swamp deposits and older volcanic would be classified as CLASS H sites with reference to footing design and construction as per AS2870-1996. The remainder of the Clyde North PSP area (flood plain and stream deposits) is likely to be classified as CLASS M. The C21 site would generally be classified as CLASS H where the geology consists of older volcanic and CLASS M for the remainder of the site (where the geology consists of flood plain and stream deposits and Silurian siltstone).

These classifications are to provide a broad indication into the geotechnical nature of the site. Geotechnical investigations will need to be carried out on individual allotments as part of the detailed design and construction process.

4.3 Bearing Capacity

From the information obtained from the field investigation, the following estimates for allowable bearing capacity are provided for the four geological units found across the site:

Quaternary Swamp Deposits – 50 kPa
Quaternary Stream Deposits - 100kPa
Tertiary Older Volcanics – 100kPa
Tertiary Baxter Formation – 100kPa

Fill was encountered in Boreholes 8 and 11. All footings will need to be taken below any fill and into natural ground.

The above estimates for allowable bearing capacity will need to be confirmed during detailed geotechnical investigations for individual sites.

Footing depths will need to take into account the reactive nature of the soils (M to H).

4.4 Pavement Construction

Apart from the swamp deposits, a California Bearing Capacity (CBR) of 3.0% can be assumed for preliminary pavement design purposes. In the swampy area, a CBR of 2.0% should be assumed.

5 Applicability

5.1 This report has been prepared for The GAA and Tract Consultants Pty Ltd for the proposed Limted Geotechnical Assessment , Cranbourne North (Stage 2) PSP and Clyde North PSP project, with respect to the particular brief given to us, and it may not be relied upon in any other context or for any other purpose without our prior review and agreement

5.2 No responsibility for this report will be taken by CT&T if it is altered in any way, or not reproduced in full.

5.3 If at a later time it is found that the information previously provided to CT&T was incorrect, incomplete and/or if at any time the soil conditions are found to differ from those reported, CT&T should be contacted immediately for further site assessment.

5.4 In subsurface investigations, the soil profiles encountered may differ significantly between test points and sample intervals and at locations other than where observations, explorations or investigations have been carried out. Thus any conclusions drawn in this report have some level of uncertainty because of the inherent variations that can exist at any site. CT&T accepts no responsibility and shall not be liable for any consequence of changed or unanticipated surface or subsurface conditions.

5.5 The conclusions of this report may become invalid if filling or excavation occurs after the bore holes referred to in this report were drilled.

Should you require any further information regarding this report, please do not hesitate to contact the undersigned on (03) 8796 7900

CHADWICK T&T PTY LTD

Environmental and Engineering Consultants

Report prepared by:	Authorised for Chadwick T&T by:
.....	.....
Dale Morcombe	Nick Rogers
Senior Pavements Engineer	Manager Consulting Services

dm

Appendix A: Figures 1 -10

LEGEND
Urban Growth Boundary
PSP Boundary

SCALE 1: 50,000
0 500 1000 1500 2000 2500(m)

Notes:
1. PSP & Urban Growth Boundaries are approximate only. Sourced from Growth Areas Authority. Ref: 3138–11, October 2008
2. Aerial Imagery © DigitalGlobe & Sinclair Knight Merz, 2009

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SCALES (AT A4 SIZE) 1: 50,000		
PROJECT No. 500994		

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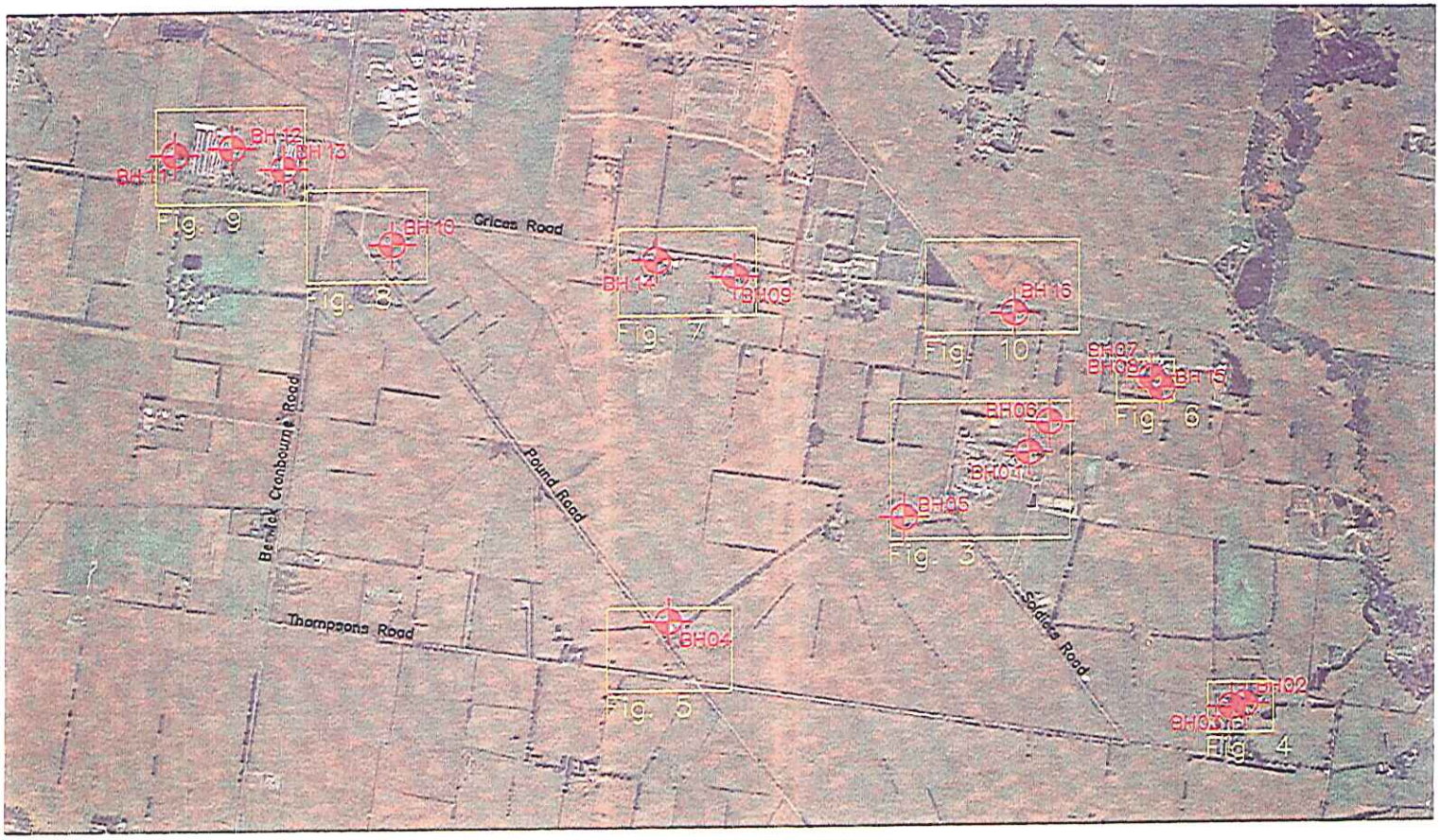
CLYDE NORTH PRECINCT
General Location Map including Precinct boundaries

FIG. No. Figure 1 REV. 0



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Approximate Borehole Locations

FIG. No. Figure 2

REV. 0

SCALE 1:5000

0 50 100 150 200 250 (m)

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BH 01,05,06 Location Map

FIG. No. Figure 3

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0 50 100 150 (m)

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BH 02,03 Location Map

FIG. No. Figure 4

REV. 0

SCALE 1:5000

0 50 100 150 200 250 (m)

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BH04 Location Map

FIG. No. Figure 5

REV. 0

SCALE 1:2,500

0 50 100 150 (m)

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CLYDE NORTH PRECINCT
BH 07,08,15 Location Map

FIG. No. Figure 06 REV. 0

SCALE 1:5000

0 50 100 150 200 250 (m)

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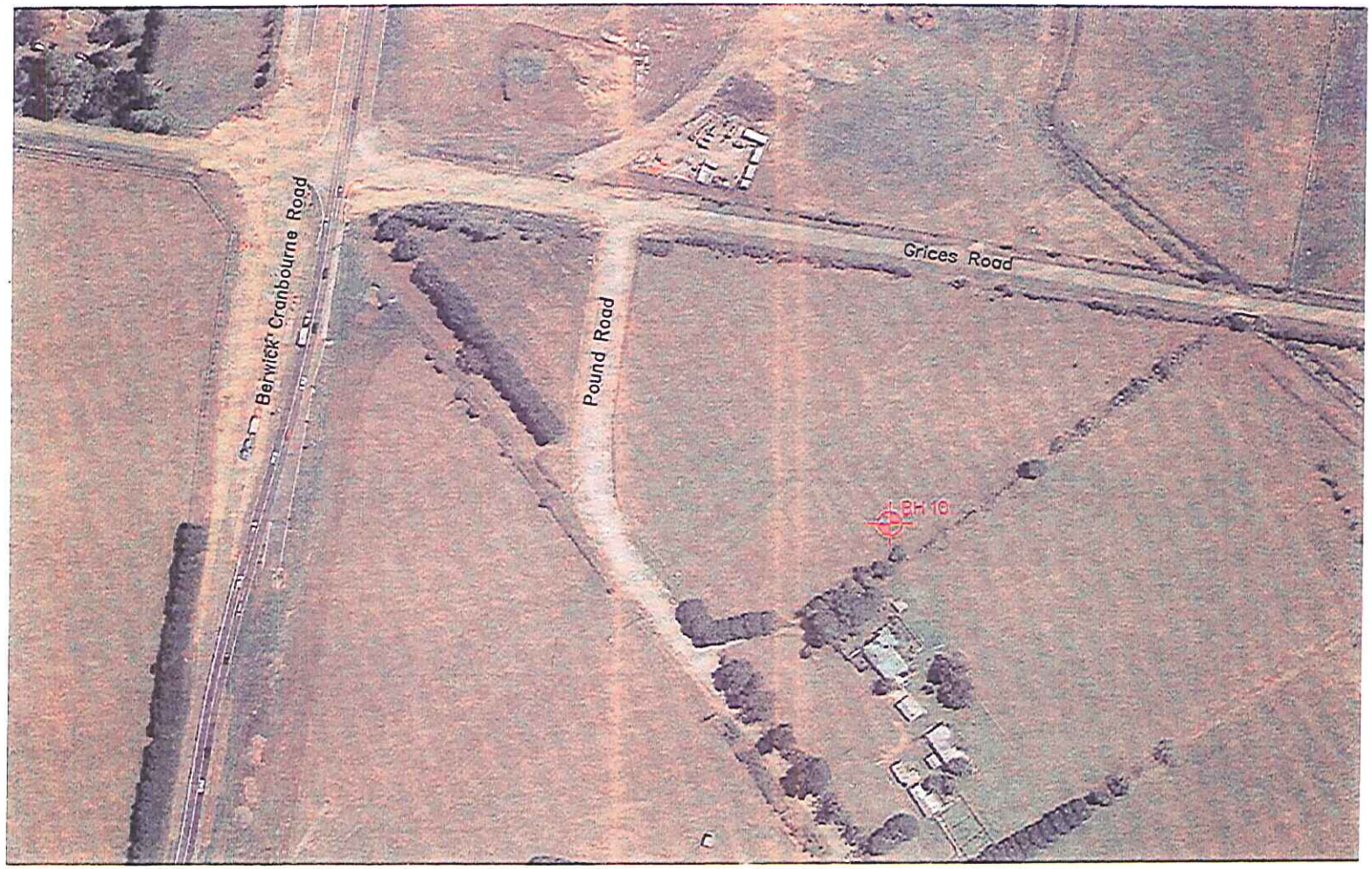
CLYDE NORTH PRECINCT
BH 09, 14 Location Map

FIG. No. Figure 07

REV. 0



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0 50 100 150 200 250 (m)

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CLYDE NORTH PRECINCT
BH 10 Location Map

FIG. No. Figure 8

REV. 0

SCALE 1:5000

0 50 100 150 200 250 (m)

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CLYDE NORTH PRECINCT
BH 11, 12, 13 Location Map

FIG. No. Figure 9

REV. 0

SCALE 1:5000

0 50 100 150 200 250 (m)

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SCALES (AT A4 SIZE) 1:5,000		
PROJECT No. 500994		

AUSTRALAND PTY LTD
GEOTECHNICAL & ENVIRONMENTAL ASSESSMENT
CLYDE NORTH PRECINCT
BH 16 Location Map

FIG. No. Figure 10

REV. 0

Appendix B: Engineering Logs (refer to Appendix H)

Appendix B: Current Title Details

REGISTER SEARCH STATEMENT Land Victoria

Security no : 124028048102L

Volume 06588 Folio 458
Produced 25/11/2008 03:57 pm

CROWN GRANT

LAND DESCRIPTION

Crown Allotment 60A Parish of Cranbourne.

REGISTERED PROPRIETOR

Estate Fee Simple
Sole Proprietor
STRAHAN INVESTMENTS PTY LTD of LEVEL17 114 WILLIAM STREET MELBOURNE VIC 3000
AF963272C 11/07/2008

ENCUMBRANCES, CAVEATS AND NOTICES

MORTGAGE AF963273A 11/07/2008
NATIONAL AUSTRALIA BANK LTD

Any crown grant reservations exceptions conditions limitations and powers noted on the plan or imaged folio set out under DIAGRAM LOCATION below. For details of any other encumbrances see the plan or imaged folio set out under DIAGRAM LOCATION below.

DIAGRAM LOCATION

SEE TP744063M FOR FURTHER DETAILS AND BOUNDARIES

ACTIVITY IN THE LAST 125 DAYS

NIL

STATEMENT END

Security no : 1240280047569Q

Volume 04024 Folio 689
Produced 25/11/2008 03:38 pm

LAND DESCRIPTION

Lot 1 on Title Plan 392956D (formerly known as part of Portion 59 Parish of Cranbourne).
PARENT TITLE Volume 03146 Folio 148
Created by instrument 820034 17/02/1917

REGISTERED PROPRIETOR

Estate Fee Simple
Sole Proprietor
FRONTLINK PTY LTD of 18-22 LEEMAK CR BERWICK 3806
X337193Q 26/02/2001

ENCUMBRANCES, CAVEATS AND NOTICES

Any encumbrances created by Section 98 Transfer of Land Act 1958 or Section 24 Subdivision Act 1988 and any other encumbrances shown or entered on the plan set out under DIAGRAM LOCATION below.

DIAGRAM LOCATION

SEE TP392956D FOR FURTHER DETAILS AND BOUNDARIES

ACTIVITY IN THE LAST 125 DAYS

NIL

STATEMENT END

Clyde Nth

Security no : 124028047695D

Volume 10515 Folio 166
Produced 25/11/2008 03:42 pm

LAND DESCRIPTION

Lot 1 on Plan of Subdivision 431277A.
PARENT TITLES :
Volume 09751 Folio 024 to Volume 09751 Folio 025
Created by instrument PS431277A 10/05/2000

REGISTERED PROPRIETOR

Estate Fee Simple
Sole Proprietor
RUSSELL JOHN PATTERSON of 2125 THOMPSONS RD CLYDE 3978
W732015G 17/04/2000

ENCUMBRANCES, CAVEATS AND NOTICES

MORTGAGE W732045T 17/04/2000
WESTPAC BANKING CORPORATION

Any encumbrances created by Section 98 Transfer of Land Act 1958 or Section 24 Subdivision Act 1988 and any other encumbrances shown or entered on the plan set out under DIAGRAM LOCATION below.

DIAGRAM LOCATION

SEE PS431277A FOR FURTHER DETAILS AND BOUNDARIES

ACTIVITY IN THE LAST 125 DAYS

NIL

The following information is provided for customer information only.

Street Address: 2125 THOMPSONS ROAD CLYDE NORTH VIC 3978

STATEMENT END

Security no : 124028047799Q

Volume 10515 Folio 167
Produced 25/11/2008 03:45 pm

LAND DESCRIPTION

Lot 2 on Plan of Subdivision 431277A.
PARENT TITLES :
Volume 09751 Folio 024 to Volume 09751 Folio 025
Created by instrument PS431277A 10/05/2000

REGISTERED PROPRIETOR

Estate Fee Simple
Joint Proprietors
GLENDA CHERYL HUTCHINSON
BRETT HUTCHINSON both of 2175 SMITHS LANE. CLUDE 3978
W732014K 17/04/2000

ENCUMBRANCES, CAVEATS AND NOTICES

MORTGAGE W806556W 26/05/2000
WESTPAC BANKING CORPORATION

Any encumbrances created by Section 98 Transfer of Land Act 1958 or Section 24 Subdivision Act 1988 and any other encumbrances shown or entered on the plan set out under DIAGRAM LOCATION below.

DIAGRAM LOCATION

SEE PS431277A FOR FURTHER DETAILS AND BOUNDARIES

ACTIVITY IN THE LAST 125 DAYS

NIL

STATEMENT END

REGISTER SEARCH STATEMENT Land Victoria

Security no : 124028047842T

Volume 09713 Folio 671
Produced 25/11/2008 03:46 pm

LAND DESCRIPTION

Land in Plan of Consolidation 162696E.
PARENT TITLES :
Volume 08417 Folio 494 Volume 09707 Folio 273
Created by instrument CP162696E 26/11/1986

REGISTERED PROPRIETOR

Estate Fee Simple
Sole Proprietor
HILLCREST CHRISTIAN COLLEGE (VIC) INC of RSD MCDONALDS TRACK NYORA VIC 3987
T422219V 18/11/1994

ENCUMBRANCES, CAVEATS AND NOTICES

MORTGAGE AC169977Q 02/07/2003
WESTPAC BANKING CORPORATION

CAVEAT V078646J 06/11/1997
Caveator
EASTERN ENERGY LTD
Capacity SEE CAVEAT
Lodged by
EASTERN ENERGY LTD
Notices to
EASTERN ENERGY LTD; 452 FLINDERS ST MELBOURNE 3000

Any encumbrances created by Section 98 Transfer of Land Act 1958 or Section 24 Subdivision Act 1988 and any other encumbrances shown or entered on the plan or imaged folio set out under DIAGRAM LOCATION below.

AGREEMENT Section 173 Planning and Environment Act 1987
AE818459G 03/01/2007

DIAGRAM LOCATION

SEE TP322591P FOR FURTHER DETAILS AND BOUNDARIES

ACTIVITY IN THE LAST 125 DAYS

NIL

STATEMENT END

Security no : 124028048045X

Volume 10558 Folio 952
Produced 25/11/2008 03:54 pm

LAND DESCRIPTION

Lot 1 on Title Plan 819098B (formerly known as part of Portion 60 Parish of Cranbourne).
PARENT TITLE Volume 03774 Folio 655
Created by instrument X059130Y 26/09/2000

REGISTERED PROPRIETOR

Estate Fee Simple
Sole Proprietor
FRONTLINK PTY LTD of 10 DOROTHY STREET DOVETON VIC 3177
AC382701U 06/10/2003

ENCUMBRANCES, CAVEATS AND NOTICES

Any encumbrances created by Section 98 Transfer of Land Act 1958 or Section 24 Subdivision Act 1988 and any other encumbrances shown or entered on the plan set out under DIAGRAM LOCATION below.

DIAGRAM LOCATION

SEE TP819098B FOR FURTHER DETAILS AND BOUNDARIES

ACTIVITY IN THE LAST 125 DAYS

NIL

The following information is provided for customer information only.

Street Address: 490 SOLDIERS ROAD CLYDE NORTH VIC 3978

STATEMENT END

Security no : 124028048150J

Volume 06153 Folio 539
Produced 25/11/2008 03:59 pm

LAND DESCRIPTION

Lot 1 on Title Plan 341390S (formerly known as part of Portion 47 Parish of Cranbourne).
PARENT TITLE Volume 03356 Folio 191
Created by instrument 1667384 30/10/1937

REGISTERED PROPRIETOR

Estate Fee Simple
Sole Proprietor
RONALD ROSANOVE of "EYRECOURT" GRICES ROAD BERWICK
C778638 17/05/1967

ENCUMBRANCES, CAVEATS AND NOTICES

MORTGAGE L676990Y 21/05/1985
NATIONAL AUSTRALIA BANK LTD

Any encumbrances created by Section 98 Transfer of Land Act 1958 or Section 24 Subdivision Act 1988 and any other encumbrances shown or entered on the plan set out under DIAGRAM LOCATION below.

DIAGRAM LOCATION

SEE TP341390S FOR FURTHER DETAILS AND BOUNDARIES

ACTIVITY IN THE LAST 125 DAYS

NIL

The following information is provided for customer information only.

Street Address: 211 GRICES ROAD CLYDE NORTH VIC 3978

STATEMENT END

Security no : 124028048336G

Volume 03659 Folio 736
Produced 25/11/2008 04:05 pm

LAND DESCRIPTION

Lots 1 and 2 on Title Plan 679465B.
PARENT TITLES :
Volume 03362 Folio 390 Volume 03482 Folio 390
Created by instrument 1561824R 17/12/1912

REGISTERED PROPRIETOR

Estate Fee Simple
Sole Proprietor
FRONTLINK PTY LTD of LEVEL 3 SUITE 66/255 DRUMMOND STREET CARLTON 3053
X599405F 13/07/2001

ENCUMBRANCES, CAVEATS AND NOTICES

Any encumbrances created by Section 98 Transfer of Land Act 1958 or Section 24 Subdivision Act 1988 and any other encumbrances shown or entered on the plan set out under DIAGRAM LOCATION below.

DIAGRAM LOCATION

SEE TP679465B FOR FURTHER DETAILS AND BOUNDARIES

ACTIVITY IN THE LAST 125 DAYS

NIL

STATEMENT END

Security no : 124028048566G

Volume 09768 Folio 698
Produced 25/11/2008 04:14 pm

LAND DESCRIPTION

Lot 2 on Plan of Subdivision 208772B.
PARENT TITLE Volume 09528 Folio 479
Created by instrument LP208772B 17/01/2001

REGISTERED PROPRIETOR

Estate Fee Simple
Sole Proprietor
MICHELLE LOUISE SHOOBERT of 105 GRICES ROAD CLYDE NORTH VIC 3978
AC897440A 02/06/2004

ENCUMBRANCES, CAVEATS AND NOTICES

MORTGAGE AC897441X 02/06/2004
NATIONAL AUSTRALIA BANK LTD

MORTGAGE AF294778V 24/08/2007
ST. GEORGE BANK LTD

Any encumbrances created by Section 98 Transfer of Land Act 1958 or Section 24 Subdivision Act 1988 and any other encumbrances shown or entered on the plan or imaged folio set out under DIAGRAM LOCATION below.

DIAGRAM LOCATION

SEE LP208772B FOR FURTHER DETAILS AND BOUNDARIES

ACTIVITY IN THE LAST 125 DAYS

NIL

The following information is provided for customer information only.

Street Address: 105 GRICES ROAD CLYDE NORTH VIC 3978

STATEMENT END

Security no : 124028048603R

Volume 09768 Folio 697
Produced 25/11/2008 04:15 pm

LAND DESCRIPTION

Lot 1 on Plan of Subdivision 208772B.
PARENT TITLE Volume 09528 Folio 479
Created by instrument LP208772B 17/01/2001

REGISTERED PROPRIETOR

Estate Fee Simple
Sole Proprietor
ALBERTI INVESTMENTS PTY LTD of 1095 POUND RD. BERWICK
U948462D 26/08/1997

ENCUMBRANCES, CAVEATS AND NOTICES

MORTGAGE AG028042E 14/08/2008
AUSTRALAND INDUSTRIAL NO 143 PTY LTD

CAVEAT AF284695G 20/08/2007
Caveator
AUSTRALAND INDUSTRIAL NO 143 PTY LTD
Capacity PURCHASER/FEE SIMPLE
Lodged by
SEPTIMUS JONES & LEE
Notices to
SEPTIMUS JONES & LEE of LEVEL 5, 99 WILLIAM STREET MELBOURNE VIC 3000

Any encumbrances created by Section 98 Transfer of Land Act 1958 or Section 24 Subdivision Act 1988 and any other encumbrances shown or entered on the plan or imaged folio set out under DIAGRAM LOCATION below.

DIAGRAM LOCATION

SEE LP208772B FOR FURTHER DETAILS AND BOUNDARIES

ACTIVITY IN THE LAST 125 DAYS

NUMBER		STATUS	DATE
AG028041G	DISCHARGE OF MORTGAGE	Registered	24/09/2008
AG028042E	MORTGAGE	Registered	24/09/2008

The following information is provided for customer information only.

Street Address: 1095 POUND ROAD CLYDE NORTH VIC 3978

STATEMENT END

Appendix C: Historical Title Summary

Vol/ Folio	Owner	Year	Parent title
Lot 13			
06588/458	Strahan Investments Pty Ltd	2008	crown land
04024/689	Frontlink Pty Ltd	2001	03146/148
03146/148	Robert Gibb (Grazier)	1906	01646/100
			01749/672
01646/100	Richard Grice	1885	00989/774
01749/672	Richard Grice	1885	Details Unknown
00989/774	Williams Skyes (Farmer)	1878	Details Unknown
Lot 10			
10515/166	Russel John Patterson	2000	09751/024
09751/024	John Stanley Patterson and Eileen Edith Patterson	1987	03996/076
09751/025	John Stanley Patterson and Eileen Edith Patterson	1987	03996/076
03996/076	James Lecky (Grazier)	1916	03955/939
03955/939	National Trustees Executors and Agency Company of Australia Limited	1916	Details Unknown
Lot 11			
10515/167	Glenda Cheryl and Brett Hutchinson	2000	09751/024
09751/024	John Stanley Patterson and Eileen Edith Patterson	1987	03996/076
09751/025	John Stanley Patterson and Eileen Edith Patterson	1987	03996/076
03996/076	James Lecky (Grazier)	1916	03955/939
03955/939	National Trustees Executors and Agency Company of Australia Limited	1916	Details Unknown
Lot 12A			
09713/671	Hilcrest Christian College	1994	08417/494
08417/494	Allan Fullerton Wilson (Farmer)	1962	04036/164
04036/164	Frederick William Bridge (rubber planter) and William Bridge and Lancaster Lionel Bridge (framers)	1917	02943/485
02943/485	Scott Alexander Sharp (Grazier)	1903	01964/637
01964/637	George William Taylor (Auctioneer)	1888	Details Unknown
09707/273	Brian Douglas and Margeret Shirley Douglas	1986	03996/076
03996/076	James Lecky (Grazier)	1916	03955/939
03955/939	National Trustees Executors and Agency Company of Australia Limited	1916	Details Unknown
Lot 12B			
08116/735	APA Gasnet Australia	2008	08091/510
08091/510	Gas and Fuel Corporation of Victoira	1955	08091/509
08091/509	Gas and Fuel Corporation of Victoira	1955	04036/164
04036/164	Frederick William Bridge (rubber planter) and William Bridge and Lancaster Lionel Bridge (framers)	1917	02943/485
02943/485	Scott Alexander Sharp (Grazier)	1903	01964/637
01964/637	George William Taylor (Auctioneer)	1888	Details Unknown
09707/273	Brian Douglas and Margeret Shirley Douglas	1986	03996/076
03996/076	James Lecky (Grazier)	1916	03955/939
03955/939	national Trustees Executors and Agency Company of Australia Limited	1916	Details Unknown
08116/734	Gas and Fuel Corporation of Victoira	1955	04036/164
04036/164	Frederick William Bridge (rubber planter) and William Bridge and Lancaster Lionel Bridge (framers)	1917	02943/485
02943/485	Scott Alexander Sharp (Grazier)	1903	01964/637
01964/637	George William Taylor (Auctioneer)	1888	Details Unknown
09707/273	Brian Douglas and Margeret Shirley Douglas	1986	03996/076
03996/076	James Lecky (Grazier)	1916	03955/939
03955/939	National Trustees Executors and Agency Company of Australia Limited	1916	Details Unknown
Lot 3D			
10558/952	Frontlink Pty Ltd	2003	03774/655
03774/655	Frank Binotto (Concretor and Ines Pauline Binotto	1983	02943/485
02943/485	Scott Alexander Sharp (Grazier)	1903	01964/637
01964/637	George William Taylor (Auctioneer)	1888	Details Unknown
09707/273	Brian Douglas and Margeret Shirley Douglas	1986	03996/076
03996/076	James Lecky (Grazier)	1916	03955/939
03955/939	National Trustees Executors and Agency Company of Australia Limited	1916	Details Unknown

Vol/ Folio	Owner	Year	Parent title
Lot 9A			
06153/539	Ronald Rosanove	1967	03356/191
03356/191	William Himphrey Meyrich Wienholt	1909	01646/100
01646/100	Richard Grice	1885	00989/744
00989/774	Williams Skyes (Farmer)	1878	Details Unknown
Lot 9B			
06850/889	Ronald Rosanove	1967	03576/014
03576/014	Thomas Carroll (dairyman)	1912	01646/100
01646/100	Richard Grice	1885	00989/744
00989/774	Williams Skyes (Farmer)	1878	Details Unknown
Lot 3B			
03659/736	Frontlink Pty Ltd	2001	03362/290
03482/390	John Murray Bell (farmer)	1911	01646/100
01646/100	Richard Grice	1885	00989/744
00989/774	Williams Skyes (Farmer)	1878	Details Unknown
Lot 8			
03431/066	Annat pty ltd	2004	01646/100
01646/100	Richard Grice	1885	00989/744
00989/774	Williams Skyes (Farmer)	1878	Details Unknown
Lot 6			
09310/362	Sam Rudokas and Geffrey Rudokas	1983	09039/206
09039/206	William Roy Wilson mary Fayette Wilson (farmers)	1974	07652/191
07652/191	Thomas Henry Uaher (farmer)	1951	04220/898
04220/898	Aubert William Lougham (Grazier)	1919	03431/065
03431/065	Joseph Keenan	1902	01646/100
01646/100	Richard Grice	1885	00989/744
00989/774	Williams Skyes (Farmer)	1878	Details Unknown
Lot 7			
09329/578	Patrick John and Elise May Hoare	1997	09039 206
09039/206	William Roy Wilson mary Fayette Wilson (farmers)	1974	07652/191
07652/191	Thomas Henry Uaher (farmer)	1951	04220/898
04220/898	Aubert William Lougham (Grazier)	1919	03431/065
03431/065	Joseph Keenan	1902	01646/100
01646/100	Richard Grice	1885	00989/744
00989/774	Williams Skyes (Farmer)	1878	Details Unknown
Lot 5			
09320/510	Formes McDonald and Barbara Caroline Laing	1981	08092/359
08092/359	John David Handley (Farmer)	1955	06017/389
06017/389	Gwen Brunt	1936	04036/096
04036/096	Elizabeth Joyce Taylor and Anne Hill (Hotel proprietors)	1917	03431/064
03431/064	Joesph Keenan	1910	01646/100
01646/100	Richard Grice	1885	00989/744
00989/774	Williams Skyes (Farmer)	1878	Details Unknown

Vol/ Folio	Owner	Year	Parent title
Lot 4			
09768/698	Michelle Louise Shoobert	2004	09528/479
09528/479	John David Handley (farmer)	1983	08092/359
08092/359	John David Handley (Farmer)	1955	06017/389
06017/389	Gwen Brunt	1936	04036/096
04036/096	Elizabeth Joyce Taylor and Anne Hill (Hotel proprietors)	1917	03431/064
03431/064	Joesph Keenan	1910	01646/100
01646/100	Richard Grice	1885	00989/744
00989/774	Williams Skyes (Farmer)	1878	Details Unknown
Lot 3A			
09768/698	Michelle Louise Shoobert	2004	09528/479
09528/479	John David Handley (farmer)	1983	08092/359
09768/697	Alberti Investments Pty Ltd	1997	09528/479
08092/359	John David Handley (Farmer)	1955	06017/389
06017/389	Gwen Brunt	1936	04036/096
04036/096	Elizabeth Joyce Taylor and Anne Hill (Hotel proprietors)	1917	03431/064
03431/064	Joesph Keenan	1910	01646/100
01646/100	Richard Grice	1885	00989/744
00989/774	Williams Skyes (Farmer)	1878	Details Unknown
Lot 14			
08560/750	Ian Marshal Baillieu	1983	crown grant
Lot 14			
03451/097	Ian Marshal Baillieu	1985	02943/485
02943/485	Scott Alexander Sharp (Grazier)	1903	01964/637
01964/637	George William Taylor (Auctioneer)	1888	Details Unknown
1085 Glasscocks Road			
10586/811	Raymond Lightower	2001	08461/033
08461/033	Leslie Kieth Allen (Market gardener)	1962	08172/500
08172/500	John Thomas Haberfield (farmer)	1957	08149/627
08394/088	Lachlan Keith Gardiner (Solicitor and Elaine Gardiner	1962	08149/627
08149/627	Fairlie Margaret Herd (farmer)	1957	04810/860
04810/860	Charles Forrester Greaves	1924	04326/111

Vol/ Folio	Owner	Year	Parent title
358S Clyde Road			
11049/937	IGM development Pty Ltd	2008	09396/285
09396/285	Zoltan Marosy, Georgia Marosy and Andrew Marosy (farmers)	1980	08172/550
08172/500	John Thomas Haberfield (farmer)	1957	08149/627
08149/627	Fairlie Margaret Herd (farmer)	1957	04810/860
04810/860	Charles Forrester Greaves	1924	04326/111
04326/111	Edwin Greaves	1920	Details Unknown
1095 Glasscocks Road			
08250/220	John Vella and Sandra Gai Vella	1997	08149/627
08149/627	Fairlie Margaret Herd (farmer)	1957	04810/860
04810/860	Charles Forrester Greaves	1924	04326/111
04326/111	Edwin Greaves	1920	Details Unknown
1105 Glasscocks Road			
08486/436	Daphne Frances Butler	2005	08149/627
08149/627	Fairlie Margaret Herd (farmer)	1957	04810/860
04810/860	Charles Forrester Greaves	1924	04326/111
04326/111	Edwin Greaves	1920	Details Unknown
1115 Glasscocks Road			
08519/143	Marika Zenz	1996	08149/627
08149/627	Fairlie Margaret Herd (farmer)	1957	04810/860
04810/860	Charles Forrester Greaves	1924	04326/111
04326/111	Edwin Greaves	1920	Details Unknown
1135 Glasscocks Road			
08239/867	Fast Earn Pty Ltd	1997	09149/627
08149/627	Fairlie Margaret Herd (farmer)	1957	04810/860
04810/860	Charles Forrester Greaves	1924	04326/111
04326/111	Edwin Greaves	1920	Details Unknown
1145 Glasscocks Road			
10994/908	Joseph Santucci and Maria Santucci	2007	08296/903
08296/903	Gerald John Rashleigh (maintenance fitter)	1960	08149/627
08149/627	Fairlie Margaret Herd (farmer)	1957	04810/860
04810/860	Charles Forrester Greaves	1924	04326/111
04326/111	Edwin Greaves	1920	Details Unknown

Appendix D: Aerial Photograph Summary

Chadwick

Preliminary Site Investigation - Site History (Historical Aerial Photographs)

Job Ref: 5009

Area Name	Clyde North PSP Area																	
Lot ID	1A	1B	2	3A	3B	3C	3D	4	5	6	7	8	9A	9B	10	11	12A	12B
Street Address				1095 Pound	181 Grices	1275 Pound	490 Soldiers	105 Grices	111 Grices	121 Grices	125 Grices	161 Grices	211 Grices		2125 Thompsons	2175 Smith Lane / Thompsons	500 Soldiers	
Landowner/Resident	Roads Corporation	Roads Corporation	Melbourne Water Corporation	Australand, Mondous / Alberti	Australand, Mondous	Australand, Mondous	Australand, Mondous	Michelle Shoobert	Forbes & B. Laing	AV Jennings	Patrick & Elsie Hoare	Annat Pty Ltd	Ronald Rosanove		Russel Patterson	Glenda & Brett Hutchinson	Hillcrest Christian Colledge	
Contact Phone Number																		
Contaminating Activity																		
Grazing/Agricultural Landuse	✔ (1960 - 1989)	✔ (1960 - 1989)	✔ (1960 - 1989)	✔ (1960 - 1991)	✔ (1960 - 1991)	✔ (1960 - 1991)	✔ (1960 - 1991)	✔ (1960 - 1989)	✔ (1960 - 1989)	✔ (1960 - 1989)	✔ (1960 - 1989)	✔ (1960 - 1989)	✔ (1960 - 1991)	✔ (1960 - 1991)	✔ (1960 - 1991)	✔ (1960 - 1991)	✔ (1960 - 1989)	✔ (1960 - 1989)
Market Garden																		
Nursery																		
Farmhouse/Sheds				✔ (1960 - 1991)	✔ (1960 - 1991)	✔ (1960 - 1991)	✔ (1960 - 1991)	✔ (1960 - 1989)	✔ (1960 - 1989)	✔ (1989)	✔ (1989)	✔ (1960 - 1989)	✔ (1960 - 1991)		✔ (1960 - 1991)	✔ (1960 - 1991)	✔ (1960 - 1989)	✔ (1960 - 1989)
Chicken Sheds																		
Drainange/Irrigation Channel				✔ (1960 - 1991)		✔ (1960 - 1991)												
Filled Dam / Water Course					✔ (1960 - 1991)		✔ (1960 - 1991)						✔ (1980 - 1989)	✔ (1980 - 1989)	✔ (1960 - 1991)	✔ (1960 - 1991)		
Air strip						✔ (1960 - 1991)												

Chadwick

994

Job Ref: 500994

Area Name		Cranbourne North (Stage 2) PSP Area							C21 Business Park PSP Area						
Lot ID	13								1C	1D	14A	14B	14C	14D	14E
Street Address	335 Grices	1085 Glasscocks	1095 Glasscocks	1105 Glasscocks	1115 Glasscocks	1135 Glasscocks	2-26 Pound / 1145 Glasscocks	358 Clyde Road			2-106 and 108-128 Soldiers				
Landowner/Resident	Strahan Investments	Ray & Jane Lightowler	Berwick Speedy Seedlings	Daphne Butler							Mr. Baillieu				
Contact Phone Number															
Contaminating Activity															
Grazing/Agricultural Landuse	✔ (1960 - 1989)	✔ (1960 - 1989)	✔ (1960 - 1989)	✔ (1960 - 1989)	✔ (1960 - 1989)	✔ (1960 - 1989)	✔ (1960 - 1989)	✔ (1960 - 1989)	✔ (1960 - 1989)	✔ (1960 - 1989)	✔ (1960 - 1989)	✔ (1960 - 1989)	✔ (1960 - 1989)	✔ (1960 - 1989)	✔ (1960 - 1989)
Market Garden															
Nursery			✔ (1960 - 1989)												
Farmhouse/Sheds	✔ (1960 - 1989)		✔ (1960 - 1989)	✔ (1960 - 1989)	✔ 1960 - 1989)	✔ (1960 - 1989)	✔ (1960 - 1989)				✔ (1960 - 1989)	✔ (1960 - 1989)	✔ (1960 - 1989)		
Chicken Sheds						✔ (1960 - 1989)									
Drainange/Irrigation Channel															
Filled Dam / Water Course	✔ (1960 - 1989)	✔ (1960 - 1989)						✔ (1960 - 1989)			✔ (1960 - 1989)	✔ (1960 - 1989)		✔ (1960 - 1989)	✔ (1960 - 1989)
Air strip															

Appendix E: Summary of site walkover

Job Ref: 500994

Preliminary Site Investigation

Area Name	Clyde North PSP Area														
Lot ID	1A	1B	2	3A	3B	3C	3D	4	5	6	7	8	9A	9B	10
Street Address				1095 Pound	181 Grices	1275 Pound	490 Soldiers	105 Grices	111 Grices	121 Grices	125 Grices	161 Grices	211 Grices		2125 Thompsons
Landowner/Resident	Roads Corporation	Roads Corporation	Melbourne Water Corporation	Australand, Mondous / Alberti	Australand, Mondous	Australand, Mondous	Australand, Mondous	Michelle Shoobert	Forbes & B. Laing	AV Jennings	Patrick & Elsie Hoare	Annat Pty Ltd	Ronald Rosanove		Russel Patterson
Contact Phone Number				9702 5076 / 0412 042 819 (John Smitard)		0418 990 329		9702 1174 / 0418 340 278			9702 2175		PO Box 3, Berwick		0417 583 822
Comments													Refused access to property		
Contaminating Activity															
Predominant land use	Cattle grazing			Farming: Cattle	Horses	Horses	Horses	Trucks Yard	Garden	Farming: Cattle, sheep	Garden	Horses	Cattle and sheep		Cattle
Historical land use											Vineyard				Sheep
Stock Dip															✔
Stock Yard															
Quarry															
Machinery Shed					✔	✔	✔ no access to large shed	✔		✔	✔	✔			✔
(Waste) Drums					Paint, oil		Aviation gasoline (UN1203)	Glycerina, Indosorb, Hydraulic Oil, Engine Oil				Lubricants			Diesel and petrol drums, paint,
Waste/Refuse					Horse manure			Metal, wood, car batteries				Horse manure	Owner said garbage was buried on property		Unused tank
Chemical Storage Shed						Animal shampoo, flee rince					Historically pesticides				
Chemical Applications				Fertilizer		Capeweed spray					Historically pesticides	Spot spraying of herbicides			Thistle-Killem 750, Roundup, Anacide, Crop Care Dominex, Grazon, fertilizer (Liquid Lime)
Market Garden															
Fence Poles Storage															

Job Ref: 500994

Preliminary Site Investigation

Area Name	Clyde North PSP Area														
Lot ID	1A	1B	2	3A	3B	3C	3D	4	5	6	7	8	9A	9B	10
Street Address				1095 Pound	181 Grices	1275 Pound	490 Soldiers	105 Grices	111 Grices	121 Grices	125 Grices	161 Grices	211 Grices		2125 Thompsons
Excavated Area															
Waste Stockpile															
Burning Area						✔									
Incinerator						Drum used as incinerator									
Filled Dam / Water Course										2					
Easement Present onsite															
Septic Tank						✔					✔	✔			✔
AST						Heating oil									
UST															
Bowser										Unused					
Air strip						✔									
Trucks								✔							

Notes: Indosorb TS 7 Sorbitol Syrup, used for tooth paste, pharmaceutical products

Job Ref: 500994

Area Name					Cranbourne North (Stage 2) PSP Area							C21 Business Park PSP Area						
Lot ID	11	12A	12B	13								1C	1D	14A	14B	14C	14D	14E
Street Address	2175 Smith Lane / Thompsons	500 Soldiers		335 Grices	1085 Glasscocks	1095 Glasscocks	1105 Glasscocks	1115 Glasscocks	1135 Glasscocks	2-26 Pound / 1145 Glasscocks	358S Clyde Road			2-106 and 108-128 Soldiers				
Landowner/Resident	Glenda & Brett Hutchinson	Hillcrest Christian Colledge		Strahan Investments / Darrell	Ray & Jane Lightowler	John & Sandra Vella / Berwick Speedy Seedlings	Daphne Butler	Marika Zenz	Fast Earn Pty Ltd	Maria & Joseph Santucci	IGM Developments			Mr. Baillieu				
Contact Phone Number	0418 207 045	9702 2144 / 0434 566 820		422973569	9702 5658	0414 836 990 / 03 9702 1144	97021552	9561 8545	no phone number	no phone number	9587 4155			0408 365 629 / 0408 349 092				
Comments							Refused access to property											
Contaminating Activity																		
Predominant land use	Cattle	School: includes equestrian centre, agriculture, sheep		Cattle Grazing and Horses	Cattle/horse and garden	Nursery	Cattle and sheep grazing		Poultry	Horses	Cattle Grazing			Agricultural: Crops of wheat, canola, sorghum				
Historical land use	Sheep	Dairy farm; cattle and horses																
Stock Dip																		
Stock Yard									Chook sheds and silos									
Quarry	Historically sand mined																	
Machinery Shed	✔	✔		✔	✔									✔				
(Waste) Drums		Content unknown		Oil, paint, fuel, pesticides	Oil, grease									Fuel Divoflow (not used onsite)				
Waste/Refuse		Building material		Ash	Machinery parts, tyres	Machinery parts, old cars on 1099 Glasscocks								Railway sleepers				
Chemical Storage Shed						For Nursery various and; Vermiculite, Dolomite, Hydrated Lime, Millaquin (?Sugar), Throw Down									Herbicides, pesticides, weedicides, e.g. roundup				
Chemical Applications	Roundup, MCPI, insecticides	Pesticides (Capeweed), rat poison			Minor Roundup use									Farm chemicals				
Market Garden																		
Fence Poles Storage				✔														

Job Ref: 500994

Area Name					Cranbourne North (Stage 2) PSP Area							C21 Business Park PSP Area						
Lot ID	11	12A	12B	13								1C	1D	14A	14B	14C	14D	14E
Street Address	2175 Smith Lane / Thompsons	500 Soldiers		335 Grices	1085 Glasscocks	1095 Glasscocks	1105 Glasscocks	1115 Glasscocks	1135 Glasscocks	2-26 Pound / 1145 Glasscocks	358S Clyde Road			2-106 and 108-128 Soldiers				
Excavated Area																		
Waste Stockpile					Used pottery mix	Dark soil in backyard								Soil stockpiles (motorcycling?)				
Burning Area				✔														
Incinerator														✔				
Filled Dam / Water Course	Former Sand Quarry			2										4 + (next to creek)				
Easement Present onsite																		
Septic Tank	✔	6 sewage treatment		✔	✔													
AST		Diesel and petrol, bonded; oil not bonded		Diesel	Empty diesel, another unused tank	3 Diesel and petrol								✔ at all residential buildings				
UST					Excavated, unused UST	✔								Diesel and petrol and bowsers				
Bowser																		
Air strip																		
Trucks																		

Notes: Indosorb TS 7

Appendix F: EPA Priority Site Registry

Extract of EPA Priority Site Register

EPA VICTORIA

PROPERTY INQUIRY DETAILS:

STREET ADDRESS: Unit 2 1275 POUND ROAD
SUBURB: CLYDE NORTH
MUNICIPALITY: CITY OF CASEY
MAP REFERENCES: Melways 35th Edition, Street Directory, Map 131 Reference C10
Melways 35th Edition, Street Directory, Map 131 Reference D10
Melways 35th Edition, Street Directory, Map 131 Reference E10
Melways 35th Edition, Street Directory, Map 131 Reference F10
Melways 35th Edition, Street Directory, Map 131 Reference G10
Melways 35th Edition, Street Directory, Map 131 Reference H10
Melways 35th Edition, Street Directory, Map 131 Reference J10
Melways 35th Edition, Street Directory, Map 131 Reference C11
Melways 35th Edition, Street Directory, Map 131 Reference D11
Melways 35th Edition, Street Directory, Map 131 Reference E11
Melways 35th Edition, Street Directory, Map 131 Reference F11
Melways 35th Edition, Street Directory, Map 131 Reference G11
Melways 35th Edition, Street Directory, Map 131 Reference H11
Melways 35th Edition, Street Directory, Map 131 Reference J11
Melways 35th Edition, Street Directory, Map 131 Reference C12
Melways 35th Edition, Street Directory, Map 131 Reference D12
Melways 35th Edition, Street Directory, Map 131 Reference E12
Melways 35th Edition, Street Directory, Map 131 Reference F12
Melways 35th Edition, Street Directory, Map 131 Reference G12
Melways 35th Edition, Street Directory, Map 131 Reference H12
Melways 35th Edition, Street Directory, Map 131 Reference J12
Melways 35th Edition, Street Directory, Map 135 Reference C1
Melways 35th Edition, Street Directory, Map 135 Reference D1
Melways 35th Edition, Street Directory, Map 135 Reference E1
Melways 35th Edition, Street Directory, Map 135 Reference F1
Melways 35th Edition, Street Directory, Map 135 Reference G1
Melways 35th Edition, Street Directory, Map 135 Reference H1
Melways 35th Edition, Street Directory, Map 135 Reference J1

DATE OF SEARCH: 12th January 2009

PRIORITY SITES REGISTER REPORT:

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of the Environment Protection Act 1970 on the occupier of the site to require active management of these sites.

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Extract of EPA Priority Site Register

Victoria. A site should not be presumed to be free of contamination just because it does not appear on the Priority Sites Register.

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EPA Information Centre
Herald & Weekly Times Tower
40 City Road, Southbank 3006
Tel: (03)9695 2700 Fax:(03)9695 2710

Extract of EPA Priority Site Register

PROPERTY INQUIRY DETAILS:

STREET ADDRESS: 1105 GLASSCOCKS ROAD
SUBURB: NARRE WARREN SOUTH
MUNICIPALITY: CITY OF CASEY
MAP REFERENCES: Melways 35th Edition, Street Directory, Map 130 Reference K6
Melways 35th Edition, Street Directory, Map 130 Reference K7
Melways 35th Edition, Street Directory, Map 131 Reference A6
Melways 35th Edition, Street Directory, Map 131 Reference A7

DATE OF SEARCH: 12th January 2009

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Herald & Weekly Times Tower
40 City Road, Southbank 3006
Tel: (03)9695 2700 Fax:(03)9695 2710

[Extract of Priority Sites Register] # 8870946 - 8870946125411 '500994'

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[Extract of Priority Sites Register] # 8870946 - 8870946125411 '500994'

Extract of EPA Priority Site Register

EPA VICTORIA

PROPERTY INQUIRY DETAILS:

STREET ADDRESS: 1095 POUND ROAD
SUBURB: CLYDE NORTH
MUNICIPALITY: CITY OF CASEY
MAP REFERENCES: Melways 35th Edition, Street Directory, Map 131 Reference B7
Melways 35th Edition, Street Directory, Map 131 Reference C7
Melways 35th Edition, Street Directory, Map 131 Reference D7
Melways 35th Edition, Street Directory, Map 131 Reference B8
Melways 35th Edition, Street Directory, Map 131 Reference C8
Melways 35th Edition, Street Directory, Map 131 Reference D8
Melways 35th Edition, Street Directory, Map 131 Reference B9
Melways 35th Edition, Street Directory, Map 131 Reference C9
Melways 35th Edition, Street Directory, Map 131 Reference D9
Melways 35th Edition, Street Directory, Map 131 Reference B10
Melways 35th Edition, Street Directory, Map 131 Reference C10
Melways 35th Edition, Street Directory, Map 131 Reference D10

DATE OF SEARCH: 12th January 2009

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[Extract of Priority Sites Register] # 8870953 - 8870953125515 '500994'

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Land Audit Site Listing (EPA Publication 735). For a copy of this publication, copies of relevant Notices, or for more information relating to sites listed on the Priority Sites Register, please contact EPA as given below:

EPA Information Centre
Herald & Weekly Times Tower
40 City Road, Southbank 3006
Tel: (03)9695 2700 Fax:(03)9695 2710

[Extract of Priority Sites Register] # 8870953 - 8870953125515 '500994'

Extract of EPA Priority Site Register

PROPERTY INQUIRY DETAILS:

STREET ADDRESS: 211 GRICES ROAD
SUBURB: CLYDE NORTH
MUNICIPALITY: CITY OF CASEY
MAP REFERENCES: Melways 35th Edition, Street Directory, Map 131 Reference F8
Melways 35th Edition, Street Directory, Map 131 Reference G8
Melways 35th Edition, Street Directory, Map 131 Reference H8
Melways 35th Edition, Street Directory, Map 131 Reference F9
Melways 35th Edition, Street Directory, Map 131 Reference G9
Melways 35th Edition, Street Directory, Map 131 Reference H9
Melways 35th Edition, Street Directory, Map 131 Reference F10
Melways 35th Edition, Street Directory, Map 131 Reference G10
Melways 35th Edition, Street Directory, Map 131 Reference H10

DATE OF SEARCH: 12th January 2009

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Extract of EPA Priority Site Register

EPA VICTORIA

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PROPERTY INQUIRY DETAILS:

STREET ADDRESS: 2 - 106 SOLDIERS ROAD
SUBURB: BERWICK
MUNICIPALITY: CITY OF CASEY
MAP REFERENCES: Melways 35th Edition, Street Directory, Map 131 Reference F5
Melways 35th Edition, Street Directory, Map 131 Reference G5
Melways 35th Edition, Street Directory, Map 131 Reference H5
Melways 35th Edition, Street Directory, Map 131 Reference J5
Melways 35th Edition, Street Directory, Map 131 Reference K5
Melways 35th Edition, Street Directory, Map 131 Reference F6
Melways 35th Edition, Street Directory, Map 131 Reference G6
Melways 35th Edition, Street Directory, Map 131 Reference H6
Melways 35th Edition, Street Directory, Map 131 Reference J6
Melways 35th Edition, Street Directory, Map 131 Reference K6
Melways 35th Edition, Street Directory, Map 131 Reference F7
Melways 35th Edition, Street Directory, Map 131 Reference G7
Melways 35th Edition, Street Directory, Map 131 Reference H7
Melways 35th Edition, Street Directory, Map 131 Reference J7
Melways 35th Edition, Street Directory, Map 131 Reference K7
Melways 35th Edition, Street Directory, Map 131 Reference F8
Melways 35th Edition, Street Directory, Map 131 Reference G8
Melways 35th Edition, Street Directory, Map 131 Reference H8
Melways 35th Edition, Street Directory, Map 131 Reference J8
Melways 35th Edition, Street Directory, Map 131 Reference K8
Melways 35th Edition, Street Directory, Map 131 Reference F9
Melways 35th Edition, Street Directory, Map 131 Reference G9
Melways 35th Edition, Street Directory, Map 131 Reference H9
Melways 35th Edition, Street Directory, Map 131 Reference J9
Melways 35th Edition, Street Directory, Map 131 Reference K9
Melways 35th Edition, Street Directory, Map 214 Reference A5
Melways 35th Edition, Street Directory, Map 214 Reference B5
Melways 35th Edition, Street Directory, Map 214 Reference A6
Melways 35th Edition, Street Directory, Map 214 Reference B6
Melways 35th Edition, Street Directory, Map 214 Reference A7
Melways 35th Edition, Street Directory, Map 214 Reference B7
Melways 35th Edition, Street Directory, Map 214 Reference A8
Melways 35th Edition, Street Directory, Map 214 Reference B8
Melways 35th Edition, Street Directory, Map 214 Reference A9
Melways 35th Edition, Street Directory, Map 214 Reference B9

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Extract of EPA Priority Site Register

PROPERTY INQUIRY DETAILS:

STREET ADDRESS: 2125 THOMPSONS ROAD
SUBURB: CLYDE NORTH
MUNICIPALITY: CITY OF CASEY
MAP REFERENCES: Melways 35th Edition, Street Directory, Map 131 Reference K11
Melways 35th Edition, Street Directory, Map 131 Reference K12
Melways 35th Edition, Street Directory, Map 135 Reference K1
Melways 35th Edition, Street Directory, Map 214 Reference A11
Melways 35th Edition, Street Directory, Map 214 Reference B11
Melways 35th Edition, Street Directory, Map 214 Reference A12
Melways 35th Edition, Street Directory, Map 214 Reference B12

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Tel: (03)9695 2700 Fax:(03)9695 2710

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Appendix G: Aerial Photographs

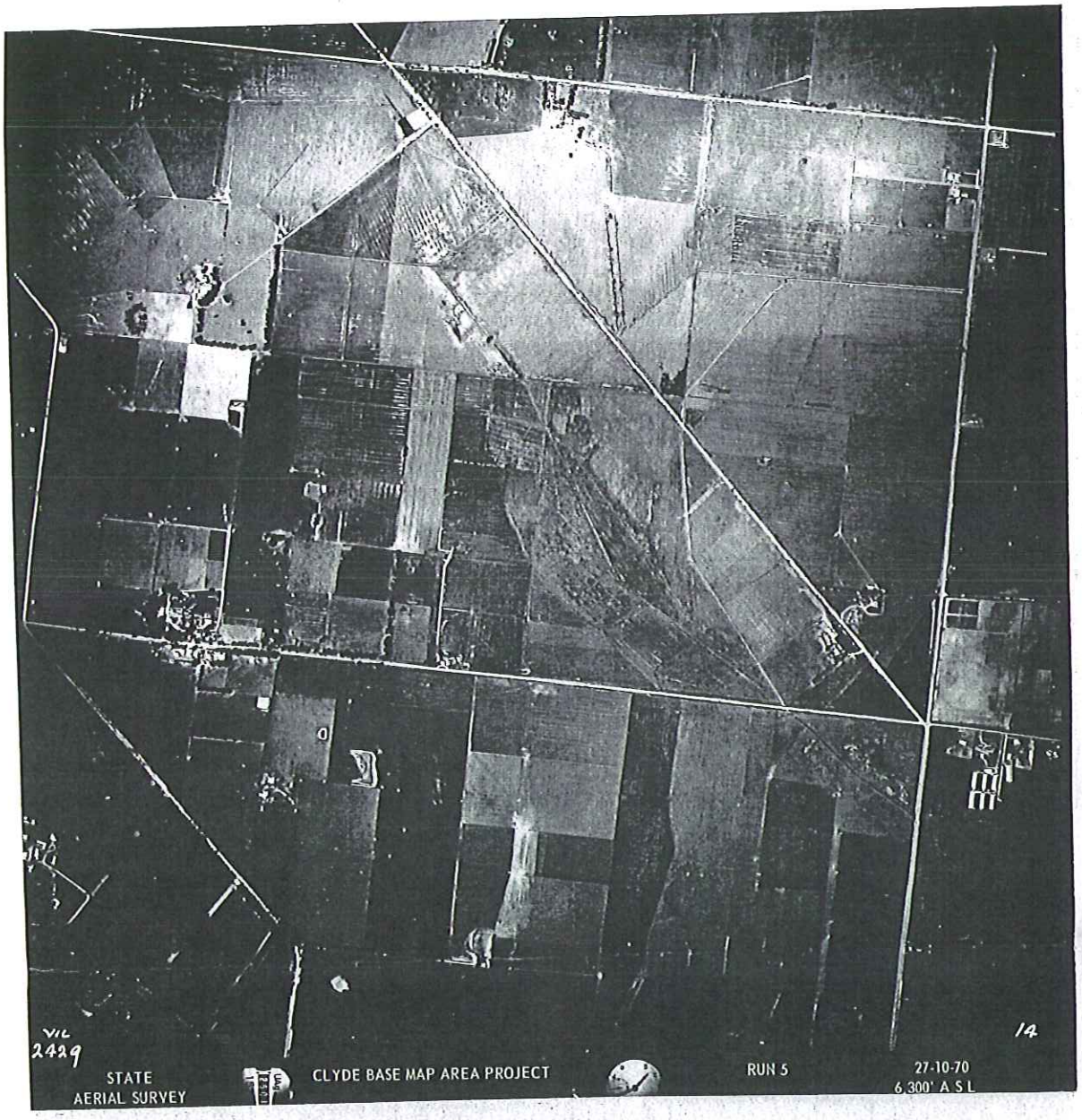
NORTH
(approx.)

NORTH (approx.)

NORTH
(approx.)

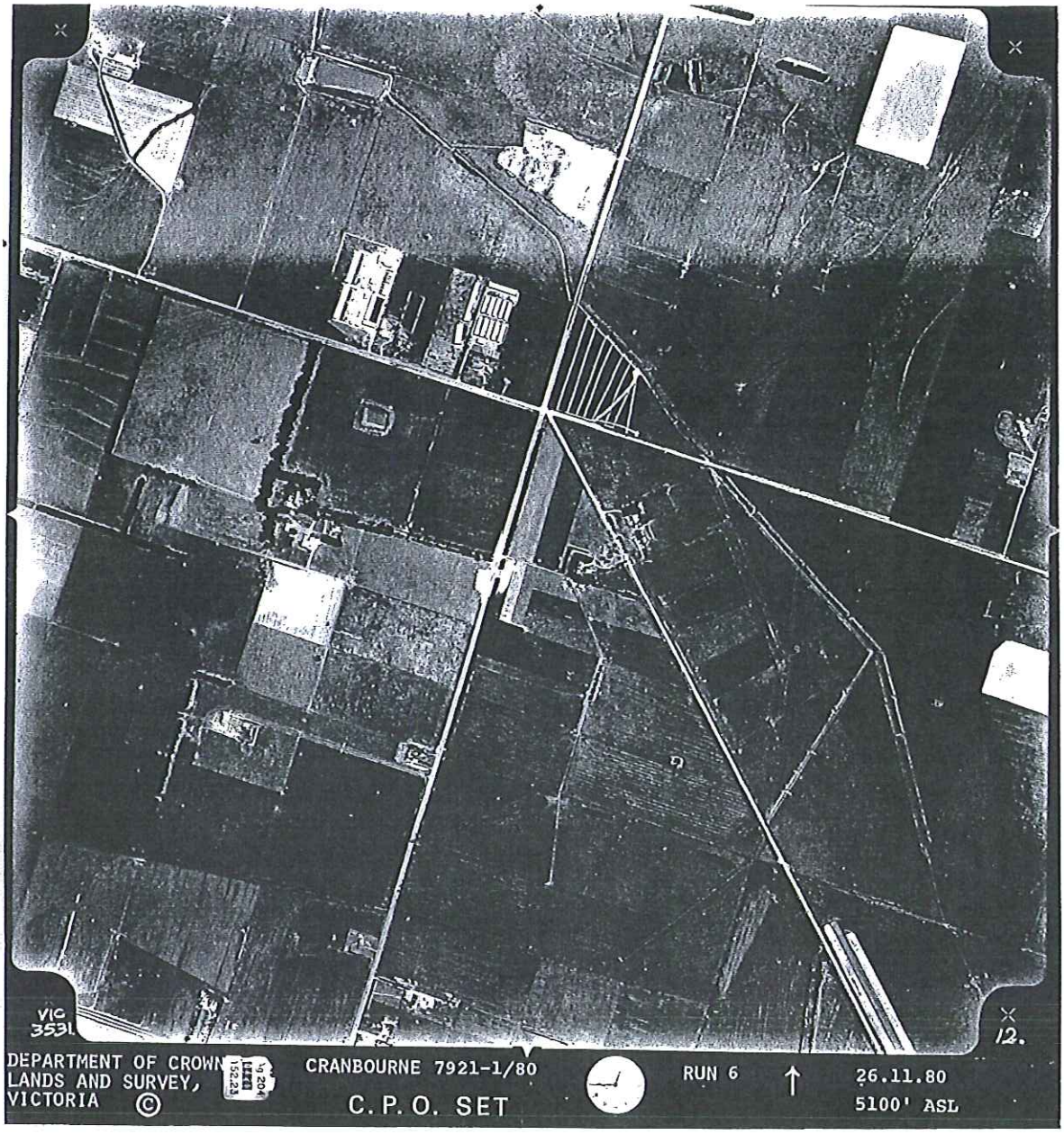
NORTH (appror.)

1970

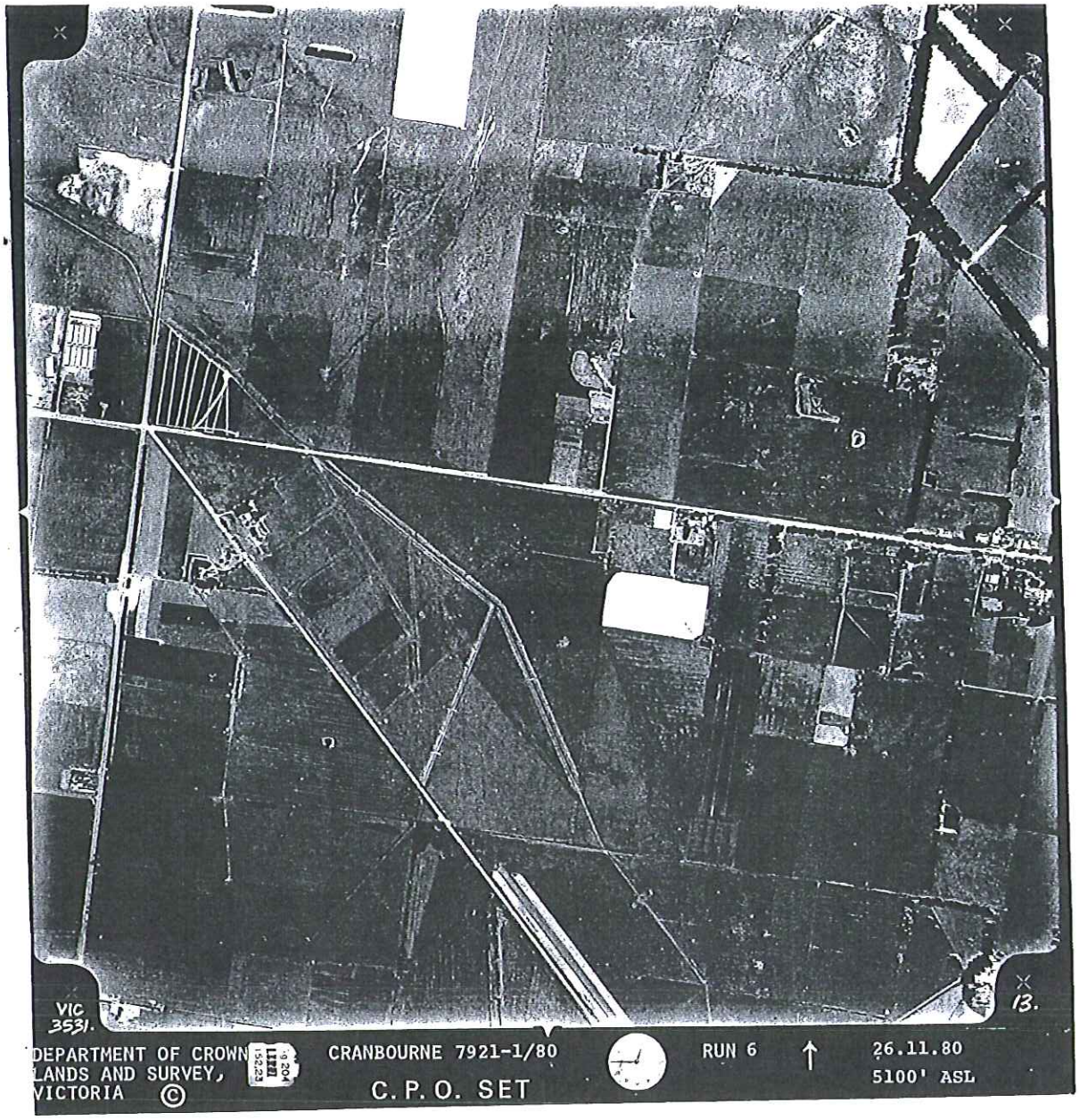


NORTH
(approx.)

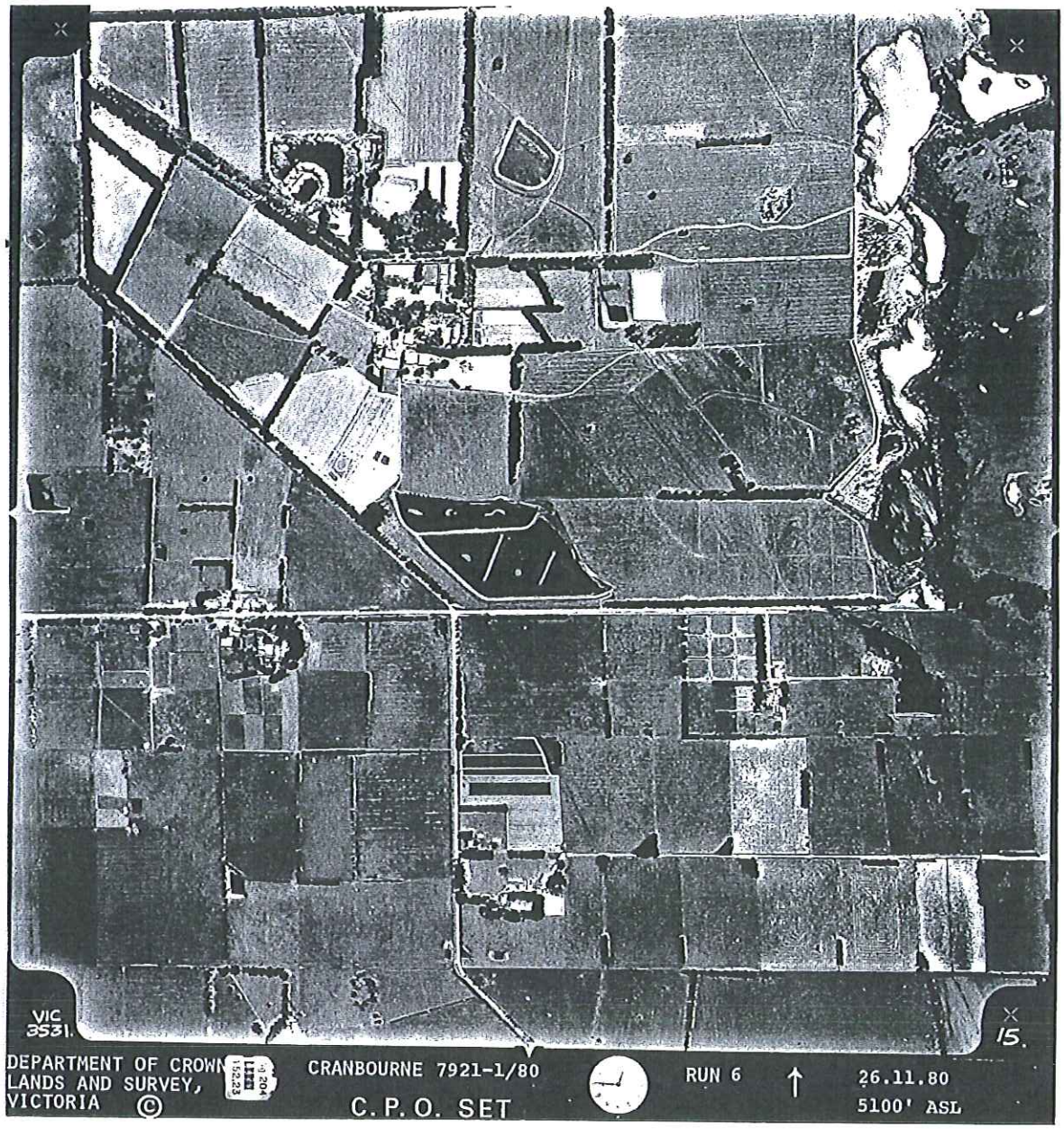
NORTH
(approx.)



NORTH
(approx.)



NORTH
(approx.)



NORTH
(approx.)

NORTH (approx.)

1989

NORTH (approx.)

Appendix H: Bore Logs

Chadwick

BOREHOLE LOG

BOREHOLE No: 01
Hole Location: Lot 12A

SHEET 1 OF 1

PROJECT: Clyde North		OWNER: Tract Consultants Pty Ltd	
LOCATION:			JOB No: 500994
COLLAR RL:	TOTAL BORE DEPTH: 0.40 m	EASTINGS: mE	NORTHINGS: mN
TYPE OF CASING:	WATER LEVEL INITIAL: m	STATIC: m	DIAMETER: m
SCREEN DIAMETER: m	LENGTH: m	TYPE/SIZE: m	
CASING DIAMETER: m	LENGTH: m	TYPE/SIZE: m	
WELL MATERIAL:		RIG/CORE:	
DRILL COMPANY: CT&T		METHOD: Hand Auger	
DRILLER:	LOGGED BY: BEZ	BORE STARTED: 19/12/08	BORE FINISHED: 19/12/08
CHECKED BY:		BORE LICENCE NO.:	

ENGINEERING DESCRIPTION

DEPTH (m)	METHOD	GRAPHIC LOG	CLASSIFICATION SYMBOL	SOIL DESCRIPTION / ROCK DESCRIPTION	STRENGTH/DENSITY CLASSIFICATION	MOISTURE CONDITION / WEATHERING	Contaminant Indicators (Odours, staining, imported fill, ash and seperate phase liquids)	SAMPLE ID	PID	DCP	WATER
				Silty CLAY, brown with black staining, small amount of gravel (0.5-2cm in diameter)	Loose, Friable	Dry	Oily hydrocarbon odour	BH01/0.2 BH01/0.4	4.7 4.3		
				Borehole terminated at 0.4m							

1
2
3
4
5
6

Chadwick

BOREHOLE LOG

BOREHOLE No: 02
Hole Location: Lot 10

SHEET 1 OF 1

PROJECT: Clyde North		OWNER: Tract Consultants Pty Ltd	
LOCATION:			JOB No: 500994
COLLAR RL:	TOTAL BORE DEPTH: 0.50 m	EASTINGS: mE	NORTHINGS: mN
TYPE OF CASING:	WATER LEVEL INITIAL: m	STATIC: m	DIAMETER: m
SCREEN DIAMETER: m	LENGTH: m	TYPE/SIZE: m	
CASING DIAMETER: m	LENGTH: m	TYPE/SIZE: m	
WELL MATERIAL:		RIG/CORE:	
DRILL COMPANY: CT&T		METHOD: Hand Auger	
DRILLER:	LOGGED BY: BEZ	BORE STARTED: 22/12/08	BORE FINISHED: 22/12/08
CHECKED BY:		BORE LICENCE NO.:	

ENGINEERING DESCRIPTION

DEPTH (m)	METHOD	GRAPHIC LOG	CLASSIFICATION SYMBOL	SOIL DESCRIPTION / ROCK DESCRIPTION	STRENGTH/DENSITY CLASSIFICATION	MOISTURE CONDITION / WEATHERING	Contaminant Indicators (Odours, staining, imported fill, ash and seperate phase liquids)	SAMPLE ID	PID	DCP	WATER
				Silty SAND, dark brown	Loose	Dry-moist	Soil odour				
				Silty SAND, grey-brown	Loose	Moist	Soil odour	BH02/0.2	2.0		
								BH2/0.5	4.4		
				Borehole terminated at 0.5m							

Chadwick

BOREHOLE LOG

BOREHOLE No: 03
Hole Location: Lot 10

SHEET 1 OF 1

PROJECT: Clyde North		OWNER: Tract Consultants Pty Ltd	
LOCATION:			JOB No: 500994
COLLAR RL:	TOTAL BORE DEPTH: 3.00 m	EASTINGS: mE	NORTHINGS: mN
TYPE OF CASING:	WATER LEVEL INITIAL: m	STATIC: m	DIAMETER: m
SCREEN DIAMETER: m	LENGTH: m	TYPE/SIZE: m	
CASING DIAMETER: m	LENGTH: m	TYPE/SIZE: m	
WELL MATERIAL:		RIG/CORE:	
DRILL COMPANY: CT&T		METHOD: Drill Rig	
DRILLER: AM & JL	LOGGED BY: BEZ	BORE STARTED: 22/12/08	BORE FINISHED: 22/12/08
CHECKED BY:		BORE LICENCE NO.:	

ENGINEERING DESCRIPTION

DEPTH (m)	METHOD	GRAPHIC LOG	CLASSIFICATION SYMBOL	SOIL DESCRIPTION / ROCK DESCRIPTION	STRENGTH/DENSITY CLASSIFICATION	MOISTURE CONDITION / WEATHERING	Contaminant Indicators (Odours, staining, imported fill, ash and seperate phase liquids)	SAMPLE ID	PID	DCP	WATER
				Sandy LOAM						3 2	
				Silty SAND, grey brown to dark \brown	Loose	Dry to moist	Soil odour	BH03/0.2 BH03/0.4 BH03/0.7	0.6 0.8 0.8	2 3 3 4 5 5	
1				Silty clayey SAND, brown	Medium dense	Moist	Soil odour	BH03/1.2	2.6	9 13 16 10	1
				Sandy CLAY, grey, Fe-oxide stains	Soft	Moist	Soil odour			9 9 10	
2				CLAY, grey-brown, high plasticity	Soft	Moist	Soil odour				2
				CLAY, brown-grey, Fe-oxide stains	Soft to firm	Very moist	Soil odour				
3					FIrm	Moist					3
				Borehole terminated at 3.0m							
4											4
5											5
6											6

Chadwick

BOREHOLE LOG

BOREHOLE No: 04
Hole Location: Lot 3C

SHEET 1 OF 1

PROJECT: Clyde North		OWNER: Tract Consultants Pty Ltd	
LOCATION:			JOB No: 500994
COLLAR RL:	TOTAL BORE DEPTH: 3.00 m	EASTINGS: mE	NORTHINGS: mN
TYPE OF CASING:	WATER LEVEL INITIAL: m	STATIC: m	DIAMETER: m
SCREEN DIAMETER: m	LENGTH: m	TYPE/SIZE: m	
CASING DIAMETER: m	LENGTH: m	TYPE/SIZE: m	
WELL MATERIAL:		RIG/CORE:	
DRILL COMPANY: CT&T		METHOD: Drill Rig	
DRILLER: AM & JL	LOGGED BY: BEZ	BORE STARTED: 22/12/08	BORE FINISHED: 22/12/08
CHECKED BY:		BORE LICENCE NO.:	

ENGINEERING DESCRIPTION

DEPTH (m)	METHOD	GRAPHIC LOG	CLASSIFICATION SYMBOL	SOIL DESCRIPTION / ROCK DESCRIPTION	STRENGTH/DENSITY CLASSIFICATION	MOISTURE CONDITION / WEATHERING	Contaminant Indicators (Odours, staining, imported fill, ash and seperate phase liquids)	SAMPLE ID	PID	DCP	WATER
0				Sandy CLAY, brown, sand fine grained	Soft	Dry to moist	Soil odour			4 1 2	
								BH04/0.3	3.9		
				CLAY, grey, large amount of light brown Fe-oxide stains, small amount of dark red, rounded pebbles (1-2mm in diameter)	Soft to firm	Moist	Soil odour			2 3 3 3 4 4 3	
								BH04/0.6	5.3		
1								BH0.4/1.0	4.5		1
				CLAY, grey with large amount of light brown Fe-oxide stains	Soft to firm	Moist	Soil odour			5 3 4 4 4	
2					Soft to firm	Moist	Soil odour				2
				Groundwater appears to be at 2.5-2.7m	Soft	Moist	Soil odour				
3					Soft to firm	Moist					3
				Borehole terminated at 3m							
4											4
5											5
6											6

Chadwick CT&T

BOREHOLE LOG

BOREHOLE No: 05
Hole Location: Lot 3C

SHEET 1 OF 1

PROJECT: Clyde North		OWNER: Tract Consultants Pty Ltd	
LOCATION:			JOB No: 500994
COLLAR RL:	TOTAL BORE DEPTH: 6.00 m	EASTINGS: mE	NORTHINGS: mN
TYPE OF CASING:	WATER LEVEL INITIAL: m	STATIC: m	DIAMETER: m
SCREEN DIAMETER: m	LENGTH: m	TYPE/SIZE: m	
CASING DIAMETER: m	LENGTH: m	TYPE/SIZE: m	
WELL MATERIAL:		RIG/CORE:	
DRILL COMPANY: CT&T		METHOD: Drill Rig	
DRILLER: AM & JL	LOGGED BY: BEZ	BORE STARTED: 22/12/08	BORE FINISHED: 22/12/08
CHECKED BY:		BORE LICENCE NO.:	

ENGINEERING DESCRIPTION

DEPTH (m)	METHOD	GRAPHIC LOG	CLASSIFICATION SYMBOL	SOIL DESCRIPTION / ROCK DESCRIPTION	STRENGTH/DENSITY CLASSIFICATION	MOISTURE CONDITION / WEATHERING	Contaminant Indicators (Odours, staining, imported fill, ash and seperate phase liquids)	SAMPLE ID	PID	DCP	WATER
0				Silty CLAY, light brown. Clay properties only obvious after adding water	Friable	Dry	Soil odour	BH05/0.2	1.9	4 5 4 4 4	
					Friable	Dry	Soil odour	BH05/0.5	1.0	4 5	
					Friable	Dry	Soil odour	BH05/0.8	0.3	4 4	
1				CLAY, grey-brown, some Fe-oxide staining	Stiff	Dry to moist	Soil odour			7 6 6 5 5 6	1
					Stiff	Dry to moist	Soil odour				
2				CLAY, grey with large amount of orange-red staining	Stiff	Dry to moist	Soil odour	BH05/2.0	1.8		2
3				CLAY, grey, some light brown to orange staining. Oxidises fast to light brown in air	Firm	Dry to moist	Soil odour				3
					Firm	Dry to moist	Soil odour				
4					Soft to firm	Moist	Soil odour				4
5								BH05/5.0	3.4		5
				Small amount of white grains, angular, 1mm in diameter	Soft to firm	Moist	Soil odour				
6				**Borehole terminated at 6m**							6

Chadwick

BOREHOLE LOG

BOREHOLE No: 06
Hole Location: Lot 3D

SHEET 1 OF 1

PROJECT: Clyde North		OWNER: Tract Consultants Pty Ltd	
LOCATION:			JOB No: 500994
COLLAR RL:	TOTAL BORE DEPTH: 3.00 m	EASTINGS: mE	NORTHINGS: mN
TYPE OF CASING:	WATER LEVEL INITIAL: m	STATIC: m	DIAMETER: m
SCREEN DIAMETER: m	LENGTH: m	TYPE/SIZE: m	
CASING DIAMETER: m	LENGTH: m	TYPE/SIZE: m	
WELL MATERIAL:		RIG/CORE:	
DRILL COMPANY: CT&T		METHOD: Drill Rig	
DRILLER: AM & JL	LOGGED BY: BEZ	BORE STARTED: 22/12/08	BORE FINISHED: 22/12/08
CHECKED BY:		BORE LICENCE NO.:	

ENGINEERING DESCRIPTION

DEPTH (m)	METHOD	GRAPHIC LOG	CLASSIFICATION SYMBOL	SOIL DESCRIPTION / ROCK DESCRIPTION	STRENGTH/DENSITY CLASSIFICATION	MOISTURE CONDITION / WEATHERING	Contaminant Indicators (Odours, staining, imported fill, ash and seperate phase liquids)	SAMPLE ID	PID	DCP	WATER
0				Silty CLAY, brown	Friable	Dry	Soil odour			8	
				CLAY, grey-brown, brown Fe-oxide staining	Firm	Dry to moist	Soil odour	BH06/0.3	3.2	7 6 5 4	
								BH06/0.6	1.0	3 3 2 3	
1					Firm	Moist	Soil odour	BH06/1.0	2.7	3 3 2 3 3 4	1
					Soft to firm	Moist	Soil odour				
2					Soft to firm	Moist	Soil odour				2
3					Soft firm	Moist	Soil odour				3
				Borehole terminated at 3.0m							
4											4
5											5
6											6

Chadwick

BOREHOLE LOG

BOREHOLE No: 07
Hole Location: Lot 13

SHEET 1 OF 1

PROJECT: Clyde North		OWNER: Tract Consultants Pty Ltd	
LOCATION:			JOB No: 500994
COLLAR RL:	TOTAL BORE DEPTH: 2.80 m	EASTINGS: mE	NORTHINGS: mN
TYPE OF CASING:	WATER LEVEL INITIAL: m	STATIC: m	DIAMETER: m
SCREEN DIAMETER: m	LENGTH: m	TYPE/SIZE: m	
CASING DIAMETER: m	LENGTH: m	TYPE/SIZE: m	
WELL MATERIAL:		RIG/CORE:	
DRILL COMPANY: CT&T		METHOD: Drill Rig	
DRILLER: AM & JL	LOGGED BY: BEZ	BORE STARTED: 22/12/08	BORE FINISHED: 22/12/08
CHECKED BY:		BORE LICENCE NO.:	

ENGINEERING DESCRIPTION

DEPTH (m)	METHOD	GRAPHIC LOG	CLASSIFICATION SYMBOL	SOIL DESCRIPTION / ROCK DESCRIPTION	STRENGTH/DENSITY CLASSIFICATION	MOISTURE CONDITION / WEATHERING	Contaminant Indicators (Odours, staining, imported fill, ash and seperate phase liquids)	SAMPLE ID	PID	DCP	WATER
0				Silty CLAY, brown	Friable	Dry	Soil odour	BH07/0.3	3.6	6 8 12 17	
				CLAY, brown, small amount of red, rounded gravel (3mm in diameter), Fe-oxide stains: dark red	Firm	Dry to moist	Soil odour	BH07/0.6	4.1	7 4 5 4	
1				CLAY, light brown with dark brown streaks	Soft	Dry to moist	Soil odour	BH07/1.0	3.1	5 12	1
				Clayey sandy SILT, light brown, white grains and larger rock fragments with shells	Friable	Dry	Soil odour	BH07/1.5	4.4	20+	
2					Friable	Dry	Soil odour				2
					Friable	Dry	Soil odour				
3				**Refusal at 2.8m**							3
4											4
5											5
6											6

Chadwick

BOREHOLE LOG

BOREHOLE No: 08
Hole Location: Lot 13

SHEET 1 OF 1

PROJECT: Clyde North		OWNER: Tract Consultants Pty Ltd	
LOCATION:			JOB No: 500994
COLLAR RL:	TOTAL BORE DEPTH: 0.30 m	EASTINGS: mE	NORTHINGS: mN
TYPE OF CASING:	WATER LEVEL INITIAL: m	STATIC: m	DIAMETER: m
SCREEN DIAMETER: m	LENGTH: m	TYPE/SIZE: m	
CASING DIAMETER: m	LENGTH: m	TYPE/SIZE: m	
WELL MATERIAL:		RIG/CORE:	
DRILL COMPANY: CT&T		METHOD: Hand Auger	
DRILLER:	LOGGED BY: BEZ	BORE STARTED: 22/12/08	BORE FINISHED: 22/12/08
CHECKED BY:		BORE LICENCE NO.:	

ENGINEERING DESCRIPTION

DEPTH (m)	METHOD	GRAPHIC LOG	CLASSIFICATION SYMBOL	SOIL DESCRIPTION / ROCK DESCRIPTION	STRENGTH/DENSITY CLASSIFICATION	MOISTURE CONDITION / WEATHERING	Contaminant Indicators (Odours, staining, imported fill, ash and seperate phase liquids)	SAMPLE ID	PID	DCP	WATER
				FILL:Silty CLAY, dark brown to black, ceramic fragments	Soft	Moist	Hydrocarbon "old diesel" odour	BH08/0.15 QC03 QC04 BH08/0.3	7.9 118.9		
0.5				**Borehole terminated at 0.3m**							0.5
1.0											1.0
1.5											1.5

Chadwick

BOREHOLE LOG

BOREHOLE No: 09
Hole Location: Lot 8

SHEET 1 OF 1

PROJECT: Clyde North		OWNER: Tract Consultants Pty Ltd	
LOCATION:			JOB No: 500994
COLLAR RL:	TOTAL BORE DEPTH: 3.00 m	EASTINGS: mE	NORTHINGS: mN
TYPE OF CASING:	WATER LEVEL INITIAL: m	STATIC: m	DIAMETER: m
SCREEN DIAMETER: m	LENGTH: m	TYPE/SIZE: m	
CASING DIAMETER: m	LENGTH: m	TYPE/SIZE: m	
WELL MATERIAL:		RIG/CORE:	
DRILL COMPANY: CT&T		METHOD: Drill Rig	
DRILLER: AM & JL	LOGGED BY: BEZ	BORE STARTED: 22/12/08	BORE FINISHED: 22/12/08
CHECKED BY:		BORE LICENCE NO.:	

ENGINEERING DESCRIPTION

DEPTH (m)	METHOD	GRAPHIC LOG	CLASSIFICATION SYMBOL	SOIL DESCRIPTION / ROCK DESCRIPTION	STRENGTH/DENSITY CLASSIFICATION	MOISTURE CONDITION / WEATHERING	Contaminant Indicators (Odours, staining, imported fill, ash and seperate phase liquids)	SAMPLE ID	PID	DCP	WATER
0				Silty CLAY, brown, small amount of fine sand and Fe-oxide staining	Friable	Dry to moist	Soil odour	BH09/0.3	4.7	2 4 2 2	
				CLAY, brown, large amount of orange-red Fe-oxide staining	Firm	Moist	Soil odour	BH09/0.6	5.0	5 8 8	
1				CLAY, brown, some orange-red Fe-oxide staining	Firm to stiff	Moist	Soil odour	BH09/1.0	5.1	8 10 8 9	1
				CLAY, light brown, small amount of black straks, small amount of rounded gravel (2-3mm in diameter)	Stiff	Moist	Soil odour			6 6 5 7 11	
2				CLAY, grey, small amount of Fe-oxide staining	Friable	Dry	Soil odour				2
				CLAY, beige, brown, orange mottled with some green areas, some pebbles (1cm in diameter)	Friable	Dry	Soil odour	BH09/3.0	3.8		
3				**Borehole terminated at 3m**							3
4											4
5											5
6											6

Chadwick

BOREHOLE LOG

BOREHOLE No: 10
Hole Location: Lot 3A

SHEET 1 OF 1

PROJECT: Clyde North		OWNER: Tract Consultants Pty Ltd	
LOCATION:			JOB No: 500994
COLLAR RL:	TOTAL BORE DEPTH: 3.00 m	EASTINGS: mE	NORTHINGS: mN
TYPE OF CASING:	WATER LEVEL INITIAL: m	STATIC: m	DIAMETER: m
SCREEN DIAMETER: m	LENGTH: m	TYPE/SIZE: m	
CASING DIAMETER: m	LENGTH: m	TYPE/SIZE: m	
WELL MATERIAL:		RIG/CORE:	
DRILL COMPANY: CT&T		METHOD: Drill Rig	
DRILLER: AM & JL	LOGGED BY: BEZ	BORE STARTED: 22/12/08	BORE FINISHED: 22/12/08
CHECKED BY:		BORE LICENCE NO.:	

ENGINEERING DESCRIPTION

DEPTH (m)	METHOD	GRAPHIC LOG	CLASSIFICATION SYMBOL	SOIL DESCRIPTION / ROCK DESCRIPTION	STRENGTH/DENSITY CLASSIFICATION	MOISTURE CONDITION / WEATHERING	Contaminant Indicators (Odours, staining, imported fill, ash and seperate phase liquids)	SAMPLE ID	PID	DCP	WATER
0				Silty CLAY, brown, some ash/coal fragments. Clay properties only after moistening	Friable	Dry	Soil odour	BH10/0.3	3.4	3 5 5 5	
				CLAY, brown, some coal/ash fragments	Firm to stiff	Dry to moist	Soil odour	BH10/0.6	3.2	7 8 8 10	
1				CLAY, light brown, brown Fe-oxide staining	Soft to firm	Moist	Soil odour	BH10/1.0	3.0	13 12 9 13 10	1
				CLAY, light brown, small amount of rounded gravel (2-5mm in diameter), some dark staining, minor amount of fine grained sand	Stiff	Moist	Soil odour			10 9	
2				CLAY, grey and light brown, some brown Fe-oxide staining	Stiff	Moist	Soil odour				2
				Sandy gravelly CLAY, dark red to brown	Friable	Dry to moist	Soil odour				
3				CLAY, grey and light brown, some brown Fe-oxide staining	Stiff	Moist	Soil odour				3
				Borehole terminated at 3m							
4											4
5											5
6											6

Chadwick

BOREHOLE LOG

BOREHOLE No: 11
Hole Location: 1085 Glasscocks

SHEET 1 OF 1

PROJECT: Clyde North		OWNER: Tract Consultants Pty Ltd	
LOCATION:			JOB No: 500994
COLLAR RL:	TOTAL BORE DEPTH: 3.40 m	EASTINGS: mE	NORTHINGS: mN
TYPE OF CASING:	WATER LEVEL INITIAL: m	STATIC: m	DIAMETER: m
SCREEN DIAMETER: m	LENGTH: m	TYPE/SIZE: m	
CASING DIAMETER: m	LENGTH: m	TYPE/SIZE: m	
WELL MATERIAL:		RIG/CORE:	
DRILL COMPANY: CT&T		METHOD: Drill Rig	
DRILLER: AM & JL	LOGGED BY: BEZ	BORE STARTED: 22/12/08	BORE FINISHED: 22/12/08
CHECKED BY:		BORE LICENCE NO.:	

ENGINEERING DESCRIPTION

DEPTH (m)	METHOD	GRAPHIC LOG	CLASSIFICATION SYMBOL	SOIL DESCRIPTION / ROCK DESCRIPTION	STRENGTH/DENSITY CLASSIFICATION	MOISTURE CONDITION / WEATHERING	Contaminant Indicators (Odours, staining, imported fill, ash and seperate phase liquids)	SAMPLE ID	PID	DCP	WATER
0				Potential FILL: Silty SAND with angular gravel, brown	Loose	Dry to moist	Soil odour	BH11/0.2	1.2	3 4 5 5	
				CLAY, brown to dark brown, small amount of red angular fragments (1-2mm in diameter)	Soft	Moist	Soil odour	BH11/0.6	0.6	4 3 2 2 2	
1				CLAY, grey with dark brown staining	Soft	Moist	Soil odour	BH11/1.0	1.4	6 6 11 14 11 11	1
2					Soft	Moist	Soil odour				2
3					Firm	Moist	Soil odour	BH11/3.4			3
4				**Borehole terminated at 3.4m**							4
5											5
6											6

Chadwick

BOREHOLE LOG

BOREHOLE No: 12
Hole Location: 1095 Glasscocks

SHEET 1 OF 1

PROJECT: Clyde North		OWNER: Tract Consultants Pty Ltd	
LOCATION:			JOB No: 500994
COLLAR RL:	TOTAL BORE DEPTH: 0.40 m	EASTINGS: mE	NORTHINGS: mN
TYPE OF CASING:	WATER LEVEL INITIAL: m	STATIC: m	DIAMETER: m
SCREEN DIAMETER: m	LENGTH: m	TYPE/SIZE: m	
CASING DIAMETER: m	LENGTH: m	TYPE/SIZE: m	
WELL MATERIAL:		RIG/CORE:	
DRILL COMPANY: CT&T		METHOD: Hand Auger	
DRILLER:	LOGGED BY: BEZ	BORE STARTED: 23/12/08	BORE FINISHED: 23/12/08
CHECKED BY:		BORE LICENCE NO.:	

ENGINEERING DESCRIPTION

DEPTH (m)	METHOD	GRAPHIC LOG	CLASSIFICATION SYMBOL	SOIL DESCRIPTION / ROCK DESCRIPTION	STRENGTH/DENSITY CLASSIFICATION	MOISTURE CONDITION / WEATHERING	Contaminant Indicators (Odours, staining, imported fill, ash and seperate phase liquids)	SAMPLE ID	PID	DCP	WATER
				Crushed rock and metal foil	Loose	Moist to wet	Soil odour				
				CLAY, dark grey	Soft	Moist	Soil odour	BH12/0.2	1.5		
								BH12/0.4	2.8		
0.5				**Borehole terminated at 0.4m**							0.5
1.0											1.0
1.5											1.5

Chadwick

BOREHOLE LOG

BOREHOLE No: 13
Hole Location: 1135 Glasscocks

SHEET 1 OF 1

PROJECT: Clyde North		OWNER: Tract Consultants Pty Ltd	
LOCATION:			JOB No: 500994
COLLAR RL:	TOTAL BORE DEPTH: 0.40 m	EASTINGS: mE	NORTHINGS: mN
TYPE OF CASING:	WATER LEVEL INITIAL: m	STATIC: m	DIAMETER: m
SCREEN DIAMETER: m	LENGTH: m	TYPE/SIZE: m	
CASING DIAMETER: m	LENGTH: m	TYPE/SIZE: m	
WELL MATERIAL:		RIG/CORE:	
DRILL COMPANY: CT&T		METHOD: Hand Auger	
DRILLER:	LOGGED BY: BEZ	BORE STARTED: 23/12/08	BORE FINISHED: 23/12/08
CHECKED BY:		BORE LICENCE NO.:	

ENGINEERING DESCRIPTION

DEPTH (m)	METHOD	GRAPHIC LOG	CLASSIFICATION SYMBOL	SOIL DESCRIPTION / ROCK DESCRIPTION	STRENGTH/DENSITY CLASSIFICATION	MOISTURE / WEATHERING CONDITION	Contaminant Indicators (Odours, staining, imported fill, ash and seperate phase liquids)	SAMPLE ID	PID	DCP	WATER
				Clayey sandy LOAM, dark brown	Loose	Moist	Soil odour				
				Silty SAND, brown, fine to medium grained	Loose	Moist	Soil odour	BH13/0.2	1.6		
				CLAY, dark grey	Firm	Moist	Soil odour	BH13/0.35	1.1		
0.5				**Borehole terminated at 0.4m**							0.5
1.0											1.0
1.5											1.5

Chadwick

BOREHOLE LOG

BOREHOLE No: 14
Hole Location: Lot 7

SHEET 1 OF 1

PROJECT: Clyde North		OWNER: Tract Consultants Pty Ltd	
LOCATION:			JOB No: 500994
COLLAR RL:	TOTAL BORE DEPTH: 0.40 m	EASTINGS: mE	NORTHINGS: mN
TYPE OF CASING:	WATER LEVEL INITIAL: m	STATIC: m	DIAMETER: m
SCREEN DIAMETER: m	LENGTH: m	TYPE/SIZE: m	
CASING DIAMETER: m	LENGTH: m	TYPE/SIZE: m	
WELL MATERIAL:		RIG/CORE:	
DRILL COMPANY: CT&T		METHOD: Hand Auger	
DRILLER:	LOGGED BY: BEZ	BORE STARTED: 23/12/08	BORE FINISHED: 23/12/08
CHECKED BY:		BORE LICENCE NO.:	

ENGINEERING DESCRIPTION

DEPTH (m)	METHOD	GRAPHIC LOG	CLASSIFICATION SYMBOL	SOIL DESCRIPTION / ROCK DESCRIPTION	STRENGTH/DENSITY CLASSIFICATION	MOISTURE / WEATHERING CONDITION	Contaminant Indicators (Odours, staining, imported fill, ash and seperate phase liquids)	SAMPLE ID	PID	DCP	WATER
				Silty CLAY, brown	Loose, friable	Dry	Soil odour	BH14/0.2 BH14/0.35	0.8 0.9		
				Borehole terminated at 0.4m							

1
2
3
4
5
6

Chadwick

BOREHOLE LOG

BOREHOLE No: 15
Hole Location: Lot 13

SHEET 1 OF 1

PROJECT: Clyde North		OWNER: Tract Consultants Pty Ltd	
LOCATION:			JOB No: 500994
COLLAR RL:	TOTAL BORE DEPTH: 0.10 m	EASTINGS: mE	NORTHINGS: mN
TYPE OF CASING:	WATER LEVEL INITIAL: m	STATIC: m	DIAMETER: m
SCREEN DIAMETER: m	LENGTH: m	TYPE/SIZE: m	
CASING DIAMETER: m	LENGTH: m	TYPE/SIZE: m	
WELL MATERIAL:		RIG/CORE:	
DRILL COMPANY: CT&T		METHOD: Hand Auger	
DRILLER:	LOGGED BY: BEZ	BORE STARTED: 23/12/08	BORE FINISHED: 23/12/08
CHECKED BY:		BORE LICENCE NO.:	

ENGINEERING DESCRIPTION

DEPTH (m)	METHOD	GRAPHIC LOG	CLASSIFICATION SYMBOL	SOIL DESCRIPTION / ROCK DESCRIPTION	STRENGTH/DENSITY CLASSIFICATION	MOISTURE / WEATHERING CONDITION	Contaminant Indicators (Odours, staining, imported fill, ash and seperate phase liquids)	SAMPLE ID	PID	DCP	WATER
				Sample from subsurface 5-10cm. Silty CLAY , light brown with large amount of building rubble			Potential for asbestos but no asbestos containing material observed	BH15/0.11			
0.5				**Borehole terminated at 0.1m**							0.5
1.0											1.0
1.5											1.5

SOIL DESCRIPTION
Soil type, minor components, plasticity or particle size, colour.

ROCK DESCRIPTION
Substance: Rock type, particle size, colour, minor components.

Chadwick

BOREHOLE LOG

BOREHOLE No: 16
Hole Location: Lot 13

SHEET 1 OF 1

PROJECT: Clyde North		OWNER: Tract Consultants Pty Ltd	
LOCATION:			JOB No: 500994
COLLAR RL:	TOTAL BORE DEPTH: 0.40 m	EASTINGS: mE	NORTHINGS: mN
TYPE OF CASING:	WATER LEVEL INITIAL: m	STATIC: m	DIAMETER: m
SCREEN DIAMETER: m	LENGTH: m	TYPE/SIZE: m	
CASING DIAMETER: m	LENGTH: m	TYPE/SIZE: m	
WELL MATERIAL:		RIG/CORE:	
DRILL COMPANY: CT&T		METHOD: Hand Auger	
DRILLER:	LOGGED BY: BEZ	BORE STARTED: 23/12/08	BORE FINISHED: 23/12/08
CHECKED BY:		BORE LICENCE NO.:	

ENGINEERING DESCRIPTION

DEPTH (m)	METHOD	GRAPHIC LOG	CLASSIFICATION SYMBOL	SOIL DESCRIPTION / ROCK DESCRIPTION	STRENGTH/DENSITY CLASSIFICATION	MOISTURE CONDITION / WEATHERING	Contaminant Indicators (Odours, staining, imported fill, ash and seperate phase liquids)	SAMPLE ID	PID	DCP	WATER
				Ash and coal and silty material	Loose	Dry	Burnt odour	BH16/0.1			
				Silty CLAY, brown, with some coal particles	Loose	Dry	Soil odour	BH16/0.2	0.4		
								BH16/0.4 QC05 QC06	25.4		
0.5				**Borehole terminated at 0.4m**							0.5
1.0											1.0
1.5											1.5

Appendix I: Soil Analytical Laboratory Reports

Tract Consultants
500994: Clyde North

Table 1:

Field_ID	LocCode	Sample_Depth_Range	Sampled_Date-Time	Matrix_Description	Bolstar (Sulprofos)	Chlordane (gamma)	Merphos	Oxychlordane	Phosphate total (P)	Pronamide	Sulphur (Total Oxidised as SO4)	Sulphur as S	BTEX Benzene	BTEX Ethylbenzene	BTEX Toluene	BTEX Xylene Total
					mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL					0.2	0.5	0.2	0.5	10	0.5	100	100	0.05	0.05	0.05	0.05
NEPM 1999 EIL												**600**				
EPA 1994 Health and Ecological													**1**	**50**	**130**	**25**
NEPM 1999 HIL A																
BH01/0.2	BH01/0.2	BH01 0.2m	18/12/2008	Silty Clay	-	-	-	-	-	-	-	-	<0.05	<0.05	<0.05	<0.05
BH01/0.4	BH01/0.4	BH01 0.4m	18/12/2008	Silty Clay	-	-	-	-	-	-	-	-	<0.05	<0.05	<0.05	<0.05
BH02/0.2	BH02/0.2	BH02 0.2m	22/12/2008	Silty Sand	-	-	-	-	210	<0.5	-	<100	<0.05	<0.05	<0.05	<0.05
BH03/0.2	BH03/0.2	BH03 0.2m	22/12/2008	Silty Sand	<0.2	-	<0.2	-	-	-	-	-	-	-	-	-
BH04/0.3	BH04/0.3	BH04 0.3m	22/12/2008	Sandy Clay	<0.2	-	<0.2	-	-	-	-	-	<0.05	<0.05	<0.05	<0.05
BH05/0.5	BH05/0.5	BH05 0.5m	22/12/2008	Silty Clay	-	-	-	-	-	-	-	-	<0.05	<0.05	<0.05	<0.05
BH06/0.3	BH06/0.3	BH06 0.3m	22/12/2008	Clay	-	-	-	-	-	-	-	-	<0.05	<0.05	<0.05	<0.05
BH07/1.0	BH07/1.0	BH07 1.0m	22/12/2008	Clay	-	-	-	-	<10	<0.5	-	460	<0.05	<0.05	<0.05	<0.05
BH08/0.15	BH08/0.15	BH08 0.15m	22/12/2008	Fill, Silty Clay	-	-	-	-	-	-	-	-	<0.05	<0.05	0.45	<0.05
BH09/0.3	BH09/0.3	BH09 0.3m	22/12/2008	Silty Clay	-	-	-	-	-	-	-	-	<0.05	<0.05	<0.05	<0.05
BH10/0.3	BH10/0.3	BH10 0.3m	22/12/2008	Silty Clay	-	-	-	-	-	-	-	-	-	-	-	-
BH10/1.0	BH10/1.0	BH10 1.0m	22/12/2008	Clay	-	-	-	-	<10	<0.5	-	130	<0.05	<0.05	<0.05	<0.05
BH11/0.2	BH11/0.2	BH11 0.2m	22/12/2008	Fill, Silty Sand	-	-	-	-	-	-	-	-	<0.05	<0.05	<0.05	<0.05
BH11/1.0	BH11/1.0	BH11 1.0m	22/12/2008	Clay	-	-	-	-	-	-	<100	-	-	-	-	-
BH12/0.2	BH12/0.2	BH12 0.2m	23/12/2008	Clay	<0.2	-	<0.2	-	-	-	-	-	-	-	-	-
BH12/0.4	BH12/0.4	BH12 0.4m	23/12/2008	Clay	-	-	-	-	-	-	200	-	-	-	-	-
BH13/0.2	BH13/0.2	BH13 0.2m	23/12/2008	Silty Sand	-	-	-	-	-	-	-	-	<0.05	<0.05	<0.05	<0.05
BH13/0.35	BH13/0.35	BH13 0.35m	23/12/2008	Clay	-	-	-	-	-	-	-	-	-	-	-	-
BH14/0.2	BH14/0.2	BH14 0.2m	23/12/2008	Silty Clay	<0.2	-	<0.2	-	-	-	-	-	-	-	-	-
BH16/0.4	BH16/0.4	BH16 0.4m	23/12/2008	Silty Clay	-	-	-	-	-	-	-	-	<0.05	<0.05	<0.05	<0.05
QC03	BH08/0.15	BH08 0.15m	22/12/2008	Fill, Silty Clay	-	-	-	-	-	-	-	-	-	-	-	-
QC04	BH08/0.15	BH08 0.15m	22/12/2008	Fill, Silty Clay	-	<0.5	-	<0.5	-	-	-	-	-	-	-	-
QC05	BH16/0.4	BH16 0.4m	23/12/2008	Silty Clay	-	-	-	-	-	-	-	-	<0.05	<0.05	<0.05	<0.05
QC06	BH16/0.4	BH16 0.4m	23/12/2008	Silty Clay	-	<0.5	-	<0.5	-	-	-	-	-	-	-	-

Chlorinated Hydrocarbons

Field_ID	1,1,1,2-tetrachloroethane	1,1,1-trichloroethane	1,1,2,2-tetrachloroethane	1,1,2-trichloroethane	1,1-dichloroethane	1,1-dichloroethene	1,2,3,4-tetrachlorobenzene	1,2,3,5-Tetrachlorobenzene	1,2,3-trichlorobenzene	1,2,3-trichloropropane	1,2,4,5-tetrachlorobenzene	1,2,4-trichlorobenzene	1,2-dichlorobenzene	1,2-dichloroethane	1,3,5-Trichlorobenzene	1,3-dichlorobenzene	1,4-dichlorobenzene	Benzyl chloride	Carbon tetrachloride	Chlorobenzene	Chloroethane	Chloroform	cis-1,2-dichloroethene	cis-1,3-dichloropropene	Dichloromethane
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL	0.05	0.05	0.05	0.05	0.05	0.05	0.5	0.5	0.5	0.05	0.5	0.5	0.05	0.05	0.5	0.05	0.05	0.5	0.05	0.05	0.05	0.05	0.05	0.05	0.05
NEPM 1999 EIL																									
EPA 1994 Health and Ecological																									
NEPM 1999 HIL A																									
BH01/0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH01/0.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH02/0.2	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.5	<0.5	<0.5	<0.05	<0.5	<0.5	<0.05	<0.05	<0.5	<0.05	<0.05	<0.5	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
BH03/0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH04/0.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH05/0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH06/0.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH07/1.0	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.5	<0.5	<0.5	<0.05	<0.5	<0.5	<0.05	<0.05	<0.5	<0.05	<0.05	<0.5	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
BH08/0.15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH09/0.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH10/0.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH10/1.0	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.5	<0.5	<0.5	<0.05	<0.5	<0.5	<0.05	<0.05	<0.5	<0.05	<0.05	<0.5	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
BH11/0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH11/1.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH12/0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH12/0.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH13/0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH13/0.35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH14/0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH16/0.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
QC03	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
QC04	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
QC05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
QC06	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Statistical Summary

Statistic	Bolstar (Sulprofos)	Chlordane (gamma)	Merphos	Oxychlordane	Phosphate total (P)	Pronamide	Sulphur (Total Oxidised as SO4)	Sulphur as S	Benzene	Ethylbenzene	Toluene	Xylene Total
Number of Results	4	2	4	2	3	3	2	3	14	14	14	14
Number of Detects	0	0	0	0	1	0	1	2	0	0	1	0
Minimum Concentration	<0.2	<0.5	<0.2	<0.5	<10	<0.5	<100	<100	<0.05	<0.05	<0.05	<0.05
Minimum Detect	ND	ND	ND	ND	210	ND	200	130	ND	ND	0.45	ND
Maximum Concentration	<0.2	<0.5	<0.2	<0.5	210	<0.5	200	460	<0.05	<0.05	0.45	<0.05
Maximum Detect	ND	ND	ND	ND	210	ND	200	460	ND	ND	0.45	ND
Average Concentration	0.1	0.25	0.1	0.25	73	0.25	125	213	0.025	0.025	0.055	0.025
Median Concentration	0.1	0.25	0.1	0.25	5	0.25	125	130	0.025	0.025	0.025	0.025
Standard Deviation	0	0	0	0	118	0	106	217	0	0	0.11	0
Number of Guideline Exceedances	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####
Number of Guideline Exceedances(Detects Only)	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####

Statistic	1,1,1,2-tetrachloroethane	1,1,1-trichloroethane	1,1,2,2-tetrachloroethane	1,1,2-trichloroethane	1,1-dichloroethane	1,1-dichloroethene	1,2,3,4-tetrachlorobenzene	1,2,3,5-Tetrachlorobenzene	1,2,3-trichlorobenzene	1,2,3-trichloropropane	1,2,4,5-tetrachlorobenzene	1,2,4-trichlorobenzene	1,2-dichlorobenzene	1,2-dichloroethane	1,3,5-Trichlorobenzene	1,3-dichlorobenzene	1,4-dichlorobenzene	Benzyl chloride	Carbon tetrachloride	Chlorobenzene	Chloroethane	Chloroform	cis-1,2-dichloroethene	cis-1,3-dichloropropene	Dichloromethane
Number of Results	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Number of Detects	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minimum Concentration	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.5	<0.5	<0.5	<0.05	<0.5	<0.5	<0.05	<0.05	<0.5	<0.05	<0.05	<0.5	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Minimum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.5	<0.5	<0.5	<0.05	<0.5	<0.5	<0.05	<0.05	<0.5	<0.05	<0.05	<0.5	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Maximum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Average Concentration	0.025	0.025	0.025	0.025	0.025	0.025	0.25	0.25	0.25	0.025	0.25	0.25	0.025	0.025	0.25	0.025	0.025	0.25	0.025	0.025	0.025	0.025	0.025	0.025	0.025
Median Concentration	0.025	0.025	0.025	0.025	0.025	0.025	0.25	0.25	0.25	0.025	0.25	0.25	0.025	0.025	0.25	0.025	0.025	0.25	0.025	0.025	0.025	0.025	0.025	0.025	0.025
Standard Deviation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of Guideline Exceedances	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####
Number of Guideline Exceedances(Detects Only)	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####

Chadwick

Tract Consultants
500994: Clyde North

Table 1:

												Explosives			Halogenated Hydrocarbons							Inorganics					Lead	Metals										
					Hexachlorobenzene	Hexachlorobutadiene	Hexachlorocyclopentadiene	Hexachloroethane	Pentachlorobenzene	TCE	Tetrachloroethene	trans-1,2-dichloroethene	trans-1,3-dichloropropene	Vinyl chloride	2,4-Dinitrotoluene	2,6-dinitrotoluene	Nitrobenzene	1,2-dibromoethane	Bromodichloromethane	Bromoform	Chlorodibromomethane	Dibromomethane	Iodomethane	Trichlorofluoromethane	Cyanide Total	Moisture	Moisture Content (dried @ 103°C)	Nitrate (as N)	Sulphate as S	Lead	Antimony	Arsenic	Beryllium	Cadmium	Chromium (hexavalent)	Chromium (III+VI)	Cobalt	Copper	Mercury	Molybdenum	Nickel
					mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	%	%	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL					0.05	0.5	0.5	0.5	0.5	0.05	0.05	0.05	0.05	0.05	0.5	0.5	0.5	0.05	0.05	0.05	0.05	0.05	0.05	0.05	5	1	0.1	5	10	2	10	2	2	0.5	1	2	5	2	0.01	10	2
NEPM 1999 EIL																														600		20		3	1			100	1		60
EPA 1994 Health and Ecological																														300											
NEPM 1999 HIL A																									500					*300*		*100*	*20*	*20*	*100*		*100*	*1000*	*15*		*600*
Field_ID	**LocCode**	**Sample_Depth_Range**	**Sampled_Date-Time**	**Matrix_Description**																																			
BH01/0.2	BH01/0.2	BH01 0.2m	18/12/2008	Silty Clay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18	-	-	11	<10	<2	<2	<0.5	-	17	<5	<5	<0.1	<10	<5
BH01/0.4	BH01/0.4	BH01 0.4m	18/12/2008	Silty Clay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8	-	-	9.1	<10	<2	<2	<0.5	-	17	<5	<5	<0.1	<10	<5
BH02/0.2	BH02/0.2	BH02 0.2m	22/12/2008	Silty Sand	<0.05	<0.5	<0.5	<0.5	<0.5	<0.05	<0.05	<0.05	<0.05	<0.05	<0.5	<0.5	<0.5	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<5	-	9.2	44	12	<5	-	2.4	-	<0.5	<1	<5	-	<5	<0.1	<10	<5
BH03/0.2	BH03/0.2	BH03 0.2m	22/12/2008	Silty Sand	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.6	-	-	<5	-	<2	-	<0.5	-	<5	-	<5	<0.1	<10	<5
BH04/0.3	BH04/0.3	BH04 0.3m	22/12/2008	Sandy Clay	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13	-	-	6.9	<10	7.4	<2	<0.5	-	11	<5	<5	<0.1	<10	<5
BH05/0.5	BH05/0.5	BH05 0.5m	22/12/2008	Silty Clay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8.5	-	-	7	<10	<2	<2	<0.5	-	16	<5	<5	<0.1	<10	<5
BH06/0.3	BH06/0.3	BH06 0.3m	22/12/2008	Clay	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14	-	-	9.5	<10	<2	<2	<0.5	-	12	<5	<5	<0.1	<10	<5
BH07/1.0	BH07/1.0	BH07 1.0m	22/12/2008	Clay	<0.05	<0.5	<0.5	<0.5	<0.5	<0.05	<0.05	<0.05	<0.05	<0.05	<0.5	<0.5	<0.5	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<5	-	20	<5	26	14	-	11	-	<0.5	<1	44	-	19	<0.1	<10	6.8
BH08/0.15	BH08/0.15	BH08 0.15m	22/12/2008	Fill, Silty Clay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	25	-	-	63	<10	<2	<2	<0.5	-	17	11	35	<0.1	<10	45
BH09/0.3	BH09/0.3	BH09 0.3m	22/12/2008	Silty Clay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13	-	-	8.3	<10	4.4	<2	<0.5	-	82	6.9	7.6	<0.1	<10	11
BH10/0.3	BH10/0.3	BH10 0.3m	22/12/2008	Silty Clay	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH10/1.0	BH10/1.0	BH10 1.0m	22/12/2008	Clay	<0.05	<0.5	<0.5	<0.5	<0.5	<0.05	<0.05	<0.05	<0.05	<0.05	<0.5	<0.5	<0.5	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<5	-	21	<5	41	7.2	-	3	-	<0.5	<1	33	-	<5	<0.1	<10	7
BH11/0.2	BH11/0.2	BH11 0.2m	22/12/2008	Fill, Silty Sand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.1	-	-	<5	<10	<2	<2	<0.5	-	32	17	38	<0.1	<10	**67**
BH11/1.0	BH11/1.0	BH11 1.0m	22/12/2008	Clay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	23	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH12/0.2	BH12/0.2	BH12 0.2m	23/12/2008	Clay	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	23	-	-	<5	-	<2	-	<0.5	-	21	-	6.2	<0.1	<10	16
BH12/0.4	BH12/0.4	BH12 0.4m	23/12/2008	Clay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	21	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH13/0.2	BH13/0.2	BH13 0.2m	23/12/2008	Silty Sand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15	460	-	<5	<10	<2	<2	<0.5	-	26	19	15	<0.1	<10	41
BH13/0.35	BH13/0.35	BH13 0.35m	23/12/2008	Clay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.1	130	-	-	-	-	-	-	-	-	-	-	-	-	-
BH14/0.2	BH14/0.2	BH14 0.2m	23/12/2008	Silty Clay	<0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13	-	-	15	-	<2	-	<0.5	-	64	-	11	<0.1	<10	13
BH16/0.4	BH16/0.4	BH16 0.4m	23/12/2008	Silty Clay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15	-	-	8.1	<10	<2	<2	<0.5	-	18	<5	<5	<0.1	<10	<5
QC03	BH08/0.15	BH08 0.15m	22/12/2008	Fill, Silty Clay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	24	-	-	110	-	<2	-	<0.5	-	14	-	34	0.1	<10	32
QC04	BH08/0.15	BH08 0.15m	22/12/2008	Fill, Silty Clay	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16	-	-	-	71	-	<2	-	<2	-	17	-	28	0.05	-	34
QC05	BH16/0.4	BH16 0.4m	23/12/2008	Silty Clay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13	-	-	8.5	<10	<2	<2	<0.5	-	18	<5	<5	<0.1	<10	<5
QC06	BH16/0.4	BH16 0.4m	23/12/2008	Silty Clay	<0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	15	-	-	-	22	-	2.4	-	<2	-	15	-	2.3	<0.01	-	2.2

Statistical Summary

Number of Results	11	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2	22	5	3	20	11	20	11	20	3	20	11	20	20	18	20
Number of Detects	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	22	3	3	15	0	6	0	0	0	18	4	10	2	0	11
Minimum Concentration	<0.05	<0.5	<0.5	<0.5	<0.5	<0.05	<0.05	<0.05	<0.05	<0.05	<0.5	<0.5	<0.5	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	15	5.1	<5	12	<5	<10	<2	<2	<0.5	<1	<5	<5	2.3	<0.01	<10	2.2
Minimum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	15	5.1	44	12	6.9	ND	2.4	ND	ND	ND	11	6.9	2.3	0.05	ND	2.2
Maximum Concentration	<0.5	<0.5	<0.5	<0.5	<0.5	<0.05	<0.05	<0.05	<0.05	<0.05	<0.5	<0.5	<0.5	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<5	16	25	460	41	110	<10	11	<2	<2	<1	82	19	38	0.1	<10	67
Maximum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	16	25	460	41	110	ND	11	ND	ND	ND	82	19	38	0.1	ND	67
Average Concentration	0.066	0.25	0.25	0.25	0.25	0.025	0.025	0.025	0.025	0.025	0.25	0.25	0.25	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	2.5	16	15	128	26	19	5	2.2	1	0.33	0.5	24	6.5	11	0.05	5	15
Median Concentration	0.025	0.25	0.25	0.25	0.25	0.025	0.025	0.025	0.025	0.025	0.25	0.25	0.25	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	2.5	15.5	13.5	44	26	8.4	5	1	1	0.25	0.5	17	2.5	2.5	0.05	5	4.65
Standard Deviation	0.091	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.71	6.2	193	15	28	0	2.6	0	0.23	0	20	6.3	13	0.015	0	19
Number of Guideline Exceedances	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####
Number of Guideline Exceedances(Detects Only)	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####

SDG in('238972','239116','361490') and (Matrix_Type IN('SOIL')) and (Sample_Type = 'Normal' or Sample_Type = 'Composite' Or Sample_Type ='Composite (2 Samples)' Or Sample_Type ='Composite (3 Samples)' Or Sample_Type ='Composite (4 Samples)')

Table 1:

						OCP																						Organophosphorus Pesticides									
	Selenium	Silver	Tin	Zinc	4,4-DDE	a-BHC	Aldrin	Aldrin + Dieldrin	b-BHC	chlordane	Chlordane (cis)	d-BHC	DDD	DDT	DDT+DDE+DDD	Dieldrin	Endosulfan I	Endosulfan II	Endosulfan sulphate	Endrin	Endrin aldehyde	Endrin ketone	g-BHC (Lindane)	Heptachlor	Heptachlor epoxide	Methoxychlor	Toxaphene	Chlorpyrifos	Diazinon	Disulfoton	Ethion	Fenitrothion	Phorate	Ronnel	2,4,5-trichlorophenol	2,4-dichlorophenol	2,4-dimethylphenol
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL	2	5	10	2	0.05	0.05	0.05		0.05	0.1	0.5	0.05	0.05	0.05		0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.5	0.1	0.1
NEPM 1999 EIL				**200**																																	
EPA 1994 Health and Ecological																																					
NEPM 1999 HIL A				*7000*				*10*		*50*					*200*									*10*													
Field_ID	**LocCode**	**Sample_Depth_Range**	**Sampled_Date-Time**	**Matrix_Description**																																			
BH01/0.2	BH01/0.2	BH01 0.2m	18/12/2008	Silty Clay	<2	<5	<10	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH01/0.4	BH01/0.4	BH01 0.4m	18/12/2008	Silty Clay	<2	<5	<10	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH02/0.2	BH02/0.2	BH02 0.2m	22/12/2008	Silty Sand	<2	<5	<10	15	<0.05	<0.05	<0.05	<0.1	<0.05	<0.1	-	<0.05	<0.05	<0.05	<0.15	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	-	-	-	-	-	-	<0.5	<0.1	<0.1
BH03/0.2	BH03/0.2	BH03 0.2m	22/12/2008	Silty Sand	<2	<5	<10	<5	<0.05	<0.05	<0.05	<0.1	<0.05	<0.1	-	<0.05	<0.05	<0.05	<0.15	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	-	-	-
BH04/0.3	BH04/0.3	BH04 0.3m	22/12/2008	Sandy Clay	<2	<5	<10	<5	<0.05	<0.05	<0.05	<0.1	<0.05	<0.1	-	<0.05	<0.05	<0.05	<0.15	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	-	-	-
BH05/0.5	BH05/0.5	BH05 0.5m	22/12/2008	Silty Clay	<2	<5	<10	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH06/0.3	BH06/0.3	BH06 0.3m	22/12/2008	Clay	<2	<5	<10	<5	<0.05	<0.05	<0.05	<0.1	<0.05	<0.1	-	<0.05	<0.05	<0.05	<0.15	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	-	-	-	-	-	-	-	-	-	-
BH07/1.0	BH07/1.0	BH07 1.0m	22/12/2008	Clay	<2	<5	<10	12	<0.05	<0.05	<0.05	<0.1	<0.05	<0.1	-	<0.05	<0.05	<0.05	<0.15	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	-	-	-	-	-	-	-	<0.5	<0.1	<0.1
BH08/0.15	BH08/0.15	BH08 0.15m	22/12/2008	Fill, Silty Clay	<2	<5	<10	**600**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH09/0.3	BH09/0.3	BH09 0.3m	22/12/2008	Silty Clay	<2	<5	<10	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH10/0.3	BH10/0.3	BH10 0.3m	22/12/2008	Silty Clay	-	-	-	-	<0.05	<0.05	<0.05	<0.1	<0.05	<0.1	-	<0.05	<0.05	<0.05	<0.15	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	-	-	-	-	-	-	-	-	-	-
BH10/1.0	BH10/1.0	BH10 1.0m	22/12/2008	Clay	<2	<5	<10	<5	<0.05	<0.05	<0.05	<0.1	<0.05	<0.1	-	<0.05	<0.05	<0.05	<0.15	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	-	-	-	-	-	-	-	<0.5	<0.1	<0.1
BH11/0.2	BH11/0.2	BH11 0.2m	22/12/2008	Fill, Silty Sand	<2	<5	<10	36	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH11/1.0	BH11/1.0	BH11 1.0m	22/12/2008	Clay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH12/0.2	BH12/0.2	BH12 0.2m	23/12/2008	Clay	<2	<5	<10	9.6	<0.05	<0.05	<0.05	<0.1	<0.05	<0.1	-	<0.05	<0.05	<0.05	<0.15	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	-	-	-
BH12/0.4	BH12/0.4	BH12 0.4m	23/12/2008	Clay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH13/0.2	BH13/0.2	BH13 0.2m	23/12/2008	Silty Sand	<2	<5	<10	65	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH13/0.35	BH13/0.35	BH13 0.35m	23/12/2008	Clay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH14/0.2	BH14/0.2	BH14 0.2m	23/12/2008	Silty Clay	<2	<5	<10	11	<0.05	<0.05	<0.05	<0.1	<0.05	<0.1	-	<0.05	<0.05	<0.05	<0.15	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	-	-	-
BH16/0.4	BH16/0.4	BH16 0.4m	23/12/2008	Silty Clay	<2	<5	<10	<5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
QC03	BH08/0.15	BH08 0.15m	22/12/2008	Fill, Silty Clay	<2	<5	<10	**550**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
QC04	BH08/0.15	BH08 0.15m	22/12/2008	Fill, Silty Clay	-	-	-	**350**	-	<0.5	<0.5	<1	<0.5	-	<0.5	<0.5	<0.5	<0.5	<1.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	-	-	-	-	-	-	-	-	-
QC05	BH16/0.4	BH16 0.4m	23/12/2008	Silty Clay	<2	<5	<10	8.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
QC06	BH16/0.4	BH16 0.4m	23/12/2008	Silty Clay	-	-	-	2.7	-	<0.5	<0.5	<1	<0.5	-	<0.5	<0.5	<0.5	<0.5	<1.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<0.5	<0.5	<0.5	-	-	-	-	-	-	-	-	-

Statistical Summary

Number of Results	18	18	18	20	9	11	11	11	11	9	2	11	11	11	11	11	11	11	11	11	11	11	9	11	11	11	11	9	4	4	4	4	4	4	4	3	3	3
Number of Detects	0	0	0	11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minimum Concentration	<2	<5	<10	2.7	<0.05	<0.05	<0.05	<0.1	<0.05	<0.1	<0.5	<0.05	<0.05	<0.05	<0.15	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.1	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.5	<0.1	<0.1
Minimum Detect	ND	ND	ND	2.7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration	<2	<5	<10	600	<0.05	<0.5	<0.5	<1	<0.5	<0.1	<0.5	<0.5	<0.5	<0.5	<1.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.1	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.5	<0.1	<0.1
Maximum Detect	ND	ND	ND	600	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Average Concentration	1	2.5	5	84	0.025	0.066	0.066	0.13	0.066	0.05	0.25	0.066	0.066	0.066	0.2	0.066	0.066	0.066	0.066	0.066	0.066	0.025	0.066	0.066	0.066	0.066	0.05	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.25	0.05	0.05
Median Concentration	1	2.5	5	5.6	0.025	0.025	0.025	0.05	0.025	0.05	0.25	0.025	0.025	0.025	0.075	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.05	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.25	0.05	0.05
Standard Deviation	0	0	0	185	0	0.091	0.091	0.18	0.091	0	0	0.091	0.091	0.091	0.27	0.091	0.091	0.091	0.091	0.091	0.091	0	0.091	0.091	0.091	0.091	0	0	0	0	0	0	0	0	0	0	0
Number of Guideline Exceedances	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####
Number of Guideline Exceedances(Detects Only)	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####

Table 1:

					PAH/Phenols																				PCB								Pesticides							
					2-chlorophenol	2-methylphenol	3-&4-methylphenol	3-methylcholanthrene	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a) pyrene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	PAHs (Sum of total)	Phenanthrene	Phenol	Pyrene	Arochlor 1016	Arochlor 1221	Arochlor 1232	Arochlor 1242	Arochlor 1248	Arochlor 1254	Arochlor 1260	PCBs (Sum of total)	Azinophos methyl	DDE	Dichlorvos	Fenthion	Methyl parathion	Prothiofos	1-Chloronaphthalene
					mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL					0.1	0.1	0.2	0.5	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	1	0.2	0.5	0.2	0.2	0.2	0.2	0.5
NEPM 1999 EIL																																							
EPA 1994 Health and Ecological																							**20**																
NEPM 1999 HIL A													*1*										*20*		*8500*								*10*						
Field_ID	**LocCode**	**Sample_Depth_Range**	**Sampled_Date-Time**	**Matrix_Description**																																				
BH01/0.2	BH01/0.2	BH01_0.2m	18/12/2008	Silty Clay	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH01/0.4	BH01/0.4	BH01_0.4m	18/12/2008	Silty Clay	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH02/0.2	BH02/0.2	BH02_0.2m	22/12/2008	Silty Sand	<0.1	<0.1	<0.2	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<1	-	-	-	-	-	-	<0.5
BH03/0.2	BH03/0.2	BH03_0.2m	22/12/2008	Silty Sand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.2	-	<0.2	<0.2	<0.2	<0.2	-
BH04/0.3	BH04/0.3	BH04_0.3m	22/12/2008	Sandy Clay	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	-	-	<0.2	-	<0.2	<0.2	<0.2	<0.2	-
BH05/0.5	BH05/0.5	BH05_0.5m	22/12/2008	Silty Clay	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH06/0.3	BH06/0.3	BH06_0.3m	22/12/2008	Clay	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH07/1.0	BH07/1.0	BH07_1.0m	22/12/2008	Clay	<0.1	<0.1	<0.2	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<1	-	-	-	-	-	-	<0.5
BH08/0.15	BH08/0.15	BH08_0.15m	22/12/2008	Fill, Silty Clay	-	-	-	-	<0.5	<0.5	<0.5	<0.5	<0.1	<0.1	<0.1	<0.1	<0.5	<0.1	<0.5	<0.5	<0.1	<0.1	<2	<1	-	<2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH09/0.3	BH09/0.3	BH09_0.3m	22/12/2008	Silty Clay	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH10/0.3	BH10/0.3	BH10_0.3m	22/12/2008	Silty Clay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH10/1.0	BH10/1.0	BH10_1.0m	22/12/2008	Clay	<0.1	<0.1	<0.2	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<1	-	-	-	-	-	-	<0.5
BH11/0.2	BH11/0.2	BH11_0.2m	22/12/2008	Fill, Silty Sand	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH11/1.0	BH11/1.0	BH11_1.0m	22/12/2008	Clay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH12/0.2	BH12/0.2	BH12_0.2m	23/12/2008	Clay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.2	-	<0.2	<0.2	<0.2	<0.2	-
BH12/0.4	BH12/0.4	BH12_0.4m	23/12/2008	Clay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH13/0.2	BH13/0.2	BH13_0.2m	23/12/2008	Silty Sand	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH13/0.35	BH13/0.35	BH13_0.35m	23/12/2008	Clay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH14/0.2	BH14/0.2	BH14_0.2m	23/12/2008	Silty Clay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.2	-	<0.2	<0.2	<0.2	<0.2	-
BH16/0.4	BH16/0.4	BH16_0.4m	23/12/2008	Silty Clay	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
QC03	BH08/0.15	BH08_0.15m	22/12/2008	Fill, Silty Clay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
QC04	BH08/0.15	BH08_0.15m	22/12/2008	Fill, Silty Clay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	-	-	-	-	-	-
QC05	BH16/0.4	BH16_0.4m	23/12/2008	Silty Clay	-	-	-	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	-	<0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
QC06	BH16/0.4	BH16_0.4m	23/12/2008	Silty Clay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.5	-	-	-	-	-	-

Statistical Summary

Number of Results					3	3	3	3	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	3	14	3	3	3	3	3	3	3	3	4	2	4	4	4	4	3
Number of Detects					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minimum Concentration					<0.1	<0.1	<0.2	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<1	<0.2	<0.5	<0.2	<0.2	<0.2	<0.2	<0.5
Minimum Detect					ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration					<0.1	<0.1	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.1	<0.1	<0.1	<0.1	<0.5	<0.1	<0.5	<0.5	<0.1	<0.1	<2	<1	<0.1	<2	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<1	<0.2	<0.5	<0.2	<0.2	<0.2	<0.2	<0.5
Maximum Detect					ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Average Concentration					0.05	0.05	0.1	0.25	0.064	0.064	0.064	0.064	0.05	0.05	0.05	0.05	0.064	0.05	0.064	0.064	0.05	0.05	0.12	0.082	0.05	0.12	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.5	0.1	0.25	0.1	0.1	0.1	0.1	0.25
Median Concentration					0.05	0.05	0.1	0.25	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.5	0.1	0.25	0.1	0.1	0.1	0.1	0.25
Standard Deviation					0	0	0	0	0.053	0.053	0.053	0.053	0	0	0	0	0.053	0	0.053	0.053	0	0	0.25	0.12	0	0.25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of Guideline Exceedances					#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####
Number of Guideline Exceedances(Detects Only)					#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####

SDG in('238972','239116','361490') and (Matrix_Type IN('SOIL')) and (Sample_Type = 'Normal' or Sample_Type = 'Composite' Or Sample_Type ='Composite (2 Samples)' Or Sample_Type ='Composite (3 Samples)' Or Sample_Type ='Composite (4 Samples)')

Table 1:

SVOC

Field_ID	LocCode	Sample_Depth_Range	Sampled_Date-Time	Matrix_Description	1-naphthylamine	2,3,4,6-tetrachlorophenol	2,4,6-trichlorophenol	2,4-dinitrophenol	2,6-dichlorophenol	2-chloronaphthalene	2-methylnaphthalene	2-naphthylamine	2-nitrophenol	2-Picoline	3,3-Dichlorobenzidine	3-nitroaniline	4-(dimethylamino) azobenzene	4,6-Dinitro-2-methylphenol	4-aminobiphenyl	4-bromophenyl phenyl ether	4-chloro-3-methylphenol	4-chlorophenyl phenyl ether	4-nitrophenol
					mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL					0.5	0.5	0.1	0.5	0.1	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.1	0.5	0.5
NEPM 1999 EIL																							
EPA 1994 Health and Ecological																							
NEPM 1999 HIL A																							
BH01/0.2	BH01/0.2	BH01 0.2m	18/12/2008	Silty Clay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH01/0.4	BH01/0.4	BH01 0.4m	18/12/2008	Silty Clay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH02/0.2	BH02/0.2	BH02 0.2m	22/12/2008	Silty Sand	<0.5	<0.5	<0.1	<0.5	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.1	<0.5	<0.5
BH03/0.2	BH03/0.2	BH03 0.2m	22/12/2008	Silty Sand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH04/0.3	BH04/0.3	BH04 0.3m	22/12/2008	Sandy Clay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH05/0.5	BH05/0.5	BH05 0.5m	22/12/2008	Silty Clay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH06/0.3	BH06/0.3	BH06 0.3m	22/12/2008	Clay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH07/1.0	BH07/1.0	BH07 1.0m	22/12/2008	Clay	<0.5	<0.5	<0.1	<0.5	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.1	<0.5	<0.5
BH08/0.15	BH08/0.15	BH08 0.15m	22/12/2008	Fill, Silty Clay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH09/0.3	BH09/0.3	BH09 0.3m	22/12/2008	Silty Clay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH10/0.3	BH10/0.3	BH10 0.3m	22/12/2008	Silty Clay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH10/1.0	BH10/1.0	BH10 1.0m	22/12/2008	Clay	<0.5	<0.5	<0.1	<0.5	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.1	<0.5	<0.5
BH11/0.2	BH11/0.2	BH11 0.2m	22/12/2008	Fill, Silty Sand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH11/1.0	BH11/1.0	BH11 1.0m	22/12/2008	Clay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH12/0.2	BH12/0.2	BH12 0.2m	23/12/2008	Clay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH12/0.4	BH12/0.4	BH12 0.4m	23/12/2008	Clay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH13/0.2	BH13/0.2	BH13 0.2m	23/12/2008	Silty Sand	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH13/0.35	BH13/0.35	BH13 0.35m	23/12/2008	Clay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH14/0.2	BH14/0.2	BH14 0.2m	23/12/2008	Silty Clay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH16/0.4	BH16/0.4	BH16 0.4m	23/12/2008	Silty Clay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
QC03	BH08/0.15	BH08 0.15m	22/12/2008	Fill, Silty Clay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
QC04	BH08/0.15	BH08 0.15m	22/12/2008	Fill, Silty Clay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
QC05	BH16/0.4	BH16 0.4m	23/12/2008	Silty Clay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
QC06	BH16/0.4	BH16 0.4m	23/12/2008	Silty Clay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Field_ID	7,12-dimethylbenz(a)anthracene	Acetophenone	Aniline	Bis(2-chloroethoxy) methane	Bis(2-chloroisopropyl) ether	Bis(2-ethylhexyl) phthalate	Butyl benzyl phthalate	Coumaphos	Demeton-O	Dibenz(a.j)acridine	Dibenzofuran	Diethylphthalate	Dimethyl phthalate	Di-n-butyl phthalate	Di-n-octyl phthalate	Diphenylamine	Ethoprop	Fensulfothion
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.2	0.2	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.2	0.2
NEPM 1999 EIL																		
EPA 1994 Health and Ecological																		
NEPM 1999 HIL A																		
BH01/0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH01/0.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH02/0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	-
BH03/0.2	-	-	-	-	-	-	-	<0.2	<0.2	-	-	-	-	-	-	-	<0.2	<0.2
BH04/0.3	-	-	-	-	-	-	-	<0.2	<0.2	-	-	-	-	-	-	-	<0.2	<0.2
BH05/0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH06/0.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH07/1.0	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	-
BH08/0.15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH09/0.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH10/0.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH10/1.0	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	-	-
BH11/0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH11/1.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH12/0.2	-	-	-	-	-	-	-	<0.2	<0.2	-	-	-	-	-	-	-	<0.2	<0.2
BH12/0.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH13/0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH13/0.35	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH14/0.2	-	-	-	-	-	-	-	<0.2	<0.2	-	-	-	-	-	-	-	<0.2	<0.2
BH16/0.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
QC03	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
QC04	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
QC05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
QC06	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Statistical Summary

Statistic	1-naphthylamine	2,3,4,6-tetrachlorophenol	2,4,6-trichlorophenol	2,4-dinitrophenol	2,6-dichlorophenol	2-chloronaphthalene	2-methylnaphthalene	2-naphthylamine	2-nitrophenol	2-Picoline	3,3-Dichlorobenzidine	3-nitroaniline	4-(dimethylamino) azobenzene	4,6-Dinitro-2-methylphenol	4-aminobiphenyl	4-bromophenyl phenyl ether	4-chloro-3-methylphenol	4-chlorophenyl phenyl ether	4-nitrophenol
Number of Results	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Number of Detects	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minimum Concentration	<0.5	<0.5	<0.1	<0.5	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.1	<0.5	<0.5
Minimum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration	<0.5	<0.5	<0.1	<0.5	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.1	<0.5	<0.5
Maximum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Average Concentration	0.25	0.25	0.05	0.25	0.05	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.05	0.25	0.25
Median Concentration	0.25	0.25	0.05	0.25	0.05	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.05	0.25	0.25
Standard Deviation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of Guideline Exceedances	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####
Number of Guideline Exceedances(Detects Only)	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####

Statistic	7,12-dimethylbenz(a)anthracene	Acetophenone	Aniline	Bis(2-chloroethoxy) methane	Bis(2-chloroisopropyl) ether	Bis(2-ethylhexyl) phthalate	Butyl benzyl phthalate	Coumaphos	Demeton-O	Dibenz(a.j)acridine	Dibenzofuran	Diethylphthalate	Dimethyl phthalate	Di-n-butyl phthalate	Di-n-octyl phthalate	Diphenylamine	Ethoprop	Fensulfothion
Number of Results	3	3	3	3	3	3	3	4	4	3	3	3	3	3	3	3	4	4
Number of Detects	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minimum Concentration	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.2
Minimum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.2
Maximum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Average Concentration	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.1	0.1	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.1	0.1
Median Concentration	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.1	0.1	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.1	0.1
Standard Deviation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of Guideline Exceedances	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####
Number of Guideline Exceedances(Detects Only)	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####

Table 1:

											TPH					VOC																					
					Mevinphos (Phosdrin)	Naled (Dibrom)	N-nitrosodi-n-butylamine	N-nitrosodi-n-propylamine	N-nitrosopiperidine	Pentachloronitrobenzene	Pentachlorophenol	Trichloronate	Trifluralin	TPH C 6 - C 9 Fraction	TPH C10 - C14 Fraction	TPH C15 - C28 Fraction	TPH C29-C36 Fraction	TPH+C10 - C36 (Sum of total)	1,2,4-trimethylbenzene	1,2-dichloropropane	1,3,5-trimethylbenzene	1,3-dichloropropane	2-butanone (MEK)	4-chlorotoluene	4-methyl-2-pentanone (MIBK)	Acetone	Allyl chloride	Bromobenzene	Bromochloromethane	Bromomethane	Carbon disulfide	Chloromethane	Dichlorodifluoromethane	Isopropylbenzene	Styrene	Vinyl acetate
					mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
EQL					0.2	0.2	0.5	0.5	0.5	0.5	0.5	0.2	0.5	20	50	100	100		0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
NEPM 1999 EIL																																				
EPA 1994 Health and Ecological														**65**				**1000**																		
NEPM 1999 HIL A																																				
Field_ID	**LocCode**	**Sample_Depth_Range**	**Sampled_Date-Time**	**Matrix_Description**																																
BH01/0.2	BH01/0.2	BH01 0.2m	18/12/2008	Silty Clay	-	-	-	-	-	-	-	-	-	<20	<50	2800	4100	**6925**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH01/0.4	BH01/0.4	BH01 0.4m	18/12/2008	Silty Clay	-	-	-	-	-	-	-	-	-	<20	<50	<100	<100	<250	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH02/0.2	BH02/0.2	BH02 0.2m	22/12/2008	Silty Sand	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<20	<50	<100	<100	<250	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
BH03/0.2	BH03/0.2	BH03 0.2m	22/12/2008	Silty Sand	<0.2	<0.2	-	-	-	-	-	<0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH04/0.3	BH04/0.3	BH04 0.3m	22/12/2008	Sandy Clay	<0.2	<0.2	-	-	-	-	-	<0.2	-	<20	<50	<100	<100	<250	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH05/0.5	BH05/0.5	BH05 0.5m	22/12/2008	Silty Clay	-	-	-	-	-	-	-	-	-	<20	<50	<100	<100	<250	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH06/0.3	BH06/0.3	BH06 0.3m	22/12/2008	Clay	-	-	-	-	-	-	-	-	-	<20	<50	<100	<100	<250	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH07/1.0	BH07/1.0	BH07 1.0m	22/12/2008	Clay	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<20	<50	<100	<100	<250	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
BH08/0.15	BH08/0.15	BH08 0.15m	22/12/2008	Fill, Silty Clay	-	-	-	-	-	-	-	-	-	<20	870	1600	110	**2580**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH09/0.3	BH09/0.3	BH09 0.3m	22/12/2008	Silty Clay	-	-	-	-	-	-	-	-	-	<20	<50	<100	<100	<250	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH10/0.3	BH10/0.3	BH10 0.3m	22/12/2008	Silty Clay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH10/1.0	BH10/1.0	BH10 1.0m	22/12/2008	Clay	-	-	<0.5	<0.5	<0.5	<0.5	<0.5	-	<0.5	<20	<50	<100	<100	<250	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
BH11/0.2	BH11/0.2	BH11 0.2m	22/12/2008	Fill, Silty Sand	-	-	-	-	-	-	-	-	-	<20	<50	<100	<100	<250	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH11/1.0	BH11/1.0	BH11 1.0m	22/12/2008	Clay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH12/0.2	BH12/0.2	BH12 0.2m	23/12/2008	Clay	<0.2	<0.2	-	-	-	-	-	<0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH12/0.4	BH12/0.4	BH12 0.4m	23/12/2008	Clay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH13/0.2	BH13/0.2	BH13 0.2m	23/12/2008	Silty Sand	-	-	-	-	-	-	-	-	-	<20	<50	<100	<100	<250	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH13/0.35	BH13/0.35	BH13 0.35m	23/12/2008	Clay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH14/0.2	BH14/0.2	BH14 0.2m	23/12/2008	Silty Clay	<0.2	<0.2	-	-	-	-	-	<0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BH16/0.4	BH16/0.4	BH16 0.4m	23/12/2008	Silty Clay	-	-	-	-	-	-	-	-	-	<20	<50	<100	<100	<250	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
QC03	BH08/0.15	BH08 0.15m	22/12/2008	Fill, Silty Clay	-	-	-	-	-	-	-	-	-	<20	830	1200	<100	2080	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
QC04	BH08/0.15	BH08 0.15m	22/12/2008	Fill, Silty Clay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
QC05	BH16/0.4	BH16 0.4m	23/12/2008	Silty Clay	-	-	-	-	-	-	-	-	-	<20	<50	<100	<100	<250	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
QC06	BH16/0.4	BH16 0.4m	23/12/2008	Silty Clay	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Statistical Summary

Number of Results	4	4	3	3	3	3	3	4	3	15	15	15	15	15	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Number of Detects	0	0	0	0	0	0	0	0	0	0	2	3	2	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minimum Concentration	<0.2	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<20	<50	<100	<100	<250	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Minimum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	830	1200	110	2080	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration	<0.2	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<20	870	2800	4100	6925	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Maximum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	870	2800	4100	6925	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Average Concentration	0.1	0.1	0.25	0.25	0.25	0.25	0.25	0.1	0.25	10	135	413	324	872	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025
Median Concentration	0.1	0.1	0.25	0.25	0.25	0.25	0.25	0.1	0.25	10	25	50	50	125	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025	0.025
Standard Deviation	0	0	0	0	0	0	0	0	0	0	290	815	1045	1846	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of Guideline Exceedances	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####
Number of Guideline Exceedances(Detects Only)	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####	#####

Appendix C Groundwater Management System Data

GMS search 1500m

SITE NO	OLD SITE NO	RIG NO./ LIC NO.	MGA ZONE	EAST	NORTH	DATE COMPLETED	TOTAL DEPTH (m)	RLNS	SITE TYPE	USES	DRILL METHOD	LOGS G	LOGS D	AQUIF FROM (m)	AQUIF TO (m)	TSS mg/L	DATE COMPLETED	ACTIVITY TYPE	AQUIF FROM (m)	AQUIF TO (m)	LITH	SWL (m)
2131 BERWICK																						
301859	3213100144	NONE	55	355833.21	5785714.10	10.01.1975	5.49	-	BOR	NG	-	N	N	-	-	N/A	10.01.1975	-	-	-	-	-
301774	3213100048	NONE	55	355833.21	5785724.10	11.05.1974	2.44	-	BOR	NG	-	N	N	-	-	N/A	11.05.1974	-	-	-	-	-
301775	3213100049	NONE	55	355753.21	5785204.10	11.05.1974	5.49	-	BOR	NG	-	N	N	-	-	N/A	11.05.1974	-	-	-	-	-
301776	3213100050	NONE	55	356153.21	5784704.09	11.05.1974	5.49	-	BOR	NG	-	N	N	-	-	N/A	11.05.1974	-	-	-	-	-
301777	3213100051	NONE	55	356213.21	5784344.09	11.05.1974	5.49	-	BOR	NG	-	N	N	-	-	N/A	11.05.1974	-	-	-	-	-
301778	3213100052	NONE	55	355673.21	5784424.09	11.05.1974	7.01	-	BOR	NG	-	N	N	-	-	N/A	11.05.1974	-	-	-	-	-
301855	3213100138	NONE	55	355713.21	5786024.10	20.12.1974	9.14	-	BOR	NG	-	N	N	-	-	N/A	20.12.1974	-	-	-	-	-
S9034700/1	-	S9034700	55	355651.00	5786011.00	17.07.2008	15.00	-	BOR	IV	AGM	N	Y	-	-	N/A	17.07.2008	TEST	8.7	15.0	-	-
301773	3213100047	NONE	55	355533.21	5786044.10	11.05.1974	3.96	-	BOR	NG	-	N	N	-	-	N/A	11.05.1974	-	-	-	-	-
S9020758/1	-	S9020758	55	356766.21	5786625.10	24.02.2005	105.00	-	BOR	DS	DHH	N	N	-	-	N/A	24.02.2005	TEST	93.0	105.0	-	-
S9031227/1	-	S9031227	55	356536.00	5784623.00	31.10.2007	66.00	-	BOR	IR	ROA	N	Y	-	-	N/A	31.10.2007	TEST	46.0	61.0	MUST	14.0
2462 CRANBOURNE																						
305320	3246200061	NONE	55	357033.21	5784164.09	06.01.1975	3.66	-	BOR	NG	-	N	N	-	-	N/A	06.01.1975	-	-	-	-	-
305317	3246200058	NONE	55	355993.21	5784324.09	11.04.1974	2.44	-	BOR	NG	-	N	N	-	-	N/A	11.04.1974	-	-	-	-	-
305315	3246200056	NONE	55	357363.21	5784134.09	11.05.1974	3.96	-	BOR	NG	-	N	N	-	-	N/A	11.05.1974	-	-	-	-	-
305314	3246200055	NONE	55	357033.21	5784164.09	11.05.1974	2.44	-	BOR	NG	-	N	N	-	-	N/A	11.05.1974	-	-	-	-	-
305313	3246200054	NONE	55	356563.21	5784244.09	11.05.1974	3.96	-	BOR	NG	-	N	N	-	-	N/A	11.05.1974	-	-	-	-	-

Appendix D Site Inspection Photographs

- **Photo 1. Aboveground storage tank (AST).**

- **Photo 2. Numerous fuel drums distributed across the site.**

- **Photo 3. Store of herbicides and pesticides.**

- **Photo 4. Vehicle Maintenance Shed.**

- **Photo 5. Diesel bowser adjacent to main vehicle shed.**

- **Photo 6. Petrol bowser adjacent to main vehicle shed.**

- **Photo 7. Pile of waste in storage yard.**

- **Photo 8. Septic tank.**