Huntlee Development Preliminary Stage 1 Site Investigation

North Rothbury, NSW

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North Rothbury, NSW

Prepared for

Huntlee Pty Ltd

Prepared by

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This document was prepared for the specific purpose described in our proposal dated 3 April 2012 and as agreed to Huntlee. From a technical perspective, the subsurface environment at any site may present substantial uncertainty. It is a heterogeneous, complex environment, in which small subsurface features or changes in geologic conditions can have substantial impacts on water, vapour and chemical movement. Uncertainties may also affect source characterisation, assessment of chemical fate and transport in the environment, assessment of exposure risks and health effects, and remedial action performance.

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Quality Information

Document Huntlee Development Preliminary Stage 1 Site Investigation

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Prepared by Jonathon Deacon

Reviewed by Beth Toivonen

Revision History

Revision	Revision Date	Details	Authorised	
			Name/Position	Signature
0	6 July 2012	Draft for Client Comment	Beth Toivonen Associate Director	
1	31-Jul-2012	Final Report	Beth Toivonen Associate Director	

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Executive Summary

AECOM Australia Pty Ltd (AECOM) was engaged by Huntlee Pty Ltd (Huntlee) to conduct a Stage 1 Preliminary Site Investigation across targeted areas within the *Stage 1 Development Area* of their proposed Huntlee (new town) development located at North Rothbury, NSW (the Site).

AECOM previously conducted a Phase 1 Environmental Site Assessment (ESA) across the Site in March 2011 (AECOM, 2011[1]) and concluded that the Site was essentially a "*Greenfield*" property and not subject to intensive historical development. AECOM (2011) comprised a visual inspection and historical review of the Site to identify discrete areas with the potential for significant contamination that could impact upon the proposed development.

The main objective of this phase of work was to conduct a preliminary site investigation of the moderate risk AECs to allow a baseline assessment of actual or potential contamination risks that could impact upon the proposed development within the *Stage 1 Development Area*, more specifically to:

- Assess the nature and possible extent of shallow soil and groundwater contamination;
- Assess the potential for off-site migration of the above contamination if found in significant concentrations (considering the substantial distance from the potential source areas to the site boundaries);
- Assess the suitability of the AECs for the proposed development; and
- Assess the potential for the risk of significant harm to human health or the wider environment, under current site use, and identify consequent liabilities under the Contaminated Land Management Act (1997) from the above AECs.

To achieve the objectives, the following scope of work was undertaken:

- Review of the Phase 1 and any other available information;
- Preparation and implementation of a site specific health and safety plan and undertake all necessary site inductions;
- Site inspection and underground service clearance;
- Collection of eight surface grab samples to assess for potential localised contamination;
- Intrusive soil investigation of 11 boreholes (BH01 to BH11) to a maximum depth of 6 m below ground surface (m bgs);
- Installation of three groundwater monitoring wells (MW01 to MW03);
- Soil sampling. No shallow groundwater was identified during the investigation and therefore sampling of the groundwater wells was not required;
- Analytical analysis of soil samples (and QA/QC samples) by a National Association of Testing Authorities (NATA) registered laboratory, accredited for the identified contaminants of concern;
- Data analysis and interpretation; and
- Reporting.

The purpose of this investigation was to assess the potential for significant source areas of contamination to be present within potential AECs that could impede the proposed Huntlee Stage 1 Development and to provide a sufficient Stage 1 Preliminary Site Investigation to support the Project Approval Application. The following conclusions are drawn:

- Elevated concentrations of Total Petroleum Hydrocarbons (TPH) were identified at two locations within the Huntlee Stage 1 Development area at concentrations greater than the assessment criteria. The first of these was associated with a minor spill from a small drum of transmission oil located on a residential property. The second area was associated with a small spill from a small unbunded diesel AST located in close proximity to the Site shed. Both areas of impact, although resulting in elevated concentrations (approximately 27 000mg/L) are considered to be of minor volume and are unlikely to have impacted groundwater/surface water/runoff due to the low permeability of the underlying geology, depth of groundwater underlying the Site and the leachable concentration of TPH;

[1] AECOM, 2011. *Limited Phase 1 Environmental Site Assessment, North Rothbury* (reference 60162904 dated 10 March 2011).

- Elevated concentrations of lead were encountered in one soil sample from a stockpile of waste material including metal scraps and fragments located near the unbunded AST. No other elevated concentrations of metals were detected in any of the samples analysed;
- Leachable concentrations of metals were detected; however these samples have generally been from natural soils with no obvious source of metal contamination and therefore are likely associated with the natural mineral composition of the soil rather than a significant source of contamination;
- Asbestos containing materials have been identified on Site. No asbestos fibres have been encountered in the soil samples analysed;
- No concentrations of BTEX, PAHs, OCP, OPP and phenols were identified at concentrations greater than the laboratory LOR; and
- The absence of OCP/OPP corroborates our opinion that wide scale use and adverse impact from pesticide / herbicide use is unlikely to have occurred and that this is unlikely to pose a site wide and significant impediment to the proposed development.

The qualitative risk assessment undertaken on the areas of environmental concern concludes that the concentrations and volume of impacted materials is generally a low and therefore there is a low to very low risk to human health and the wider environment. There does not appear to be a significant, wide scale or gross, contaminant source on Site requiring substantial remedial works prior to development. However, AECOM recommends that bonded asbestos exposed at the Site surface be removed as a priority.

The former Ayrefield Colliery located approximately 200 m south of the Site boundary and also owned by Huntlee, will be incorporated into later development stages and is to be thoroughly investigated and remediated in the foreseeable future (less than 2 years). AECOM understands that the former landfill on the Ayrefield colliery site is currently undergoing closure and capping and that gas and leachate monitoring results recorded to date do not indicate that gas and leachate generation is a significant impediment to surrounding development. Given the distance of the colliery from the Stage 1 development Site, the anticipated depth to groundwater and the geological profile (stiff clays) the potential for on Site migration of contamination from the colliery is considered to be low.

Overall contamination issues should not be seen as an impediment to the proposed development and further Stage 2 Detailed Investigations for contamination are not considered necessary at this stage. Based on the information to date, AECOM concludes that the Site should be suitable for the proposed Stage 1 Development, inclusive of all land uses, subject to the implementation of the following recommendations.

Prior to development AECOM recommends that the areas identified as having minor TPH and lead impacts be excavated and disposed off-site in general accordance with the Waste Classification Guidelines (2008). This can be done at the enabling works stage, acute short-term risks are considered negligible. Prior to any disposal of material, it is recommended that the impacted soils be excavated, stockpiled with environmental controls and adequately sampled for waste classification purposed.

The area identified as having asbestos impact should also be excavated and disposed off-site as a priority to mitigate the risk of breakdown on the materials and the release of free fibres to the atmosphere. If there is substantial delay in having the asbestos impacted material removed, this area should be covered in plastic to prevent any further weathering of the asbestos fragments and to minimise the potential for any asbestos fibres to become airborne. An Asbestos Management Plan is recommended if this option is pursued as an interim exposure control measure.

These areas should be validated after excavation and disposal of impacted material and a report prepared by a suitably qualified environmental consultant. A Remedial Action Plan may also be required to support these future works and can be prepared post planning approval.

It is also recommended that, before any redevelopment/demolition of Site buildings is undertaken, a hazardous materials study should be conducted to assess the potential presence of hazardous materials, including lead paint and asbestos.

With regards to the remaining wider Site areas considered to be of low to very low risk, AECOM recommends that an EMP be prepared for the development works, including procedures to be followed in the event that evidence of significant contamination, such as visual or olfactory indicators of contamination, is encountered during the development works.

In addition, given the scale of the development, the potential exists for previously unidentified sources of contamination, such as areas filled with materials of unknown origin, equipment graveyards, etc. As a result, AECOM recommends that an unexpected find protocol be included in the EMP for development works at the Site, to be implemented in the event that further areas of environmental concern are encountered (for example, former sheep or cattle dips). The unexpected finds protocol should include stopping works and contacting an environmental professional to undertake an assessment of the risk associated with any finds and implementation of further investigations and remediation, if necessary.

Based on our understanding of the Site and the nature of the proposed development, which includes zones of sensitive residential land-use, it is considered prudent to conduct limited environmental investigations of remaining low to very low risk areas during future development phases. This can be carried out in tandem with lot specific geotechnical investigations.

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1.0 Introduction

reamble

AECOM Australia Pty Ltd (AECOM) was engaged by Huntlee Pty Ltd (Huntlee) to conduct a Stage 1 Preliminary Site Investigation across targeted areas within the *Stage 1 Development Area* of their proposed Huntlee (new town) development located at North Rothbury, NSW.

The concept master plan indicates a mixed use development to be completed in discrete phases and proposes sensitive end-uses comprising residential with gardens and Primary and Secondary school. The Stage 1 Project Approval Application area (the "Site") is shown on **F ure F** by black hatching. AECOM understands that the Site is approximately 367 hectares (Ha), which is split into a northern area (287 Ha) and a detached southern area (80 Ha).

AECOM previously conducted a Phase 1 Environmental Site Assessment (ESA) across the Site in March 2011 (AECOM, 2011) and concluded that the Site was essentially a "*Greenfield*" property and not subject to intensive historical development. AECOM (2011) comprised a visual inspection and historical review of the Site to identify discrete areas with the potential for significant contamination that could impact upon the proposed development.

Based on the conclusions and recommendations presented in AECOM (2011), it was considered that further investigations should be undertaken to address the requirements of State Environmental Planning Policy (SEPP) 55 (and other regulatory guidelines and planning instruments) relating to land contamination. The additional investigations undertaken, the results of which are presented in this report, are associated with the primary areas of concern identified during the AECOM (2011) study, strictly relating to the Site. Summary information from the AECOM (2011) study is presented in this report and, on occasion, the northern and southern portions of the Site are discussed separately to provide background context.

ac roun

AECOM (2011) included a review of available published information (including aerial photographs, land titles information, topographical, soil and geological maps, etc.) and a Site inspection. Both the northern and southern portions of the Site were generally used for cattle grazing at the time of the Site inspection (March 2011). There were also a number of existing residential properties through the Site.

Based on the available published information and the Site inspection, the following key potential sources of contamination and Areas of Environmental Concern (AECs) were identified within the Site:

- Scrap metal storage area in the central portion of the northern area, which also contained two aboveground storage tanks (ASTs);
- The area surrounding a derelict shed, an abandoned residence and a shed used for the manufacturing of timber furniture, near the western boundary of the northern area;
- The area surrounding and down-gradient of an unbunded AST in the western portion of the northern area understood to formerly contain diesel. At the time of AECOM's Site inspection, the tank was reportedly empty;
- The area beneath a car wreck in the north-western portion of the northern area;
- Stockpiles of metal materials, soil, wood and plastics in the north-western portion of the northern area;
- Cleared area in the north-western portion of the northern area, potentially related to historic mining activities at the adjacent property;
- The area surrounding a rusted drum in the south-western portion of the southern area; and
- Contoured dams and channels in the southern portion of the southern area.

The remaining Site area was also considered to be a potential AEC with respect to the use of pesticides/herbicides and potential unrecorded areas of localised filling and/or waste disposal (farm equipment, animal carcasses, etc.). However, the associated risks to human health and the wider environment were considered to be very low due to the nature of such chemicals in the environment. A wider investigation of the Site, outside of the identified AECs, was therefore considered to be unwarranted at that stage of assessment.

It is noted that the Site development boundary has changed since the 2011 Phase 1 ESA, with the scrap metal storage area and ASTs associated with Lot 34 DP 755211 no longer included in the Site. Therefore, these areas have been removed from this stage of investigation. It is understood that these areas will be investigated as part of subsequent development stages.

AECOM (2011) identified contaminants of potential concern (CoPC) associated with the AECs identified above as well as potential sensitive receptors to contamination. A preliminary qualitative risk assessment was then conducted as part of AECOM (2011) and is summarised in **Table** below:

Table otent al Source s an n or r mar s Areas

s an n	otent al Source Area
o erate s	Area surroun n unbun e AST n northern port on o the S te
	T mber urn ture manu actur n area n the northern port on o the S te
	erel ct she an aban one res ence both n the northern port on o the S te
o	T o stoc p les n the northern port on o the S te
Very Low	Area around the car wreck in the northern portion of the Site
	Dam with contouring in the southern portion of the Site
	Rusted drum in the southern portion of the Site
	Overall Site for pesticide/herbicide use
	North-western portion of the northern area in relation to clearance of the land potentially for historic mining activities at the adjacent property.

The results of AECOM (2011) indicated that there was a potential for localised contamination of typically minor volumes to exist at the Site, presenting a very low to moderate risk to human health and/or the wider environment. Further investigation was considered necessary with regards to the areas assessed as posing a moderate risk to the future development, including the AST, the furniture manufacturing area, the metal scraps storage area, the derelict shed and the uninhabited residences.

AECOM (2011) identified a number of other low to very low risk areas and preliminary site investigations were generally not considered necessary in these areas at this stage to support the project approval application, as it is unlikely that any significant contamination would been present. However, limited background samples were collected to assess the potential for pesticide use and impact at random locations across the Site and a borehole was installed in the north-western portion of the northern area where land clearance and potential quarrying had occurred. Grab samples were also collected from the two stockpiles identified during AECOM (2011) and from the area adjacent to an old oil drum identified during the 2012 walkover.

AECOM (2011) recommended that an Environmental Management Plan (EMP) be prepared for the development works to address low risk areas; including procedures to be followed in the event that evidence of unforseen contamination, including significant fill, was encountered during the works. Future “lot-specific” environmental investigations of low to very low risk areas could be included within the EMP and combined with geotechnical investigations required for foundation and infrastructure design.

Contam nate an an the lann n e me

When assessing Development Applications, SEPP 55 requires consenting authorities to consider ‘the suitability of the site for the development’. The risk to human health and the wider environment from contamination must be included in this assessment, including risks during the construction and operation of the development. SEPP 55 provides detailed guidance on the stages of investigation required to provide the planning authority with the information it needs to carry out its planning functions. SEPP 55 refers to the EPA guidelines for guidance on how works should be conducted.

Generally, the proponent or person(s) who will benefit from the granting of the approval must demonstrate that the land is, or can be made, suitable for the proposed use. This may require several stages of investigation and remediation works.

The first stage (Stage 1) in the process is to conduct a desktop study comprising a detailed appraisal of the site’s history and a visual site inspection to determine the potential for site contamination, as presented in AECOM

(2011). Preliminary sampling and analysis of suspect areas of contamination can then be undertaken as an extension to Stage 1, thereby allowing an initial quantitative assessment of the site's suitability for the proposed development.

Where the results of a preliminary site investigation demonstrate the potential for, or the existence of, significant contamination, a detailed site investigation should be undertaken (Stage 2). This would require a higher density of sampling locations and groundwater monitoring wells (soil vapour surveys and surface water monitoring may also be required).

SEPP 55 advocates that the detailed site investigation does not necessarily have to immediately follow the preliminary investigation, but should be conducted before the new use commences. For example, some planning authorities may condition detailed site investigation, assessment and remediation in the Project Approval. However, AECOM cannot guarantee that the local planning authority will adopt such an approach to the Huntlee New Town development.

ra t untlee e elopment Control lan

The Draft Huntlee Development Control Plan (DCP) 2012 lists the key areas of potential or observed contamination as within the Stage 1 Application Boundary:

- Stained soil material in and around a storage area containing fuels, lead acid batteries, oils and greases;
- Asbestos sheeting and friable insulation materials; and
- Mounds of fill in locations across the site including building rubble that may contain asbestos, hydrocarbons and car tyres.

Areas identified as contaminated in the Draft DCP, but outside the Stage 1 Application Boundary, are:

- The landfill operations in the former Ayrefield Colliery fines settling pond areas;
- The 400 m^2 area to the south of the fines settling ponds where sandblasting has occurred;
- Hydrocarbon stained areas in and around the railway vehicle storage areas and workshops likely to contain Total Petroleum Hydrocarbons (TPH) and inorganics;
- Potential contaminants in sludge contained in the main dam to the west and downstream of the colliery pit top area;
- Leachate water draining from the coal fine cells downstream from a storage dam potentially discharging highly saline water into the aquatic environment;
- The Bath-house complex of the Maitland Extended No. 2 Colliery, including materials within buildings, surrounding soils and open land fill used for rubbish dumping;
- General contamination of areas associated with mining activities including haul roads, emplacement areas and coal handling areas; and
- Discarded asbestos brake linings adjacent to rail lines.

The Ayrefield Colliery, defined on Figure 47 of the Draft DCP as contaminated and will require a Stage 2 Detailed Investigation, is outside of the Stage 1 Application Boundary. A Remedial Action Plan (RAP) will be required as part of any project approval application relating the Ayrefield Colliery.

bject es

The methodology for this stage of assessment is to carrying out a Stage 1 Preliminary Site Investigation of targeted areas within the Site, in line with the SEPP 55 guidance, and is an important step in deciding whether Stage 2 Detailed Site Investigations and/or remedial works are needed to support the development process and address potential future planning conditions relating to contaminated land.

Consequently, the main objective of this phase of work is to conduct a preliminary site investigation of the moderate risk AECs (**Table** , above) to allow a preliminary assessment of actual or potential contamination risks that could impact upon the proposed development within the Site, more specifically to:

- Assess the nature and possible extent of shallow soil and groundwater contamination;
- Assess the potential for off-site migration of the above contamination if found in significant concentrations (considering the substantial distance from the potential source areas to the site boundaries);

- Assess the suitability of the AECs for the proposed development; and
- Assess the potential for the risk of significant harm to human health or the wider environment, under current site use, and identify consequent liabilities under the Contaminated Land Management Act (1997) from the above AECs.

Scope o Wor

To achieve the objectives, the following scope of work was undertaken:

- Review of the Phase 1 report and other readily available information;
- Preparation and implementation of a site-specific health and safety plan and undertake all necessary Site inductions;
- Site inspection and underground service clearance;
- Collection of eight surface grab samples to assess for potential localised contamination (six surface scrapes and two stockpile samples);
- Intrusive soil investigation of 11 boreholes (BH01 to BH11) to a maximum depth of 6 m below ground surface (m bgs);
- Installation of three groundwater monitoring wells (MW01 to MW03) at selected locations;
- Screening of soil samples with a Photo Ionisation Device (PID);
- Collection of representative soil samples from the boreholes. Shallow groundwater was not encountered during the investigation and upon return groundwater monitoring; therefore sampling of the groundwater wells was not possible; and
- Analytical analysis of soil samples (and QA/QC samples) by a National Association of Testing Authorities (NATA) registered laboratory, accredited for the identified contaminants of concern:
    - TPH;
    - Benzene, Toluene, Ethylbenzene and Xylenes (BTEX);
    - Polycyclic Aromatic Hydrocarbons (PAHs);
    - Heavy Metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc);
    - Asbestos Containing Materials (ACM);
    - Organochlorine and organophosphate pesticides (OCP and OPP); and
    - Australian Standard Leaching Procedure (ASLP) on selected contaminants.
- Data analysis and interpretation; and
- Reporting.

Further information regarding the methodology of the investigation is provided in **Sect on** below.

ele ant u el nes

The Stage 1 Preliminary Site Investigation was conducted with general reference to relevant parts of the following guidelines:

- NSW Department of Planning, 1998. *Managing Land Contamination, Planning Guidelines, SEPP 55-Remediation of Land* – were considered throughout the entire investigation;
- NSW Department of Environment and Conservation (DEC), 2006. *Guidelines for the NSW Site Auditor Scheme, 2nd Edition* – provided the soil assessment criteria and determination of data quality objectives (DQOs);
- NSW EPA, 2000. *Guidelines for Consultants Reporting on Contaminated Sites* – followed throughout the investigation and during the preparation of this report;
- NSW EPA, 1995. *Sampling Design Guidelines* – referred to during the investigation;

- NSW DEC, March 2007. *Guidelines for the Assessment and Management of Groundwater Contamination* – considered for the assessment of groundwater conditions;
- National Environment Protection Council (NEPC), 1999. *National Environment Protection (Assessment of Site Contamination)* – was considered throughout the entire investigation; and
- NSW EPA, December 1994. *Guidelines for the Assessing Service Station Sites* – considered when investigating potential contamination associated with historical fuel storage.

ata ual t bject es

To ensure that data of adequate type and reliability was collected and assessed for the investigation, the seven-step Data Quality Objective (DQO) approach, endorsed in the NSW DEC Guidelines for the NSW Site Auditor Scheme 2nd Edition (2006), was adopted. The DQOs have set quality assurance and quality control parameters for the field and laboratory programs to ensure data of appropriate reliability have been used to assess the environmental condition of the Site.

In determining the type, quantity and quality of data needed to support decisions relating to the environmental condition of the Site, AECOM has undertaken the seven-step process to develop the DQOs in accordance with NSW DEC (2006) guidelines, which is presented in the following paragraphs.

Step State the problem:

The Huntlee development is a proposed new town to be located near North Rothbury, NSW and is proposed to be a mix of residential and commercial properties which will be developed over a number of different stages across a 30 year period. The development is currently in the planning stages and this investigation is required to identify any potentially significant contamination issues which could impact on the future development within the Site.

A Phase 1 ESA was conducted in March 2011 by AECOM, which indicated that there were a limited number of AECs warranting further intrusive investigation to assess the potential impacts that these areas could pose to the proposed development. The AECs are presented in **Table** below. The preliminary Conceptual Site Model, on which this investigation is based, is presented in **Sect on**

Table Areas o n ronmental Concern re u r n a t onal n est at on

s an n	otent al Source Area
o erate s	Area surroun n unbun e AST n northern port on o the S te
	T mber urn ture manu actur n area n the northern port on o the S te
	erel ct she an aban one res ence both n the northern port on o the S te
o	T o stoc p les n the northern port on o the S te
Very Low	Pesticide/herbicide use
	North-western portion of the northern area in relation to clearance of the land potentially for historic mining activities at the adjacent property.

Step l ent cat on o the ec s ons o the stu :

The following decisions are required to be answer:

- Has there been any potentially contaminating site uses identified?
- Is there a source of contamination in the soil?
- Do any of the activities historically or currently being undertaken on Site have the potential to impact soil or groundwater?
- Is there a potential for off-site migration of contaminated groundwater that could cause adverse impact to sensitive receptors e.g. surface water bodies, drinking water supply boreholes?
- Does soil and/or groundwater contamination at the Site, if identified, require remediation/management in order for the Site to be considered suitable for residential and commercial land use?

Step l ent nputs to the ec s ons:

The information required to make the above decisions include:

- Site historical information;
- Geological data and information;
- Hydrogeological data;
- Concentrations of chemicals of concern in fill, soil and groundwater; and
- Field observations.

Step e ne the stu boun ar es:

The boundaries for this investigation were generally limited to the AECs exhibiting a greater than low risk located within the Site as identified in **Table** . However additional surface samples were taken throughout the Site to assess for potential pesticide use and a borehole, converted into a groundwater well, was situated in the area in the north-western portion of the Site, which had evidence of clearing and potentially quarry. The two stockpiles and a drum of oil stored adjacent to a residential property were also targeted.

Vertically, this investigation was limited to a maximum depth of 6 m bgs and the majority of deeper borehole locations reached refusal at this depth, terminating on suspected sandstone bedrock. No groundwater was identified during the investigation or subsequent monitoring.

The temporal boundary was limited to the data set collected in May 2012 which minimises potential temporal and seasonal variations in the data collected.

Step e elop a ec s on rule:

To be able to make the decisions identified in Step 2 above, the following rules were applied:

- If CoPCs are detected at concentrations greater than the adopted assessment criteria in soil or groundwater, then contamination will be considered to be present at that sampling location. This information will be used to assess the nature of soil and groundwater contamination at the Site and the requirements for further investigation, remediation and/or management;
- If concentrations of CoPCs are detected in groundwater greater than the groundwater assessment criteria at the up hydraulic gradient boundary of the Site, then the potential for on-site migration of contamination will be assessed; and
- If the analytical data is considered to meet the meet defined performance/quality criteria, discussed in Step 6, below, and **Sect on** of this report, then the data will be considered to be of adequate quality for inclusion into the report.

Step Spec per ormance or acceptance cr ter a that the ata nee to ach e e:

The acceptable limits on decision errors to be applied for the project and the manner of addressing possible decision errors have been developed based on the Data Quality Indicators (DQIs) of sensitivity, precision, accuracy, representativeness, comparability and completeness (SPARCC) as described in **Appen F**.

The tolerable limits on decision errors are:

- Probability that 95% of data will satisfy the DQIs, therefore a limit on the decision error will be 5% that a conclusive statement may be incorrect; and
- In applying statistical analysis of the data set:
  - No individual sample result should have a concentration that exceeds 250% of the adopted Site assessment criteria;
  - A normal distribution will only be used if the coefficient of variance is not greater than 1.2; and
  - The standard of deviation of a sample population should not exceed 50% of the Site assessment criteria.

Step pt m sat on o the es n o the collect on o ata:

The collection of data was optimised by the development of an appropriate sampling and analytical strategy, discussed in **Sect on** .

Attainment of the DQOs has been assessed by reference to the DQIs presented in **Appen F**.

eport m tat ons

This Stage 1 Preliminary Site Investigation has been carried out to support the Project Approval Application for the Site only and focusses on the primary AECs identified during the desk-based assessment reported by AECOM in March 2011.

It is not intended to provide a Detailed Stage 2 Site Investigation suitable for determining the physical extent and nature of any remedial works deemed necessary to make certain areas of the site suitable for their proposed end-use. In line with SEPP55 and relevant NSW EPA made or endorsed guidelines, AECOM has assumed that, if required, such investigations and remedial work could be carried out and validated at the development stage. It is also assumed that very low to low risk areas across the wider Site can be addressed by implementation of an EMP and through lot-specific investigations at the detailed development stage.

It should be noted that changes in development layout and/or legislation may necessitate reassessment of this process.

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2.0 Site Identification

Site identification details are summarised in **Table** , below.

Table S te I ent cat on

Item	escr pt on
Site Owner	Huntlee Pty Ltd
Site Address	Wine Country Drive, North Rothbury, NSW
Legal Description	The legal descriptions below were provided by JBA Planning on 23 February 2011 on behalf of Huntlee. • Lot 200 in DP 828486 • Lot 201 in DP 828406 • Lots 230 and 231 in DP 879198 • Lots 33, 36-39 and 43 in DP 755211 • Lot 211 in DP 828787 • Lots 2-12 in DP 729973 • Lot 2 in DP 601478 • Lot 21 in DP 1050597 • Lot 221 in DP 1064738 • Lot 10 and 11 in DP 1105639 (Southern Portion) A proposed zoning map including current Lot areas has been included into **Appen A**
Local Government Authority	Cessnock City Council
Geographic Co-ordinates	E: 374500 N:638450 (Topographic and Orthophoto 1:25000 Greta 2nd Edition)
Current Zoning	The Site is currently zoned as (1a) Rural “A” Zone, in accordance with Cessnock LEP 1989. The Cessnock City Council website contains a ‘Proposed Huntlee Land Zoning Map’, within which the Site was zoned as State Environment Protection Policy (SEPP) (Major Projects). The Site is proposed for the following re-zonings as part of the Stage 1 Project Application: <u>Northern Area:</u> B4 – Mixed Use R1 – General Residential R2 – Low Density Residential <u>Southern Area:</u> R5 – Large Lot Residential A Figure showing the future zoning is provided in **Appen A**
Current Land Use	Generally bushland with some small cattle grazing with limited residential properties. The Site contains several dams in the northern and southern portions.
Proposed Land Use	Mixed residential and commercial use
Site Elevation (m AHD)	Approximately 60-80 m AHD in the northern Site area and approximately 40 m AHD in the southern Site area
Site Area (Total)	Approximately 367 ha (Stage 1 Project Approval Application Boundary)
Site Location Plan and Site Layout	**F ure F**

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3.0 Site History

re ous n ronmental ln est at ons

The only previous environmental investigation pertaining to the Site, known to AECOM at the time of reporting, is the Phase 1 Investigation conducted by AECOM 2011. The information presented in the Phase 1 report has been reviewed, in light of the change to the Site boundary, and where applicable has been reproduced into this report.

ocal o ernment ln ormat on

The following information was obtained from Cessnock City Council in relation to the Site:

- Previous zoning of the Site is 1(a) Rural under Cessnock LEP 1989, which is assumed to be the zoning under earlier planning instruments. With the exception of the current project there are no recorded applications for or changes to the zoned land use;
- The northern and southern areas are currently zoned 1(a) Rural "A" Zone;
- The proposed Huntlee Land Zoning Map shows the Site to be classified as SEPP (Major Projects);
- The Site is not classed as environmentally sensitive land; and
- The Site areas are classified as bushfire prone. The Site area contains both Vegetation Category 1 and Vegetation Category 2.

Huntlee recently issued a Stage 1 Project Application to the NSW Department of Planning (DoP), which outlines the proposed land re-zoning on the Site as follows:

Northern Area:

- B4 – Mixed Use Residential;
- R1 – General Residential; and
- R2 – Low Density Residential.

Cert cates o T tle

The historical certificates of title for the Site were obtained through Espreon Property Services Pty Ltd (Espreon) and provide details of historical ownership and possible former uses of the Site. The information obtained from the certificates is summarised below and the documentation is contained in Appendix C of AECOM (2011).

Certificates of title indicated that the Site is currently identified as Lot 200 in DP828486, Lot 201 in DP828406, Lots 230 and 231 in DP879198, Lots 33, 36-39 and 43 in DP755211, Lot 211 in DP828787, Lots 6-12 in DP729973, Lot 21 in DP1050597, Lot 221 in DP1064738 and Lot 10 in DP1105639. AECOM was informed by Espreon that Lot 1 in DP745450 is no longer a valid parcel of land and is referred to currently as Lot 10 in DP1105639.

A review of the title information and ownership history of the Site is provided in **Table** below.

Table Summar o T tle ln ormat on an nersh p stor

ot an	ate	S te ner
Lots 6 and 7 in DP729973	7.9.2010 – to date	Huntlee Pty Limited
	2005 – 2010	Hardie Ayrefield Pty Limited
	1991 – 2005	Laurence David Macey and Alva Dawn Macey
Lot 8 in DP729973	7.9.2010 – to date	Huntlee Pty Limited
	2005 – 7.9.2010	Hardie Ayrefield Pty Limited
	1993 – 2005	L.D. & A.C. Macey Pty Limited
	1988 – 1993	Laurence David Macey and Alva Dawn Macey

ot an	ate	S te ner
	1976 – 1988	John Archibald Peter Keogh, Pensioner and Margaret Keogh, his wife
	15.4.1976 – 20.8.1976	Leo Gerard Bates, Retired
	1962 – 1967	Frederick Henry Wheeler, Mine Worker and Larl Geraldine Mary Wheeler, his wife
	1955 – 1962	Edward Robert Hickson Merewether, Architect and Victor Albert Boyd, Solicitor
	1925 – 1955	William David Mitchell Merewether, Barrister at Law and Edward Robert Hickson Merewether, Architect
	Circa 1917 – 1925	Edward Alworth Mitchell Merewether, Gentleman and William David Mitchell Merewether, Barrister at Law
Lots 9 & 10 in DP729973 and Lots 33, 36, 37, 38, 39 & 43 in DP755211	7.9.2010 – to date	Huntlee Pty Limited
	2005 – 7.9.2010	Hardie Ayrefield Pty Limited
	1987 – 2005	Laurence David Macey and Alma Dawn Macey
	24.5.1972 – 1987	Raymond Harry Swanson, Manager
	15.3.1972 – 24.5.1972	Patricia Bambach, Married Woman
	1956 – 15.3.1972	Osman James Grivell, Lorry Driver
	1948-1956	Osman James Grivell, Lorry Driver and Ana Jessie Constance Dorothy Grivell, his wife
	1934 – 1948	Charles Frederick Davis Turner, Dairy Farmer
	1925 – 1934	William David Mitchell Merewether, Barrister at Law and Edward Robert Hickson Merewether, Architect
	Circa 1917 – 1925	Edward Alworth Mitchell Merewether, Gentleman and William David Mitchell Merewether, Barrister at Law
Lot 11 in DP729973	7.9.2010 – to date	Huntlee Pty Limited
	2005 – 7.9.2010	Hardie Ayrefield Pty Limited
	2000 – 2005	7A Kemp Street Pty Limited
	1987 – 2000	Laurence David Macey and Alma Dawn Macey
	24.5.1972 – 1987	Raymond Harry Swanson, Manager
	15.3.1972 – 24.5.1972	Patricia Pamback, Married Woman
	1956 – 15.3.1972	Osman James Grivell, Lorry Driver
	1948 – 1956	Osman James Grivell, Lorry Driver and Ana Jessie Constance Dorothy Grivell, his wife
	1934 – 1948	Charles Frederick Davis Turner, Dairy Farmer
	1925 – 1934	William David Mitchell Merewether, Barrister at Law and Edward Robert Hickson Merewether, Architect

ot an	ate	S te ner
	Circa 1917 – 1925	Edward Alworth Mitchell Merewether, Gentleman and William David Mitchell Merewether, Barrister at Law
Lot 12 in DP729973	7.9.2010 – to date	Huntlee Pty Limited
	2005 – 7.9.2010	Hardie Ayrefield Pty Limited
	1987 – 2005	Laurence David Macey and Alma Dawn Macey
	24.5.1972 – 1987	Raymond Harry Swanson, Manager
	15.3.1972 – 24.5.1972	Patricia Bambach, Married Woman
	1956 – 15.3.1972	Osman James Grivell, Lorry Driver
	1948 – 1956	Osman James Grivell, Lorry Driver and Ana Jessie Constance Dorothy Grivell, his wife
	1934 – 1948	Charles Frederick Davis Turner, Dairy Farmer
	1925 – 1934	William David Mitchell Merewether, Barrister at Law and Edward Robert Hickson Merewether, Architect
	Circa 1917 – 1925	Edward Alworth Mitchell Merewether, Gentleman and William David Mitchell Merewether, Barrister at Law
Lot 10 in DP 1105639	7.9.2010 – to date	Huntlee Pty Limited
	2007 – 7.9.2010	Hardie Ayrefield Pty Limited
	1985 – 2007	Peter Damien Vizzard, Balloonist
	1930 – 1985	Lindemans Limited, later Lindemans Wines Pty Limited
	1925 – 1930	William David Mitchell Merewether, Barrister at Law and Edward Robert Hickson Merewether, Architect
	Circa 1916 – 1925	William David Mitchell Merewether, Barrister at Law
Lot 21 in DP 1050597	7.9.2010 – to date	Huntlee Pty Limited
	2007 – 2010	Hardie Ayrefield Pty Limited
	1991 – 2007	Richard Joseph Kosteliz, Teacher and Margaret Mary Kosteliz, his wife
	1985 – 1991	Richard Joseph Kosteliz, Teacher and Margaret Mary Kosteliz, his wife, and Keith Francis Thomas, Boilermaker and Jennifer Thomas, his wife
	1963 – 1985	Alexander George Thomas, Auctioneer
	Circa 1926 – 1963	Alfred Emanuel Thomas, Grazier and his Estate
Lot 200 in DP 828486	7.9.2010 – to date	Huntlee Pty Limited
	2007 – 2010	Hardie Ayrefield Pty Limited

ot an	ate	S te ner
	1980 – 2007	George William Tiernan, Licensed Builder and Gayle Francis Tiernan
	1954 – 1980	Alfred John Thomas and John Thomas, Graziers
	Circa 1862 – 1954	Samuel Clift and his Estate
Lot 201 in DP 828486	7.9.2010 – to date	Huntlee Pty Limited
	2008 – 7.9.2010	Hardie Ayrefield Pty Limited
	1996 – 2008	Wayne Stewart Collison and Kim Judith Collison
	1980 – 1996	George William Tiernan, Licensed Builder and Gayle Francis Tiernan
	1954 – 1980	Alfred John Thomas and John Thomas Thomas, Graziers
	1862 – 1954	Samuel Clift and his Estate
Lot 230 in DP 879198	1.9.2010 – to date	Huntlee Pty Limited
	1.9.2010 – 1.9.2010	Hardie Ayrefield Pty Limited
	1989 – 1.9.2010	Lindsay Thomas Russell, Earthmoving Contractor
	1977 – 1989	Alexander Thomas Russell, Earthmover and his Estate
	1954 – 1977	Alfred John Thomas and John Thomas Thomas, Graziers
	Circa 1862 – 1954	Samuel Clift and his Estate
Lot 231 in DP 879198	1.9.2010 – to date	Huntlee Pty Limited
	1.9.2010 – 1.9.2010	Hardie Ayrefield Pty Limited
	1998 – 2010	Mark John Kelly and Alison Kelly
	1989 – 1998	Lindsay Thomas Russell, Earthmoving Contractor
	1977 – 1989	Alexander Thomas Russell, Earthmover and his Estate
	1954 – 1977	Alfred John Thomas and John Thomas Thomas, Graziers
	Circa 1862 – 1954	Samuel Clift and his Estate
Lot 211 in DP 828787	7.9.2010 – to date	Huntlee Pty Limited
	2006 – 2010	Hardie Ayrefield Pty Limited
	1998 – 2006	Edward Charles Phillis and Lorraine Leathea Phillis
	1982 – 1998	Maxwell George Richards, Miner and Janette Fay Richards, his wife
	1980 – 1982	David John Axsentieff, Miner and Robyn Leslie Axsentieff, his wife

ot an	ate	S te ner
	1954 – 1980	Walter Edward Thomas, Grazier
	Circa 1862 – 1954	Samuel Clift and his Estate
Lot 221 in DP 1064738	7.9.2010 – to date	Huntlee Pty Limited
	2008 – 2010	Hardie Ayrefield Pty Limited
	1985 – 2008	Kevin Denis Hartcher, Boilermaker and Linda Anne Hartcher, his wife
	1980 – 1985	David John Axsentieff, Miner and Robyn Leslie Axsentieff, his wife
	1954 – 1980	Walter Edward Thomas, Grazier
	Circa 1862 – 1954	Samuel Clift and his Estate

Land titles information presented above indicated that the Site has generally been used for small scale agricultural purposes. There is potential that a portion of the western area of the northern portion of the Site was historically cleared for quarrying purposes, with previous owners of the parcel of land being earthmoving contractors (Lot 230 and 231 in DP 879198). No other evidence of potentially contaminating activities was identified in the land titles information as the reference to Hardie Ayrefield Pty Ltd is associated with the initial developer for the land and not with the former Ayrefield Colliery located south of the Site.

AECOM notes that Lots 2- 5 in DP 729973 were added to the Stage 1 development after the Title information had been obtained for this and therefore ownership information is not available. These Lots are associated with access roads immediately adjacent to Lots 9-11 of DP 729973 and Lot 211 of DP828787. Based on the information available to date and the Site inspection, as these Lots are associated with access roads, the likelihood of any potentially contaminating activities occurring on these small access roads is considered low and therefore not have the title information is not considered to alter the conclusion of the this report.

Aer al hoto raphs

The information outlined in **Table** below was derived from reviewing historical aerial photographs for the Site and the surrounding area as reported in the Phase 1 ESA (AECOM, 2011) report. The photographs were obtained from the NSW Land and Property Management Authority.

Table Aer al hoto raph e e

hoto raph eta ls	escr pt on
November 1952 Singleton Area Run 4	Northern area: The majority of the northern area was covered by bushland. Grazing land was noted in the north west of the area with a residence and several dams. Wine Country Drive was also visible in the photograph. Northern area surrounds: North Rothbury township was visible to the south and west of the northern area. Several roads were visible within the township. The regional rail line and New England Highway were visible to the north of the northern area as were the townships of Branxton and Greta. Anvil Creek was noted to the north of the northern area and Black Creek to the west of the northern area. Small tracks appeared to the west of Wine Country Drive, in the location of Ayrefield Colliery. Southern area: The southern area was generally sparsely vegetated and generally appeared to contain crops. There were also approximately two residences visible in the central portion of the southern area. Southern area surrounds: Farms were noted to the south of the southern area. Grazing land was also noted to the east and west of the Site. Black Creek was noted along the western boundary of the southern area. Small site roads were visible to the north of the southern area in the location of the Ayrefield Colliery.
November 1963 Cessnock Run 55	Northern area: The land in the south-eastern and central portions of the northern area appeared to have been partially cleared of vegetation. Southern area: The southern area remained unchanged. Northern and southern area surrounds: The Ayrefield Colliery appeared to have coal stockpiles. There appeared to be no other significant changes from 1952 to 1963 in the surrounding area.
September 1974 Cessnock Run 3	Northern area: The northern-eastern area appeared to have been mostly cleared of vegetation and several dams were visible across the northern area. The southern boundary of north-western portion of the northern area appeared to have been cleared, potentially related to the mine west of the Site or for quarrying/stockpiling of overburden. Surrounds: A vehicle track was noted to the immediate north and east of the Site. Several dams were located to the north of New England Highway. No other significant changes were visible.
May 1975 Cessnock Run 4	Southern area: A few minor roads were noticeable, however, the southern area appeared to have remained largely unchanged. Surrounds: North-east of the area (east of Wine Country Drive) appeared to have been largely cleared for farming. Several farming residences and dams were visible along Wine Country Drive to the east of the Site. Ayrefield Colliery appeared to have expanded with several stockpiles visible.

hoto raph eta ls	escr pt on
May 1984 Cessnock Run 3	Northern area: The area appeared to have been partially revegetated, particularly the southern portion of the northern area. The area west of Wine Country Drive remained largely unchanged. Surrounds: The township of Greta to the north-east of the northern area appeared to be larger with more residences. The Ayrefield Colliery to the west of the northern area appeared to have nine cells constructed, potentially for overburden and spoil from mining activities (these cells were later used for landfill) A number of other stockpiles were visible at the colliery.
May 1984 Cessnock Run 4	Southern area: No significant changes visible. Surrounds: No significant changes visible.
February 1991 Cessnock Run 5	Northern area: Some of the vegetation in the portion of the northern area west of Wine Country Drive appeared to have been cleared. No other significant changes were noted. Surrounds: Ayrefield Colliery to the west of the area appeared relatively unchanged. No other significant changes were noted.
February 1991 Cessnock Run 6	Southern area: The area appeared to be more densely vegetated. There were no visible crops within the area. There appeared to be more vehicle tracks in the central portion of the southern area and several new dams and more sheds were located in the northern and eastern portions of the southern area. Surrounds: Vegetation to the east of the southern area appeared to have been cleared. No other significant changes were noted.
September 1994 Cessnock Run 5	Northern area: No significant changes noted. Surrounds: No significant changes noted.
September 1994 Cessnock Run 6	Southern area: No significant changes noted. Surrounds: No significant changes noted.
January 1996 Newcastle Sydney Ctrl Blk Run 6	Northern and southern areas: No significant changes noted. Northern and southern surrounds: No significant changes noted.
October 1998 Cessnock Run 3	Northern area: A new road was visible within the central portion of the northern area. No other significant changes. Southern area: No significant changes noted. Northern and southern surrounds: No significant changes noted.
July 2000 Cessnock Run 5	Northern area: No significant changes noted. Surrounds: No significant changes noted.
July 2000 Cessnock Run 6	Southern area: No significant changes noted. Surrounds: A minor road and dam were visible on the property adjacent to the south of the area. No other significant changes were noted.

hoto raph eta ls	escr pt on
September 2004 Cessnock Run 5	Northern area: No significant changes noted. Surrounds: No significant changes noted.
September 2004 Cessnock Run 6	Southern area: No significant changes noted. Surrounds: No significant changes noted.
2010 Monteath and Powys Huntlee Stage 1 Development (provided by Monteath and Powys on the 27 July 2012)	Northern area: No significant changes noted. Surrounds: No significant changes noted.
	Southern area: No significant changes noted. Surrounds: No significant changes noted.

Based on the historical aerial photographs, it appeared that both the northern and southern portions of the Site have remained predominantly undeveloped and are likely to have been used for grazing land and low intensity pasture/crop growing purposes from approximately 1862 until the present day. A number of dams and residences were also noted on the aerial photographs. Land in the northern portion to the west of Wine Country Drive appeared to have been cleared in the 1960s. The clearing may have been related to quarrying activities associated with the former adjacent Ayrefield Colliery. The Site visit conducted on 3 May 2012 indicates that a portion of Lot 230 in DP 879198, beyond the Site boundary is currently being used as a potential quarry.

The aerial photographs indicated past potential quarrying activities occurred adjacent to the former Ayrefield Colliery. The colliery, located west of the northern area and north-west of the southern area, is considered to be a potential off-site contamination source.

SW CCW ecor s

A search of the NSW EPA record of notices indicated that no records applicable to the Site are currently held in the NSW DECCW database. No licensed activities were identified on the Site.

A search of activities licensed under Schedule 1 of the *Protection of the Environment Operations (POEO) Act 1997*, as listed on the NSW DECCW POEO Public Register, identified Environment Protection Licences for the former Ayrefield Colliery No. 3 Landfill/Remediation, which is located to the south of the Site. However, these regulations apply only to the mine and do not affect the Site.

AECOM further notes that Misthold Pty Limited (occupier of the premises known as Ayrefield Colliery) were issued with an environmental notice under Section 35 of the Environmentally Hazardous Chemicals Act (1985) in relation to the processing (washing) of coal and disposing of the coal washery spoil (chitter) waste, which was understood to have caused environmental degradation due to the generation of acid surface and groundwater from the coal washery spoil heaps.

Based on the depth to groundwater in the area, it is considered that the risk to the Site from any impacted groundwater is low. AECOM understands that Huntlee intend to investigate the Ayrefield Colliery and implementing remediation as required.

schar es to an Water an A r

Based on the information available to date, there are no known discharges to land, water and air applicable to the Site.

Compla nts

Based on the information available to date, there are no known complaints applicable to the Site.

In entor o Chem cals an Wastes

Based on the information reviewed to date there has been no storage of chemicals and or wastes on the Site, with the exception of the small diesel tank located at Lot 200 DP828486. A small drum of transmission oil was also identified at Lot 201 DP828486. No commercial storage of chemicals or wastes is apparent on Site. Minor spills were noted at both of the abovementioned locations, however there are no records of any product spills or losses. See **Sect on** for additional information.

Se a e an Ser ce lans

Based on the information available to date, there has been no industrial development on Site. There are a number of residential properties present, which are generally serviced by septic tank and therefore the extent of any service trenches associated with sewer are likely to be limited and thereby not considered a potential preferential pathway and therefore, mapping of these services is not cindered applicable.

an ll

The review of historical information did not indicate that current or former landfilling activities had been carried out on the Site. During the Site 2011 inspection, it was noted that earthworks had been undertaken to construct contour walls of dams for water storage, however, no evidence of imported fill materials was noted (discussed further in **Sect on**).

AECOM notes that the former Ayrefield Colliery, located adjacent to the Site, also formerly operated as a landfill. The landfill is undergoing capping and has recently had a reduction in monitoring requirements from the EPA as recent results have indicated that the landfill portion of the former colliery is general stable. No landfill gas, leachate or groundwater issues have been identified to date and statutory monitoring for gas, leachate and groundwater have been reduced from quarterly to annually.

Summar o ocal terature

To date there is no known literature associated with the history of the Site, which may prove beneficial to this investigation. It is noted that abundant information was available regarding the current development proposal, but unless recorded elsewhere in this report, this is considered not applicable.

u l n erm ts

With the exception of the current project approval application, there are no relevant approvals and licenses applicable to the Site.

ocal S te no le e

A site inspection was conducted with the aid of a Huntlee representative who is currently employed on the Site (refer to **Sect on**). No previous residents were contacted during this investigation.

S te stor Summar

Based on the information available for review and discussed above, the Site has been owned by individuals, generally described as famers, graziers, barristers and truck/machine operators since the late 1800s and appears to have been open-space bushland or used for low intensity grazing and cropping purposes.

The Site history review did not identify evidence of potentially contaminating activities that may have been undertaken at the Site. AECOM notes however, that the former Ayrefield Colliery operated adjacent to the Site, as identified on aerial photographs. A former landfill is also present within the former colliery.

The review of land titles documentation and aerial photographs did not indicate that the Site has historically operated as a mine or landfill. The aerial photographs did, however, indicate that a portion of the western edge of the northern portion of the Site was potentially cleared for quarrying purposes. As no industrial processes have occurred on Site, a figure detailing these is not applicable.

AECOM has assessed the quality and accuracy of the information included in this report and is of the opinion that the information available was of adequate quality to be relied upon and for inclusion in this report.

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4.0 Site Condition and Surrounding Environment

er e

Information provided in this section was obtained from the following sources:

- A Site inspection carried out by AECOM in the company of Glenn Brown (Huntlee representative) on 1 March 2011 and again on the 3 May 2012;
- Department of Mineral Resources;
- Soil Conservation Service NSW;
- NSW Natural Resource Atlas website; and
- Bureau of Meteorology website.

Current an se

At the time of reporting, the Site was predominantly owned by Huntlee and was generally bushland with some cattle grazing. The derelict residential property identified during the Phase 1 ESA was currently being renovated and the small scale timber furniture manufacturing activities had ceased. The Site surface was unsealed and generally covered by pasture, scrub vegetation and trees.

Three small buildings, small stockpiles of timber, scrap metal and plastic, and a number of dams and unsealed tracks were present on the Site. Site observations are discussed further in **Sect on** .

Surroun n an se

Based on the aerial photography review and Site inspection, the current land use surrounding the Site generally comprised agricultural activities. The following features were noted:

- North – Regional rail line, with the New England Highway beyond (approximately 400 m). The township of Branxton is situated approximately 400 m to the north of the northern area boundary. The Hunter Expressway is currently being built between the northern boundary of the Site and Branxton. Anvil Creek is located approximately 500 m west of the northern portion of the Site. The nearest major surface watercourse, the Hunter River, lies approximately 1 km to the north-east;
- East – Agricultural and/or grazing land. The township of Greta is located approximately 1.5 km east of the northern area boundary;
- South – Agricultural and/or grazing land. Cattle stockyards and a four wheel drive shed were noted south of the southern portion of the Site; and
- West – Black Creek (within 20 m of the western Site boundary), with agricultural and/or grazing land and the former Ayrefield Colliery/Landfill) located approximately 200 m south of the Site boundary.

Topo raph an ra na e

Information obtained from the Commonwealth of Australia Cessnock sheet 9132, series R651 (1:100,000) showed the northern area with an elevation of approximately 60 – 80 m above Australian height datum AHD (m AHD) and approximately 40 m AHD in the southern area. The gradient across the northern area is generally low, very gently sloping towards dams on the Site.

The abovementioned map also showed several tributaries of Anvil Creek in the northern area which flow to the north, however the tributaries were dry at the time of AECOM's inspections. In addition, the northern and southern portions of the Site contained contoured embankments to direct surface water runoff into man-made dams. Soil erosion was noted in the northern portion of the Site. The southern portion of the Site sloped very gently to the west, towards Black Creek, located within 20 m of the southern area boundary.

Overall, regional groundwater flow is expected to be to the north-east, towards the Hunter River. However, localised and/or perched groundwater flow may be influenced by the presence of Black Creek, Anvil Creek, tributaries of Anvil Creek and Site topography, resulting in a local flow direction to the west toward Black Creek or north towards Anvil Creek. Both Black Creek and Anvil Creek are tributaries of the Hunter River.

There is no information available on the background quality of any of the surrounding surface waters.

Sur ace Water

Based on observations made during the Site inspection (discussed below in **Sect on**), surface water is considered likely to infiltrate the unsealed surface of the Site. In the event that sufficient rainfall was received to allow surface water flow, such water would be expected to flow into several dams located around the Site, via the man-made contoured embankments in both the northern and southern portions of the Site and also via the soil erosion channels. Any excess or undirected water would be expected to flow into tributaries of Black Creek and Anvil Creek, located close to the western boundary of the southern portion of the Site and the northern boundary of the northern portion of the Site, respectively.

Floo potent al

The Section 149 planning certificates for LOT: 200 ALT: DP: 828486, LOT: 21 DP: 1050597, LOT: 230 ALT: DP: 879198, LOT: 201 ALT: DP: 828486 supplied by Cessnock City Council dated 1 June 2021 stated that there are currently no flood related development controls relevant to the Site.

e onal eteorolo

The Site is located in North Rothbury, north of Cessnock in the Upper Hunter region of NSW. Information available from the Bureau of Meteorology (Cessnock Airport AWS) indicated that the region experiences warm summers and cool winters with an average maximum temperature in summer (December to February) of 29.3°C. The average maximum temperature in winter (June to August) is 18.2°C. The region experiences an average annual rainfall of approximately 699.8 mm. On average rainfall is distributed unevenly with higher precipitation throughout summer months than during winter months.

eolo

Information obtained from the Department of Mines, Sydney – Singleton Sheet SI 56-1 (1:250,000) indicated that the Site was underlain by Permian aged geology.

The northern portion of the Site consists of mudstone, sandstone, shale and limestone of the Farley Formation of the Dalwood Group, with small portions of the northern area comprising conglomerate sandstone of the Rutherford Group. The northern area also comprises minor sandstone, conglomerate, shale and coal seams of the Greta Coal Measures.

The southern portion of the Site comprises mudstone, sandstone and conglomerate of the Branxton Formation of the Maitland Group, with minor mudstone, conglomeritic sandstone, sandstone and shale of the Rutherford Formation of the Dalwood Group.

ro eolo

Registered groundwater information was obtained from the NSW Natural Resource Atlas website and identified approximately 93 registered groundwater bores within a 1 km radius of the northern portion of the Site and approximately 70 groundwater bores within a 1 km radius of the southern portion of the Site. Approximately 24 registered groundwater bores were located within the northern portion of the Site and one registered borehole was located within the southern portion of the Site. Most of the boreholes did not have any information available regarding construction details, purpose, depths or water bearing zones. The limited number of registered bores with details available are summarised in **Table** below.

Table Summar o e stere roun ater ore atabase In ormat on

ore l	stance an rect on rom S te	urpose	Status	F nal epth m belo roun sur ace	Water ear n ones m belo roun sur ace
GW020723	Approx 650 m S of northern area	Unknown	Unknown	54.90	36.60 – 36.60
GW080478	Approx 600 m S of northern area	Domestic Stock	Unknown	61.00	No details

ore l	stance an rect on rom S te	urpose	Status	F nal epth m belo roun sur ace	Water ear n ones m belo roun sur ace
GW080479	Approx 500 m SE of northern area	Domestic Stock	Unknown	61.00	53.00 – 61.00
GW050646	Approx 450 m S of southern area	Stock	Unknown	38.00	32.00 – 33.00
GW080956	Approx 450 m S of southern area	Fire Fighting Monitoring Bore	Unknown	76.00	60.00 – 63.00

Based on the information provided above, groundwater is expected to be within sandstone and shale bedrock fractures at substantial depths of between approximately 32 – 37 m bgs and 53 – 63 m bgs, respectively. There is no information available on the background quality of any of the underlying groundwater.

There are no springs known to exist on Site.

S te Inspect on

er e

An inspection of the Site was undertaken by AECOM, accompanied by Glenn Brown of Huntlee, on 1 March 2011 and the 3 May 2012. The inspection consisted of a Site walkover and conversations with Mr Brown. A photographic log from the Site inspection is provided in **Appen** .

Current S te se

The Site was observed to be bushland with some small scale cattle grazing, comprised of open grazing with a number of artificially constructed dams. There was no evidence of cattle dipping/drenching activities observed during the Site inspection. A number of small, isolated residential properties were also observed on the Site.

u l n s

There were no standing buildings within the southern portion of the Site. In additional to the residential properties identified in the northern portion of the Site, an abandoned house and a small work shed were observed. Anecdotal information provided by Glenn Brown of Huntlee indicated that the shed was used for the manufacture of timber furniture. It was also stated that no wood treatments or preservatives were used in the making of this furniture. The demolished remains of a small building were also observed adjacent to the standing buildings. The abandoned house (brick and tin) is currently been renovated.

Two stockpiles were also observed in the vicinity of the buildings in the northern portion of the Site. One comprised soil, metal scraps, plastics and wood material. The second stockpile contained wood pieces and shavings. Logs were also noted to be stored in this area.

AECOM also noted a larger storage area of metal scraps, including pipes, cars and car parts, mine equipment and former above ground storage tanks (ASTs) in the central portion of the northern Site area. However this area is not considered to present an immediate risk to the environment, is located outside the Site boundary, and will be investigated during future stages of development.

Stora e o Chem cals

There were no operational chemical storage containers observed during the Site inspection. An old drum (rusted and in poor condition), which appeared to be empty was noted in the southern portion of the Site. There was no label noted on the drum to identify its previous contents. A small drum of transmission oil was identified adjacent to one of the residential properties as well as some associated surface staining.

An unbunded AST was noted adjacent to the work shed in the northern portion of the Site. Anecdotal information provided by Glenn Brown of Huntlee indicated that the AST historically stored diesel and is currently empty.

A further two ASTs were noted in the metal scraps storage area in the central portion of the northern area AECOM is not aware of the contents previously stored within these ASTs. The ASTs appeared to be dumped in the metal scraps storage area and were not operational. As discussed in **Sect on** this area will be investigated during future development stages.

eolo an ro eolo

Surface soils at the Site were observed to generally comprise brown sandy clay. A tributary of Black Creek was observed in the southern part of the southern portion of the Site; however the tributary was dry at the time of the Site inspections. No water was observed in the contour drains and dam water levels also appeared low at the time of the Site inspections.

e etat on Stress

During the Site inspection, there were no visible signs of vegetation stress.

otent al Sources o Contam nat on bser e at the S te

Potential sources of contamination observed within the Site, included and incorporated into the AECs, are as follows:

- Unbunded AST in the western portion of the northern Site area, understood to formerly contain diesel. At the time of AECOM's inspection (1 March 2011), the tank was reportedly empty;
- Two stockpiles, containing scrap metal, timber and plastic, located near the western boundary of the northern portion of the Site and in the north-western portion of the northern Site area;
- Potentially hazardous materials (lead paint and asbestos) associated with an abandoned residence and a derelict shed near the western boundary of the northern portion of the Site;
- Products potentially associated with timber furniture manufacturing near the western boundary of the northern portion of the Site;
- Oils and metals within a car wreck in the north-western part of the northern portion of the Site;
- Rusted drum in the south-western part of the southern portion of the Site; and
- Dam with contouring near the southern boundary of the southern portion of the Site and other contouring present throughout the southern portion of the Site, potentially containing imported fill materials of unknown origin.

otent al eceptors

Based on the Site inspection, potential receptors of contamination at the Site were identified as comprising:

- Current/future Site users;
- Construction and maintenance workers / visitors;
- Flora and fauna;
- Groundwater; and
- Black Creek located at the western boundary of the southern portion of the Site, Anvil Creek located north of the northern portion of the Site, and the Hunter River located north-east of the northern portion of the Site.

Potential contamination sources, pathways and receptors are discussed in more detail in **Sect on**

5.0 Preliminary Conceptual Site Model

eneral

Based on the information presented in the Phase 1 Investigation, there were several areas of potential concern with regards to the potential for significant soil, groundwater and/or surface water contamination.

This preliminary Conceptual Site Model (CSM) was developed based on the nature, location and migration potential of possible contamination sources associated with current and previous Site activities. The preliminary CSM identifies potential sources of contamination and possible exposure pathways to potentially sensitive receptors.

otent al Areas o n ronmental Concern

Potential contaminant sources that were identified during the Site inspection are discussed in **Sect on** . Based on this, the areas which are considered to be of potential areas of environmental concern (AECs) at the Site include:

- The area surrounding and down gradient of the unbunded AST near the western boundary of the northern portion of the Site;
- The area surrounding the demolished shed, abandoned residence and timber furniture manufacturing shed, located in the western part of the northern portion of the Site;
- The area beneath and adjacent to a car wreck in the north-western portion of the northern Site area;
- The stockpiles in the northern portion of the Site;
- The area surrounding the rusted drum in the south-western part of the southern portion of the Site;
- The contoured dam and channels in the southern part of the southern portion of the Site; and
- The north-western part of the northern portion of the Site, which appeared in the aerial photographs to have been cleared for quarrying purposes.

In addition, given the historic and current use of the majority of the Site as bushland, open space and grazing/cropping, the possibility of widespread past use of potentially hazardous herbicides and pesticides cannot be discounted, However, given their fate and transport in the environment and the phasing out of harmful herbicides and pesticides in past years, if indeed used, they are unlikely to remain near the site surface at significant concentrations and risk attributed with their use is considered to be very low. Localised areas of filling and the potential presence of farm equipment, animal carcass graveyards, etc. can also not be discounted.

Furthermore, contamination of surface water and groundwater is known to have occurred at the adjacent Ayrefield Colliery (currently owned by Huntlee). Although the former colliery is currently a potential area of concern with respect to potential migration of contamination onto the Site, it is AECOM's understanding that Huntlee are currently addressing these issues and further assessment is beyond the scope of this report.

However, given the substantial distance to the Site and the depths of the significant water bearing zones, the potential for significant groundwater contamination from this off-site source is considered negligible. It is further noted that Huntlee has undertaken a commitment to remediate the colliery property during future redevelopment of the mine. It is understood that detailed investigation of the mine will be undertaken over the next 2 years and any required remediation will be subsequently undertaken. The results of the gas monitoring at the landfill located on the former Ayrefield colliery do not indicate that ground gas, or its potential migration, is a problem.

otent al Contam nants o Concern

Based on the AECs identified above, the contaminants of potential concern (CoPC) at the Site are considered to include:

- Heavy Metals – commonly found in fill materials and may be associated with the rusted metals observed at the Site. Common metal contaminants include arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc. Arsenic and chromium are also common constituents of some timber treatment products and pesticides that may have been used on the Site. Lead may also be found in the northern portion of the Site in proximity to the furniture manufacturing shed, abandoned residence or derelict shed, associated with lead-based paints, which may have potentially been used at these locations;

- Organochlorine and organophosphate pesticides (OCP/OPPs) – associated with timber furniture manufacturing and historical agricultural land use;
- Asbestos – may be present in fill materials potentially used in the buildings on the northern Site;
- TPH and Benzene, Toluene, Ethylbenzene and Xylenes (BTEX) – associated with the former diesel storage in an AST in the north-western portion of the northern Site area. TPH and BTEX may also be present in the vicinity of the car wreck; and
- PAHs and Phenols– associated with the small scale, non-industrial timber furniture manufacturing in the northern portion of the Site and the storage of diesel. AECOM notes that anecdotal evidence indicated that chemicals have not been used in the manufacturing of the furniture.

otent al ath a s an eceptors

Potential contamination exposure/migration pathways between sources of contamination and potential sensitive receptors identified at the Site are discussed below.

uman ealth

Pathways between sources of potential contamination and human receptors, including current/future Site users, construction and maintenance workers and visitors, are considered to include:

- Direct dermal contact with contaminants or contaminated media (soil, groundwater, surface water);
- Inhalation of dust and/or fibres; and
- Ingestion of soil/soil dust.

n ronmental ealth

Pathways between sources of potential contamination and environmentally sensitive receptors, including groundwater on Site and down hydraulic gradient from the Site, surface water courses (Black Creek, Anvil Creek and Hunter River) and flora and fauna on Site, are considered to include:

- Leaching of mobile contaminants from soils to groundwater;
- Groundwater migration to off-site receptors (notably Black Creek located west of the southern portion of the Site and Hunter River located north-east of the northern portion of the Site);
- Uptake by Site flora through soil and/or contaminated groundwater/surface water; and
- Uptake by Site fauna through ingestion of soil, flora and/or contaminated groundwater/surface water.

6.0 Assessment Criteria

So l Assessment Cr ter a

The current criteria endorsed by NSW EPA to evaluate soil analytical results are based on the following guidelines:

- NSW DEC (2006). *Guidelines for the NSW Site Auditor Scheme (2nd Edition)*.
- NEPC (1999). *National Environment Protection (Assessment of Site Contamination) Measure*.
- NSW EPA (1994). *Guidelines for Assessing Service Station Sites*.

The guidelines to which soil analytical results are compared within NSW present a range of Health-based Soil Investigation Levels (HILs), provisional Phytotoxicity-Based Investigation Levels (PILs), Ecological Investigation Levels (EILs), sensitive land use thresholds and expected background concentration ranges for urban redevelopment sites in NSW. Application of these guidelines is briefly described below.

l s

The HILs described in NSW DEC (2006) and NEPC (1999) are based on the National Environmental Health Forum (NEHF) levels devised by Imray and Langley (1996). A series of statistically based guideline levels are provided for various substances for the protection of human health based on four specific land use and exposure scenarios including:

- HIL_1 - Residential with gardens and accessible soil (home-grown produce contributing less than 10% fruit and vegetable intake; no poultry), including children's day care centres, preschools and primary schools, or town houses or villas;
- HIL_2 - Residential with minimal access to soil access, includes dwellings with fully and permanently paved yard space such as high-rise apartments and flats;
- HIL_3 - Parks, recreational open space, playing fields including secondary schools; and
- HIL_4 - Commercial or industrial.

For the assessment of petroleum hydrocarbon contamination, NSW DEC (2006) refer to the use of the *Guidelines for Assessing Service Station Sites* (NSW EPA 1994), which contains threshold concentrations for petroleum contaminants in soil and provide for the protection of human and environmental health assuming a sensitive land use. Although these concentrations are considered conservative for the Site's commercial/industrial land use, the NSW EPA (1994) threshold concentrations will be applied for screening purposes since the development layout is not yet known and is subject to change.

The NSW DEC (2006) assessment process also stipulates that the impact of contaminants on ground and surface water, potential degradation of building structures and effects of chemical mixtures need to be considered and that HILs may not be appropriate for the protection of groundwater, surface water or all potential environmental concerns, such as the protection of wildlife.

l s l s

The PILs (NSW DEC, 2006) and EILs (NEPC 1999), which are equivalent, relate to the protection of plants, and are designed to be applied as single number criteria indicative of environmental effect. Their use has significant limitations since phytotoxicity depends on soil properties and the species of plants, and is intended to be applied as a screening guide only. The "Decision-making Process" listed in NSW DEC (2006) for assessing urban redevelopment sites relate to sandy loams with a pH range of 6 to 8 and stipulates that the PILs need to be considered on sites used for residential purposes, parks, recreational open space and schools. It is assumed that when the Site is redeveloped, importation of clean subsoil/topsoil cover to gardens/landscaped areas is anticipated and therefore significant impacts are considered negligible and not considered further in this assessment. PILs are therefore not considered applicable to this assessment.

A opte So l Assessment Cr ter a

Given the proposed residential (with access to soil)development in parts of the Site and that the development layout for less sensitive area is not yet known and subject to change, the soil analytical results have been compared to the following soil assessment criteria (SAC), which are deemed suitably conservative for the intended purpose:

- NEPC (1999) HIL_1 criteria – heavy metals, PAHs, pesticides and phenols (where applicable); and

- NSW EPA (1994) criteria – TPH and BTEX.

The SAC and the soil analytical results obtained as part of this assessment are presented in **Table T Appen** .

roun ater Assessment Cr ter a

No shallow groundwater was identified during this investigation and therefore development of groundwater assessment criteria is not considered necessary.

7.0 Sampling and Analysis Plan

In accordance with Step 7 of the DQO process, as discussed in **Sect on** , the following sampling and analysis plan was developed to optimise the collection of data. The sample and analysis plan was based on the results of the Phase 1 ESA and revised in the field based on the results of the Site Inspection undertaken on 3 May 2012.

Sampl n ocat on at onale

As discussed, the soil sampling program was based on the results of the Phase 1 ESA and was revised based on the Site inspection conducted in May 2012. The sampling program targeted the identified AECs to assess the status of potential soil and groundwater contamination. Three monitoring bores were installed on Site, however as previously discussed, groundwater was not encountered within the upper 6 m of surface deposits, indicative of negligible shallow aquifer potential or perched water potential, including base flow to local dams and creeks.

The sampling program comprised a targeted soil sampling strategy in line with the SEPP55 approach for Stage 1 Preliminary Site Investigations. The adopted sampling program does not, therefore, strictly follow the NSW EPA (1995) guidelines. However, given that the purpose of the investigation was to assess potential contamination at the identified AECs to support the Project Approval Application, it is AECOM's opinion that the sampling program adopted is appropriate to detect any significant contamination issues associated with the AECs.

The rationale behind the sampling program is provided in **Table** below.

Table Sample ocat on at onale

Sampl n ocat on	Area o otent al Concern	F ures
Grab 01 - 03	Site Coverage – OPP/OCPs	**F ure F**
Grab 04	Minimal storage of scrap material –metals and asbestos	**F ure F**
Grab 05 - 06	Adjacent to small drum storing transmission oil (staining evident) – TPHs and PAHs	**F ure F**
Grab 07 - 08	Adjacent to Site shed where furniture manufacturing had occurred – Metals, TPHs, PAHs, OPP, OCP	**F ure F**
BH01	Site Coverage and to target groundwater - Metals, TPHs, PAHs, OPP, OCP	**F ure F**
BH02	Adjacent to Site shed where furniture manufacturing had occurred – Metals, TPHs, PAHs, OPP, OCP	**F ure F**
BH03, BH05, BH06 and SP01	Adjacent to AST and storage of scrap material - Metals, TPHs, PAHs, OPP, OCP	**F ure F**
BH07	Adjacent to septic tank - Metals, TPHs, PAHs, OPP, OCP	**F ure F**
BH08 – BH11	Adjacent to scrap storage areas, derelict shed - Metals, TPHs, PAHs, OPP, OCP and Asbestos	**F ure F**
BH04	Area associated with previous clearing activities and to target groundwater - Metals, TPHs, PAHs, OPP, OCP	**F ure F**
SP01 and SP02	Stockpile of waste materials - Metals, TPHs, PAHs, Asbestos	**F ures F**

So l Assessment etho olo

The soil sampling program was undertaken on 3, 8 and 9 May 2012. Soil sampling techniques were conducted with reference to the relevant guidelines endorsed by NSW EPA. The soil assessment methodology is described in **Table** below.

Table So l Assessment etho olo

Act t	eta ls
Boreholes	Drilling subcontractors, Total Drilling, were engaged to undertake the drilling works. A Truck Mounted drill rig was used to advance boreholes using solid stem augers. Standard Penetration Test (SPT) also known as a split-spoon sampler was generally used to collect soil samples.
Soil Sampling	Soil samples were collected by gloved hand direct from the SPT casing and placed into laboratory-prepared glass jars with Teflon-lined lids. A new pair of disposable nitrile sampling gloves was used to collect each sample and the SPT was decontaminated between each sampling point. Surface samples (i.e. "Grab Samples") were collected using a trowel which was decontaminated in a bucket of diluted Decon 90 then rinsed in potable water in between sampling locations. Samples of suspected ACM were collected and placed directly into plastic zip-lock bags and double bagged.
Soil logging	Soil logging was undertaken in general accordance with the Unified Soil Classification System and AECOM standard field procedures. Samples were logged and information was recorded in the field (e.g. soil/rock type, colour, grain size, inclusions, moisture conditions, staining and odour, etc.).
QC samples	Duplicate and triplicate samples were collected at an approximate rate of 1 per 10 and 1 per 20 primary samples, respectively, in accordance with the DQIs discussed in **Appen F**.
Field Screening	Soil sub-samples were placed in snap-lock plastic bags and the headspace screened in the field for VOC using a calibrated PID equipped with a 10.6 eV lamp. Calibration details are provided in **Appen** .
Decontamination	Samples were generally collected directly from the SPT, which were decontaminated with Decon 90 and rinsed in portable water between sampling. One rinsate sample was collected each day to assess decontamination procedures used in the investigation.

Soil samples were collected throughout the profile, at changes in lithology and where evidence of contamination was noted (odours, elevated PID readings, etc.).

The target depth of the boreholes was dependent on observations made during the fieldwork and the presence of water bearing layers. Boreholes were to be extended a minimum of 1 m into natural soils, with the exception of the boreholes to be converted to groundwater wells, which were to be extended a maximum depth of 6 m bgs to check for the presence of a shallow groundwater table.

All boreholes not converted to groundwater monitoring wells were backfilled with drilling spoil (if no contamination was identified) and reinstated to original surface levels.

roun ater Assessment etho olo

The groundwater monitoring well installation, monitoring and sampling program completed by AECOM is summarised in **Table** below:

Table roun ater Assessment etho olo

Act t	scuss on
Boreholes	Groundwater monitoring wells were installed following completion of the boreholes. Boreholes were widened and/or advanced using solid augers as required prior to installation.
Well construction	Monitoring wells were constructed using Class 18 uPVC 50 mm outside diameter machine threaded casing and 0.4 mm slotted screen. Well construction, including screen lengths, was based on observations made during the drilling at each location. Monitoring well construction details are provided on the borelogs presented in **Appen C**.
Well development, gauging, purging and sampling.	All groundwater wells were dry and therefore no development was required. AECOM returned to Site the following week to assess groundwater conditions; however, the wells still did not yield any water confirming the conditions recorded during drilling.

Anal t cal lan

Analysis of primary and intra-laboratory duplicate samples was conducted by Australian Laboratory Services Environmental (ALS). Inter-laboratory duplicate samples were analysed by MGT-Labmark. Both laboratories are NATA accredited for the analyses undertaken.

An assessment of the reliability and adequacy of the analytical data is provided in **Sect on** and **Appen F**.

So l Anal t cal lan

The soil analytical program comprised the following:

- A minimum of two primary soil samples per borehole (25 in total) were analysed for a combination of TPH, BTEX PAH, OCP, OPP, metals (including As, Cd, Cr, Cu, Pb, Ni, Zn and Hg) and Asbestos. Samples were selected for analysis where visual or olfactory evidence of contamination was noted and/or to provide general coverage of the investigation area;
- Eight grab samples were collected from areas of concern and two samples were collected from stockpiles on Site and were analysed for a combination of TPH, BTEX PAH, OCP, OPP, heavy metals (including As, Cd, Cr, Cu, Pb, Ni, Zn and Hg) and Asbestos;
- Selected soil samples were also analysed for Australian Standard Leaching Procedure (ASLP) for TPH and Metals to assess potential to leach and impact groundwater; and
- Intra-laboratory and inter-laboratory duplicate samples were collected and analysed at an approximate rate of 1 per 10 and 1 per 20 primary samples (respectively) according to the DQIs provided in **Appen F**.

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8.0 Quality Assurance and Quality Control

ata al at on

The QA/QC programme implemented for this contaminated land assessment was generated as the outcome of the seven-step DQO process, as described in **Sect on** .

The achievement of the project DQOs was demonstrated by reference to the DQIs which are based on the SPARCC (sensitivity, precision, accuracy, representativeness, completeness and comparability) parameters. Details of the DQIs are presented in **Appen F**.

Achievement of the DQIs is discussed in **Appen F**.

ata seab l t

The data validation procedures employed in the assessment of the field and laboratory QA/QC data indicated that the reported analytical results are representative of soil and groundwater conditions at the sample locations and that the overall quality of the analytical data produced is acceptably reliable for the purpose of this investigation.

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9.0 Investigation Results

F el bser at ons

Sur ace Con t ons

The western portion of the northern portion of the Site was generally heavily vegetated with established woodland, with the exception of access roads and buffer zones around residential properties which were generally grassed. The eastern portion of the northern portion of the Site was a combination of woodland and open grazing land with established vegetation and grass cover. There were no signs vegetation stress observed during the Site Inspection. AECOM notes that no AECs were identified in the southern portion of the Site and therefore this area has not been included in the targeted investigations.

A summary of the surface conditions associated with each of the AECs is provided in **Table** below.

Table Summar o Sur ace bser at ons n A Cs

In est at on Area	Sur ace Con t ons
Area surrounding unbunded AST in northern portion of the Site	Some minor staining on the ground surrounding the AST.
Timber furniture manufacturing area in the northern portion of the Site	No longer used for furniture manufacturing and no sign of timber treatment products. Majority of area cleared with newly laid compacted fill.
Derelict shed and abandoned residence, both in the northern portion of the Site	Residence currently being renovated, shed demolished – evidence of bonded asbestos material associated with former shed.
Two stockpiles in the northern portion of the Site	Stockpile contained a combination of soil/fill and waste material (metals/plastics, etc.).
Residential Property	Some localised staining identified adjacent to small drum of transmission oil.
Remainder of Site	Undeveloped, open space with established vegetation.

F ll ater als

There was no evidence of significant quantities of imported fill observed at the sampling locations. All boreholes were overlain with minor quantities of topsoil with the exception of BH2, BH03, BH04 and BH09, which were generally overlain with sandy clay and gravel.

atural So ls an eolo

Natural soils encountered generally comprised low plasticity sandy clay (likely to be completely weathered bedrock) underlain by suspected sandstone bedrock at shallow depth. Occasional granular lenses of material were recorded within the clay matrix.

Extremely weathered sandstone bedrock (very stiff to hard clay) was encountered in the deeper bores, at depths varying from 1.2 to 2.4 m below ground surface (bgs) and from 0.7 – 1.7 m bgs. This was underlain by suspected fresh sandstone bedrock at around 6 m bgs.

l Screen n

Field screening of soil samples was undertaken using a PID, the results of which are recorded on the borelogs (**Appen C**). PID results were typically negligible across the Site, ranging between 0.0 parts per million (ppm) (various locations) and 0.3ppm (BH03 0.02 and 0.4 m bgs).

Anal t cal esults

Soil analytical results are provided in **Tables T** (**Appen**). Concentrations of TPH (C_{10}-C_{36} fractions) in soils that exceeded the SAC are presented on **F ure F** (**Appen A**). Laboratory Certificates, including AECOM chain of custody documentation, are provided in **Appen** .

The results of the soil assessment are summarised in the following sections.

T an T

TPH (C -C fractions) concentrations were not detected at concentrations greater than the laboratory limit of reporting (LOR) in any of the samples analysed.

TPH (C -C fractions) concentrations were detected at concentrations greater than the laboratory LORs in seven of the 32 soil samples analysed for TPH. Concentrations reported greater than the laboratory LORs ranged from 220 mg/kg (BH04_0-0.1) to 27 400 mg/kg (BH03_0.02-0.12). The following two soil samples contained concentrations greater than the NSW EPA 1994 threshold of 1000 mg/kg for TPH (C_{10}-C_{40}):

- BH03_0.02-0.12 (27 400 mg/kg); and
- Grab 06 (27 240 mg/kg).

BTEX compounds were detected at concentrations greater than the laboratory LOR in one sample (BH03_0.02-0.12), but these concentrations were less than the adopted SAC.

A s an henols

PAHs were not detected at concentrations greater than the laboratory LOR in any of the samples analysed.

Phenols were not detected at concentrations greater than the laboratory LOR in any of the samples analysed.

etals

Concentrations of lead greater that the SAC were identified in sample SP01, which returned a concentration of lead of 1550 mg/kg. This is greater than the residential and industrial land use criteria.

All other metal/metalloid concentrations were less than either the laboratory LORs or the SAC.

C s an s

OCPs and OPPs were not detected at concentrations greater than the laboratory LORs in any of the samples analysed.

Asbestos

Expected asbestos containing materials were visually identified on Site and confirmed by laboratory analysis. No free fibres were identified in any of the soil samples analysed. Asbestos fibres in soils were analysed in samples where corresponding asbestos containing material fragments had been identified.

eachate esults

Leachate analytical results are provided in **Tables T** (**Appen**). Laboratory Certificates including AECOM chain of custody documentation are provided in **Appen** .

T an T

Leachable concentrations of TPH (C -C fractions) were detected at concentrations greater than the laboratory LOR in sample Grab 06 (590 µg/L). No other samples analysed had leachable concentrations of TPH greater than the laboratory LOR.

etals

Leachable concentrations of metals and metalloids were detected at concentrations greater than the laboratory LOR in the following:

- Arsenic: 0.002 mg/L - 0.034 mg/L (BH03_0.02-0.12, BH03_0.8-0.9, BH04_0-0.1, BH04_2.9-3.0, BH05_0-0.1, BH05_2.1-2.1, and BH11_0-0.3 and BH11_1.9-2.9);
- Cadmium: 0.002 mg/L - 0.004 mg/L (BH03_0.02-0.012 and BH11_1.9-2.0);
- Chromium: 0.002 mg/L – 0.148 mg/L (BH03_0.02-0.12, BH03_0.8-0.9, BH04_0-0.1, BH04_2.9-3.0, BH05_0-0.1, BH05_2.1-2.1, and BH11_0-0.3 BH11_1.9-2.9 and Grab 06);
- Copper: 0.002 mg/L – 0.081 mg/L (BH03_0.02-0.12, BH03_0.8-0.9, BH04_0-0.1, BH04_2.9-3.0, BH05_0-0.1, BH05_2.1-2.1, and BH11_0-0.3 BH11_1.9-2.9 and Grab 06);
- Lead: 0.001 mg/L – 0.125 mg/L (BH03_0.02-0.12, BH03_0.8-0.9, BH04_0-0.1, BH04_2.9-3.0, BH05_0-0.1, BH05_2.1-2.1, and BH11_0-0.3 BH11_1.9-2.9 and Grab 06);

- Mercury: 0.0001 mg/L (BH03_0.8-0.9);
- Nickel: 0.002 mg/L – 0.496 mg/L (BH03_0.02-0.12, BH03_0.8-0.9, BH04_0-0.1, BH04_2.9-3.0, BH05_0-0.1, BH05_2.1-2.1, and BH11_0-0.3 BH11_1.9-2.9 and Grab 06); and
- Zinc: 0.089 mg/L – 2.79 mg/L (BH03_0.02-0.12, BH03_0.8-0.9, BH04_0-0.1, BH04_2.9-3.0, BH05_0-0.1, BH05_2.1-2.1, and BH11_0-0.3 BH11_1.9-2.9 and Grab 06).

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10.0 Discussion

Sources ature an tent o Contam nat on

So l

Organic Contaminants

Concentrations of TPH (C_{10}-C_{36}) were recorded at two locations, which exceeded the assessment criterion for residential land use. One of these locations was sample Grab 06, located adjacent to a small drum of transmission oil which had had a minor spill. Although elevated concentrations were detected in the grab sample collected, the area of impact was minor and of a negligible volume. A sample collected approximately 2 m north of the drum which had concentrations of TPH less than the laboratory LOR. No sample was taken from depth, however, visual staining was confined to the upper 5 cm of soil. Minor leaching of TPH from Grab 06 did occur under laboratory conditions, however, given the substantial depth to groundwater, impact to the wider environment in unlikely, In addition to this, the concentrations are generally within the heavier fractions (C_{15}-C_{36}) and therefore vapour intrusion into the adjacent property is also considered unlikely. It is likely that the impacted shallow soils will be stripped to allow construction works, therefore it is recommended that this minor volume of impacted material be excavated and characterised, which should include additional sampling of the material after excavation for waste classification purposes, for off-site disposal to a suitably licensed facility,. Validation sampling of underlying soils should also be undertaken.

The second location where TPH was identified in surface soils, in exceedence of the SAC was BH03_0.02_0.12, located adjacent to the unbunded diesel tank located on Site. Concentrations were confined to the shallow surface soils and no impact was identified in the sample collected at BH03_ 08-09. Minor TPH concentrations were identified at levels less than the SAC at samples within this area (BH05 and BH06), indicating the impact is representative of a small volume of soil and is likely associated to minor spills from the diesel AST. A groundwater bore was installed in BH03, however no groundwater was encounter. No leaching of TPH was reported in sample BH03_0.02_0.12. Again, given the depth of groundwater and that no leaching of the TPH within this sample occurred, the risk to the wider environment is considered to be low. Again, this minor volume of impacted material should be excavated for disposal off site. Additional sampling of the material should be undertaken, after excavation, for waste classification purposes and validation samples taken from the underlying soils. Concentrations less than the SAC were detected in BH07, located adjacent to the septic tank, and in BH04, located in the portion of the Site adjacent to the potential quarry activities. These concentrations were only marginally greater than the laboratory LOR and are not considered to be associated with wide spread TPH impact or to warrant further investigation (such low concentrations can also be naturally occurring).

No concentrations of BTEX, PAHs, OCP, OPP or phenols were identified at concentrations greater than the laboratory LOR.

Inorganic Contaminants

No inorganic contaminants (i.e. heavy metals) greater than the adopted assessment criteria were encountered in any of the soil samples analysed, with the exception of one sample from SP01 which reported a lead concentration greater than the SAC. Similarly, this small volume of material is recommended for off-site disposal to a licensed facility. However, additional sampling will be required in order to classify the material appropriately and validate the excavations.

Some leaching of metals is apparent in the samples analysed, however, as these samples are generally from natural materials on Site and are not associated with a contaminant source, it is likely that these concentrations are indicative of background concentrations. Based on the bore search completed, the depths of the significant water bearing zones are between 30 to 32 m and in excess of 60 m bgs. A plausible pathway to groundwater is not therefore considered realistic. Moreover the shallow deposits are of very low permeability and considered to be of negligible aquifer potential, thereby plausible pathways to surface water receptors is also not considered realistic.

Fibrous Asbestos Materials

Asbestos has been identified on Site, generally in the low risk, bonded form and likely associated with roofing materials from old buildings on Site. This material should be removed from Site and disposed of accordingly, to prevent any further weathering of the asbestos, which may result in the release of loose fibres at a later date, which could cause a risk to human health. No asbestos fibres were identified in the soil samples recovered to

date, however validation samples should be collected to confirm that no risk remains after the asbestos containing material have been removed.

p ate Conceptual S te o el

The Conceptual Site Model (CSM) provides an overview of impacted media, contaminant transport pathways, exposure routes and exposed receptors, in order to evaluate potential risks associated with contamination identified at the Site.

Contam nants o otent al Concern

Based on review of available historical information, observations made during Site inspections, and results of investigation conducted at the Site, the contaminants of potential concern (CoPCs) related to the activities conducted at or near the Site were identified as follows:

- **ea en petroleum h rocarbons**, associated with the localised and historic use of fuels and oils. The use and storage of fuels and oils has not been extensive and any impact is considered to be minor and of negligible volume in the context of the overall development;
- **etals** associated with fill materials and stockpiled waste. Not considered to have extensive impact on Site given the scale of the proposed development; and
- **Asbestos** associated with redundant building materials, however no free fibres were identified in any of the soils analysed.

ropert es an Fate an Transport o Contam nants

The properties and behaviours of the identified contaminants in the environment are summarised as follows:

- **etroleum h rocarbons** heavy end (semi-volatile) petroleum hydrocarbons. Heavy end petroleum hydrocarbons released to the soil may migrate through the soil and the individual compounds may then separate from the original mixture, depending on the chemical properties of the compound. Some of these compounds will slightly evaporate into voids within the soil and others will dissolve into the groundwater and move away from the source. Other compounds will attach to particles in the soil and may stay in the soil for a long period of time, while others will be broken down by organisms found in the soil. Some leaching was identified in the sample associated with the transmission oil, however the impact is confined to surface soils and only relatively low leachable concentrations were identified;
- **etals** have mobility in soils based on the ion exchange chemical reaction between the metal itself and the soil particles. Acid soil and groundwater conditions are likely to increase the mobility of metals from soil into groundwater, however, given the depth to groundwater, this is unlikely to be a risk. The leachable concentrations of metals detected are likely to be associated with background concentrations associated with the mineral composition of the soil rather than a significant source from fill/waste stockpiles; and
- **Asbestos** in the bonded form is relatively stable and unlikely to become airborne, however as this material weathers due to exposure to the elements and age, it is possible that fibres may become free in the future which can be inhaled causing impairment of human health.

otent al eceptors

The following have been identified as potential human and ecological receptors within the immediate vicinity of the Site:

- Current on-Site residents, construction and maintenance workers, recreational users and trespassers in the areas with the identified impact;
- Future residents, construction and maintenance workers, recreational users and trespassers of the new Huntlee development; and
- Fauna and flora present within the immediate vicinity of the areas identified with impact.

Given the localised nature of the impact identified and the depth to groundwater, surface water and groundwater are not considered to be plausible potential receptors.

otent al posure ath a s

The following have been identified as potential exposure pathways for human and ecological receptors within the immediate vicinity of the Site:

- Ingestion, absorption (direct dermal contact) and inhalation of impact soils/soil dust; and
- Inhalation of asbestos fibres.

Given the localised nature of the impact identified and the depth to groundwater, surface water and groundwater are not considered to be potential exposure pathways.

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11.0 Risk Assessment

eneral

The following section provides an evaluation of the potential for the Site to pose a risk of harm to human health and/or the wider environment with respect to the identified contamination sources.

The risk assessment considers the potential sources and nature of contaminants, pathways and receptors and assumes the most sensitive future land use as residential for a precautionary approach at this stage of assessment.

s Assessment etho olo

A qualitative risk assessment, generally based on the Construction Industry Research and Information Association (CIRIA) Contaminated Land Risk Assessment – A Guide to Good Practice (D J Rutland et al, 2001), has been conducted in order to assess the potential risks at the Site. This will determine an overall risk category which is used to identify required actions. This methodology uses non-quantitative descriptors and therefore is a qualitative approach. For a risk to exist there must be some mechanism (a pathway) by which contamination from a given source can reach a given receptor. A complete *source-pathway-receptor* relationship is generally referred to as a complete *pollutant linkage*.

The methodology employed requires the classification of:

- The magnitude of the consequences if a risk occurs; and
- The magnitude of the probability of the risk occurring.

The potential consequences of contamination risk occurring at the Site have been classified in accordance with **Table** below.

Table Class cat on o Conse uence

Class cat on	e n t on o Conse uences
Severe	Irreversible damage to human health. Substantial pollution of sensitive water resource. Significant change to the number of one or more species or ecosystems. Irreparable damage to crops, buildings, structures or the environment.
Medium	Non-permanent human health effects. Substantial pollution of non-sensitive water resources. Changes to population densities of non-sensitive species or ecosystems. Significant damage to crops, buildings, structures or the environment (on or off-site). Contamination of off-site soils or groundwater.
Mild	Easily preventable, short term human health effects. Contamination of on-site soils and groundwater. Limited pollution of non-sensitive water resources. Some changes to population densities with no negative effects on the function of the ecosystem. Localised, easily repairable damage to crops, buildings, structure or the environment (on or off-site).
Minor	No measurable effects to human health. Minor, low-level and localised contamination of on-site soils, surface water or groundwater. No off-site impacts. Non-structural damage or cosmetic harm to building or structures.

The probability of contamination risks occurring at the Site has been classified in accordance with **Table** below, which has also been adapted from the CIRIA guidance. Note that for each category, it is assumed that a pollution linkage exists. Where a pollution linkage does not exist, the likelihood is zero, as is the risk.

Table Class cat on o robab l t

Class cat on	e n t on o robab l t
High Likelihood	Circumstances are such that an event appears very likely in the short term or almost inevitable in the long-term, or there is already evidence that such an event has occurred.
Likely	Circumstances are such that such an event is not inevitable, but it is possible in the short term and is likely over the long-term.
Low Likelihood	Circumstances are such that it is by no means certain that an event would occur even over a longer period, and it is less likely in the short-term.
Unlikely	Circumstances are such that it is improbable that an event would occur even in the very long-term.

For each possible pollutant linkage (source-pathway-receptor) identified, the potential risk has been evaluated as presented in **Table** .

Table Conse uence an robab l t Assessment

		Conse uence			
		Se ere	e um	l	nor
robab l t	h el hoo	Very High Risk	High Risk	Moderate Risk	Low Risk
	el	High Risk	Moderate Risk	Moderate Risk	Low Risk
	o el hoo	Moderate Risk	Moderate Risk	Low Risk	Very Low Risk
	nl el	Low Risk	Low Risk	Very Low Risk	Very Low Risk

Table below presents the Qualitative Risk Assessment for the Site, based on the findings of the investigation and the above methodology.

Table uant tat e s Assessment

otent al Source Area	otent al Contam nants	Sens t e eceptor s	Conse uence	robab l t	s an n
Area surrounding unbunded AST	TPH/BTEX	Current and future Site residents, workers/visitors (contact with contaminated soil) Flora and fauna	Mild	Low Likelihood	Low Risk
Shed used for timber furniture manufacturing	Metals, TPH/BTEX, phenols	Current and future Site residents, workers/visitors (contact with contaminated soil) Flora and fauna	Minor	Unlikely	Very Low Risk
Two stockpiles containing scrap metal, timber and plastic	Heavy metals, TPH/BTEX, asbestos, OC/OP pesticides	Current and future Site residents, workers/visitors (contact with contaminated soil) Flora and fauna	Mild	Low Likelihood	Low Risk

otent al Source Area	otent al Contam nants	Sens t e eceptor s	Conse uence	robab l t	s an n
Derelict shed and abandoned residence	Asbestos, metals	Current and future Site residents, workers/visitors (contact with contaminated soil) Flora and fauna	Mild	Low Likelihood	Low Risk
Cleared area in the north-western part of the northern portion of the Site	Metals	Site residents and workers/visitors (contact with contaminated soil) Flora and fauna	Minor	Unlikely	Very Low Risk
Overall Site for pesticide use related to farming	OCPs/OPPs	Site residents and workers/visitors (contact with contaminated soil) Flora and fauna	Minor	Unlikely	Very Low Risk

Given the anticipated depth to groundwater and the distance of any of the AECs from surface water receptors, groundwater and surface water are not considered a potential receptor.

Table below presents the Qualitative Risk Assessment for the Site, for areas identified in the Phase 1 ESA as very low risk, which were not considered to warrant further investigation at this stage.

Table ual tat e s Assessment or the S te

otent al Source Area	otent al Contam nants	Sens t e eceptor s	Conse uence	robab l t	s an n
Car wreck	Metals, TPH/BTEX	Site residents and workers/visitors (contact with contaminated soil) Flora and fauna	Minor	Unlikely	Very Low Risk
Contoured dam	Metals, TPH/BTEX	Site residents and workers/visitors (contact with contaminated soil) Flora and fauna	Minor	Unlikely	Very Low Risk
Rusted drum	Metals/TPH/BTEX, OC/OP pesticides	Site residents and workers/visitors (contact with contaminated soil) Flora and fauna	Minor	Unlikely	Very Low Risk

Summar o s s

Table below summarises the potential source areas and ranks them in order of risk.

Table Summar o otent al Source Areas an s an n s

s an n	otent al Source Area
Low Risk	Area surrounding AST in northern portion of the Site
	Two stockpiles in the northern portion of the Site
	Derelict shed and abandoned residence, both in the northern portion of the Site
Very Low Risk	Area around the car wreck in the northern portion of the Site
	Cleared area in the north-western portion of the northern portion of the Site
	Dam with contouring in the southern portion of the Site
	Rusted drum in the southern portion of the Site
	Overall Site for pesticide use
	Shed used for timber furniture manufacturing located in the northern portion of the Site

Table presents the indicative actions that could be necessary at each risk ranking identified at the Site.

Table e n t on o s an el Act ons e u re

s Cate or	e n t on an el Act ons e u re
Moderate	Harm to a defined receptor is possible, and could have a moderate consequence. Liabilities could possibly arise. Further investigation is required. Remediation could possibly be required.
Low	Harm to a defined receptor is possible, but is likely to be mild at worst. Liabilities could theoretically arise, but are unlikely to be substantial. Further investigation is not required at this stage. Minor remediation and material management required. EMP may be required.
Very Low	Harm to a defined receptor is unlikely, and would be minor at worst. No substantial liabilities are likely to arise. Further investigation is not required at this stage. Material management may be required (i.e. disposal of scrap) Remediation is very unlikely to be required. EMP may be required.

12.0 Conclusions and Recommendations

Conclus ons

The purpose of this investigation was to assess the potential for significant source areas of contamination to be present within potential AECs that could impede the proposed Huntlee Stage 1 Development and to provide a sufficient Stage 1 Preliminary Site Investigation to support the Project Approval Application. The following conclusions are drawn:

- Elevated concentrations of TPH were identified at two locations within the Site at concentrations greater than the assessment criteria. The first of these was associated with a minor spill from a small drum of transmission oil located on a residential property. The second area was associated with a small spill from a small unbunded diesel AST located in proximity to the Site shed. Both areas of impact, although resulting in elevated concentrations (approximately 27 000 mg/L) are considered to be of minor volume and are unlikely to have impacted groundwater/surface water/runoff due to the low permeability of the underlying geology, depth of groundwater underlying the Site and the leachable concentrations of TPH;
- Elevated concentrations of lead were encountered in one soil sample from a stockpile of waste material including metals scraps and fragments located near the unbunded AST. No other elevated concentrations of metals were detected in any of the samples analysed;
- Leachable concentrations of metals were detected; however these samples have generally been from natural soils with no obvious source of metal contamination and therefore are likely to be associated with the natural mineral composition of the soil, rather than a significant source of contamination;
- Asbestos containing materials have been identified on Site. No asbestos fibres were reported in the soil samples analysed;
- No concentrations of BTEX, PAHs, OCP, OPP and phenols were identified at concentrations greater than the laboratory LOR; and
- The absence of reportable OCP/OPP concentrations supports AECOM's opinion that wide scale use and adverse impact from pesticide / herbicide use is unlikely to have occurred, and that this is unlikely to pose a Site wide and significant impediment to the proposed development.

The qualitative risk assessment undertaken on the areas of environmental concern concluded that the concentrations and volume of impacted materials is generally a low and therefore there is a low to very low potential risk to human health and the wider environment. Given the anticipated depth to groundwater, low permeability of the underlying geology and the distance of any of the AECs from surface water receptors, groundwater and surface water are not considered a potential receptor. There does not appear to be a significant, wide scale or gross, contaminant source on Site requiring substantial remedial works prior to development. However AECOM recommends that the bonded asbestos exposed at the Site surface be removed as a priority.

The former Ayrefield Colliery located approximately 200 m south of the Site boundary and also owned by Huntlee, will be incorporated into later development stages and is to be thoroughly investigated and remediated in the foreseeable future (less than 2 years). AECOM understands that the former landfill located at the former colliery, is currently undergoing closure and capping and that gas and leachate monitoring results recorded to date do not indicate that gas and leachate generation is a significant impediment to surrounding development. Given the distance of the colliery from the Site, the anticipated depth to groundwater and the geological profile (stiff clays), the potential for migration of contamination from the colliery to the Site is considered to be low. AECOM notes that the Ayrefield Colliery, defined on Figure 47 of the Draft DCP as contaminated and will require a Stage 2 Detailed Investigation, is outside of the Stage 1 Application Boundary. A Remedial Action Plan (RAP) will be required as part of any project approval application relating the Ayrefield Colliery.

Overall contamination issues should not be seen as an impediment to the proposed development and further Stage 2 Detailed Investigations for contamination are not considered necessary at this stage for of the following reasons.

- The Site has not historically been extensively used for any activity presented in Table 1 of SEPP 55, including agriculture;

- The level of contamination is considered to be minor and any change in future land use is not considered to have the potential to increase the risk of exposure to contamination subject to the implementation of the recommendations presented below; and
- The Site is not included in the area identified as requiring detailed Stage 2 Investigation (based on historical uses identified in Table 1 of SEPP 55).

The Site history review indicated that the Site has not been used for potentially contaminating industrial or agricultural activities and the potential for significant contamination to have occurred at the Site is considered to be low. The investigations conducted in the AECs are considered to be adequate to assess the risk associated with the limited impacts identified. As the contamination is considered minor in nature and the associated risk low, further detailed investigation is not considered necessary to delineate the extent of impact. Based on the information to date, AECOM concludes that the Site can be made suitable for the proposed Stage 1 Development, inclusive of all land uses, subject to the implementation of the following recommendations.

ecommen at ons

Prior to development AECOM recommends that the areas identified as having minor TPH and lead impacts be excavated and disposed off-site in accordance with the Waste Classification Guidelines (2008). This can be done at the Site preparation works stage. Acute short-term risks are considered to be negligible. Prior to any disposal of material, it is recommended that the impacted soils be excavated, stockpiled with environmental controls and adequately sampled for waste classification purposes.

The area identified as having asbestos impact should also be excavated and disposed off-site as a priority, to mitigate the risk of breakdown of the materials and the release of free fibres to the atmosphere. If there is substantial delay in having the asbestos impacted material removed, this area should be covered in plastic to prevent any further weathering of the asbestos fragments and to minimise the potential for any asbestos fibres to become airborne. An Asbestos Management Plan is recommended if this option is pursued as an interim exposure control measure.

These areas should be validated after excavation and disposal of impacted material and a report prepared by a suitably qualified environmental consultant. Due to the minor nature of the impact identified it is considered that the works could be managed by a Development Environmental Management Plan (DEMP) which can be prepared post planning approval. The DEMP would document the procedures and reporting protocols to be followed to successfully remove the areas of impact identified. AECOM notes that these minor works are not considered Category 1 remediation works as per SEPP 55 and the development of a RAP is not considered necessary at this stage, as the short term risks associated with the minor impacts identified on Site are considered to be negligible.

It is also recommended that, before any redevelopment/demolition of Site buildings is undertaken, a hazardous materials study be conducted to assess the potential presence of hazardous materials, including lead paint and asbestos.

With regards to the remaining wider Site areas considered to be of low to very low risk, AECOM recommends that an EMP be prepared for the development works, including procedures to be followed in the event that evidence of significant contamination is encountered during the works, such as visual or olfactory indicators of contamination.

In addition, given the scale of the development, the potential exists for previously unidentified sources of contamination, such as areas filled with materials of unknown origin, equipment graveyards, etc. As a result, AECOM recommends that the EMP for development works at the Site includes an unexpected finds protocol to be implemented in the event that further areas of environmental concern are encountered (for example, former sheep or cattle dips). The unexpected finds protocol should include stopping works and contacting an environmental professional to undertake an assessment of the risk associated with any find and implementation of further investigations and remediation, if necessary.

Based on our understanding of the Site and the nature of the proposed development, which includes zones of sensitive residential land-use, it is considered prudent to conduct limited environmental investigations of remaining low to very low risk areas during future development phases. This can be carried out in tandem with lot-specific geotechnical investigations.

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13.0 References

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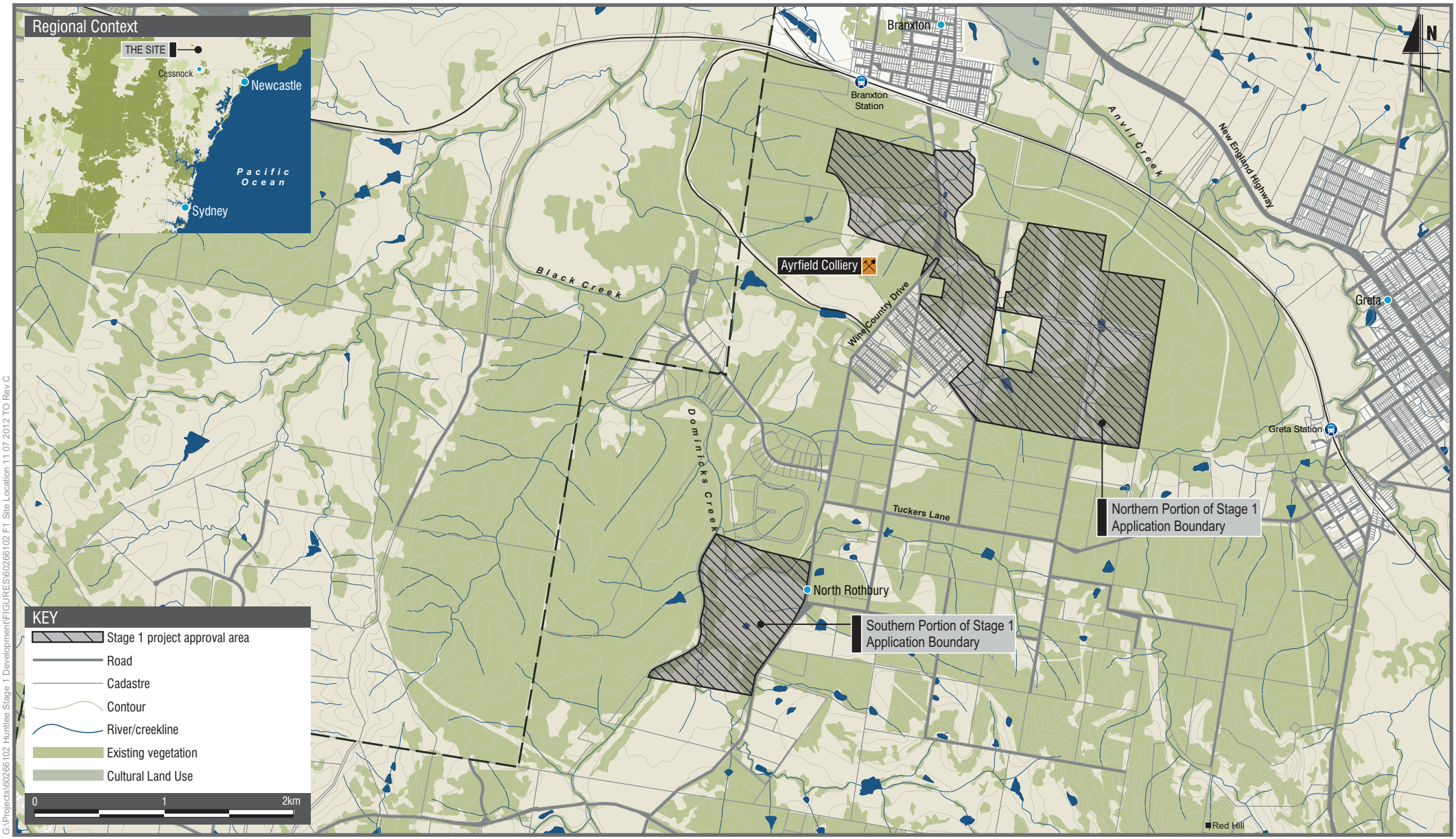
Appendix A

Figures

Appendix A Figures



G:\Projects\60266102 Huntlee Stage 1 Development\FIGURES\60266102 F1 Site Location 11 07 2012 TO Rev C

AECOM

SITE LOCATION

Preliminary Phase 1 Site Investigation
Huntlee Stage 1 Development
North Rothbury, New South Wales

FIGURE 1

G:\Projects\60266102 Huntlee Stage 1 Development\FIGURES\60266102 F2 Site Layout 11 07 2012 TO Rev D **Aerial Photography Source:** Google (2010), SKM (2011)

AECOM

SITE LAYOUT - NORTHERN PORTION

Preliminary Phase 1 Site Investigation
Huntlee Stage 1 Development
North Rothbury, New South Wales

FIGURE 2

G:\Projects\60266102 Huntlee Stage 1 Development\FIGURES\60266102 F3 Investigation Area 1 11 07 2012 TO Rev C **Aerial Photography Source:** Google (2010), SKM (2011)

AECOM

INVESTIGATION AREA 1

Preliminary Phase 1 Site Investigation
Huntlee Stage 1 Development
North Rothbury, New South Wales

FIGURE 3

AECOM

INVESTIGATION AREA 2

Preliminary Phase 1 Site Investigation
Huntlee Stage 1 Development
North Rothbury, New South Wales

FIGURE 4

G:\Projects\60266102 Huntlee Stage 1 Development\FIGURES\60266102 F5 Investigation Area 3 11 07 2012 TO Rev B **Aerial Photography Source:** Google (2010), SKM (2011)

AECOM

INVESTIGATION AREA 3

Preliminary Phase 1 Site Investigation
Huntlee Stage 1 Development
North Rothbury, New South Wales

FIGURE 5

G:\Projects\60266102 Huntlee Stage 1 Development\FIGURES\60266102 F6 Soil Exceedances Investigation Area 1 11 07 2012 TO Rev B **Aerial Photography Source:** Google (2010), SKM (2011)

AECOM

SOIL EXCEEDANCES - INVESTIGATION AREA 1

Preliminary Phase 1 Site Investigation
Huntlee Stage 1 Development
North Rothbury, New South Wales

FIGURE 6

G:\Projects\60266102 Huntlee Stage 1 Development\FIGURES\60266102 F7 Soil Exceedances - Investigation Area 2 11 07 2012 TO Rev B **Aerial Photography Source:** Google (2010), SKM (2011)

AECOM

SOIL EXCEEDANCES - INVESTIGATION AREA 2

Preliminary Phase 1 Site Investigation
Huntlee Stage 1 Development
North Rothbury, New South Wales

FIGURE 7

Appendix B

Tables

Appendix B Tables

			Field ID	BH01_0-0.1	BH01_5.5-5.7	BH02_0.4-0.5	BH02_3.5-3.6	BH03_0.02-0.12	BH03_0.8-0.9	BH03_4.1-4.3	BH04_0.0-0.1	BH04_2.9-3.0	BH05_0-0.05	BH05_2.1-2.2	BH06_0-0.05	BH06_1.9-2.0	BH07_0.05-0.15	BH07_0.4-0.5	BH07_1.9-2.0	BH08_0-0.05	BH08_0.4-0.5
			Location	BH01	BH01	BH02	BH02	BH03	BH03	BH03	BH04	BH04	BH05	BH05	BH06	BH06	BH07	BH07	BH07	BH08	BH08
			Sample Depth Range	0-0.1	5.5-5.7	0.4-0.5	3.5-3.6	0.02-0.12	0.8-0.9	4.1-4.3	0-0.1	2.9-3	0-0.05	2.1-2.2	0-0.05	1.9-2	0.05-0.15	0.4-0.5	1.9-2	0-0.05	0.4-0.5
			Sampled Date	8/05/2012	8/05/2012	8/05/2012	8/05/2012	8/05/2012	8/05/2012	8/05/2012	8/05/2012	8/05/2012	9/05/2012	9/05/2012	9/05/2012	9/05/2012	9/05/2012	9/05/2012	9/05/2012	9/05/2012	9/05/2012
Analyte	**Units**	**LOR**	**SAC**																		
TPH																					
TPH C6 - C9	mg/kg	10	65	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
TPH C10 - C14	mg/kg	50		<50	<50	<50	<50	<50	<50	<50	<50	<50	60	<50	<50	<50	<50	<50	<50	<50	<50
TPH C15 - C28	mg/kg	100		<100	<100	<100	<100	14,400	<100	<100	220	<100	370	<100	150	<100	140	<100	<100	<100	<100
TPH C29-C36	mg/kg	100		<100	<100	<100	<100	13,000	<100	<100	<100	<100	340	<100	160	<100	170	<100	<100	<100	<100
TPH+C10 - C36 (Sum of total)	mg/kg	50	1000	<50	<50	<50	<50	27,400	<50	<50	220	<50	770	<50	310	<50	310	<50	<50	<50	<50
BTEX																					
Benzene	mg/kg	0.2	1	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Ethylbenzene	mg/kg	0.5	50	<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	<0.5	<0.5	<0.5	<0.5
Toluene	mg/kg	0.5	130	<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	<0.5	<0.5	<0.5	<0.5
Xylene (m & p)	mg/kg	0.5		<0.5	<0.5	<0.5	<0.5	1.6	<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
Xylene (o)	mg/kg	0.5		<0.5	<0.5	<0.5	<0.5	0.6	<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
Xylene Total	mg/kg	0.5	25	<0.5	<0.5	<0.5	<0.5	2.2	<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
Sum of BTEX	mg/kg	0.2		<0.2	<0.2	<0.2	<0.2	2.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
PAH																					
Acenaphthene	mg/kg	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	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	mg/kg	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	<0.5	<0.5	<0.5	<0.5	<0.5
Anthracene	mg/kg	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	<0.5	<0.5	<0.5	<0.5	<0.5
Benz(a)anthracene	mg/kg	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	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a) pyrene	mg/kg	0.5	1	<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	<0.5	<0.5	<0.5	<0.5
Benzo(b)fluoranthene	mg/kg	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	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(g,h,i)perylene	mg/kg	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	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(k)fluoranthene	mg/kg	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	<0.5	<0.5	<0.5	<0.5	<0.5
Chrysene	mg/kg	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	<0.5	<0.5	<0.5	<0.5	<0.5
Dibenz(a,h)anthracene	mg/kg	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	<0.5	<0.5	<0.5	<0.5	<0.5
Fluoranthene	mg/kg	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	<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	mg/kg	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	<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1,2,3-c,d)pyrene	mg/kg	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	<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	mg/kg	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	<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene	mg/kg	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	<0.5	<0.5	<0.5	<0.5	<0.5
Pyrene	mg/kg	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	<0.5	<0.5	<0.5	<0.5	<0.5
PAHs (Sum of total)	mg/kg	0.5	20	<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	<0.5	<0.5	<0.5	<0.5
Phenols																					
Phenol	mg/kg	0.5	8500	<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	<0.5	<0.5	<0.5	<0.5
2,4-dimethylphenol	mg/kg	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	<0.5	<0.5	<0.5	<0.5	<0.5
2-methylphenol	mg/kg	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	<0.5	<0.5	<0.5	<0.5	<0.5
2-nitrophenol	mg/kg	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	<0.5	<0.5	<0.5	<0.5	<0.5
3-&4-methylphenol	mg/kg	1		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
4-chloro-3-methylphenol	mg/kg	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	<0.5	<0.5	<0.5	<0.5	<0.5
Metals																					
Arsenic	mg/kg	5	100	<5	7	6	8	5	8	9	<5	<5	<5	8	<5	<5	<5	6	<5	5	5
Cadmium	mg/kg	1	20	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Chromium (III+VI)	mg/kg	2	120000	9	54	23	17	19	13	17	16	13	11	16	9	10	9	25	8	13	22
Copper	mg/kg	5	1000	<5	7	<5	11	<5	<5	13	20	13	23	9	<5	<5	6	<5	<5	8	<5
Lead	mg/kg	5	300	8	10	12	12	14	5	14	7	<5	40	14	36	5	56	9	<5	21	6
Mercury	mg/kg	0.1	15	<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
Nickel	mg/kg	2	600	4	14	9	33	7	5	31	58	24	8	13	6	5	5	8	3	5	4
Zinc	mg/kg	5	7000	23	44	42	87	67	26	85	43	20	49	62	49	26	41	18	21	90	11
Halogenated Benzenes																					
Hexachlorobenzene	mg/kg	0.05		<0.05	-	<0.05	-	<0.25	-	-	<0.05	-	<0.05	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05
Halogenated Phenols																					
2,4,5-trichlorophenol	mg/kg	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	<0.5	<0.5	<0.5	<0.5	<0.5
2,4,6-trichlorophenol	mg/kg	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	<0.5	<0.5	<0.5	<0.5	<0.5
2,4-dichlorophenol	mg/kg	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	<0.5	<0.5	<0.5	<0.5	<0.5
2,6-dichlorophenol	mg/kg	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	<0.5	<0.5	<0.5	<0.5	<0.5
2-chlorophenol	mg/kg	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	<0.5	<0.5	<0.5	<0.5	<0.5
Pentachlorophenol	mg/kg	2		<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Pesticides																					
Demeton-S-methyl	mg/kg	0.05		<0.05	-	<0.05	-	<0.25	-	-	<0.05	-	<0.05	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05
Fenamiphos	mg/kg	0.05		<0.05	-	<0.05	-	<0.25	-	-	<0.05	-	<0.05	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05
Parathion	mg/kg	0.2		<0.2	-	<0.2	-	<0.2	-	-	<0.2	-	<0.2	<0.2	<0.2	-	<0.2	<0.2	-	<0.2	<0.2
Pirimphos-ethyl	mg/kg	0.05		<0.05	-	<0.05	-	<0.25	-	-	<0.05	-	<0.05	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05
Organochlorine Pesticides																					
4,4-DDE	mg/kg	0.05		<0.05	-	<0.05	-	<0.25	-	-	<0.05	-	<0.05	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05
a-BHC	mg/kg	0.05		<0.05	-	<0.05	-	<0.25	-	-	<0.05	-	<0.05	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05
Aldrin	mg/kg	0.05		<0.05	-	<0.05	-	<0.25	-	-	<0.05	-	<0.05	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05
Aldrin + Dieldrin	mg/kg		10	<0.1	-	<0.1	-	<0.5	-	-	<0.1	-	<0.1	<0.1	<0.1	-	<0.1	<0.1	-	<0.1	<0.1
b-BHC	mg/kg	0.05		<0.05	-	<0.05	-	<0.25	-	-	<0.05	-	<0.05	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05
Chlordane (cis)	mg/kg	0.05	50	<0.05	-	<0.05	-	<0.25	-	-	<0.05	-	<0.05	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05
Chlordane (trans)	mg/kg	0.05	50	<0.05	-	<0.05	-	<0.25	-	-	<0.05	-	<0.05	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05
d-BHC	mg/kg	0.05		<0.05	-	<0.05	-	<0.25	-	-	<0.05	-	<0.05	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05
DDD	mg/kg	0.05		<0.05	-	<0.05	-	<0.25	-	-	<0.05	-	<0.05	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05
DDT	mg/kg	0.2		<0.2	-	<0.2	-	<0.2	-	-	<0.2	-	<0.2	<0.2	<0.2	-	<0.2	<0.2	-	<0.2	<0.2
DDT+DDE+DDD	mg/kg		200	<0.3	-	<0.3	-	<0.7	-	-	<0.3	-	<0.3	<0.3	<0.3	-	<0.3	<0.3	-	<0.3	<0.3
Dieldrin	mg/kg	0.05		<0.05	-	<0.05	-	<0.25	-	-	<0.05	-	<0.05	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05
Endosulfan I	mg/kg	0.05		<0.05	-	<0.05	-	<0.25	-	-	<0.05	-	<0.05	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05
Endosulfan II	mg/kg	0.05		<0.05	-	<0.05	-	<0.25	-	-	<0.05	-	<0.05	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05
Endosulfan sulphate	mg/kg	0.05		<0.05	-	<0.05	-	<0.25	-	-	<0.05	-	<0.05	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05
Endrin	mg/kg	0.05		<0.05	-	<0.05	-	<0.25	-	-	<0.05	-	<0.05	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05
Endrin aldehyde	mg/kg	0.05		<0.05	-	<0.05	-	<0.25	-	-	<0.05	-	<0.05	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05
Endrin ketone	mg/kg	0.05		<0.05	-	<0.05	-	<0.25	-	-	<0.05	-	<0.05	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05
g-BHC (Lindane)	mg/kg	0.05		<0.05	-	<0.05	-	<0.25	-	-	<0.05	-	<0.05	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05
Heptachlor	mg/kg	0.05	10	<0.05	-	<0.05	-	<0.25	-	-	<0.05	-	<0.05	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05
Heptachlor epoxide	mg/kg	0.05		<0.05	-	<0.05	-	<0.25	-	-	<0.05	-	<0.05	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05
Methoxychlor	mg/kg	0.2		<0.2	-	<0.2	-	<0.2	-	-	<0.2	-	<0.2	<0.2	<0.2	-	<0.2	<0.2	-	<0.2	<0.2
Organophosphorous Pesticides																					
Azinophos methyl	mg/kg	0.05		<0.05	-	<0.05	-	<0.25	-	-	<0.05	-	<0.05	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05

			Field ID	BH01_0-0.1	BH01_5.5-5.7	BH02_0.4-0.5	BH02_3.5-3.6	BH03_0.02-0.12	BH03_0.8-0.9	BH03_4.1-4.3	BH04_0.0-0.1	BH04_2.9-3.0	BH05_0-0.05	BH05_2.1-2.2	BH06_0-0.05	BH06_1.9-2.0	BH07_0.05-0.15	BH07_0.4-0.5	BH07_1.9-2.0	BH08_0-0.05	BH08_0.4-0.5
			Location	BH01	BH01	BH02	BH02	BH03	BH03	BH03	BH04	BH04	BH05	BH05	BH06	BH06	BH07	BH07	BH07	BH08	BH08
			Sample Depth Range	0-0.1	5.5-5.7	0.4-0.5	3.5-3.6	0.02-0.12	0.8-0.9	4.1-4.3	0-0.1	2.9-3	0-0.05	2.1-2.2	0-0.05	1.9-2	0.05-0.15	0.4-0.5	1.9-2	0-0.05	0.4-0.5
			Sampled Date	8/05/2012	8/05/2012	8/05/2012	8/05/2012	8/05/2012	8/05/2012	8/05/2012	8/05/2012	8/05/2012	9/05/2012	9/05/2012	9/05/2012	9/05/2012	9/05/2012	9/05/2012	9/05/2012	9/05/2012	9/05/2012
Analyte	**Units**	**LOR**	**SAC**																		
Bromophos-ethyl	mg/kg	0.05		<0.05	-	<0.05	-	<0.25	-	-	<0.05	-	<0.05	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05
Carbophenothion	mg/kg	0.05		<0.05	-	<0.05	-	<0.25	-	-	<0.05	-	<0.05	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05
Chlorfenvinphos	mg/kg	0.05		<0.05	-	<0.05	-	<0.25	-	-	<0.05	-	<0.05	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05
Chlorpyrifos	mg/kg	0.05		<0.05	-	<0.05	-	<0.25	-	-	<0.05	-	<0.05	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05
Chlorpyrifos-methyl	mg/kg	0.05		<0.05	-	<0.05	-	<0.25	-	-	<0.05	-	<0.05	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05
Diazinon	mg/kg	0.05		<0.05	-	<0.05	-	<0.25	-	-	<0.05	-	<0.05	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05
Dichlorvos	mg/kg	0.05		<0.05	-	<0.05	-	<0.25	-	-	<0.05	-	<0.05	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05
Dimethoate	mg/kg	0.05		<0.05	-	<0.05	-	<0.25	-	-	<0.05	-	<0.05	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05
Ethion	mg/kg	0.05		<0.05	-	<0.05	-	<0.25	-	-	<0.05	-	<0.05	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05
Fenthion	mg/kg	0.05		<0.05	-	<0.05	-	<0.25	-	-	<0.05	-	<0.05	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05
Malathion	mg/kg	0.05		<0.05	-	<0.05	-	<0.25	-	-	<0.05	-	<0.05	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05
Methyl parathion	mg/kg	0.2		<0.2	-	<0.2	-	<0.2	-	-	<0.2	-	<0.2	<0.2	<0.2	-	<0.2	<0.2	-	<0.2	<0.2
Monocrotophos	mg/kg	0.2		<0.2	-	<0.2	-	<0.3	-	-	<0.2	-	<0.2	<0.2	<0.2	-	<0.2	<0.2	-	<0.2	<0.2
Prothiofos	mg/kg	0.05		<0.05	-	<0.05	-	<0.25	-	-	<0.05	-	<0.05	<0.05	<0.05	-	<0.05	<0.05	-	<0.05	<0.05

Notes
LOR = Limit of Reporting
SAC = Soil Assessment Criteria
- = not analysed
mg/kg = milligrams per kilogram
Shaded grey = Results exceeded SAC

			Field ID	BH08_1.9-2.0	BH09_0-0.05	BH09_1.9-2.0	BH10_0-0.05	BH10_1.7-1.8	BH11_0.03-0.13	BH11_1.9-2.0	GRAB 01	GRAB 02	GRAB 03	GRAB 04	GRAB 05	GRAB 06	GRAB 07	GRAB 08	SP01	SP02
			Location	BH08	BH09	BH09	BH10	BH10	BH11	BH11	GRAB 01	GRAB 02	GRAB 03	GRAB 04	GRAB 05	GRAB 06	GRAB 07	GRAB 08	SP01	SP02
			Sample Depth Range	1.9-2	0-0.05	1.9-2	0-0.05	1.7-1.8	0.03-0.13	1.9-2										
			Sampled Date	9/05/2012	9/05/2012	9/05/2012	9/05/2012	9/05/2012	9/05/2012	9/05/2012	3/05/2012	3/05/2012	3/05/2012	3/05/2012	3/05/2012	3/05/2012	3/05/2012	3/05/2012	9/05/2012	9/05/2012
Analyte	**Units**	**LOR**	**SAC**																	
TPH																				
TPH C6 - C9	mg/kg	10	65	<10	<10	<10	<10	<10	<10	<10	-	-	-	<10	<10	<10	<10	<10	<10	<10
TPH C10 - C14	mg/kg	50		<50	<50	<50	<50	<50	<50	<50	-	-	-	<50	<50	60	<50	<50	<50	<50
TPH C15 - C28	mg/kg	100		<100	<100	<100	<100	<100	150	<100	-	-	-	<100	<100	17,600	<100	<100	<100	<100
TPH C29-C36	mg/kg	100		<100	<100	<100	<100	<100	150	<100	-	-	-	<100	<100	9580	<100	<100	<100	<100
TPH+C10 - C36 (Sum of total)	mg/kg	50	1000	<50	<50	<50	<50	<50	300	<50	-	-	-	<50	<50	27,240	<50	<50	<50	<50
BTEX																				
Benzene	mg/kg	0.2	1	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	-	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Ethylbenzene	mg/kg	0.5	50	<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
Toluene	mg/kg	0.5	130	<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
Xylene (m & p)	mg/kg	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	<0.5
Xylene (o)	mg/kg	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	<0.5
Xylene Total	mg/kg	0.5	25	<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
Sum of BTEX	mg/kg	0.2		<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	-	-	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
PAH																				
Acenaphthene	mg/kg	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	<0.5
Acenaphthylene	mg/kg	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	<0.5
Anthracene	mg/kg	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	<0.5
Benz(a)anthracene	mg/kg	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	<0.5
Benzo(a) pyrene	mg/kg	0.5	1	<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
Benzo(b)fluoranthene	mg/kg	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	<0.5
Benzo(g,h,i)perylene	mg/kg	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	<0.5
Benzo(k)fluoranthene	mg/kg	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	<0.5
Chrysene	mg/kg	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	<0.5
Dibenz(a,h)anthracene	mg/kg	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	<0.5
Fluoranthene	mg/kg	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	<0.5
Fluorene	mg/kg	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	<0.5
Indeno(1,2,3-c,d)pyrene	mg/kg	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	<0.5
Naphthalene	mg/kg	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	<0.5
Phenanthrene	mg/kg	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	<0.5
Pyrene	mg/kg	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	<0.5
PAHs (Sum of total)	mg/kg	0.5	20	<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
Phenols																				
Phenol	mg/kg	0.5	8500	<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
2,4-dimethylphenol	mg/kg	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	<0.5
2-methylphenol	mg/kg	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	<0.5
2-nitrophenol	mg/kg	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	<0.5
3-&4-methylphenol	mg/kg	1		<1	<1	<1	<1	<1	<1	<1	-	-	-	<1	<1	<1	<1	<1	<1	<1
4-chloro-3-methylphenol	mg/kg	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	<0.5
Metals																				
Arsenic	mg/kg	5	100	7	<5	9	5	7	<5	14	-	-	-	<5	<5	<5	<5	<5	26	6
Cadmium	mg/kg	1	20	<1	<1	<1	<1	<1	<1	<1	-	-	-	<1	<1	<1	<1	<1	<1	<1
Chromium (III+VI)	mg/kg	2	120000	14	6	11	9	8	6	20	-	-	-	9	18	5	6	17	12	19
Copper	mg/kg	5	1000	<5	<5	6	22	<5	<5	14	-	-	-	<5	<5	<5	<5	<5	457	<5
Lead	mg/kg	5	300	5	9	6	38	<5	11	20	-	-	-	7	7	<5	7	11	**1580**	12
Mercury	mg/kg	0.1	15	<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
Nickel	mg/kg	2	600	7	2	9	6	5	4	138	-	-	-	3	5	2	3	6	18	5
Zinc	mg/kg	5	7000	23	28	39	170	24	46	246	-	-	-	154	13	166	16	121	280	15
Halogenated Benzenes																				
Hexachlorobenzene	mg/kg	0.05		-	<0.05	-	<0.05	-	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.25	<0.05	<0.05	<0.05	<0.05
Halogenated Phenols																				
2,4,5-trichlorophenol	mg/kg	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	<0.5
2,4,6-trichlorophenol	mg/kg	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	<0.5
2,4-dichlorophenol	mg/kg	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	<0.5
2,6-dichlorophenol	mg/kg	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	<0.5
2-chlorophenol	mg/kg	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	<0.5
Pentachlorophenol	mg/kg	2		<2	<2	<2	<2	<2	<2	<2	-	-	-	<2	<2	<2	<2	<2	<2	<2
Pesticides																				
Demeton-S-methyl	mg/kg	0.05		-	<0.05	-	<0.05	-	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.25	<0.05	<0.05	<0.05	<0.05
Fenamiphos	mg/kg	0.05		-	<0.05	-	<0.05	-	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.25	<0.05	<0.05	<0.05	<0.05
Parathion	mg/kg	0.2		-	<0.2	-	<0.2	-	<0.2	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Pirimphos-ethyl	mg/kg	0.05		-	<0.05	-	<0.05	-	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.25	<0.05	<0.05	<0.05	<0.05
Organochlorine Pesticides																				
4,4-DDE	mg/kg	0.05		-	<0.05	-	<0.05	-	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.25	<0.05	<0.05	<0.05	<0.05
a-BHC	mg/kg	0.05		-	<0.05	-	<0.05	-	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.25	<0.05	<0.05	<0.05	<0.05
Aldrin	mg/kg	0.05		-	<0.05	-	<0.05	-	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.25	<0.05	<0.05	<0.05	<0.05
Aldrin + Dieldrin	mg/kg		10	-	<0.1	-	<0.1	-	<0.1	-	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.1	<0.1	<0.1	<0.1
b-BHC	mg/kg	0.05		-	<0.05	-	<0.05	-	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.25	<0.05	<0.05	<0.05	<0.05
Chlordane (cis)	mg/kg	0.05	50	-	<0.05	-	<0.05	-	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.25	<0.05	<0.05	<0.05	<0.05
Chlordane (trans)	mg/kg	0.05	50	-	<0.05	-	<0.05	-	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.25	<0.05	<0.05	<0.05	<0.05
d-BHC	mg/kg	0.05		-	<0.05	-	<0.05	-	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.25	<0.05	<0.05	<0.05	<0.05
DDD	mg/kg	0.05		-	<0.05	-	<0.05	-	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.25	<0.05	<0.05	<0.05	<0.05
DDT	mg/kg	0.2		-	<0.2	-	<0.2	-	<0.2	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
DDT+DDE+DDD	mg/kg		200	-	<0.3	-	<0.3	-	<0.3	-	<0.3	<0.3	<0.3	<0.3	<0.3	<0.7	<0.3	<0.3	<0.3	<0.3
Dieldrin	mg/kg	0.05		-	<0.05	-	<0.05	-	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.25	<0.05	<0.05	<0.05	<0.05
Endosulfan I	mg/kg	0.05		-	<0.05	-	<0.05	-	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.25	<0.05	<0.05	<0.05	<0.05
Endosulfan II	mg/kg	0.05		-	<0.05	-	<0.05	-	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.25	<0.05	<0.05	<0.05	<0.05
Endosulfan sulphate	mg/kg	0.05		-	<0.05	-	<0.05	-	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.25	<0.05	<0.05	<0.05	<0.05
Endrin	mg/kg	0.05		-	<0.05	-	<0.05	-	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.25	<0.05	<0.05	<0.05	<0.05
Endrin aldehyde	mg/kg	0.05		-	<0.05	-	<0.05	-	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.25	<0.05	<0.05	<0.05	<0.05
Endrin ketone	mg/kg	0.05		-	<0.05	-	<0.05	-	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.25	<0.05	<0.05	<0.05	<0.05
g-BHC (Lindane)	mg/kg	0.05		-	<0.05	-	<0.05	-	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.25	<0.05	<0.05	<0.05	<0.05
Heptachlor	mg/kg	0.05	10	-	<0.05	-	<0.05	-	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.25	<0.05	<0.05	<0.05	<0.05
Heptachlor epoxide	mg/kg	0.05		-	<0.05	-	<0.05	-	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.25	<0.05	<0.05	<0.05	<0.05
Methoxychlor	mg/kg	0.2		-	<0.2	-	<0.2	-	<0.2	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Organophosphorous Pesticides																				
Azinophos methyl	mg/kg	0.05		-	<0.05	-	<0.05	-	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.25	<0.05	<0.05	<0.05	<0.05

			Field ID	BH08_1.9-2.0	BH09_0-0.05	BH09_1.9-2.0	BH10_0-0.05	BH10_1.7-1.8	BH11_0.03-0.13	BH11_1.9-2.0	GRAB 01	GRAB 02	GRAB 03	GRAB 04	GRAB 05	GRAB 06	GRAB 07	GRAB 08	SP01	SP02
			Location	BH08	BH09	BH09	BH10	BH10	BH11	BH11	GRAB 01	GRAB 02	GRAB 03	GRAB 04	GRAB 05	GRAB 06	GRAB 07	GRAB 08	SP01	SP02
			Sample Depth Range	1.9-2	0-0.05	1.9-2	0-0.05	1.7-1.8	0.03-0.13	1.9-2										
			Sampled Date	9/05/2012	9/05/2012	9/05/2012	9/05/2012	9/05/2012	9/05/2012	9/05/2012	3/05/2012	3/05/2012	3/05/2012	3/05/2012	3/05/2012	3/05/2012	3/05/2012	3/05/2012	9/05/2012	9/05/2012
Analyte	**Units**	**LOR**	**SAC**																	
Bromophos-ethyl	mg/kg	0.05		-	<0.05	-	<0.05	-	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.25	<0.05	<0.05	<0.05	<0.05
Carbophenothion	mg/kg	0.05		-	<0.05	-	<0.05	-	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.25	<0.05	<0.05	<0.05	<0.05
Chlorfenvinphos	mg/kg	0.05		-	<0.05	-	<0.05	-	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.25	<0.05	<0.05	<0.05	<0.05
Chlorpyrifos	mg/kg	0.05		-	<0.05	-	<0.05	-	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.25	<0.05	<0.05	<0.05	<0.05
Chlorpyrifos-methyl	mg/kg	0.05		-	<0.05	-	<0.05	-	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.25	<0.05	<0.05	<0.05	<0.05
Diazinon	mg/kg	0.05		-	<0.05	-	<0.05	-	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.25	<0.05	<0.05	<0.05	<0.05
Dichlorvos	mg/kg	0.05		-	<0.05	-	<0.05	-	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.25	<0.05	<0.05	<0.05	<0.05
Dimethoate	mg/kg	0.05		-	<0.05	-	<0.05	-	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.25	<0.05	<0.05	<0.05	<0.05
Ethion	mg/kg	0.05		-	<0.05	-	<0.05	-	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.25	<0.05	<0.05	<0.05	<0.05
Fenthion	mg/kg	0.05		-	<0.05	-	<0.05	-	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.25	<0.05	<0.05	<0.05	<0.05
Malathion	mg/kg	0.05		-	<0.05	-	<0.05	-	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.25	<0.05	<0.05	<0.05	<0.05
Methyl parathion	mg/kg	0.2		-	<0.2	-	<0.2	-	<0.2	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Monocrotophos	mg/kg	0.2		-	<0.2	-	<0.2	-	<0.2	-	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Prothiofos	mg/kg	0.05		-	<0.05	-	<0.05	-	<0.05	-	<0.05	<0.05	<0.05	<0.05	<0.05	<0.25	<0.05	<0.05	<0.05	<0.05

Notes
LOR = Limit of Reporting
SAC = Soil Assessment Criteria
- = not analysed
mg/kg = milligrams per kilogram
Shaded grey = Results exceeded SAC

	Field ID	BH03 0.02-0.12	BH03 0.8-0.9	BH04 0-0.1	BH04 2.9-3	BH05 0-0.05	BH05 2.1-2.2	BH11 0.03-0.13	BH11 1.9-2.0	GRAB06
	Location	BH03	BH03	BH04	BH04	BH05	BH05	BH11	BH11	GRAB06
	SampleDepth	0.02-0.12	0.8-0.9	0-0.1	2.9-3	0-0.05	2.1-2.2	0.03-0.13	1.9-2	
	Sample Date	8/05/2012	8/05/2012	8/05/2012	8/05/2012	9/05/2012	9/05/2012	9/05/2012	9/05/2012	3/05/2012
Analyte	**Units**	**LOR**								
Metals										
Arsenic	mg/L	0.001	0.008	0.005	0.003	0.006	0.003	0.006	0.002	0.034	<0.001
Cadmium	mg/L	0.0001	0.0002	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0004	<0.0001
Chromium (III+VI)	mg/L	0.001	0.085	0.085	0.024	0.11	0.014	0.04	0.013	0.148	0.002
Copper	mg/L	0.001	0.017	0.025	0.012	0.081	0.04	0.026	0.004	0.063	0.002
Lead	mg/L	0.001	0.062	0.03	0.01	0.022	0.023	0.03	0.006	0.125	0.001
Mercury	mg/L	0.0001	<0.0001	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Nickel	mg/L	0.001	0.033	0.028	0.036	0.188	0.008	0.037	0.004	0.496	0.002
Zinc	mg/L	0.005	1.38	1.25	0.27	0.88	0.627	1.98	0.652	2.79	0.089
TPH											
TPH C10 - C14	µg/L	50	<50	<50	<50	<50	<50	<50	<50	<50	80
TPH C15 - C28	µg/L	100	<100	<100	<100	<100	<100	<100	<100	<100	420
TPH C29-C36	µg/L	50	<50	<50	<50	<50	<50	<50	<50	<50	90
TPH+C10 - C36 (Sum of total)	µg/L	50	<50	<50	<50	<50	<50	<50	<50	<50	590

Notes
LOR = Limit of Reporting
mg/L = milligrams per litre
ug/L = micrograms oer litre
Shaded brown = Topsoil/fill
Shaded green = Natural material

Sample	Description	Asbestos Detected
Grab 04	Soil	No Asbestos Detected
AS01	Flat fibrous cement sheet fragment	No Asbestos Detected
AS02	Corrugated cement sheet fragment	Chrysotile asbestos detected
BH11_0.03-0.13	Soil	No Asbestos Detected
SP01	Soil	No Asbestos Detected
SP02	Soil	No Asbestos Detected
B08_0-0.05	Soil	Chrysotile asbestos detected - No free fibres.

		SDG	ES1211388	ES1211388		ES1211388	ES1211388		ES1211388	ES1211388		ES1211388	ES1211388	
		Field ID	BH03_0.02-0.12	QC03	RPD	BH05_0-0.05	QC05	RPD	BH07_0.05-0.15	QC07	RPD	BH08_0.4-0.5	QC08	RPD
		Sampled Date	8/05/2012	8/05/2012		9/05/2012	9/05/2012		9/05/2012	9/05/2012		9/05/2012	9/05/2012	
Analyte	**Units**	**LOR**												
BTEX														
Benzene	mg/kg	0.2 (Primary): 0.5 (Interlab)	<0.2	<0.2	N/C	<0.2	<0.2	N/C	<0.2	<0.2	N/C	<0.2	<0.2	N/C
Ethylbenzene	mg/kg	0.5	<0.5	<0.5	N/C	<0.5	<0.5	N/C	<0.5	<0.5	N/C	<0.5	<0.5	N/C
Toluene	mg/kg	0.5	<0.5	<0.5	N/C	<0.5	<0.5	N/C	<0.5	<0.5	N/C	<0.5	<0.5	N/C
Xylene (m & p)	mg/kg	0.5 (Primary): 1 (Interlab)	1.6	1.0	46	<0.5	<0.5	N/C	<0.5	<0.5	N/C	<0.5	<0.5	N/C
Xylene (o)	mg/kg	0.5	0.6	<0.5	18	<0.5	<0.5	N/C	<0.5	<0.5	N/C	<0.5	<0.5	N/C
Xylene Total	mg/kg	0.5 (Primary): 1.5 (Interlab)	**2.2**	**1.0**	**75**	<0.5	<0.5	N/C	<0.5	<0.5	N/C	<0.5	<0.5	N/C
Sum of BTEX	mg/kg	0.2 (Primary): 1.5 (Interlab)	**2.2**	**1.0**	**75**	<0.2	<0.2	N/C	<0.2	<0.2	N/C	<0.2	<0.2	N/C
Halogenated Benzenes														
Hexachlorobenzene	mg/kg	0.05	<0.25	<0.05	N/C	<0.05	<0.05	N/C	<0.05	<0.05	N/C	<0.05	<0.05	N/C
Halogenated Phenols														
2,4,5-trichlorophenol	mg/kg	0.5	<0.5	<0.5	N/C	<0.5	<0.5	N/C	<0.5	<0.5	N/C	<0.5	<0.5	N/C
2,4,6-trichlorophenol	mg/kg	0.5	<0.5	<0.5	N/C	<0.5	<0.5	N/C	<0.5	<0.5	N/C	<0.5	<0.5	N/C
2,4-dichlorophenol	mg/kg	0.5	<0.5	<0.5	N/C	<0.5	<0.5	N/C	<0.5	<0.5	N/C	<0.5	<0.5	N/C
2,6-dichlorophenol	mg/kg	0.5	<0.5	<0.5	N/C	<0.5	<0.5	N/C	<0.5	<0.5	N/C	<0.5	<0.5	N/C
2-chlorophenol	mg/kg	0.5	<0.5	<0.5	N/C	<0.5	<0.5	N/C	<0.5	<0.5	N/C	<0.5	<0.5	N/C
Pentachlorophenol	mg/kg	2 (Primary): 1 (Interlab)	<2.0	<2.0	N/C	<2.0	<2.0	N/C	<2.0	<2.0	N/C	<2.0	<2.0	N/C
Metals														
Arsenic	mg/kg	5 (Primary): 1 (Interlab)	5.0	5.0	N/C	<5.0	<5.0	N/C	<5.0	<5.0	N/C	5.0	<5.0	N/C
Cadmium	mg/kg	1 (Primary): 0.1 (Interlab)	<1.0	<1.0	N/C	<1.0	<1.0	N/C	<1.0	<1.0	N/C	<1.0	<1.0	N/C
Chromium (III+VI)	mg/kg	2	19.0	15.0	24	11.0	10.0	10	9.0	8.0	12	**22.0**	**7.0**	**103**
Copper	mg/kg	5 (Primary): 2 (Interlab)	<5.0	<5.0	N/C	**23.0**	**6.0**	**117**	6.0	<5.0	18	<5.0	<5.0	N/C
Lead	mg/kg	5 (Primary): 2 (Interlab)	14.0	22.0	44	40.0	36.0	11	**56.0**	**<5.0**	**167**	6.0	6.0	N/C
Mercury	mg/kg	0.1 (Primary): 0.05 (Interlab)	<0.1	<0.1	N/C	<0.1	<0.1	N/C	<0.1	<0.1	N/C	<0.1	<0.1	N/C
Nickel	mg/kg	2 (Primary): 1 (Interlab)	7.0	6.0	15	8.0	6.0	29	5.0	3.0	50	**4.0**	**2.0**	**67**
Zinc	mg/kg	5	67.0	67.0	N/C	49.0	32.0	42	**41.0**	**19.0**	**73**	**11.0**	**27.0**	**84**
Organochlorine Pesticides														
4,4-DDE	mg/kg	0.05	<0.25	<0.05	N/C	<0.05	<0.05	N/C	<0.05	<0.05	N/C	<0.05	<0.05	N/C
a-BHC	mg/kg	0.05	<0.25	<0.05	N/C	<0.05	<0.05	N/C	<0.05	<0.05	N/C	<0.05	<0.05	N/C
Aldrin	mg/kg	0.05	<0.25	<0.05	N/C	<0.05	<0.05	N/C	<0.05	<0.05	N/C	<0.05	<0.05	N/C
b-BHC	mg/kg	0.05	<0.25	<0.05	N/C	<0.05	<0.05	N/C	<0.05	<0.05	N/C	<0.05	<0.05	N/C
Chlordane (cis)	mg/kg	0.05	<0.25	<0.05	N/C	<0.05	<0.05	N/C	<0.05	<0.05	N/C	<0.05	<0.05	N/C
Chlordane (trans)	mg/kg	0.05	<0.25	<0.05	N/C	<0.05	<0.05	N/C	<0.05	<0.05	N/C	<0.05	<0.05	N/C
d-BHC	mg/kg	0.05	<0.25	<0.05	N/C	<0.05	<0.05	N/C	<0.05	<0.05	N/C	<0.05	<0.05	N/C
DDD	mg/kg	0.05	<0.25	<0.05	N/C	<0.05	<0.05	N/C	<0.05	<0.05	N/C	<0.05	<0.05	N/C
DDT	mg/kg	0.2	<0.2	<0.2	N/C	<0.2	<0.2	N/C	<0.2	<0.2	N/C	<0.2	<0.2	N/C
Dieldrin	mg/kg	0.05	<0.25	<0.05	N/C	<0.05	<0.05	N/C	<0.05	<0.05	N/C	<0.05	<0.05	N/C
Endosulfan I	mg/kg	0.05	<0.25	<0.05	N/C	<0.05	<0.05	N/C	<0.05	<0.05	N/C	<0.05	<0.05	N/C
Endosulfan II	mg/kg	0.05	<0.25	<0.05	N/C	<0.05	<0.05	N/C	<0.05	<0.05	N/C	<0.05	<0.05	N/C
Endosulfan sulphate	mg/kg	0.05	<0.25	<0.05	N/C	<0.05	<0.05	N/C	<0.05	<0.05	N/C	<0.05	<0.05	N/C
Endrin	mg/kg	0.05	<0.25	<0.05	N/C	<0.05	<0.05	N/C	<0.05	<0.05	N/C	<0.05	<0.05	N/C
Endrin aldehyde	mg/kg	0.05	<0.25	<0.05	N/C	<0.05	<0.05	N/C	<0.05	<0.05	N/C	<0.05	<0.05	N/C
Endrin ketone	mg/kg	0.05	<0.25	<0.05	N/C	<0.05	<0.05	N/C	<0.05	<0.05	N/C	<0.05	<0.05	N/C
g-BHC (Lindane)	mg/kg	0.05	<0.25	<0.05	N/C	<0.05	<0.05	N/C	<0.05	<0.05	N/C	<0.05	<0.05	N/C
Heptachlor	mg/kg	0.05	<0.25	<0.05	N/C	<0.05	<0.05	N/C	<0.05	<0.05	N/C	<0.05	<0.05	N/C
Heptachlor epoxide	mg/kg	0.05	<0.25	<0.05	N/C	<0.05	<0.05	N/C	<0.05	<0.05	N/C	<0.05	<0.05	N/C
Methoxychlor	mg/kg	0.2	<0.2	<0.2	N/C	<0.2	<0.2	N/C	<0.2	<0.2	N/C	<0.2	<0.2	N/C
Organophosphorous Pesticides														
Azinophos methyl	mg/kg	0.05 (Primary): 0.5 (Interlab)	<0.25	<0.05	N/C	<0.05	<0.05	N/C	<0.05	<0.05	N/C	<0.05	<0.05	N/C
Bromophos-ethyl	mg/kg	0.05	<0.25	<0.05	N/C	<0.05	<0.05	N/C	<0.05	<0.05	N/C	<0.05	<0.05	N/C
Carbophenothion	mg/kg	0.05	<0.25	<0.05	N/C	<0.05	<0.05	N/C	<0.05	<0.05	N/C	<0.05	<0.05	N/C
Chlorfenvinphos	mg/kg	0.05	<0.25	<0.05	N/C	<0.05	<0.05	N/C	<0.05	<0.05	N/C	<0.05	<0.05	N/C
Chlorpyrifos	mg/kg	0.05 (Primary): 0.5 (Interlab)	<0.25	<0.05	N/C	<0.05	<0.05	N/C	<0.05	<0.05	N/C	<0.05	<0.05	N/C
Chlorpyrifos-methyl	mg/kg	0.05	<0.25	<0.05	N/C	<0.05	<0.05	N/C	<0.05	<0.05	N/C	<0.05	<0.05	N/C

		SDG	ES1211388	ES1211388		ES1211388	ES1211388		ES1211388	ES1211388		ES1211388	ES1211388	
		Field ID	BH03_0.02-0.12	QC03	RPD	BH05_0-0.05	QC05	RPD	BH07_0.05-0.15	QC07	RPD	BH08_0.4-0.5	QC08	RPD
		Sampled Date	8/05/2012	8/05/2012		9/05/2012	9/05/2012		9/05/2012	9/05/2012		9/05/2012	9/05/2012	
Analyte	**Units**	**LOR**												
Diazinon	mg/kg	0.05 (Primary): 0.5 (Interlab)	<0.25	<0.05	N/C	<0.05	<0.05	N/C	<0.05	<0.05	N/C	<0.05	<0.05	N/C
Dichlorvos	mg/kg	0.05 (Primary): 0.5 (Interlab)	<0.25	<0.05	N/C	<0.05	<0.05	N/C	<0.05	<0.05	N/C	<0.05	<0.05	N/C
Dimethoate	mg/kg	0.05 (Primary): 0.5 (Interlab)	<0.25	<0.05	N/C	<0.05	<0.05	N/C	<0.05	<0.05	N/C	<0.05	<0.05	N/C
Ethion	mg/kg	0.05	<0.25	<0.05	N/C	<0.05	<0.05	N/C	<0.05	<0.05	N/C	<0.05	<0.05	N/C
Fenthion	mg/kg	0.05 (Primary): 0.5 (Interlab)	<0.25	<0.05	N/C	<0.05	<0.05	N/C	<0.05	<0.05	N/C	<0.05	<0.05	N/C
Malathion	mg/kg	0.05 (Primary): 0.5 (Interlab)	<0.25	<0.05	N/C	<0.05	<0.05	N/C	<0.05	<0.05	N/C	<0.05	<0.05	N/C
Methyl parathion	mg/kg	0.2 (Primary): 0.5 (Interlab)	<0.2	<0.2	N/C	<0.2	<0.2	N/C	<0.2	<0.2	N/C	<0.2	<0.2	N/C
Monocrotophos	mg/kg	0.2 (Primary): 10 (Interlab)	<0.3	<0.2	N/C	<0.2	<0.2	N/C	<0.2	<0.2	N/C	<0.2	<0.2	N/C
Prothiofos	mg/kg	0.05 (Primary): 0.5 (Interlab)	<0.25	<0.05	N/C	<0.05	<0.05	N/C	<0.05	<0.05	N/C	<0.05	<0.05	N/C
Phenols														
Phenol	mg/kg	0.5	<0.5	<0.5	N/C	<0.5	<0.5	N/C	<0.5	<0.5	N/C	<0.5	<0.5	N/C
2,4-dimethylphenol	mg/kg	0.5	<0.5	<0.5	N/C	<0.5	<0.5	N/C	<0.5	<0.5	N/C	<0.5	<0.5	N/C
2-methylphenol	mg/kg	0.5	<0.5	<0.5	N/C	<0.5	<0.5	N/C	<0.5	<0.5	N/C	<0.5	<0.5	N/C
2-nitrophenol	mg/kg	0.5	<0.5	<0.5	N/C	<0.5	<0.5	N/C	<0.5	<0.5	N/C	<0.5	<0.5	N/C
3-&4-methylphenol	mg/kg	1	<1.0	<1.0	N/C	<1.0	<1.0	N/C	<1.0	<1.0	N/C	<1.0	<1.0	N/C
4-chloro-3-methylphenol	mg/kg	0.5	<0.5	<0.5	N/C	<0.5	<0.5	N/C	<0.5	<0.5	N/C	<0.5	<0.5	N/C
PAH														
Acenaphthene	mg/kg	0.5	<0.5	<0.5	N/C	<0.5	<0.5	N/C	<0.5	<0.5	N/C	<0.5	<0.5	N/C
Acenaphthylene	mg/kg	0.5	<0.5	<0.5	N/C	<0.5	<0.5	N/C	<0.5	<0.5	N/C	<0.5	<0.5	N/C
Anthracene	mg/kg	0.5	<0.5	<0.5	N/C	<0.5	<0.5	N/C	<0.5	<0.5	N/C	<0.5	<0.5	N/C
Benz(a)anthracene	mg/kg	0.5	<0.5	<0.5	N/C	<0.5	<0.5	N/C	<0.5	<0.5	N/C	<0.5	<0.5	N/C
Benzo(a) pyrene	mg/kg	0.5	<0.5	<0.5	N/C	<0.5	<0.5	N/C	<0.5	<0.5	N/C	<0.5	<0.5	N/C
Benzo(b)fluoranthene	mg/kg	0.5	<0.5	<0.5	N/C	<0.5	<0.5	N/C	<0.5	<0.5	N/C	<0.5	<0.5	N/C
Benzo(g,h,i)perylene	mg/kg	0.5	<0.5	<0.5	N/C	<0.5	<0.5	N/C	<0.5	<0.5	N/C	<0.5	<0.5	N/C
Benzo(k)fluoranthene	mg/kg	0.5	<0.5	<0.5	N/C	<0.5	<0.5	N/C	<0.5	<0.5	N/C	<0.5	<0.5	N/C
Chrysene	mg/kg	0.5	<0.5	<0.5	N/C	<0.5	<0.5	N/C	<0.5	<0.5	N/C	<0.5	<0.5	N/C
Dibenz(a,h)anthracene	mg/kg	0.5	<0.5	<0.5	N/C	<0.5	<0.5	N/C	<0.5	<0.5	N/C	<0.5	<0.5	N/C
Fluoranthene	mg/kg	0.5	<0.5	<0.5	N/C	<0.5	<0.5	N/C	<0.5	<0.5	N/C	<0.5	<0.5	N/C
Fluorene	mg/kg	0.5	<0.5	<0.5	N/C	<0.5	<0.5	N/C	<0.5	<0.5	N/C	<0.5	<0.5	N/C
Indeno(1,2,3-c,d)pyrene	mg/kg	0.5	<0.5	<0.5	N/C	<0.5	<0.5	N/C	<0.5	<0.5	N/C	<0.5	<0.5	N/C
Naphthalene	mg/kg	1 (Primary): 0.5 (Interlab)	<1.0	<1.0	N/C	<1.0	<1.0	N/C	<1.0	<1.0	N/C	<1.0	<1.0	N/C
Naphthalene	mg/kg	0.5	<0.5	<0.5	N/C	<0.5	<0.5	N/C	<0.5	<0.5	N/C	<0.5	<0.5	N/C
Phenanthrene	mg/kg	0.5	<0.5	<0.5	N/C	<0.5	<0.5	N/C	<0.5	<0.5	N/C	<0.5	<0.5	N/C
Pyrene	mg/kg	0.5	<0.5	<0.5	N/C	<0.5	<0.5	N/C	<0.5	<0.5	N/C	<0.5	<0.5	N/C
PAHs (Sum of total)	mg/kg	0.5 (Primary): 1 (Interlab)	<0.5	<0.5	N/C	<0.5	<0.5	N/C	<0.5	<0.5	N/C	<0.5	<0.5	N/C
Pesticides														
Demeton-S-methyl	mg/kg	0.05	<0.25	<0.05	N/C	<0.05	<0.05	N/C	<0.05	<0.05	N/C	<0.05	<0.05	N/C
Fenamiphos	mg/kg	0.05	<0.25	<0.05	N/C	<0.05	<0.05	N/C	<0.05	<0.05	N/C	<0.05	<0.05	N/C
Parathion	mg/kg	0.2 (Primary): 0.5 (Interlab)	<0.2	<0.2	N/C	<0.2	<0.2	N/C	<0.2	<0.2	N/C	<0.2	<0.2	N/C
Pirimphos-ethyl	mg/kg	0.05	<0.25	<0.05	N/C	<0.05	<0.05	N/C	<0.05	<0.05	N/C	<0.05	<0.05	N/C
TPH														
TPH C6 - C9	mg/kg	10	<10.0	<10.0	N/C	<10.0	<10.0	N/C	<10.0	<10.0	N/C	<10.0	<10.0	N/C
TPH C10 - C14	mg/kg	50	<50.0	<50.0	N/C	60.0	60.0	N/C	<50.0	<50.0	N/C	<50.0	<50.0	N/C
TPH C15 - C28	mg/kg	100	14400.0	17800.0	21	370.0	310.0	18	140.0	<100.0	33	<100.0	<100.0	N/C
TPH C29-C36	mg/kg	100	13000.0	13900.0	7	340.0	460.0	30	**170.0**	**<100.0**	**52**	<100.0	<100.0	N/C
TPH+C10 - C36 (Sum of total)	mg/kg	50 (Primary): 100 (Interlab)	27400.0	31700.0	15	770.0	830.0	8	**310.0**	**<50.0**	**144**	<50.0	<50.0	N/C

Notes
Bold = RPD >50%
LOR = Limit of Reporting
- = not analysed
mg/L = milligrams per kilogram
N/C = Not calculated due to results below the LOR

Data Entry: JD
Data Review: LS
AECOM

		SDG	ES1211388	Interlab_D		ES1211388	Interlab_D	
		Field ID	BH01_5.5-5.7	QC02	RPD	BH10_0-0.05	QC09	RPD
		Sampled Date	8/05/2012	8/05/2012		9/05/2012	9/05/2012	
Analyte	**Units**	**LOR**						
BTEX								
Benzene	mg/kg	0.2 (Primary): 0.5 (Interlab)	<0.2	<0.5	N/C	<0.2	<0.5	N/C
Ethylbenzene	mg/kg	0.5	<0.5	<0.5	N/C	<0.5	<0.5	N/C
Toluene	mg/kg	0.5	<0.5	<0.5	N/C	<0.5	<0.5	N/C
Xylene (m & p)	mg/kg	0.5 (Primary): 1 (Interlab)	<0.5	<1.0	N/C	<0.5	<1.0	N/C
Xylene (o)	mg/kg	0.5	<0.5	<0.5	N/C	<0.5	<0.5	N/C
Xylene Total	mg/kg	0.5 (Primary): 1.5 (Interlab)	<0.5	<1.5	N/C	<0.5	<1.5	N/C
Sum of BTEX	mg/kg	0.2 (Primary): 1.5 (Interlab)	<0.2	<1.5	N/C	<0.2	<1.5	N/C
Halogenated Benzenes								
Hexachlorobenzene	mg/kg	0.05	-	-	-	<0.05	<0.05	N/C
Halogenated Phenols								
2,4,5-trichlorophenol	mg/kg	0.5	<0.5	<0.5	N/C	<0.5	<0.5	N/C
2,4,6-trichlorophenol	mg/kg	0.5	<0.5	<0.5	N/C	<0.5	<0.5	N/C
2,4-dichlorophenol	mg/kg	0.5	<0.5	<0.5	N/C	<0.5	<0.5	N/C
2,6-dichlorophenol	mg/kg	0.5						
2-chlorophenol	mg/kg	0.5	<0.5	<0.5	N/C	<0.5	<0.5	N/C
Pentachlorophenol	mg/kg	2 (Primary): 1 (Interlab)	<2.0	<1.0	N/C	<2.0	<1.0	N/C
Metals								
Arsenic	mg/kg	5 (Primary): 1 (Interlab)	7.0	5.7	20	5.0	5.9	17
Cadmium	mg/kg	1 (Primary): 0.1 (Interlab)	<1.0	<0.1	N/C	<1.0	<0.1	N/C
Chromium (III+VI)	mg/kg	2	54.0	44.0	20	9.0	10.0	11
Copper	mg/kg	5 (Primary): 2 (Interlab)	7.0	5.9	17	**22.0**	**<2.0**	**167**
Lead	mg/kg	5 (Primary): 2 (Interlab)	10.0	11.0	10	**38.0**	**7.1**	**137**
Mercury	mg/kg	0.1 (Primary): 0.05 (Interlab)	<0.1	<0.05	N/C	<0.1	0.06	N/C
Nickel	mg/kg	2 (Primary): 1 (Interlab)	14.0	14.0	N/C	**6.0**	**2.4**	**86**
Zinc	mg/kg	5	44.0	43.0	2	**170.0**	**7.3**	**184**
Organochlorine Pesticides								
4,4-DDE	mg/kg	0.05	-	-	-	<0.05	<0.05	N/C
a-BHC	mg/kg	0.05	-	-	-	<0.05	<0.05	N/C
Aldrin	mg/kg	0.05	-	-	-	<0.05	<0.05	N/C
b-BHC	mg/kg	0.05	-	-	-	<0.05	<0.05	N/C
Chlordane (cis)	mg/kg	0.05	-	-	-	<0.05	<0.05	N/C
Chlordane (trans)	mg/kg	0.05	-	-	-	<0.05	<0.05	N/C
d-BHC	mg/kg	0.05	-	-	-	<0.05	<0.05	N/C
DDD	mg/kg	0.05	-	-	-	<0.05	<0.05	N/C
DDT	mg/kg	0.2	-	-	-	<0.2	<0.2	N/C
Dieldrin	mg/kg	0.05	-	-	-	<0.05	<0.05	N/C
Endosulfan I	mg/kg	0.05	-	-	-	<0.05	<0.05	N/C
Endosulfan II	mg/kg	0.05	-	-	-	<0.05	<0.05	N/C
Endosulfan sulphate	mg/kg	0.05	-	-	-	<0.05	<0.05	N/C
Endrin	mg/kg	0.05	-	-	-	<0.05	<0.05	N/C
Endrin aldehyde	mg/kg	0.05	-	-	-	<0.05	<0.05	N/C
Endrin ketone	mg/kg	0.05	-	-	-	<0.05	<0.05	N/C
g-BHC (Lindane)	mg/kg	0.05	-	-	-	<0.05	<0.05	N/C
Heptachlor	mg/kg	0.05	-	-	-	<0.05	<0.05	N/C
Heptachlor epoxide	mg/kg	0.05	-	-	-	<0.05	<0.05	N/C
Methoxychlor	mg/kg	0.2	-	-	-	<0.2	<0.2	N/C
Organophosphorous Pesticides								
Azinophos methyl	mg/kg	0.05 (Primary): 0.5 (Interlab)	-	-	-	<0.05	<0.5	N/C
Bromophos-ethyl	mg/kg	0.05	-	-	-			
Carbophenothion	mg/kg	0.05	-	-	-			
Chlorfenvinphos	mg/kg	0.05	-	-	-			
Chlorpyrifos	mg/kg	0.05 (Primary): 0.5 (Interlab)	-	-	-	<0.05	<0.5	N/C
Chlorpyrifos-methyl	mg/kg	0.05	-	-	-			

		SDG	ES1211388	Interlab_D		ES1211388	Interlab_D	
		Field ID	BH01_5.5-5.7	QC02	RPD	BH10_0-0.05	QC09	RPD
		Sampled Date	8/05/2012	8/05/2012		9/05/2012	9/05/2012	
Analyte	**Units**	**LOR**						
Diazinon	mg/kg	0.05 (Primary): 0.5 (Interlab)	-	-	-	<0.05	<0.5	N/C
Dichlorvos	mg/kg	0.05 (Primary): 0.5 (Interlab)	-	-	-	<0.05	<0.5	N/C
Dimethoate	mg/kg	0.05 (Primary): 0.5 (Interlab)	-	-	-	<0.05	<0.5	N/C
Ethion	mg/kg	0.05	-	-	-			
Fenthion	mg/kg	0.05 (Primary): 0.5 (Interlab)	-	-	-	<0.05	<0.5	N/C
Malathion	mg/kg	0.05 (Primary): 0.5 (Interlab)	-	-	-	<0.05	<0.5	N/C
Methyl parathion	mg/kg	0.2 (Primary): 0.5 (Interlab)	-	-	-	<0.2	<0.5	N/C
Monocrotophos	mg/kg	0.2 (Primary): 10 (Interlab)	-	-	-	<0.2	<10.0	N/C
Prothiofos	mg/kg	0.05 (Primary): 0.5 (Interlab)	-	-	-	<0.05	<0.5	N/C
Phenols								
Phenol	mg/kg	0.5	<0.5	<0.5	N/C	<0.5	<0.5	N/C
2,4-dimethylphenol	mg/kg	0.5	<0.5	<0.5	N/C	<0.5	<0.5	N/C
2-methylphenol	mg/kg	0.5	<0.5	<0.5	N/C	<0.5	<0.5	N/C
2-nitrophenol	mg/kg	0.5	<0.5	<0.5	N/C	<0.5	<0.5	N/C
3-&4-methylphenol	mg/kg	1	<1.0	<1.0	N/C	<1.0	<1.0	N/C
4-chloro-3-methylphenol	mg/kg	0.5	<0.5	<0.5	N/C	<0.5	<0.5	N/C
PAH								
Acenaphthene	mg/kg	0.5	<0.5	<0.5	N/C	<0.5	<0.5	N/C
Acenaphthylene	mg/kg	0.5	<0.5	<0.5	N/C	<0.5	<0.5	N/C
Anthracene	mg/kg	0.5	<0.5	<0.5	N/C	<0.5	<0.5	N/C
Benz(a)anthracene	mg/kg	0.5	<0.5	<0.5	N/C	<0.5	<0.5	N/C
Benzo(a) pyrene	mg/kg	0.5	<0.5	<0.5	N/C	<0.5	<0.5	N/C
Benzo(b)fluoranthene	mg/kg	0.5						
Benzo(g,h,i)perylene	mg/kg	0.5	<0.5	<0.5	N/C	<0.5	<0.5	N/C
Benzo(k)fluoranthene	mg/kg	0.5						
Chrysene	mg/kg	0.5	<0.5	<0.5	N/C	<0.5	<0.5	N/C
Dibenz(a,h)anthracene	mg/kg	0.5	<0.5	<0.5	N/C	<0.5	<0.5	N/C
Fluoranthene	mg/kg	0.5	<0.5	<0.5	N/C	<0.5	<0.5	N/C
Fluorene	mg/kg	0.5	<0.5	<0.5	N/C	<0.5	<0.5	N/C
Indeno(1,2,3-c,d)pyrene	mg/kg	0.5	<0.5	<0.5	N/C	<0.5	<0.5	N/C
Naphthalene	mg/kg	1 (Primary): 0.5 (Interlab)	<1.0	<0.5	N/C	<1.0	<0.5	N/C
Naphthalene	mg/kg	0.5	<0.5	<0.5	N/C	<0.5	<0.5	N/C
Phenanthrene	mg/kg	0.5	<0.5	<0.5	N/C	<0.5	<0.5	N/C
Pyrene	mg/kg	0.5	<0.5	<0.5	N/C	<0.5	<0.5	N/C
PAHs (Sum of total)	mg/kg	0.5 (Primary): 1 (Interlab)	<0.5	<1.0	N/C	<0.5	<1.0	N/C
Pesticides								
Demeton-S-methyl	mg/kg	0.05	-	-	-			
Fenamiphos	mg/kg	0.05	-	-	-			
Parathion	mg/kg	0.2 (Primary): 0.5 (Interlab)	-	-	-	<0.2	<0.5	N/C
Pirimphos-ethyl	mg/kg	0.05	-	-	-			
TPH								
TPH C6 - C9	mg/kg	10	<10.0	<10.0	N/C	<10.0	<10.0	N/C
TPH C10 - C14	mg/kg	50	<50.0	<50.0	N/C	<50.0	<50.0	N/C
TPH C15 - C28	mg/kg	100	<100.0	<100.0	N/C	<100.0	<100.0	N/C
TPH C29-C36	mg/kg	100	<100.0	<100.0	N/C	<100.0	<100.0	N/C
TPH+C10 - C36 (Sum of total)	mg/kg	50 (Primary): 100 (Interlab)	<50.0	<100.0	N/C	<50.0	<100.0	N/C

Notes
Bold = RPD >50%
LOR = Limit of Reporting
- = not analysed
mg/L = milligrams per kilogram
N/C = Not calculated due to results below the LOR

Data Entry: JD
Data Review: LS
AECOM

		Field ID	RINSATE 01	RINSATE 02	TRIP BLANK	TRIP SPIKE	TSC	RPD
		Sampled Date	8/05/2012	9/05/2012	9/05/2012	9/05/2012	9/05/2012	
Analyte	**Units**	**LOR**						
BTEX								
Benzene	µg/L (µg/kg Soils)	1	<1	<1	<200	0.2	0.3	40.00
Ethylbenzene	µg/L (µg/kg Soils)	2	<2	<2	<500	1.2	1.1	8.70
Toluene	µg/L (µg/kg Soils)	2	<2	<2	<500	12.3	11.7	5.00
Xylene (m & p)	µg/L (µg/kg Soils)	2	<2	<2	<500	6.7	6.2	7.75
Xylene (o)	µg/L (µg/kg Soils)	2	<2	<2	<500	2.9	2.2	27.45
Xylene Total	µg/L (µg/kg Soils)	2	<2	<2	<500	9.6	8.4	13.33
Sum of BTEX	mg/L (mg/kg Soils)	0.001	<0.001	<0.001	<200	23.3	21.5	8.04
Halogenated Benzenes								
Hexachlorobenzene	µg/L	0.5	<0.5	<0.5	-	-	-	-
Halogenated Phenols								
2,4,5-trichlorophenol	µg/L	1	<1	<1	-	-	-	-
2,4,6-trichlorophenol	µg/L	1	<1	<1	-	-	-	-
2,4-dichlorophenol	µg/L	1	<1	<1	-	-	-	-
2,6-dichlorophenol	µg/L	1	<1	<1	-	-	-	-
2-chlorophenol	µg/L	1	<1	<1	-	-	-	-
Pentachlorophenol	µg/L	2	<2	<2	-	-	-	-
Metals								
Arsenic	mg/L	0.001	<0.001	<0.001	-	-	-	-
Cadmium	mg/L	0.0001	<0.0001	<0.0001	-	-	-	-
Chromium (III+VI)	mg/L	0.001	<0.001	<0.001	-	-	-	-
Copper	mg/L	0.001	<0.001	<0.001	-	-	-	-
Lead	mg/L	0.001	<0.001	<0.001	-	-	-	-
Mercury	mg/L	0.0001	<0.0001	<0.0001	-	-	-	-
Nickel	mg/L	0.001	<0.001	<0.001	-	-	-	-
Zinc	mg/L	0.005	<0.005	<0.005	-	-	-	-
Organochlorine Pesticides								
4,4-DDE	µg/L	0.5	<0.5	<0.5	-	-	-	-
a-BHC	µg/L	0.5	<0.5	<0.5	-	-	-	-
Aldrin	µg/L	0.5	<0.5	<0.5	-	-	-	-
b-BHC	µg/L	0.5	<0.5	<0.5	-	-	-	-
Chlordane (cis)	µg/L	0.5	<0.5	<0.5	-	-	-	-
Chlordane (trans)	µg/L	0.5	<0.5	<0.5	-	-	-	-
d-BHC	µg/L	0.5	<0.5	<0.5	-	-	-	-
DDD	µg/L	0.5	<0.5	<0.5	-	-	-	-
DDT	µg/L	2	<2	<2	-	-	-	-
Dieldrin	µg/L	0.5	<0.5	<0.5	-	-	-	-
Endosulfan I	µg/L	0.5	<0.5	<0.5	-	-	-	-
Endosulfan II	µg/L	0.5	<0.5	<0.5	-	-	-	-
Endosulfan sulphate	µg/L	0.5	<0.5	<0.5	-	-	-	-
Endrin	µg/L	0.5	<0.5	<0.5	-	-	-	-
Endrin aldehyde	µg/L	0.5	<0.5	<0.5	-	-	-	-
Endrin ketone	µg/L	0.5	<0.5	<0.5	-	-	-	-
g-BHC (Lindane)	µg/L	0.5	<0.5	<0.5	-	-	-	-
Heptachlor	µg/L	0.5	<0.5	<0.5	-	-	-	-
Heptachlor epoxide	µg/L	0.5	<0.5	<0.5	-	-	-	-
Methoxychlor	µg/L	2	<2	<2	-	-	-	-
Organophosphorous Pesticides								
Azinophos methyl	µg/L	0.5	<0.5	<0.5	-	-	-	-
Bromophos-ethyl	µg/L	0.5	<0.5	<0.5	-	-	-	-
Carbophenothion	µg/L	0.5	<0.5	<0.5	-	-	-	-
Chlorfenvinphos	µg/L	0.5	<0.5	<0.5	-	-	-	-
Chlorpyrifos	µg/L	0.5	<0.5	<0.5	-	-	-	-
Chlorpyrifos-methyl	mg/L	0.0005	<0.0005	<0.0005	-	-	-	-
Diazinon	µg/L	0.5	<0.5	<0.5	-	-	-	-
Dichlorvos	µg/L	0.5	<0.5	<0.5	-	-	-	-
Dimethoate	µg/L	0.5	<0.5	<0.5	-	-	-	-
Ethion	µg/L	0.5	<0.5	<0.5	-	-	-	-
Fenthion	µg/L	0.5	<0.5	<0.5	-	-	-	-
Malathion	µg/L	0.5	<0.5	<0.5	-	-	-	-
Methyl parathion	µg/L	2	<2	<2	-	-	-	-
Monocrotophos	µg/L	2	<2	<2	-	-	-	-
Prothiofos	µg/L	0.5	<0.5	<0.5	-	-	-	-
PAH/Phenols								
2,4-dimethylphenol	µg/L	1	<1	<1	-	-	-	-
2-methylphenol	µg/L	1	<1	<1	-	-	-	-
2-nitrophenol	µg/L	1	<1	<1	-	-	-	-
3-&4-methylphenol	µg/L	2	<2	<2	-	-	-	-
4-chloro-3-methylphenol	µg/L	1	<1	<1	-	-	-	-
Acenaphthene	µg/L	1	<1	<1	-	-	-	-
Acenaphthylene	µg/L	1	<1	<1	-	-	-	-
Anthracene	µg/L	1	<1	<1	-	-	-	-
Benz(a)anthracene	µg/L	1	<1	<1	-	-	-	-
Benzo(a) pyrene	µg/L	0.5	<0.5	<0.5	-	-	-	-
Benzo(b)fluoranthene	µg/L	1	<1	<1	-	-	-	-
Benzo(g,h,i)perylene	µg/L	1	<1	<1	-	-	-	-
Benzo(k)fluoranthene	µg/L	1	<1	<1	-	-	-	-
Chrysene	µg/L	1	<1	<1	-	-	-	-
Dibenz(a,h)anthracene	µg/L	1	<1	<1	-	-	-	-
Fluoranthene	µg/L	1	<1	<1	-	-	-	-
Fluorene	µg/L	1	<1	<1	-	-	-	-
Indeno(1,2,3-c,d)pyrene	µg/L	1	<1	<1	-	-	-	-
Naphthalene	µg/L (µg/kg Soils)	1	<1	<1	<1000	<1000	<1000	NC
PAHs (Sum of total)	µg/L	0.5	<0.5	<0.5	-	-	-	-
Phenanthrene	µg/L	1	<1	<1	-	-	-	-
Phenol	µg/L	1	<1	<1	-	-	-	-
Pyrene	µg/L	1	<1	<1	-	-	-	-
Pesticides								
Demeton-S-methyl	µg/L	0.5	<0.5	<0.5	-	-	-	-
Fenamiphos	µg/L	0.5	<0.5	<0.5	-	-	-	-
Parathion	µg/L	2	<2	<2	-	-	-	-
Pirimphos-ethyl	µg/L	0.5	<0.5	<0.5	-	-	-	-

		Field ID	RINSATE 01	RINSATE 02	TRIP BLANK	TRIP SPIKE	TSC	RPD
		Sampled Date	8/05/2012	9/05/2012	9/05/2012	9/05/2012	9/05/2012	
Analyte	**Units**	**LOR**						
TPH								
TPH C6 - C9	µg/L (µg/kg Soils)	20	<20	<20	<10000	41	40	2.47
TPH C10 - C14	µg/L	50	<50	<50	-	-	-	-
TPH C15 - C28	µg/L	100	<100	<100	-	-	-	-
TPH C29-C36	µg/L	50	<50	<50	-	-	-	-
TPH+C10 - C36 (Sum of total)	µg/L	50	<50	<50	-	-	-	-

Notes
LOR = Limit of Reporting
- = not analysed
µg/L = micrograms per litre
µg/kg = micrograms per kilogram
mg/L = milligrams per litre
NC = not calculated
TCS = Trip Spike Control

Appendix C

Borelogs

Appendix C Borelogs

AECOM Australia Pty Ltd
17 Warabrook Boulevarde,
Warabrook, NSW 2304

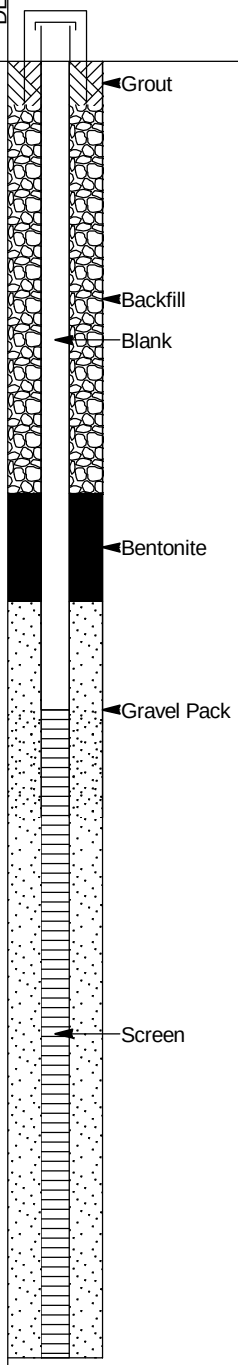
IT I W W

CT	60266102	AT	8 May 12
CT A	Huntlee Phase 2 ESA	A	3.42
CATI	North Rothbury	SC	3
I I T	Solid-Stem Auger	A AC	3.5
SA I T	SPT	SA ITA S A T IT	0.5
W A T C	6 m BGS	WAT ATI	m BGS
	J. Deacon		

C TS Borehole terminated, target depth reached. Refusal on suspected sandstone.

PID (ppm)	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGS)	GRAPHIC LOG	USCS CLASS	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
0		BH01_0-0.1	✳	0		TOPSOIL	SANDY CLAY, Soft, Dry, Low Plasticity, Brown, Rootlets, NOC	0.10
				0.2		CLS		
0		BH01_0.4-0.5		0.4			SANDY CLAY, Stiff, Dry, Low Plasticity, Orange, Rootlets, NOC	
				0.6				
				0.8				
				1.0				
0.1		BH01_1.2-1.3		1.2		CLS	SANDY CLAY (Weathered Sandstone), Very Stiff, Dry, Low Plasticity, Orange, NOC	1.20
				1.4				
				1.6				
				1.8				
				2.0				
0		BH01_2.1-2.3		2.2				
				2.4				
				2.6				
				2.8				
0		BH01_3.0-3.1		3.0				
				3.2				
				3.4				
				3.6				
				3.8				
				4.0				
				4.2				
0		BH01_4.4-4.5		4.4				
				4.6				
				4.8				
				5.0				
				5.2				
				5.4				
0		BH01_5.5-5.7	✳	5.6				
				5.8				
				6.0			Total Depth: 6.00 m	6.00

WELL DIAGRAM



60266102 _BORELOGS.GPJ 15/6/12

AECOM Australia Pty Ltd
17 Warabrook Boulevarde,
Warabrook, NSW 2304

CT 60266102 **AT** 8 May 12
CT A Huntlee Phase 2 ESA
CATI North Rothbury
I I T Solid-Stem Auger
SA I T SPT

J. Deacon
C TS Refusal of SPT at 1.7 m on weathered sandstone. Refusal of Auger at 6 m on suspected sandstone.

PID (ppm)	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGS)	GRAPHIC LOG	USCS CLASS	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
0		BH02_0-0.1		0.2		FILL	SANDY GRAVEL, Medium Dense, Dry, Light Orange, NOC	0.20
						FILL	GRAVELLY SANDY CLAY, Loose, Slightly Moist, Brown, Gravels to 20 mm, NOC	
0		BH02_0.4-0.5	*	0.4		CL	CLAY, Very Stiff, Dry, Low Plasticity, Grey and Orange Mottles, NOC	0.50
0		BH02_0.9-1.0		1.0				
0		BH02_1.6-1.7		1.6		CLS	SANDY CLAY (Weathered Sandstone), Very Stiff, Dry, Low Plasticity, Orange, NOC	1.70
0		BH02_2.6-2.7	*	2.6				
0		BH02_3.5-3.6		3.6				
0		BH02_4.5-4.6		4.6				
0		BH02_5.8-5.9		5.8				
				6.0			Total Depth: 6.00 m	6.00

60266102 _BORELOGS.GPJ 15/6/12

AECOM Australia Pty Ltd
17 Warabrook Boulevarde,
Warabrook, NSW 2304

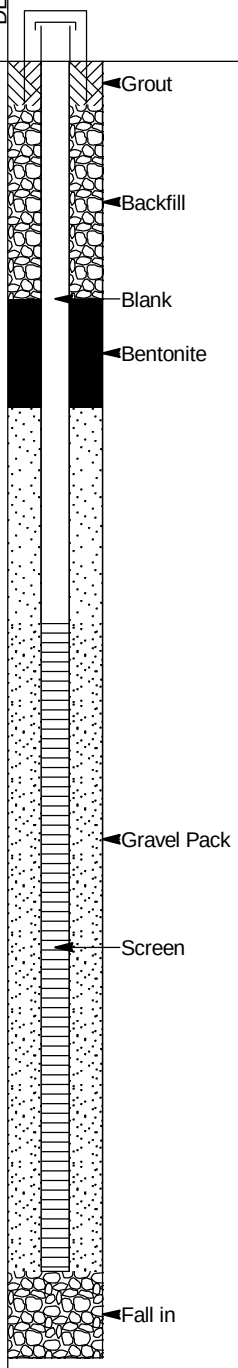
IT I W W

CT	60266102	AT	8 May 12
CT A	Huntlee Phase 2 ESA	A	2.8
CATI	North Rothbury	SC	3
I I T	Solid-Stem Auger	A AC	4
SA I T	SPT	SA ITA S A T IT	0.5
W A T C	5.6 m BGS	WAT ATI	m BGS
	J. Deacon		

C TS Refusal at 6 m on suspected sandstone.

PID (ppm)	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGS)	GRAPHIC LOG	USCS CLASS	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
0.3		BH03_0.02-0.12	✳	0		CLS	SANDY CLAY, Stiff, Slightly Moist, Low Plasticity, Black, Staining, Slight HC Odour, Rootlets	0.02
				0.2		CLS		
0.3		BH03_0.4-0.5		0.4			SANDY CLAY, Stiff, Slightly Moist, Low Plasticity, Brown, Slight HC Odour, Rootlets	
				0.6				0.70
0		BH03_0.8-0.9	✳	0.8		CLS	SANDY CLAY (Weathered Sandstone), Very Stiff, Dry, Low Plasticity, Orange, NOC	
				1.0				
				1.2		CLS	Becomes stiffer	1.20
				1.4				
				1.6				
				1.8				
				2.0				
0		BH03_2.1-2.2	✳	2.2				
				2.4				
				2.6				
				2.8				
0		BH03_2.9-3.0		3.0				
				3.2				
				3.4				
				3.6				
				3.8				
				4.0				
0		BH03_4.1-4.3	✳	4.2				
				4.4				
				4.6				
				4.8				
0		BH03_5.0-5.1		5.0				
				5.2				
				5.4				
				5.6				
				5.8				
0		BH03_5.9-6.0		6.0				6.00
							Total Depth: 6.00 m	

WELL DIAGRAM



60266102_BORELOGS.GPJ 15/6/12

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IT I W W

CT	60266102	AT	8 May 12
CT A	Huntlee Phase 2 ESA	A	1.01
CATI	North Rothbury	SC	3
I I T	Solid-Stem Auger	A AC	3
SA I T	SPT	SA ITA S A T IT	0.5
W A T C	3.6 m BGS	WAT ATI	m BGS
	J. Deacon		

C TS Refusal of SPT at 2.4 m on weathered sandstone. Refusal of Auger at 4 m on suspected sandstone

PID (ppm)	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGS)	GRAPHIC LOG	USCS CLASS	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
0		BH04_0-0.1	✳	0.2		FILL	CLAYEY SANDY GRAVEL, Medium Dense, Slighly Moist, Low Plasticity, Brown, Gravels to 6mm, NOC	
0.1	☒	BH04_0.4-0.5		0.4		CLG	GRAVELLY CLAY, Soft, Sligtly Moist, Low Plasticity, Orange and Grey, NOC, Gravels to 15mm	0.40
				0.6		CLG	Becomes very moist	0.80
0.2	■	BH04_0.9-1.0		0.8				
				1.0		CLG	Becomes less moist	1.10
				1.2				
				1.4				
				1.6				
0	■	BH04_1.8-2.0		1.8				
				2.0				
				2.2				
				2.4		CLS	SANDY CLAY (Weathered Sandstone), Very Stiff, Dry, Low Plasticity, Orange, NOC	2.40
				2.6				
				2.8				
0	☒	BH04_2.9-3.0	✳	3.0				
				3.2				
				3.4				
				3.6				
				3.8				
0	☒	BH04_3.9-4.0		4.0			Total Depth: 4.00 m	4.00

WELL DIAGRAM: Grout, Blank, Bentonite, Screen, Gravel Pack, Fall in

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CT 60266102 **AT** 9 May 12
CT A Huntlee Phase 2 ESA
CATI North Rothbury
I I T Solid-Stem Auger
SA I T SPT

J. Deacon
C TS Borehole terminated, target depth reached.

PID (ppm)	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGS)	GRAPHIC LOG	USCS CLASS	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
0		BH05_0-0.05	✳			TOPSOIL	TOPSOIL, Slightly Moist, Brown, NOC	0.05
0	☒	BH05_0.05-0.15		0.2		FILL	CLAYEY GRAVEL, Medium Dense, Slightly Moist, Grey, Gravels to 3 mm	0.20
						CLS	SANDY CLAY, Stiff, Slightly Moist, Low Plasticity, Orange and Grey Mottles, NOC	
0	☒	BH05_0.4-0.5		0.4				
				0.6				
				0.8				
0	☒	BH05_1.0-1.1		1.0				
				1.2				1.30
				1.4		CLS	Becomes stiffer	
				1.6				
				1.8				
				2.0				
0	☒	BH05_2.1-2.2	✳	2.2				2.20
							Total Depth: 2.20 m	

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CATI North Rothbury

I I T Solid-Stem Auger

SA I T SPT

J. Deacon

C TS Borehole terminated, target depth reached.

PID (ppm)	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGS)	GRAPHIC LOG	USCS CLASS	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
0		BH06_0-0.05	✳	0		TOPSOIL	TOPSOIL, Soft, Slightly Moist, Brown and Black, Charcoal, Staining, No Odour	0.05
				0.2		CLS	SANDY CLAY, Stiff, Slightly Moist, Low Plasticity, Orange and Grey Mottles, NOC	
0		BH06_0.4-0.5		0.4				
				0.6				
				0.8				
0		BH06_0.9-1.0		1.0				
				1.2				
				1.4				
				1.6				
				1.8				
0		BH06_1.9-2.0	✳	2.0			Total Depth: 2.00 m	2.00

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CATI North Rothbury
I I T Solid-Stem Auger
SA I T SPT

J. Deacon
C TS Borehole terminated, target depth reached.

PID (ppm)	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGS)	GRAPHIC LOG	USCS CLASS	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
0.1		BH07_0.05-0.15	✳	0		TOPSOIL	TOPSOIL, Stiff, Dry, Brown, Rootlets, NOC	0.15
				0.2		CLS	SANDY CLAY, Stiff, Slightly Moist, Low Plasticity, Orange and Grey Mottles, NOC	
0.2		BH07_0.4-0.5	✳	0.4				
				0.6				0.70
				0.8		CLS	Becomes orange and grey	
0		BH07_0.9-1.0		1.0				
				1.2				1.30
				1.4		CLS	Becomes less orange	
				1.6				
				1.8				
0		BH07_1.9-2.0	✳	2.0				2.00
							Total Depth: 2.00 m	

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CT A Huntlee Phase 2 ESA

CATI North Rothbury

I I T Solid-Stem Auger

SA I T SPT

J. Deacon

C TS Borehole terminated, target depth reached.

PID (ppm)	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGS)	GRAPHIC LOG	USCS CLASS	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
0.1		BH08_0-0.05	✳	0.2		TOPSOIL	TOPSOIL, Loose, Dry, Brown, Some building waste, NOC	
								0.30
0.2	☒	BH08_0.4-0.5	✳	0.4		CLS	SANDY CLAY, Stiff to Very Stiff, Slightly Moist, Low Plasticity, Orange and Grey, NOC	
				0.6				
				0.8				
0.1	☒	BH08_0.9-1.0		1.0				
				1.2				
				1.4				
				1.6				
				1.8				
0.1	☒	BH08_1.9-2.0	✳	2.0			Total Depth: 2.00 m	2.00

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CT A Huntlee Phase 2 ESA

CATI North Rothbury

I I T Solid-Stem Auger

SA I T SPT

J. Deacon

C TS Borehole terminated, target depth reached.

PID (ppm)	RECOVERY	SAMPLE NUMBER	ANALYSED	DEPTH (m BGS)	GRAPHIC LOG	USCS CLASS	LITHOLOGIC DESCRIPTION	CONTACT DEPTH
0.1		BH09_0-0.05	✳	0.2		FILL	SAND, Loose, Dry, Light Brown, Rootlets, NOC	
								0.30
0.2		BH09_0.4-0.5		0.4		CLS	SANDY CLAY, Very Stiff, Dry to Slightly Moist, Low Plasticity, Orange and Grey Mottles, Rootlets, NOC	
				0.6				
				0.8				
0.1		BH09_0.9-1.0		1.0				
				1.2				
				1.4				
				1.6				
				1.8				
0.2		BH09_1.9-2.0	✳	2.0				2.00
							Total Depth: 2.00 m	

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