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Report on
Targeted (Phase 2) Site Contamination Investigation

Stage 2 Proposed Horsley Drive Business Park
Cowpasture Road, Wetherill Park

Prepared for
Western Sydney Parklands Trust

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The undersigned, on behalf of Douglas Partners Pty Ltd, confirm that this document and all attached drawings, logs and test results have been checked and reviewed for errors, omissions and inaccuracies.

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Table of Contents

Page

Report on Targeted (Phase 2) Site Contamination Investigation
Stage 2 Proposed Horsley Drive Business Park
Cowpasture Road, Wetherill Park

1. Introduction

This report presents the results of a targeted (phase 2) site contamination investigation [TSI] undertaken for Stage 2 of the Horsley Drive Business Park (the site). The investigation was commissioned by Tim Colless of Western Sydney Parklands Trust (WSPT) and was undertaken in accordance with Douglas Partners Pty Ltd (DP) proposal SYD170224 dated 28 February 2017.

It is understood that the TSI report will form part of the additional response to submissions (SSD 7664) required by the Department of Planning and Environment in accordance with clause 85A of the *Environmental Planning and Assessment Regulation 2000*.

The proposed development of the site is to include the construction of four warehouses. An access road will be established in the eastern portion of the site, connecting to Cowpasture Street. In addition, a proposed basin will be constructed in the south-eastern portion of the site. A plan shown the proposed development is presented on Drawing 3 in Appendix A.

The TSI was based on the recommendations provided in a report on a phase 1 preliminary site investigation (PSI) carried by A.D. Envirotech Australia Pty Ltd (ADE) in October 2016. The site entails the majority of Lots 18-23 in DP 13961. The boundary of the site is depicted on Drawings 1 and 2 in Appendix A. A summary of key findings of the PSI are outlined in Section 5.

The objectives of the TSI are as follows:

- Supplement the environmental assessment carried out by ADE in October 2016;
- Investigate concentrations of potential contaminants in soils and surface water at the site;
- Assess the laboratory results with respect to the suitability of the site for the proposed development;
- Make recommendations for further work, if considered necessary; and
- Satisfy the requests of the Department of Planning and Environment.

The contamination assessment for the site has been undertaken with reference to NSW EPA *Guidelines for Consultants Reporting on Contaminated Sites* (August 2011) and the National Environment Protection Council, *National Environment Protection (Site Contamination) Measure 1999, as amended 2013* (NEPC, 2013).

2. Scope of Works

The scope of works was as follows:

- Excavation of 32 test pits to depths of 0.5 m into natural, a maximum depth of 3 m or prior refusal/collapse or into stockpiles using a 5-8 tonne excavator. Samples were collected at regular depth intervals and at any signs of potential contamination. It should be noted that the dam walls and sediments were not readily accessible at the time of assessment;
- Collection of 12 material samples (potential asbestos-containing material) from ground surface or in stockpiles for asbestos testing;
- Use hand equipment to sample surface soils from 89 locations positioned on an approximate 50 m square grid across parts of the site within the footprint of former market gardens;
- Collection of surface water from four dams using a long-handled swing sampler;
- Logging of the subsurface profile and surface water condition, including visual and olfactory assessment of potential contaminants in filling and surface water;
- Soil samples collected were screened for the presence of volatile organic compounds (VOC) using a PID, where considered beneficial;
- Analysis at a NATA accredited laboratory of selected soil samples for various combinations of: heavy metals, polycyclic aromatic hydrocarbons (PAH), BTEXN (benzene, toluene, ethyl benzene, xylenes and naphthalene), total recoverable hydrocarbons (TRH), total phenols, polychlorinated biphenyls (PCB), Polychlorinated biphenyls (PCB), organochlorine pesticides (OCP), organophosphorus pesticides (OPP) and asbestos;
- Sampling and analysis for quality control/quality assurance, comprising:
    - 5% Intra-laboratory replicate sample (same suite as primary sample);
    - 5% Inter-laboratory replicate sample (same suite as primary sample);
    - Trip blank sample (TRH/BTEX) (1 per batch); and
    - Trip spike sample (BTEX) (1 per batch).
- Analysis of 4 water samples (including three QA/QC samples) for heavy metals, TRH, BTEX, PAH (low level), Phenols, OCP, OPP and PCB (trace level); and
- Preparation of a report presenting the findings of the investigation.

3. Site Information

3.1 Site Details

Site details are provided in Table 1, below. A site plan is provided as Drawing 1, Appendix A.

Table 1: General Site Information

Item	Description
Site Address	The site is located off Cowpasture Road and Trivet Street, Wetherill Park NSW: Lot 18, DP 13961 - 15 Trivet Street, Wetherill Park Lot 19, DP 13961 - 5 Trivet Street, Wetherill Park Lot 20, DP 13961 - 130 Cowpasture Road, Wetherill Park Lot 21, DP 13961 - 132-142 Cowpasture Road, Wetherill Park Lot 22, DP 13961 - 144-154 Cowpasture Road, Wetherill Park Lot 23, DP 13961 - 130 Cowpasture Road, Wetherill Park
Lot and DP Number	Part of Lots 18 to 23 in DP 13961
Local Government Authority	Fairfield City Council
County/Parish	Parish of Melville and the County of Cumberland
Total Site Area	Approximately 16.76 ha
Current Zoning	WSP – Western Sydney Parklands
Site Owner	Western Sydney Parklands Trust
Current Site Use	Semi-Rural Residential
Possible Future Land Use	Horsley Drive Business Park
Adjacent Land Use	• **Northern boundary:** Low density rural / agricultural properties with open paddocks. Further to the north lies the Prospect Reservoir and associated infrastructure. It should be noted that the immediate northern lots are under licence from WSPT for urban farming and are also currently owned by WSPT; • **Eastern boundary:** High density commercial / industrial estate which houses industrial manufacturing including metal work and mechanical businesses; • **Southern boundary:** Horsley Drive Business Park (Stage 1) followed by The Horsley Drive and further low density rural / agricultural properties. Areas south of The Horsley Drive are owned by WSPT; and • **Western boundary:** A culvert / canal, WaterNSW Upper Canal, followed by low density rural / agricultural properties. Areas west of the WaterNSW Upper Canalare owned by WSPT.

3.2 Site Description

The site has not changed significantly since the PSI was carried out in October 2016. This section should be reviewed in conjunction with Drawing 1 in Appendix A.

The majority of the site is covered by overgrown vegetation. Various trees, shrubs, blackberry bush and stockpiles were present across most parts of the site. Although WSPT has assisted to slash the overgrown vegetation in parts of the site for accessibility, the thick, overgrown vegetation in some areas limited inspection of ground surface for potential asbestos-containing material (ACM).

A total of four residential dwellings are currently present within the site and two of the properties appear to be abandoned, as described in Table 2.

Table 2: Residential Dwellings at the Site

Premises	Description
15 Trivet Street, Wetherill Park (in Lot 18)	Fibro residential cottage with a front and rear garden and a gravelly driveway. The cottage is maintained in good condition.
5 Trivet Street, Wetherill Park (in Lot 19)	Fibro residential cottage – storage of used construction materials and old cars/car parts were observed in the backyard. The area of the dumping ground is approximately 1500 m^2. The premises appear to be abandoned with feral/house cats surrounding the house.
132-142 Cowpasture Road, Wetherill Park (in Lot 21)	The premises consists of a long, gravelly driveway leading to a fibro cottage, a horse yard, sheds to house greyhounds and a 150 m long, greyhound training track located at the rear of the cottage. The overall premises appear to be well maintained with a small mound located in the front of the residential cottage. The surface of the mound contained building rubble, predominately roof tiles. The content of mound was not investigated further due to the occupancy of the tenant.

Premises	Description
144-154 Cowpasture Road, Wetherill Park (in Lot 22)	Access was restricted for premises 144-154 Cowpasture Road due to the presence of farm animals at the premises. The intrusive investigation was conducted in the surrounding area of premises 144-154 Cowpasture Road to the immediate west of the fencing boundary in order to prevent the animals from escaping the premises. Anecdotal information provided by the tenant in premises 132-142 Cowpasture Road suggested that burial of miscellaneous waste including trucks and vans and possibly other car parts were witnessed in the past. Based on ADE's information and DP's observation, the property was observed to contain derelict cars and storage of construction material.

There were three dams observed at the site and a tributary connecting from the dam located in the western portion of Lot 21. Given the recent rainfall events, the dams were overflowing and access to the dams by an excavator was not readily accessible. The surface of two of the dams in Lots 18 and 21 were covered by algal blooms.

The southernmost section of the site (in Lot 23) had been subject to earthworks, as part of the access road and construction of the Stage 1 of the Horsley Drive Business Park to the south. Presumed cut and fill earthworks appeared to have been undertaken around drainage on the northern side of the access road.

Stockpiles of various volumes were identified in Areas 2, 4, 7 and 8 as shown on Drawing 1 in Appendix A. A summary of the stockpile information is outlined in Section 9.2.

Suspected ACM was observed on the ground surface and within stockpiles of Areas 1, 4, 5 and 8, as shown on Drawing 1 in Appendix A. A summary of asbestos findings is outlined in Section 9.3.

4. Regional Topography and Geology, Soils and Hydrogeology

4.1 Topography

The site is at an elevation varying between approximately 60 - 75 m Australian Height Datum (AHD) and undulates locally with a general slight fall to the south. Surface water is expected to drain into the dams located on the site, and towards the local drainage system to the east.

4.2 Geology

Reference to the Penrith 1:100 000 Geological Series Sheet indicates that the site is underlain by Wianamatta Group Ashfield Shale and Bringelly Shale formations.

4.3 Acid Sulphate Soils

Data supplied by the *NSW Department of Environment and Climate Change* based on published *1:25,000 Acid Sulfate Soil Risk Mapping*, 1994-1998 classed the site as being in an area of no known occurrence of acid sulphate soils.

4.4 Hydrogeology

The WaterNSW Upper Canal is located directly west of the site, which flows in a northerly direction into Prospect Reservoir located approximately 1.2 km north of the site. Overall groundwater movement is expected to flow in a general south easterly direction towards Orphan School Creek located approximately 3 km to the south / south east of site and eventually discharging into the Georges River system.

5. Review of ADE (2016) Report

ADE prepared a Phase 1 preliminary site investigation report in October 2016 entitled: *Phase 1 preliminary site investigation for Horsley Drive Business Park – Stage 2 Site, Wetherill Park, NSW* (REF: STC-247-10924 / psi1 / v2 final), October 2016 (ADE 2016).

The key findings of ADE (2016) in relation to the site are summarised below:

- Historical site information revealed potentially contaminating land uses including: market gardens, orchards and poultry farming. In addition to former agricultural uses, there was evidence within the Land Title Records of a motor mechanic occupying Lot 20 in the past;
- The potential areas of environmental concern included: former agricultural activities, illegal dumping activities, uncontrolled demolition activities, motor mechanic activities and existing/former buildings and structures on site constructed of hazardous building material; and
- Based on the site history information and site walkover carried out by ADE, the potential for contamination to be present within the site was considered by ADE to be moderate, however further investigation(s) of the site was recommended by ADE as follows:
    1. *Investigation of the site in accordance with the 'Guidelines for Assessing Former Orchards and Market Gardens' (DEC 2005) including the sediment and water of the on-site dams;*
    2. *Investigation of the presence and extent of asbestos contamination on the soil surface of the site and within stockpiled materials;*
    3. *Investigation of demolished building footprints and surrounds for potential contamination due to the demolition process or historical site use;*

4. *Investigation of inaccessible residences (including storage sheds, beneath houses etc.) on Lots 19 and 22 for evidence and extent of contamination due to current and historical site uses including potential mechanical works;*
5. *Investigation of heavily vegetated areas and areas of stockpiled blackberry for indicators of contamination;*
6. *Inspection of the dam walls when access to the soil surface can be obtained (i.e during Site clearing/construction works) to ensure the bunds are created from reworked natural materials; and*
7. *Prior to further investigation works a Sampling and Analysis Quality Plan (SAQP) should be developed to effectively guide future works and orcharding since the 1940s. In addition to the agricultural use, there is evidence within the Land Title Records of motor mechanic occupying Lot 20 in the past.*

It should be noted that while most of the above recommendations have been achieved during the current investigation, the assessment of sediment of the on-site dams, inspection of the dam walls and investigation of demolished building footprints will be carried out following demolition of site buildings and structures and dewatering of the dams. It should be noted that the walls and sediments of the dams were not readily accessible at the time of assessment due to recent heavy rains and subsequent flooding of the dams. The dam walls and sediments should be assessed following dewatering of dams and as recommended by ADE during site clearing and construction phases of the development.

6. Conceptual Site Model

A conceptual site model (CSM) is a representation of site-related information regarding contamination sources, receptors and exposure pathways between those sources and receptors. The CSM provides the framework for identifying how the site became contaminated and how potential receptors may be exposed to contamination either in the present or in the future i.e. it enables an assessment of the potential source – pathway – receptor linkages.

6.1 Potential Contamination Sources

The following Table 3 summarises potential sources of contamination identified based on ADE (2016) and the DP field investigations.

Table 3: Potential Contamination Sources and Contaminants of Concern

Potential Source		Description of Potential Contaminating Activity	Contaminants of Concern
S1	Illegal dumping of waste and imported filling of unknown origin	Dumping and importing of potentially contaminated waste/filling.	Common contaminants associated with filling are heavy metals, TRH, BTEX, PAH, PCB, OCP, OPP, phenol and asbestos.

Potential Source		Description of Potential Contaminating Activity	Contaminants of Concern
S2	Demolition of former buildings	Demolition of former houses/ structures which were present at the site. These have a high risk of having contained hazardous building materials.	Asbestos, PCB and lead
S3	Previous and current land uses	Use of the site for agricultural activities (market gardens, orchards and poultry farming).	Heavy metals and OCP/OPP
		Potential use of Lot 20 for mechanical workshop.	Phenol, PAH, OCP and heavy metals
S4	Hazardous building material	Potential use of hazardous building material during construction of existing cottages and sheds.	Asbestos, PCB and lead

6.2 Potential Receptors

6.2.1 Human Health Receptors

R1 – Construction workers;

R2 – Future site users;

R3 – Intrusive maintenance workers;

R4 – Land users in adjacent areas (commercial/ industrial); and

R5 – Extraction of groundwater for portable/agricultural uses.

6.2.2 Environmental Receptors

R6 – Groundwater;

R7 – Surface water (local dams, canal, reservoir, creek and river); and

R8 – Terrestrial ecology.

6.2.3 Building and Structures Receptors

R9 – Buildings and foundations; and

R10 – Underground services.

6.3 Potential Pathways

Potential pathways for contamination include the following:

P1 – Ingestion and dermal contact;

P2 – Inhalation of dust and/or vapours;

P3 – Leaching of contaminants and vertical mitigation into groundwater;

P4 – Contact with terrestrial ecology; and

P5 – Contact with buildings and structures.

6.4 Summary of CSM

A 'source–pathway–receptor' approach has been used to assess the potential risks of harm being caused to human, water or environmental receptors from contamination sources on or in the vicinity of the site, via exposure pathways. The possible pathways between the above sources and receptors are provided in Table 4 below.

Table 4: Conceptual Site Model

Source	Transport Pathway	Receptor
S1: Illegal dumping of waste and imported filling of unknown origin S2: Demolition of former buildings S3: Previous and current land uses. S4: Hazardous building material	**Human Health**	
	P1: Ingestion and dermal contact	R1: Construction workers
		R2: Future site users
		R3: Intrusive maintenance workers
	P2: Inhalation of dust and/or vapours	R1: Construction workers
		R2: Future site users
		R3: Intrusive maintenance workers
		R4: Land users in adjacent areas (commercial/industrial)
		R5: Extraction of groundwater for portable/agricultural uses
	Environment	
	P3: Leaching of contaminants and vertical mitigation into groundwater	R6: Groundwater
	P4: Contact with terrestrial ecology	R7: Terrestrial ecology
	Buildings and Structures	
	P5: Contact with buildings and structures	R8: Underground services
		R9: Buildings and foundations

7. Investigation Rationale and Methodology

The rationale and methodology of this TSI was based on EPA endorsed guidance and included determining the data quality objectives required to meet the objectives. Details of the rationale and methodology are provided below.

7.1 Data Quality Objectives (DQO)

The scope of the DSI has been devised generally in accordance with the seven step data quality objective (DQO) process, as defined in NEPC (2013). The DQO process is outlined as follows:

7.1.1 State the Problem

The "problem" to be addressed is whether the site is suitable (or will be suitable after remediation) for the proposed commercial / industrial redevelopment. The proposed development will involve the construction of industrial warehouses therefore the site will be assessed against commercial/industrial land use criteria.

7.1.2 Identify the Decision

The decisions to be made in completing the TSI are as follows:

- What is the risk of elevated soil or groundwater contamination within the site?
- Does the site, or is the site likely to, present a risk to human health or the environment for the proposed development?
- Are there likely to be any significant contamination issues that would pose restrictions on the proposed development?
- Does the site require further investigation, remediation and/or validation for the proposed development?
- Is there any contamination requiring notification to EPA?

7.1.3 Identify Inputs into the Decision

The inputs into the decision process are as follows:

- ADE (2016) report findings;
- Site operations and observation details;
- Soil profile information obtained through the sampling phase;
- Screening results;
- Chemical test data on analysed soil and groundwater samples;
- Assessment of test data against applicable site assessment criteria; and
- Details of the proposed development.

7.1.4 Define the Boundary of the Assessment

The boundary of the site for the purpose of TSI is depicted on Drawing 1 in Appendix A. The maximum borehole depth was 3 m below existing ground level and this forms the vertical boundary of the investigation.

7.1.5 Develop a Decision Rule

The information obtained through this TSI was used to assess the suitability of the site (from a contamination standpoint) for the proposed development. The decision rule in conducting this TSI was as follows:

- Laboratory test results were assessed individually, and/or statistically where appropriate;
- The site assessment criteria (SAC) have been endorsed by the EPA or, for analytes where there are no EPA endorsed criteria, other relevant Australian or internationally recognised standards have been referred to as screening thresholds;
- The soil and surface water analytical results provide an indication of the likely potential for contamination at the site;
- Relevant site information, observations and exceedances of the SAC were used to evaluate whether the site is suitable for the proposed development, from a contamination standpoint; and
- Further investigations and/or remediation works have been recommended, if required.

Laboratory test results were assessed and considered useable for the assessment based on the following conditions:

- All laboratories used are accredited by National Association of Testing Authorities (NATA) for the analyses undertaken;
- Practical quantitation limits (PQL) set by the laboratories being below the assessment criteria adopted;
- The reported concentrations of analytes in the replicate sample pairs are within accepted limits; and
- The quality assurance/quality control (QA/QC) protocols and results reported by the laboratories comply with the requirements of the NEPC (2013).

7.1.6 Specify Acceptable Limits on Decision Errors

The limits on decision errors for the proposed assessment will be as follows:

- The analyte selection is based on the conceptual site model provided in Section 6 of this report;
- The SAC adopted from the guidelines stated in Section 8 have risk probabilities already incorporated;
- The acceptable limits for replicate comparisons are outlined in Australian Standard AS 4482.1-2005, *Guide to the investigation and sampling of sites with potentially contaminated soil, Part1: Non—volatile and semi-volatile compounds*; and

- The acceptance limits for laboratory QA/QC parameters are based on the laboratory reported acceptance limits and those stated in NEPC 2013 Schedule B3 "*Guideline on Laboratory Analysis of Potentially Contaminated Soils*".

7.1.7 Optimise the Design for Obtaining Data

The sampling design regime is based on the findings reported in ADE (2016), and in consideration of the generally low sensitivity of the proposed development. A total of nine potential areas of environmental concern (PAECs) had been identified during the site visit conducted by ADE (Areas 1 to 9), as shown on Drawing 1, Appendix A. A summary of the sampling design regime is outlined in Tables 5 & 5a, below with any new PAECs identified by DP.

Table 5: Sampling Design Regime

Area	Potential Area of Environmental Concerns	Number of Test Pits and Sampling Regime	Contaminants of Concern
1	Shed constructed from potential asbestos fibre cement. Potential asbestos fibre cement debris (<7 mm) scattered extensively on soil surface.	3 test pits excavated within the footprint of the shed 0.5 m into natural and allowed 3 material samples for testing of asbestos fibre cement debris.	Heavy metals, TRH, BTEX, PAH, Phenols, OCP, OPP, PCB and Asbestos.
2	Stockpile of cleared blackberry bush / material with potential asbestos fibre cement debris on soil surface.	3 test pits excavated into the stockpile.	Heavy metals, TRH, BTEX, PAH, Phenols, OCP, OPP, PCB and Asbestos.
3	Residential dwellings with potential asbestos building fabric, abandoned cars.	3 test pits excavated within the area to 0.5 m into natural.	Heavy metals, TRH, BTEX, PAH, Phenols, OCP, OPP, PCB and Asbestos.
4	Areas cleared of blackberry with stockpiled material and potential asbestos fibre cement in poor condition (<7 mm) on soil surface.	Same as Item 2. Allowed 3 material samples for testing of asbestos fibre cement debris.	Same as Item 2.
5	Fly-tipped waste i.e. batteries, tyres, potential asbestos fibre cement debris on the soil surface. Abandoned trailer with potential asbestos fibre cement inside.	3 test pits excavated across the area, allowed 3 material samples for testing of asbestos fibre cement debris and classify the waste material into its relevant category (i.e. tyre waste are pre-classified as Special Waste)	Heavy metals, TRH, BTEX, PAH, Phenols, OCP, OPP, PCB and Asbestos.
6	Residential dwelling with potential asbestos building fabric.	Same as Item 3	Same as Item 3

Area	Potential Area of Environmental Concerns	Number of Test Pits and Sampling Regime	Contaminants of Concern
7	Multiple overgrown stockpiles of material / vegetation	6 test pits excavated into the stockpiles. Allowed 3 material samples for testing of asbestos fibre cement debris.	Heavy metals, TRH, BTEX, PAH, Phenols, OCP, OPP, PCB and Asbestos.
8	Possible stockpiles overgrown with grass	Same as Item 2.	Same as Item 2.
9	Area contains general rubbish stockpiles, abandoned cars, tools.	3 test pits excavated within the footprint of general rubbish stockpiles, abandoned cars and tools to 0.5 m into natural.	Heavy metals, TRH, BTEX, PAH, Phenols, OCP, OPP, PCB and Asbestos.
Sub Total	**9 PAECs**	**30 Soil Samples/Test Pits; 12 Material Samples**	**-**

In addition, ADE (2016) also recommended inspection of the dam walls and sampling sediment and/or surface water in four dams for potential contamination attributed from water runoff and accumulation of historical application of herbicide / insecticide. Sampling regime associated with the dams is outlined in Table 5a.

It should be noted that the walls and sediments of the dams were not readily accessible at the time of assessment due to recent heavy rains and subsequent flooding of the dams. The dam walls and sediments should be assessed following dewatering of dams and as recommended by ADE during site clearing and construction phases of the development.

Table 5a: Additional Sampling Design Regime

Item	Potential Area of Environmental Concerns	Number of Test Pit and Sampling Regime	Contaminants of Concern
10	Water of dams contaminated from water runoff and accumulation of historical application of herbicide / insecticide.	Four surface water samples collected from four dams.	Heavy metals, TRH, BTEX, PAH, Phenols, OCP, OPP and PCB
11	Anecdotal information indicated that burial of old vehicles and car parts in Lot 22	Excavated two test pits in Lot 22 at rear of premises 144-154 Cowpasture Road for evidence of buried waste.	Heavy metals, TRH, BTEX, PAH, Phenols, and PCB
Total	**11 PAECs**	**32 Soil Samples/Test Pits; 4 Surface Water Samples and 12 Material Samples**	**-**

In addition to the abovementioned specific targets, ADE (2016) also recommended sampling across the entire site in accordance with the NSW EPA's '*Guidelines for Assessing Former Orchards and Market Gardens*' (DEC 2005). Under the guidelines, this would require sampling from at least 207 points spaced across the site. Given the proposed industrial nature (low sensitivity) of the proposed development, and the time elapsed since the use of the site for market gardening, a lower density of sampling was undertaken in accordance with DP's proposal submission for the works. A sampling grid of 50 m spacing across the site, culminating in a total of 89 test locations was undertaken. At each location, the surface soil (0 - 0.15 m) was sampled for analysis of heavy metals, with half the samples also analysed for OCP and OPP.

To optimise the selection of samples for chemical analysis, test pit and stockpile fill samples were screened using a calibrated photo-ionisation detector (PID). The results of the PID readings are provided in the borehole logs. The interpretation of PID values enabled better assessment of the investigation samples to determine the analytical programme and the need, if any, for further investigation. Further, DP employed NATA accredited analytical laboratories to conduct sample analysis.

7.1.8 Data Quality Indicators

The performance of the assessment in achieving the DQO was assessed through the application of Data Quality Indicators (DQI), defined as follows:

- Completeness – a measure of the amount of usable data from a data collection activity;
- Comparability – the confidence (qualitative) that data may be considered to be equivalent for each sampling and analytical event;
- Representativeness – the confidence (qualitative) of data representativeness of media present on-site;
- Precision – a measure of variability or reproducibility of data; and
- Accuracy – a measure of closeness of the data to the 'true' value.

The adopted DQIs and the procedures designed to enable achievement of the DQIs.

7.2 Field Quality Assurance and Quality Control

DP's quality assurance (QA) and quality control (QC) procedures were adopted throughout the field sampling program to assess sampling precision and accuracy and prevent cross-contamination.

Appropriate sampling procedures were undertaken to limit cross contamination and followed procedures described in DP's *Standard Operating Procedures Manual*. This specifies that:-

- Standard operating procedures were followed;
- Site specific safe work method statement(s) were developed prior to commencement of works and were applied during fieldwork;
- Replicate field samples were collected and analysed, comprising 5% intra-laboratory samples. Replicate samples were analysed for heavy metals and/or PAH and TRH/BTEX;
- Trip spike and trip blank samples were taken out into the field. These samples were analysed for BTEX;
- Rinsate samples were not collected due to the use of disposable sampling equipment;

- Samples were stored under secure, temperature controlled conditions. An ice box (esky) cooled with ice was used for storage during fieldwork and transportation; and
- Chain-of-custody documentation was employed for the handling, transport and delivery of samples to the selected laboratory.

The results of laboratory QA/QC are shown in Appendix E, with the full laboratory certificates included in Appendix D.

7.3 Laboratory Quality Assurance/Quality Control

The contract laboratories were NATA accredited and conduct in-house QA/QC procedures involving the routine testing of:

- Reagent blanks;
- Spike recovery analysis;
- Laboratory duplicate analysis;
- Analysis of control standards;
- Calibration standards and blanks; and
- Statistical analysis of QC data including control standards and recovery plots.

Samples were analysed using NATA endorsed methods. Samples were analysed within the required holding times.

The results of laboratory QA/QC are included in Appendix E, with the full laboratory certificates included in Appendix D.

7.4 Field Investigation

Field investigations were conducted between 16 March and 6 April 2017 and comprised excavation and sampling of 17 test pits within or in the vicinity of PAECs, excavation and sampling of 15 test pits in stockpiles within PAECs, surface soil sampling at 89 locations and surface water sampling at 4 locations.

7.5 Sampling Locations and Rationale

7.5.1 Sampling Density

The adopted sampling density is discussed in Section 7.1.7.

7.5.2 Sampling Pattern

Sampling locations were determined to target potential point sources where identified by ADE and accessible, as well as general site coverage in areas of former market gardening or orchard farming.

The surface water sampling points targeted the three dams and the end (down-stream) of the tributary.

The surface water and soil sampling locations are shown on Drawings 1 and 2, Appendix A.

7.5.3 Sampling Depths

Boreholes were all extended into natural soils (unless prior refusal was met), with borehole depths of between 1.0 m and 3.0 m.

Soil samples were collected at regular intervals and based on field observations, including changes in strata and signs of contamination. Samples for surface soil and water were recovered to depths of between 0 m and 0.15 m.

7.6 Soil Sampling Procedures

All sampling data were recorded on DP borehole logs with samples also recorded on chain-of-custody sheets. The general sampling procedure adopted for the collection of environmental samples is summarised below:

- Collect soil samples using new disposable sampling equipment (excavator bucket, nitrile gloves or hand shovel);
- Transfer samples into laboratory-prepared glass jars, completely filled to minimise the headspace within the sample jars, and capping immediately with a Teflon lined lid to minimise loss of volatiles;
- At every sampling depth, additional samples were collected for acid sulphate soil testing. The acid sulphate soil samples were placed in zip-lock bags, cooled and sealed for transport to the laboratory;
- Label sample containers with individual and unique identification, including project number, sample location and sample depth;
- Place the glass jars into a cooled, insulated and sealed container for transport to the laboratory;
- Collection of additional replicate samples for QA/QC requirements; and
- Screen all soil samples using a calibrated PID to assess the presence of volatile organic compounds.

Prior to PID screening, the PID was calibrated using a 100 ppm isobutylene standard. Replicate samples were collected at the time of sampling and placed in snap lock bags, sealed with some air to allow volatilisation into the headspace. Screening was conducted by pushing the PID intake valve through the snap lock seal.

Envirolab Services Pty Ltd (primary laboratory) and Eurofins Mgt Pty Ltd (secondary laboratory), both NATA accredited laboratories, were employed to conduct the sample analysis. The laboratories are required to conduct in-house QC procedures.

7.7 Surface Water Sampling

On 31 March and 5 April 2017, surface water was collected from the dams using a long-handled swing sampler. The sample was then placed with a minimum of aeration into appropriately preserved bottles.

Sample handling and transport procedures are set out below:

- Surface water sampling undertaken by an experienced engineer;
- Samples placed in laboratory prepared sample containers;
- Sample containers labelled with individual and unique identification, including project number and sample location;
- Sample containers placed into a cooled, insulated and sealed container for transport to the laboratory;
- The samples delivered to the selected analytical laboratory on the day following fieldwork completion; and
- Chain-of-Custody documentation maintained at all times and countersigned by the receiving laboratory on transfer of samples.

7.8 Analytical Rationale

The analytical scheme was designed to assess the potential presence and possible distribution of the contaminants of potential concern identified in ADE (2016) report and the CSM (Section 6). The analysis focussed primarily on surface soils and filling (including stockpiles) as these media were considered most likely to carry the identified contaminants, if present.

8. Site Assessment Criteria

8.1 Soils

The assessment criteria have been sourced primarily from NEPC (2013).

The proposed development involves the construction of new industrial warehouses therefore the site is assessed against a commercial/industrial land use.

The analytical results from the laboratory testing have been assessed (as a Tier 1 assessment) against the investigation and screening levels in Schedule B1 of NEPC (2013). This guideline has been endorsed by the EPA under the CLM Act. Schedule B1 provides investigation and screening levels for commonly encountered contaminants which are applicable to generic land uses and include consideration of, where relevant, the soil type and the depth of contamination.

The investigation and screening levels are not intended to be used as clean up levels. They establish concentrations above which further appropriate investigation (e.g. Tier 2 assessment) should be undertaken. They are intentionally conservative and are based on a reasonable worst-case scenario for four generic land use scenarios including low to high density residential (HSL A & B), recreational / open space (HSL C) and commercial / industrial (HSL D).

The laboratory practical quantitation limit (PQL) has been adopted as a screening level for some contaminants.

8.1.1 Health Investigation and Screening Levels

The Health Investigation Levels (HIL) and Health Screening Levels (HSL) are scientifically-based, generic assessment criteria designed to be used in the first stage (Tier 1) of an assessment of potential human health risk from chronic exposure to contaminants. HIL are applicable to assessing health risk arising via all relevant pathways of exposure for a range of contaminants. HSL are applicable to selected petroleum compounds and fractions to assess the risk to human health via inhalation and direct contact with affected soils and water. HSL have been developed for different land uses, soil types and depths to contamination.

The generic HIL and HSL are considered to be appropriate for the assessment of contamination at the site. Given the proposed land use the adopted HIL and HSL are:

Health Investigation Levels

HIL-D – Commercial/Industrial.

Health Screening Levels

HSL-D – Commercial/Industrial.

Potential exposure pathway:

- Soil vapour intrusion.

Soil Type (refer to Section 9):

- Silty Clay (filling was predominantly clay).

Depth to Contamination

- 0 m to <1 m;
- 1 m to <2 m; and
- 2 m to <4 m.

Direct contact HSLs have not been included as assessment criteria HSLs for direct contact are significantly higher than most other soil screening levels and are unlikely to become drivers for further investigation or site management (NEPC (2013) Schedule B1 Section 2.4.11).

Only those contaminants common to both Table 1A(1) or Table 1A(3) (NEPC, 2013) and the list of potential contaminants of concern have been included.

The adopted soil HIL and HSL for assessing the human health risk from a contaminant via relevant pathways of exposure as detailed in the CSM, Section 6 are shown on the following Table 6.

Table 6: HIL and HSL for Soil Contaminants

Contaminants		HIL-D	HSL-D Vapour Intrusion Clay 0 m to <1 m/1 m to <2 m/2 m to <4m
Metals	Arsenic	3000	-
	Cadmium	900	-
	Chromium (VI)	3600	-
	Copper	240000	-
	Lead	1500	-
	Mercury (inorganic)	730	-
	Nickel	6000	-
	Zinc	400000	-
PAH	Benzo(a)pyrene TEQ[1]	40	-
	Total PAH	4000	-
TRH	C6 – C10 (less BTEX) [F1]	-	310/480/NL
	>C10-C16 (less Naphthalene) [F2]	-	NL/NL/NL
	>C16-C34 [F3]	-	-
	>C34-C40 [F4]	-	-
BTEXN	Benzene	-	4/4/9
	Toluene	-	NL/NL/NL
	Ethylbenzene	-	NL/NL/NL
	Xylenes	-	NL/NL/NL
	Napthalene	-	NL/NL/NL
Phenol	Phenol	240000	-
OCP	Aldrin + Dieldrin	45	-
	Chlordane	530	-
	DDT+DDE+DDD	3600	-
	Endosulfan	2000	-
	Endrin	100	-
	Heptachlor	50	-
	HCB	80	-
	Methoxychlor	2500	-
OPP	Chlorpyrifos	2000	-
PCB[2]		7	-

Notes:

1. Benzo(a)pyrene TEQ calculated in accordance with NEPC (2013)
2. Non dioxin-like PCBs only.

NL “Not Limiting” to human health for the proposed land use for vapour intrusion from petroleum hydrocarbons

8.1.2 Ecological Investigation Levels

Ecological Investigation Levels (EIL) have been derived for selected metals and organic compounds and are applicable for assessing risk to terrestrial ecosystems (NEPC, 2013). EIL depend on specific soil physiochemical properties and land use scenarios and generally apply to the top 2 m of soil, which corresponds to the root zone and habitation zone of many species. The EIL is determined for a contaminant using the following formula:

EIL = ABC + ACL, where

ABC = Ambient Background Concentration
ACL = Added Contaminant Limit

The ABC of a contaminant is the soil concentration in a specific locality that is the sum of naturally occurring background levels and the contaminants levels that have been introduced from diffuse or non-point sources (e.g. motor vehicle emissions). The ABC is determined through direct measurement at an appropriate reference site (preferred) or through the use of methods defined by Olszowy et al. (1995) or Hamon et al. (2004).

The ACL is the added concentration (above the ABC) of a contaminant above which further appropriate investigation and evaluation of the impact on ecological values is required. ACLs are based on the soil characteristics of pH, CEC and clay content.

EIL have been derived in NEPC (2013) for only a short list of contaminants comprising As, DDT, naphthalene and Pb which have been used in this assessment. ACL have also been derived in NEPC (2013) for a short list of contaminants comprising Cu, Cr (III), Ni and Zn the most conservative ACL for urban residential/public open space have been adopted to provide an initial screening of the soil results.

The following data and assumptions have been used to determine the EIL using the *Interactive (Excel) Calculation Spreadsheet* provided in the ASC NEPM Toolbox available on the SCEW (Standing Council on Environment and Water) website (http://www.scew.gov.au/node/941):

- Commercial/industrial land use has been adopted;
- The EILs will apply to the top 2 m of the soil profile;
- A high traffic volume; and
- Given the likely source of soil contaminants (i.e. historical site use/fill) the contamination is considered as “aged” (>2 years).

Table 7: Ecological Investigation Levels (EILs) in mg/kg – Proposed Residential Development

Analyte		EIL
Heavy Metals	Arsenic	160
	Chromium (III)	680
	Copper	330
	Lead	1800
	Nickel	460
	Zinc	1200
OCP	DDT	640
PAH	Naphthalene	370

8.1.3 Ecological Screening Levels – Petroleum Hydrocarbons and PAH

Ecological Screening Levels (ESLs) are used to assess the risk of selected petroleum hydrocarbon compounds, BTEX and benzo(a)pyrene to terrestrial ecosystems. ESLs apply to the top 2 m of the soil profile, which essentially corresponds to the root zone and habitation zone of many species.

ESLs have been derived in NEPC (2013) for the same four petroleum fractions as the HSLs (F1 to F4) as well as BTEX and benzo(a)pyrene. The adopted ESLs, from Table 1B(6), Schedule B1 of NEPC (2013) are shown on the following table. The following site specific data and assumptions have been used to determine the ESLs:

- The ESLs will apply to the top 2 m of the soil profile;
- The ESLs for commercial/industrial apply; and
- The majority of soils encountered at the site comprised clay therefore a fine soil texture has been adopted.

Table 8: Ecological Screening Levels (ESLs) in mg/kg

Analyte		ESL	Comments
TRH	C6 – C10 (less BTEX) [F1]	215*	All ESLs are low reliability apart from those marked with * which are moderate reliability
	>C10-C16 (less Naphthalene) [F2]	170*	
	>C16-C34 [F3]	2500	
	>C34-C40 [F4]	6600	
BTEX	Benzene	95	
	Toluene	135	
	Ethylbenzene	185	
	Xylenes	95	
PAH	Benzo(a)pyrene	1.4	

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8.1.4 Management Limits – Petroleum Hydrocarbons

In addition to appropriate consideration and application of the HSL, there are additional considerations which reflect the nature and properties of petroleum hydrocarbons, including:

- Formation of observable light non-aqueous phase liquids (LNAPL);
- Fire and explosion hazards; and
- Effects on buried infrastructure e.g. penetration of, or damage to, in-ground services.

Management Limits to avoid or minimise these potential effects have been adopted in NEPC (2013) as interim Tier 1 guidance. Management Limits have been derived in NEPC (2013) for the same four petroleum fractions as the HSL (F1 to F4). The adopted Management Limits, from Table 1B(7), Schedule B1 of NEPC (2013) are shown in the following Table 9. The following site specific data and assumptions have been used to determine the Management Limits:

- The Management Limits will apply to any depth within the soil profile;
- The Management Limits for commercial/industrial apply; and
- A “fine” soil texture has been adopted given the predominantly silty clay present across the surface soil profile.

Table 9: Management Limits

TPH Fraction	Management Limit Commercial/Industrial (mg/kg)
Soil Texture	Fine
C_6-C_9 #	800
>C_{10}-C_{16} #	1000
>C_{16}-C_{34}	5000
>C_{34}-C_{40}	10000

\# Separate management limits for BTEX and naphthalene are not available hence these have not been subtracted from the relevant fractions to obtain F1 and F2

8.1.5 Asbestos

Bonded ACM is the most common form of asbestos contamination across Australia, generally arising from:

- Inadequate removal and disposal practices during demolition of buildings containing asbestos products;
- Widespread dumping of asbestos products and asbestos containing fill on vacant land and development sites; and
- Commonly occurring in historical fill containing unsorted demolition materials.

Mining, manufacturing or distribution of asbestos products may result in sites being contaminated by friable asbestos including free fibres. Severe weathering or damage to bonded ACM may also result in the formation of friable asbestos comprising fibrous asbestos (FA) and/or asbestos fines (AF).

Asbestos only poses a risk to human health when asbestos fibres are made airborne and inhaled. If asbestos is bound in a matrix such as cement or resin, it is not readily made airborne except through substantial physical damage. Bonded ACM in sound condition represents a low human health risk, whilst both FA and AF materials have the potential to generate, or be associated with, free asbestos fibres. Consequently, FA and AF must be carefully managed to prevent the release of asbestos fibres into the air.

As the investigation was limited to collection of soil samples from test pits and potential ACM from ground surface, a detailed characterisation of asbestos contamination in soil in line with NEPC (2013) has not been undertaken at this stage and, therefore, the presence of any detectable asbestos (at the laboratory reporting limit) will be considered significant for the purpose of this assessment. It should be noted that a detailed characterisation of asbestos contamination in soil is not required at this stage.

8.1.6 Contaminants with No Assessment Criteria

Where no guidance is provided in NEPC (2013) for a specific analyte, the PQL will be used as the initial screening criteria.

If concentrations are recorded above the PQL, reference criteria will be sourced from other national and international guidance as relevant and used to determine the significance of the recorded concentration.

8.2 Surface Water

The potential receptors of surface water from the site include:

- WaterNSW Upper Canal located directly west of the site;
- Prospect Reservoir located approximately 1.2 km north of the site; and
- Orphan School Creek located approximately 3 km to the south / south east of the site and eventually discharging into the Georges River System.

8.2.1 Surface Water Investigation Levels

The Surface Water Investigation Levels (GIL) adopted in NEPC (2013) are based on:

- *Australian Drinking Water Guidelines* 2011 (ADWG); and
- *National water quality management strategy. Australian and New Zealand guidelines for fresh and marine water quality* 2000 (ANZECC & ARMCANZ).

However, as no potable use of the dams has been identified, and the surface water of two of the dams appear to be heavily impacted by algal bloom, the drinking water criteria are not referenced as SAC / GIL. The adopted GIL for the analytes included in the assessment (where applicable), and the corresponding source documents, are shown in Table 10.

Table 10: Surface Water Investigation Levels (in µg/L unless otherwise stated)

Analyte		NEPC (2013) Fresh Waters[a]
Metals	Arsenic (V)	13
	Cadmium	0.2
	Chromium (VI)	1
	Copper	1.4
	Lead	3.4
	Mercury (total)	0.06
	Nickel	11
	Zinc	8
PAH	Naphthalene	16
Phenol	Phenol	320
	Pentachlorophenol	3.6
PCB	Aroclor 1242	-
	Aroclor 1254	-
OPP	Chlorpyrifos	0.01
	Diazinon	0.01
	Dimethoate	0.15
	Fenitrothion	0.2
	Malathion	0.05
	Parathion	0.004
OCP	-	-

Notes:

a Unless otherwise stated, investigation levels apply to typically slightly-moderately disturbed systems (95% Level of Protection for most analytes, 99% Level of Protection for analytes with bioaccumulative potential);

\- No threshold available

8.2.2 Health Screening Levels – Petroleum Hydrocarbons

The generic HSL are considered to be appropriate for the assessment of contamination at the site. Given the proposed land use the adopted HSL is:

- **HSL-D (Commercial/Industrial).**

In addition, the HSL adopted is predicated on the following inputs prescribed in Table 11.

Table 11: Inputs to the Derivation of HSLs

Variable	Input	Rationale
Potential exposure pathway	Groundwater vapour intrusion (inhalation)	Initial screening of surface water
Soil Type	Clay	Clay was the predominately soil type.
Depth to contamination	2 m to <4 m	Initial screening of surface water; criteria for shallower depths are not available and require a site specific risk assessment.

The adopted surface water HSL for vapour intrusion, from Table 1A(4), Schedule B1 of NEPC (2013) are shown in the following table.

Table 12: Screening Levels for Petroleum Hydrocarbons (µg/L)

Analyte		ANZECC & ARMCANZ (2000) Fresh Water[b]	NEPC (2013) HSL D 2 m to <4m Clay
TRH	$C_6 – C_{10}$ (less BTEX) [F1]	-	NL
	$>C_{10}$-C_{16} (less Naphthalene) [F2]	-	NL
	>C16-C34 [F3]	-	-
	>C34-C40 [F4]	-	-
BTEX	Benzene	950[a]	29000
	Toluene	-	NL
	Ethylbenzene	-	NL
	Xylene (m)	75	-
	Xylene (o)	350	-
	Xylene (p)	200	-
	Xylenes (Total)	-	NL
PAH	Naphthalene	16	NL

Notes:

a Figure may not protect key species from chronic toxicity.

NL The solubility limit is defined as the groundwater concentration at which the water cannot dissolve any more of an individual chemical based on a petroleum mixture. The soil vapour which is in equilibrium with the groundwater will be at its maximum. If the derived groundwater HSL exceeds the water solubility limit, a soil-vapour source concentration for a petroleum mixture could not exceed a level that would result in the maximum allowable vapour risk for a given scenario. For these scenarios no HSL is presented for these chemicals. These are denoted as not limiting 'NL'.

\- In absence of screening levels for petroleum hydrocarbons, concentrations of contaminants below PQL have been adopted as initial screening levels.

8.3 Classification for Off-Site Disposal

The following guidance applies to off-site disposal of soils:

- NSW EPA *Waste Classification Guidelines* 2014 (EPA, 2014); or
- A General or Specific Exemption under the *Protection of the Environment Operations (Waste) Regulation* 2005.

For contaminated stockpiles and filling, waste classification for disposal to a licenced waste facility is an option to consider. Three main categories of waste apply (from lower to higher contaminant levels): General Solid Waste, Restricted Solid Waste and Hazardous Waste. Other waste categories also exist and can apply in conjunction with these three main categories, including Special Waste (including asbestos contaminated wastes), Putrescible General Solid Waste.

General Solid Waste comprises wastes with contaminant levels within the threshold levels CT1 and/ or SCC1 and TCLP1 (as applicable). Restricted Solid Waste comprises wastes with contaminant levels within the CT2 and/ or SCC2 and TCLP2 (as applicable) threshold levels. Hazardous Waste comprises wastes with contaminant levels above the SCC2 and TCLP2 (as applicable) threshold levels.

Liquids are classified as Liquid Waste, with no further assessment required to obtain a formal classification in accordance with EPA (2014). Depending on the source of the liquid, however, further testing can be required by the receiving facility to ensure they are legally able to receive it and have the capability to process it.

9. Fieldwork Results

9.1 Test Pits

A description of the materials observed in test pits is presented on the test pit logs in Appendix C. The locations of the test pits are depicted on Drawing 1 in Appendix A. The subsurface profile encountered is summarised as follows:

Filling:	Dark brown to grey, silty clay filling with some fine to medium ironstone gravel or ripped shale and rootlets, and some brick, tile and concrete fragments in TP2 and steel scraps in TP32 to depths of between 0.1 m and 1.6 m; underlain by
Natural Soil:	Orange brown to grey silty clay and orange brown mottled grey clay to depths of between 1 m and 3 m; and
Shale:	Extremely low to high strength, highly weathered grey and brown shale is expected below the natural soils.

No free groundwater was observed in test pits.

Photo-ionisation detector (PID) readings were less than 2 ppm in all boreholes.

9.2 Stockpile

Stockpiles of various volumes were identified in Areas 2, 4, 7 and 8 by ADE, as shown on Drawing 1, Appendix A. A summary of the stockpile information is outlined in the table below.

Table 13: A Summary of Stockpile Information

Stockpile ID	Location	GPS Coordinates (3 m Error)	Volume (~m^3)	Material Description	PID Reading (ppm)
SP4	Area 2	303612; 6253599	288	Brown silty clay filling	<1
SP5		303617; 6253604		Brown clayed silt filling with timber	<1
SP6		303601; 6253589	36	Brown silty clay filling	<1
SP10	Area 4	303468; 6253585	18	Brown silty clay filling	1
SP11		303466; 6253577		Brown silty clay filling	1.1
SP12		303481; 6253557	100	Brown silty clay filling	1.2
SP19	Area 7	303750; 6253451	600	Brown silty clay filling	<1
SP20		303741; 6253454			<1
SP21		303736; 6253457			<1
SP22		303734; 6253458			<1
SP23		303726; 6253462			<1
SP24		303737; 6253468			<1
SP25	Area 8	303363; 6253264	225	Brown silty clay filing with some gravel	<1
SP26		303363; 6253277		Brown silty clay filling with bricks, tiles and possible asbestos	<1
SP27		303333; 6253288	800	Brown silty clay with some ironstone gravel	<1

9.3 Asbestos-Containing Material

Suspected ACM was observed on the ground surface and within stockpiles of the following locations. The locations of ACM are depicted on Drawing 1, Appendix A.

A summary of ACM identified during field investigation is presented in Table below.

Table 14: A summary of ACM Identified During Field Investigation

Location	ACM Description	Potential Source of ACM
Ground surface in Area 1 located in the north-western corner of Lot 18	1) Flat fibro fragment (cream) 2) Flat fibro fragment (cream) 3) Flat tile (white)	Damaged parts of an asbestos shed. Potential ACM were scattered extensively on soil surface.
Ground surface in Area 4 located in the north-western corner of Lot 20	1) Flat fibro fragment 2) Flat fibro fragment 3) Roof tile fragment	Illegal dumping; potential asbestos fibre observed on soil surface.
Ground surface in Area 5 located in the north-western corner of Lot 21	1) Flat fibro fragment 2) Corrugated fibro fragment 3) Flat fibro fragment	Illegal dumping activities i.e. batteries, tyres, potential asbestos fibre cement debris were found on the soil surface. Also, there was an abandoned trailer with potential asbestos fibre cement inside.
Stockpile (303363; 6253277) in Area 8 located in the south-western of Lot 23	1) Roof tile fragment (SP26) 2) Roof tile fragment (SP26) 3) Flat fibro (SP26)	Illegal dumping i.e. ACM identified in stockpiles.

A total of 12 suspected ACM were collected for laboratory analysis. The results of asbestos testing are summarised in Table C2 in Appendix C. Asbestos was confirmed in all 12 samples.

9.4 Surface Soil and Water

A description of surface soil and water is presented on the record of samples in Appendix B. The locations of the surface soil and water samples are presented on Drawing 2 in Appendix A. The general subsurface soil encountered during field investigation indicated brown silty clay filling (topsoil) with trace to some gravel and crushed sandstone. Sewage odour was noticed at sampling locations SS34 and SS38.

Algal blooms were observed on the surface of dams located in Lots 18 and 21. No other signs of environmental concern (oily sheen or odour) were noted on the surface of the dams.

10. Laboratory Results

The results of the laboratory analysis are summarised in Appendix C, and NATA laboratory certificates including chain-of-custody and sample receipt information are presented in Appendix D.

10.1 Test Pits (Areas 1 to 9)

The reported concentrations of heavy metals, PAH, TRH, BTEX, phenols, OCP, OPP, PCB and asbestos were either below the laboratory practical quantitation limit (PQL) and/or below the adopted SAC.

10.2 Stockpiles (Areas 1 to 9)

The reported concentrations of heavy metals, PAH, TRH, BTEX, phenols, OCP, OPP and PCB were either below the laboratory PQL and/or below the adopted SAC with the exception of asbestos in Stockpile SP26 as noted in Table 15 below. The recommended management options are also listed in the table.

Table 15: Management of Stockpiles on Site

Stockpile ID	Beneficial Reuse	Waste Classification
SP 4-6 SP 10-12 SP 19-25	On-site use as general fill subject to monitoring and compaction properties Note: SP11 pending TCLP results	Off-site disposal as General Solid Waste (with the exception of SP11 requiring further confirmation from TCLP results)
SP26	Contains asbestos	Off-site disposal as Special Waste – Asbestos Waste and General Solid Waste; or On-site retention under a "cap and contain" strategy (conditional[1])
SP27	On-site use as general fill subject to monitoring and compaction properties	Off-site disposal as General Solid Waste

Note:
[1] The "cap and contain" strategy would be subject to Council approval, notification on the title and implementation of an Environmental Management Plan (EMP).

Given the inherent variability of stockpile contents, the re-use of any stockpiles currently present on site is subject to action under an unexpected finds protocol to be incorporated in a site management plan developed by the civil contractor.

10.3 Asbestos-Containing Material

ACM was identified on ground surface of Areas 1, 4, 5 and in the stockpile (SP26) of Area 8. Asbestos was found in all 12 material samples. The source is likely to be the deterioration of wall cladding on existing and/or previous structures. A summary of the laboratory results of material samples is outlined below.

Table 16: Asbestos-containing Material

Location	ACM Description and Measurement	Type of Asbestos
Ground surface in Area 1 located in the north-western corner of Lot 18	Grey, compressed fibre cement material	Chrysotile, amosite and crocidolite asbestos detected
	Grey, compressed fibre cement material	Chrysotile and amosite asbestos detected
	Grey, compressed fibre cement material	Chrysotile asbestos detected
Ground surface in Area 4 located in the north-western corner of Lot 20	Grey, compressed fibre cement material	Chrysotile, amosite and crocidolite asbestos detected
	Grey, compressed fibre cement material	Chrysotile, amosite and crocidolite asbestos detected
	Grey, compressed fibre cement material	Chrysotile, amosite and crocidolite asbestos detected
Ground surface in Area 5 located in the north-western corner of Lot 21	Grey, compressed fibre cement material	Chrysotile asbestos detected
	Grey, compressed fibre cement material	Chrysotile asbestos and organic fibre detected
	Grey, compressed fibre cement material	Chrysotile and amosite asbestos detected
Stockpile (303363; 6253277) in Area 8 located in the south-western of Lot 23	Grey, compressed fibre cement material	Chrysotile and amosite asbestos detected
	Grey, compressed fibre cement material	Chrysotile asbestos detected
	Grey, compressed fibre cement material	Chrysotile asbestos detected

10.4 Surface Soil and Water

The reported concentrations of heavy metals, OCP and OPP were either below the laboratory PQL or below the adopted SAC for surface soil samples.

The reported concentrations of heavy metals, TRH/BTEX, PAH, phenols, OCP and OPP were either below the laboratory PQL or below the adopted SAC for surface water samples.

11. Discussion

- The identified PAECs in ADE (2016) included: illegal dumping of waste, imported filling of unknown origin, demolition of former buildings, previous agricultural activities (market gardens, orchards and poultry farming), mechanical workshop and hazardous building material. No additional PAEC were identified by DP during the course of this investigation;
- The TSI was based on the PAECs identified in ADE (2016). The sampling regime comprised: excavation and sampling of 17 test pits within or in the vicinity of PAECs, excavation and sampling of 15 test pits in stockpiles within PAECs, surface soil sampling at 89 locations and surface water sampling at 4 locations;
- Overall, the analytical results reflected a low risk of soil contamination with the exception of asbestos contamination on ground surfaces and stockpiles in Areas 1, 4, 5 and 8. It should be noted that heavy vegetation over some areas of the site limited examination of the ground surface for ACM in areas, and therefore ACM is likely to be found around previous and existing structures. The presence of scattered ACM will increase the extent of remediation works but is not likely to limit the potential for the site to be developed as per the proposed use;

  The ground surface of Areas of 1, 4 and 5 will require emu-bob (hand picking/raking) to remove surface ACM in accordance with NEPC (2013) and the ground surface of cleared areas must be validated by an Occupational Hygienist;

  Stockpile in Area 8 with GPS coordinates 303363; 6253864-77 should be either removed off-site as Special Waste (Asbestos Waste) or capped and contained on site. Any other stockpiles with construction and/or demolition waste observed during removal or transportation phase should be reassessed for signs of asbestos contamination prior to disposal;

  Details of asbestos contamination will be outlined in the remediation action plan (RAP) as recommended in Section 12;
- Whilst no asbestos contamination was encountered in test pits and during surface soil sampling, there is a potential for contamination to be present between sampled locations, particularly given that building rubble (an indicator of potential asbestos) has been encountered in some of the test pits; and
- Although considered to be a low risk on the basis of the data presented in this report, the footprints of the existing building and heavily vegetated areas remain a data gap in relation to potential surface soil contamination.

12. Recommendations

Based on ADE (2016), field and analytical results reported herein, it is considered that the site can be made suitable for the proposed development subject to the preparation, implementation and validation of a RAP to outline and detail the following:

- Validation of the surface soil within the footprints of the site buildings following demolition;
- Dewatering of the dams, including any additional testing requirements;
- Sampling and testing of dam sediment and dam walls following dewatering;

- Remediation / management and validation / clearance of surface asbestos, where identified in this current report;
- Remediation / management of soils containing asbestos, such as Stockpile SP26;
- Waste classification procedures for any soils to be removed from the site;
- Validation / verification procedures for any materials planned to be imported to the site; and
- Unexpected finds protocol for managing actual or indicators of contamination uncovered during civil and construction works, including potentially other areas of ACM impact and localised burial sites.

13. Limitations

Douglas Partners (DP) has prepared this report for this project at Cowpasture Road, Wetherill Park in accordance with DP's proposal SYD170224 dated 28 February 2017 and by acceptance received from Tim Colless of Western Sydney Parklands Trust (WSPT). The work was carried out under Western Sydney Parklands Trust Professional Services Contract. This report is provided for the exclusive use of Western Sydney Parklands Trust for this project only and for the purposes as described in the report. It should not be used by or relied upon for other projects or purposes on the same or other site or by a third party. Any party so relying upon this report beyond its exclusive use and purpose as stated above, and without the express written consent of DP, does so entirely at its own risk and without recourse to DP for any loss or damage. In preparing this report DP has necessarily relied upon information provided by the client and/or their agents.

The results provided in the report are indicative of the sub-surface conditions on the site only at the specific sampling and/or testing locations, and then only to the depths investigated and at the time the work was carried out. Sub-surface conditions can change abruptly due to variable geological processes and also as a result of human influences. Such changes may occur after DP's field testing has been completed.

DP's advice is based upon the conditions encountered during this investigation. The accuracy of the advice provided by DP in this report may be affected by undetected variations in ground conditions across the site between and beyond the sampling and/or testing locations. The advice may also be limited by budget constraints imposed by others or by site accessibility.

This report must be read in conjunction with all of the attached and should be kept in its entirety without separation of individual pages or sections. DP cannot be held responsible for interpretations or conclusions made by others unless they are supported by an expressed statement, interpretation, outcome or conclusion stated in this report.

This report, or sections from this report, should not be used as part of a specification for a project, without review and agreement by DP. This is because this report has been written as advice and opinion rather than instructions for construction.

Asbestos has not been detected by observation or by laboratory analysis, in filling materials at the test locations sampled and analysed. Building demolition materials, were, however, located below-ground filling, and these are considered as indicative of the possible presence of hazardous building materials (HBM), including asbestos.

Although the sampling plan adopted for this investigation is considered appropriate to achieve the stated project objectives, there are necessarily parts of the site that have not been sampled and analysed. This is either due to undetected variations in ground conditions or to budget constraints, or to parts of the site being inaccessible and not available for inspection/sampling. It is therefore considered possible that HBM, including asbestos, may be present in unobserved or untested parts of the site, between and beyond sampling locations, and hence no warranty can be given that asbestos is not present on other parts of the site.

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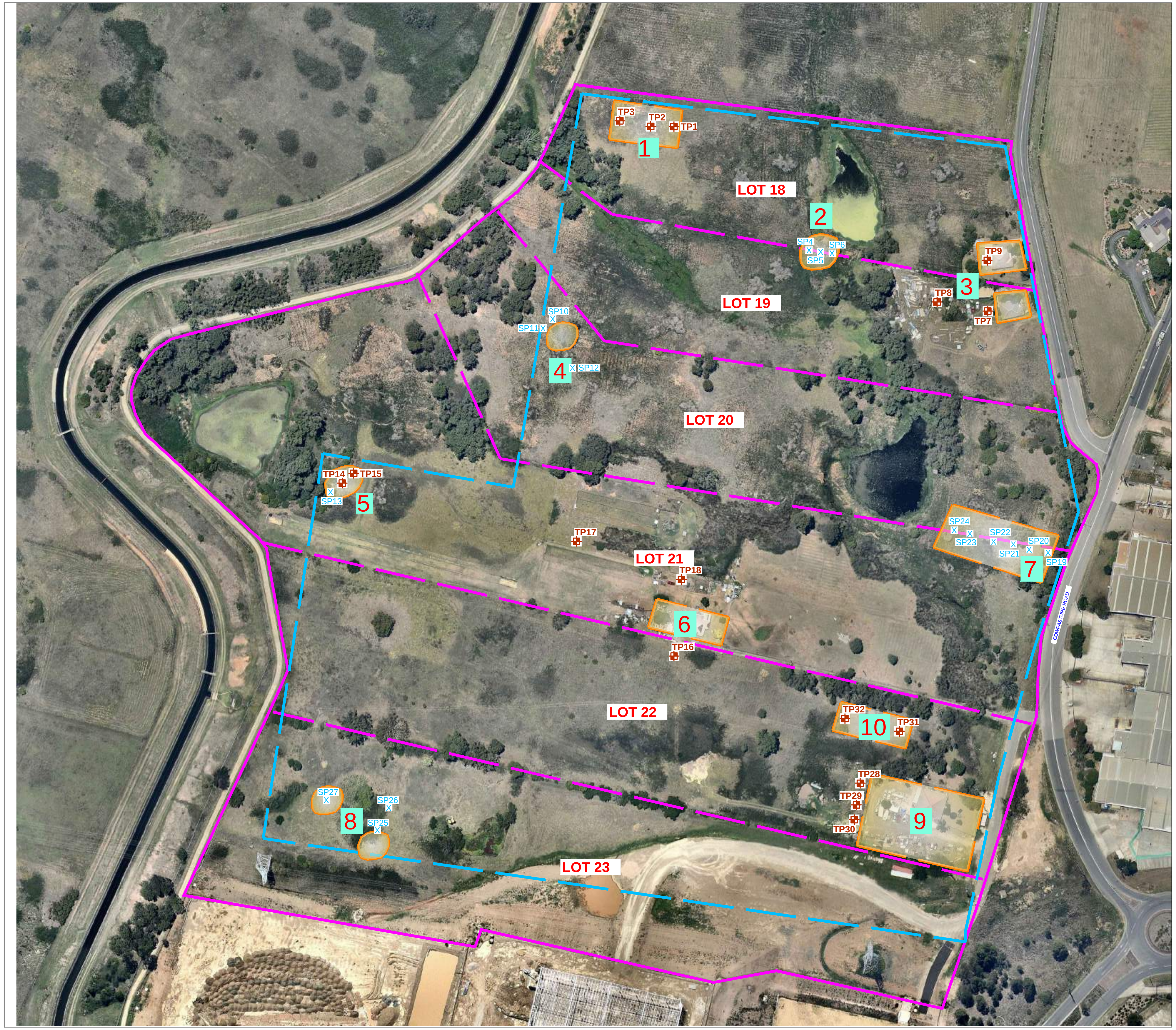
Appendix A

Drawings 1, 2 and 3

About This Report



Locality Plan

NOTE:
1: Base image from Nearmap.com (Dated Feb. 2017)
2: Test locations are approximate only and were located using hand-held GPS.

0 20 40 60 80 100 150 200 300 400m

1:4000 @ A3

LEGEND

- Test pit location (1,3,5,6,9)
- X Stockpile (2,4,7,8)
- Area of environmental concern
- Site boundary
- Lot boundary (existing)

TEST LOCATION AREAS:

Area	Tests
1	TP1-3
2	SP4-6
3	TP7-9
4	SP10-12
5	TP13-15
6	TP16-18
7	SP19-24
8	SP25-27
9	TP28-30

ACM* LOCATION AREAS:

Area	No. of samples
1	3
4	3
5	3
8	3

* Asbestos containing material

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Geotechnics | Environment | Groundwater

CLIENT: Western Sydney Parklands Trust		TITLE:	**Location of Contamination Samples**
OFFICE: Sydney	DRAWN BY: PSCH		**Stage 2 Horsley Drive Business Park**
SCALE: 1:4000 @ A3	DATE: 7.4.2017		**Cowpasture Road, WETHERILL PARK**

PROJECT No:	85884.00
DRAWING No:	1
REVISION:	1

P:\85884.00 - WETHERILL PARK, Targeted CA & RAP\7.0 Drawings\7.2 Out\85884.00.D.001.dwg, 24/04/2017 1:44:24 PM

NOTE:
1: Base image from Nearmap.com (Dated Feb. 2017)
2: Test locations are approximate only and were located using hand-held GPS.

0 20 40 60 80 100 150 200 300 400m

1:4000 @ A3

LEGEND

- Surface soil sample
- Surface water sample
- Lot boundary

Douglas Partners Geotechnics / Environment / Groundwater	CLIENT: Western Sydney Parklands Trust		TITLE: **Location of Surface Soil/ Water Samples**
	OFFICE: Sydney	DRAWN BY: PSCH	**Stage 2 Horsley Drive Business Park**
	SCALE: 1:4000 @ A3	DATE: 7.4.2017	**Cowpasture Road, WETHERILL PARK**

N

PROJECT No:	85884.00
DRAWING No:	2
REVISION:	0

P:\85884.00 - WETHERILL PARK, Targeted CA & RAP\7.0 Drawings\7.2 Out\85884.00.D.002.dwg, 20/04/2017 2:49:00 PM

LOT AREA 1	25 322 SQM
WAREHOUSE 1	14 620 SQM
OFFICE (2 LEVELS)	500 SQM
CAR PARKING	74 SPACES
TOTAL BUILDING AREA	15 120 SQM

LOT AREA 2	45 063 SQM
WAREHOUSE 2	30 490 SQM
OFFICE (2 LEVELS)	1 000 SQM
CAR PARKING	145 SPACES
TOTAL BUILDING AREA	31 490 SQM

LOT AREA 3	31 268 SQM
WAREHOUSE 3	18 500 SQM
OFFICE (2 LEVELS)	500 SQM
CAR PARKING	74 SPACES
TOTAL BUILDING AREA	19 000 SQM

LOT AREA 4	44 412 SQM
WAREHOUSE 4	22 590 SQM
OFFICE (2 LEVELS)	500 SQM
CAR PARKING	92 SPACES
TOTAL BUILDING AREA	23 090 SQM

TOTAL BUILDING AREA	88 700 SQM
ACCESS ROAD	5 374 SQM
BASIN LOT	14 445 SQM
TOTAL SITE AREA	165 884 SQM

hansen yuncken

NSW GOVERNMENT Western Sydney Parklands Trust

project
HORSLEY DRIVE BUSINESS PARK STAGE 2
COWPASTURE ROAD, WETHERILL PARK, NSW

CONCEPTARCHITECTURE P/L

title INDICATIVE MASTERPLAN

date 16-11-2016

drawing no. WS-HW-MP-005

scale 1:1200 @ A1

- C

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: Western Sydney Parklands Trust		TITLE:	Proposed Development Plan		PROJECT No:	85884
OFFICE: Sydney	DRAWN BY: WFY		STAGE 2 Horsley Drive Business Park		DRAWING No:	3
SCALE: NTS	DATE: 12.04.2017		Cowpasture Road, Wetherill Park		REVISION:	0

About this Report

Douglas Partners

Introduction

These notes have been provided to amplify DP's report in regard to classification methods, field procedures and the comments section. Not all are necessarily relevant to all reports.

DP's reports are based on information gained from limited subsurface excavations and sampling, supplemented by knowledge of local geology and experience. For this reason, they must be regarded as interpretive rather than factual documents, limited to some extent by the scope of information on which they rely.

Copyright

This report is the property of Douglas Partners Pty Ltd. The report may only be used for the purpose for which it was commissioned and in accordance with the Conditions of Engagement for the commission supplied at the time of proposal. Unauthorised use of this report in any form whatsoever is prohibited.

Borehole and Test Pit Logs

The borehole and test pit logs presented in this report are an engineering and/or geological interpretation of the subsurface conditions, and their reliability will depend to some extent on frequency of sampling and the method of drilling or excavation. Ideally, continuous undisturbed sampling or core drilling will provide the most reliable assessment, but this is not always practicable or possible to justify on economic grounds. In any case the boreholes and test pits represent only a very small sample of the total subsurface profile.

Interpretation of the information and its application to design and construction should therefore take into account the spacing of boreholes or pits, the frequency of sampling, and the possibility of other than 'straight line' variations between the test locations.

Groundwater

Where groundwater levels are measured in boreholes there are several potential problems, namely:

- In low permeability soils groundwater may enter the hole very slowly or perhaps not at all during the time the hole is left open;
- A localised, perched water table may lead to an erroneous indication of the true water table;
- Water table levels will vary from time to time with seasons or recent weather changes. They may not be the same at the time of construction as are indicated in the report; and
- The use of water or mud as a drilling fluid will mask any groundwater inflow. Water has to be blown out of the hole and drilling mud must first be washed out of the hole if water measurements are to be made.

More reliable measurements can be made by installing standpipes which are read at intervals over several days, or perhaps weeks for low permeability soils. Piezometers, sealed in a particular stratum, may be advisable in low permeability soils or where there may be interference from a perched water table.

Reports

The report has been prepared by qualified personnel, is based on the information obtained from field and laboratory testing, and has been undertaken to current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal, the information and interpretation may not be relevant if the design proposal is changed. If this happens, DP will be pleased to review the report and the sufficiency of the investigation work.

Every care is taken with the report as it relates to interpretation of subsurface conditions, discussion of geotechnical and environmental aspects, and recommendations or suggestions for design and construction. However, DP cannot always anticipate or assume responsibility for:

- Unexpected variations in ground conditions. The potential for this will depend partly on borehole or pit spacing and sampling frequency;
- Changes in policy or interpretations of policy by statutory authorities; or
- The actions of contractors responding to commercial pressures.

If these occur, DP will be pleased to assist with investigations or advice to resolve the matter.

About this Report

Site Anomalies

In the event that conditions encountered on site during construction appear to vary from those which were expected from the information contained in the report, DP requests that it be immediately notified. Most problems are much more readily resolved when conditions are exposed rather than at some later stage, well after the event.

Information for Contractual Purposes

Where information obtained from this report is provided for tendering purposes, it is recommended that all information, including the written report and discussion, be made available. In circumstances where the discussion or comments section is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. DP would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

Site Inspection

The company will always be pleased to provide engineering inspection services for geotechnical and environmental aspects of work to which this report is related. This could range from a site visit to confirm that conditions exposed are as expected, to full time engineering presence on site.